Declines and Regains in Income Status and Health Status Among Mid- and Later-life Canadians

by

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A thesis submitted in conformity with the requirements for the degree of Doctor of Philosophy
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Abstract

As Canada’s population ages, understanding the associated economic and social issues that may emerge becomes critical. This study’s purpose was to investigate sociodemographic and health behaviour factors that influence income and/or health changes among Canadians in mid- and later-life. To examine these factors, logistic regression analyses were undertaken using a representative sample (n = 2,368) of Canadians, ages 40 to 59 from seven cycles (1994-1995 to 2006-2007) of longitudinal data from the National Population Health Survey.

This study examined whether, for this age group, income decline was a stronger determinant of health decline (social causation) than vice versa (reverse causation). Of 382 respondents who experienced both an income and health decline, 230 experienced an income before a health decline. Several logistic regression findings supported social causation and only one supported reverse causation.

Also explored by this study was the comparative influence of sociodemographic versus health behaviour factors on changes in income and health. Compared to sociodemographic factors, health behaviour factors had less influence on changes in income and health. The physical inactivity and obesity variables were infrequently statistically significant predictors of income
and health changes. The drinking habits variable was frequently a statistically significant
 predictor of changes in income and health. A history of smoking was very frequently a
 statistically significant predictor--of health declines only, both income and health declines, and
 income declines before health declines.

The factors associated with

- two-fold declines (income and health) were higher income, good or very good (vs.
  excellent) health, being older, not having graduated from high school, and a history of
  smoking;
- income regains were lower income, being male, younger, married, and a high school
  graduate; and
- health regains were higher income, being neither a high school graduate nor an
  immigrant, never having smoked, and being a moderate or nondrinker.

A better understanding of the patterns and predictors of income and health declines and regains
among mid- and later-life Canadians may serve to identify opportunities to improve the future
welfare of the elderly.
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1.1 Outline of Research Study

Because individuals’ health status declines as they age and because Canada’s population is aging, the issues discussed in this thesis will be of concern to a high proportion of the Canadian population. Furthermore, managing deterioration in the population’s health status and avoiding declines in the population’s income status will be important public policy issues. For this reason, studying these issues is important and studying them now is important.

This study examines whether income status decline is a stronger determinant of health status decline than health status decline is of income status decline for mid- and later-life Canadians. It also assesses which sociodemographic factors and health behaviours are associated with changes in income status and health status among these same Canadians. Specifically, the study’s aim is to discover the characteristics of those who experience an income status decline or health status decline, with or without a regain. One aspect of this is the extent to which health at the outset predicts income status decline compared to other factors. Similarly, to what extent does total household income at the outset predict health status decline compared with these same factors?

To begin, it is important to note several sociodemographic characteristics of the target population of this thesis. In a report on current demographic trends, Kerr and Michalski (2005) sociologists at the University of Western Ontario pointed out that the elderly have life histories, employment experiences, family constellations, and financial situations that are more diverse than those of younger people. They note that it makes sense that older people constitute a more heterogeneous group than young people do because they have many more years of life experience. For example, some older people are much wealthier than are others. Wealthier seniors enjoy secure investments, private pension plans, and Canada Pension Plan (CPP) or Quebec Pension Plan (QPP), while other seniors may rely almost completely upon government transfers in later life. Another case in point is that older Canadian women are more likely than are men to live on their own--most women over 65 years of age are single, and this trend increases as women age. These living arrangements are partly because women are more likely than men are to be widowed. If a couple divorces, men are more likely than women to remarry (Beaupré, 2008; Eichler & Pedersen, 2012). On average, women live five years longer than men do and marry men who are older than they are. Men, in contrast, are more likely than are women to remarry if their spouse
dies. Older people who live alone do not have the option of pooling government pensions and supplements. Older women are also more likely than are older men to experience poverty because they do not have substantial assets, a private pension and/or CPP/QPP. These factors have implications for older women’s financial security.

Although the likelihood of poor health increases with age, female as well as male older adults often report enjoying good health, despite the fact that they live with one or more chronic health conditions. Unfortunately, most Canadian studies that examine chronic conditions do not measure the severity of chronic conditions, even though severity is a better indicator of the degree of dependency than is the simple existence of a chronic condition (Statistics Canada, 2006f). The Canadian Community Health Survey (CCHS); however, does measure activity limitation. The estimates for 2005 (Cycle 3.1) are that 32.9% of Canadian women 40 years of age or older and 30.5% of Canadian men 40 years of age or older either “sometimes” or “often” have “difficulty hearing, seeing, communicating, walking, climbing stairs, bending, learning or doing any similar activities” (Statistics Canada, 2006a, p. 55). As people age, they require more health care, medications, and sometimes institutionalization. This, in turn, means the individual must bear some of the consequent financial burden. The interplay of these factors has and likely will continue to have a deleterious influence on the welfare of many older Canadians.

Auspiciously, much of the research on Canadian men and women in their later years has focused on financial security, health and chronic conditions vis-à-vis aging, gender and marital status. Research in recent years has made it clear that these topics are intertwined. However, surveys have focused on gathering data on, for example, either income status or health status independently (Crystal, 2006). Surveys that incorporate a wider range of topics, and therefore are more comprehensive, facilitate research that is particularly germane to the issues facing Canadians in their later years.

1.2 Context of Problem

The following section summarizes important contextual information that is specifically relevant to researching this study’s cohort, that is, mid- and later-life Canadians. First, information is provided on the age and aging of Canadians. Next, information on the income status of Canadians, including older Canadians, is presented as well as information on the most financially vulnerable Canadians. Also provided is information about the health status of Canadians as a
whole, and about older Canadians’ health status specifically. Finally, information about chronic health conditions among Canadians is discussed further.

1.2.1 Age and aging

Older adults now represent a larger proportion of the population than ever before. Worldwide, in 2008, the proportion of people aged 65 and over was estimated at 7% (Kinsella & He, 2009). By 2010, the proportion worldwide was estimated at 8%. It is projected that by 2050, it will be 16% worldwide (World Health Organization, 2011). In 2006, older adults aged 65 and over comprised 13.7% of Canada’s population (4.3 million; Statistics Canada, 2007b) while in 2012, those 65 and older accounted for 14.9% of the population or 5.2 million (Statistics Canada, 2012b). The burgeoning of the ranks of older people began in 2011 when the first baby boomer turned 65 (Ramage-Morin, Shields, & Martel, 2010). Approximately one quarter of Canada’s population will be age 65 by the sixth decade of this century (Statistics Canada, 2010d), a proportion that was only 8% fifty years ago (Ramage-Morin et al., 2010).

During the past decades, older adults’ life expectancies have risen; the numbers of years that they live beyond age 65 is increasing. In Canada, the life expectancy at birth is age 78.5 for men and age 83.1 for women, and the life expectancy at age 65 is age 83.3 for men and age 86.5 for women (Statistics Canada, 2011e). This trend and decreasing fertility rates mean that, over time, older adults are becoming a larger proportion of the population (M. S. Kaplan et al., 2008; McMunn, Breeze, Goodman, Nazroo, & Oldfield, 2006). In descending order, the fastest growing groups of Canadians are those aged 60 to 64, those aged 100 and older, and those aged 85 to 89 (Statistics Canada, 2011d). By 2041, those aged 85 and older will be 4% of Canada’s population (Public Health Agency of Canada, 2002). Moreover, the majority of the growing oldest-old population will be women. In 2010, more than half of Canada’s aging population were women (56%), and 63% of those 80 years or older were women (Milan & Vézina, 2011). Older senior women are currently ranked among the poorest of the groups over age sixty-five (Plouffe, 2003). Although women tend to live longer than do men, the life expectancy of men is catching up to that of women (Statistics Canada, 2010d).

These trends have economic and social implications for the utilization of resources, in particular, health care resources (Statistics Canada, 2010c; United Nations, 2001).
1.2.2 Financial vulnerability among Canadians

Canada’s proverbial success story is that there have been declines in older people’s low-income rates (Picot & Myles, 2005); the incomes of older Canadians have improved dramatically since the 1970s (Human Resources and Skills Development Canada, 2013). Historically, older Canadians, compared to younger Canadians, were much more likely to have low incomes (Kerr & Michalski, 2005). In the 1960s, over two fifths of seniors’ households were considered low income (Podoluk, 1968). Senior Canadians were twice as likely as were children to be poor (Kerr & Michalski, 2005). During the past few decades, the low-income rate for all people 65 years of age and older dropped dramatically in Canada (Canada, 2008; Canadian Association of Social Workers, 2007; Statistics Canada, 2003a). A recent report by Human Resources and Skills Development Canada (2013) indicated that, between 1976 and 2010, seniors’ after-tax low-income rates declined from 29.0% to 5.3%. Seniors experienced a decline in rates of low income that was more remarkable than the decline for any other age group in Canada (Picot & Myles, 2005). In fact, seniors’ low-income rates declined to the point that their rates became lower than the low-income rates of any other group.

The findings of the 30-nation Luxembourg Income Study (LIS), which covered 1967 to 2001, indicated that no other country reduced the rate of older people’s poverty to the extent that Canada has (Smeeding & Sandstrom, 2005). However, the LIS confirmed that, older Canadian women, as compared to all Canadians (men and women), were generally more likely to have incomes that were less than 50% of adjusted national median disposable incomes.

Canada’s pension system ensures that fewer and fewer elderly Canadians are poor (Smeeding & Sandstrom, 2005). This system includes the Old Age Security (OAS) pension (Service Canada, 2012). At age 65, Canadians who have lived in Canada a minimum of 10 years are eligible for OAS. Low-income seniors may be eligible for an additional monthly benefit, that is, the Guaranteed Income Supplement (GIS). As well, GIS recipients’ common-law partners or spouses aged 60 to 64 may be entitled to an additional allowance. In addition, widowed Canadians between ages 60 and 64 who meet the eligibility requirements for OAS may also receive a survivor’s allowance. Finally, some individual provinces provide their pensioners with an additional income supplement. Ontario’s Guaranteed Annual Income System (GAINS) is an example of this type of income supplement.
In Canada, one’s income is categorized as low by Statistics Canada if it is below a certain point, that is, the Low-Income Cut-Off (LICO; Statistics Canada, 2008f). Every year, Statistics Canada estimates, while adjusting for changes in the Consumer Price Index, whether a family’s expenditures in a given geographic locale place its income below the LICO. Although the LICO is not an official poverty line (in Canada, there is no official definition of poverty and therefore no official measure of poverty), the LICO is estimated from the average proportion of income spent by a Canadian family on basic needs such as food, clothing, and shelter (Statistics Canada, 2003b, 2006g). Family units that spend 20% more of their income on basic needs than the average for Canadian family units are considered poor. LICO in Ontario for single employable person is $19,774 (Tweddle, Battle, & Torjman, 2014).

In Canada, except for families headed by seniors, most family income is market income. In 2008, families whose major income earner was a senior had a median market income of $25,500; on the other hand, the median market income for all other families amounted to $72,500 (Statistics Canada, 2008c). Families headed by a senior received a median of $24,100 from government transfers, whereas for families not headed by a senior, the median government transfer was $2,900. It is therefore evident that government transfers, usually in the form of public pensions, augment the incomes of seniors. OAS and GIS are major sources of income among seniors who are poor; these subsidies make up 90 percent of their total income (Government of Canada, 2006a). In Ontario, the annual income (unadjusted for rural and urban locales) of an unattached senior who depends solely on OAS, GIS, and GAINS is $16,589 (Ontario Ministry of Finance, 2014).

In 2008, the top one fifth of Canadian families had, on average, 5.4 times the after-tax income of those in the bottom one fifth. Using the after-tax LICO as a measure, more than 3 million Canadians (9.4%) had low incomes (Statistics Canada, 2008c). Although the low-income rates for all seniors decreased during the past few decades, poverty remains the reality for some seniors (Canada, 2008; French et al., 2000; Government of Canada, 2004b, 2006a, 2006b; Public Health Agency of Canada, 2001; Scott & Lessard, 2002; Statistics Canada, 2009d; Townson, 2000). Compared to the 9.4% of all Canadians whose after-tax income was below the LICO, there were 15.6% of unattached senior Canadians whose incomes were below the LICO (Statistics Canada, 2010b).
It is apparent that, despite Canada’s so-called success story in terms of poverty reduction among seniors, certain seniors are among those Canadians who are likely to have incomes below the LICO. Figures that depict men’s and women’s incomes separately, tell a more complete story: Figure 1-1 demonstrates the trends in the LICO rates (before-tax) among Canadian women between 1980 and 2004. The low-income rates for unattached female seniors obviously dropped; however, as can be seen in Figure 1-1 low-income rates in 2004 for unattached female seniors were still comparable to those of female lone parents and of unattached females under 65 years of age. In addition, the before-tax low-income rates for unattached female seniors were beginning to decline more slowly than they had in the previous decade.


In comparison, Figure 1-2 demonstrates the change in the LICO rates (before-tax) among Canadian men between 1980 and 2004. The low-income rates for men overall remained stable, but low-income rates for men remained lower than the rates for women. Similar to the considerable drop in the low-income rates for unattached female seniors, there was a considerable drop in the low-income rates for unattached male seniors. As depicted in Figure 1-2, low-income rates in 2004 for unattached male seniors were close to those of unattached men under 65 years of age, but higher than those of male lone parents. Finally, as was the case for unattached female seniors, the before-tax low-income rates for unattached male seniors were beginning to decline more slowly than they did in the previous decade.
Moreover, as depicted in Figure 1-3 the “gap between women and men . . . [is] greater for persons 65 and older than it is for younger adults” (Government of Canada, 2006a, p. 4) with the gap increasing progressively in each of the older age groups. The greatest gap in poverty rates between women and men is among those persons 85 and older.

As demonstrated in Figure 1-4 which compares the trends in the before-tax LICO rates of unattached senior Canadian men and women between 1980 and 2004, the rates for men and women differed, with women’s rates being higher at baseline. For both, for the period between 1988 and 1998, there was a decline in the LICO rates, with differentiated effects for men and women. Nevertheless, over time the difference narrowed marginally (Government of Canada, 2006b). Being alone is associated with low-income rates for both senior Canadian men and senior Canadian women (Statistics Canada, 2005a). The absence of a spouse is a major predictor of low income for older Canadian men and women, and many older Canadian women, in particular, are without a spouse. Almost 1.2 million of Canada’s 4.6 million seniors were unattached, and almost three quarters (72.0%) of unattached seniors were women (Statistics Canada, 2008b). In 2008, their low-income rate was higher than was the low-income rate of unattached senior men (17% vs. 12%; Milan & Vézina, 2011). In 2009, there were approximately 46,000 unattached senior men and 140,000 unattached senior women who were among the poor in Canada based on their after-tax income. Based on their before tax-income, in the same year, there were 99,000 unattached men and 311,000 unattached women 65 years of age and over (Statistics Canada, 2010a).

1.2.2.1 The persistence of low income among women

To understand the situation of older women who are poor today, it is necessary to look at their financial situations prior to their later years. As early as the 1980s, sociologist McDaniel (1986) pointed out that the assumption that women are poor when they are old because they are old may be fallacious. She suggested that the women who are poor when they are old have been poor for much of their lives. Indeed, two decades later, the Government of Canada (2006a) supported the view that poverty in an individual’s younger years likely reinforces the risk of poverty in later life. In Canada, in 2010, on average, for every dollar earned by a man who works full-time year-round, a woman who works full-time year-round earns 73.6 cents (Statistics Canada, 2012c). Based on the 2006 Canadian census (reporting 2005 data), women were more likely than were men to earn less than $20,000 annually. Women have lower incomes than do men (Statistics Canada, 2011h). What is more, approximately 11% or 1,772,000 Canadian women had incomes that were considered low (Statistics Canada, 2006b).

McDaniel (1986) attributed men and women’s differing economic security in old age to systemic factors such as women’s place in the social hierarchy, and to women’s increased rates of never marrying, separation, and divorce. For example, in 2005, in Canada, 32.0% of unattached women under age 65 had low incomes, as compared to 7.9% of women who were attached (Canadian Association of Social Workers, 2009). In 2005, the number of unattached Canadian women under age 65 who lived in poverty was approximately 600,000 (Government of Canada, 2006a; Statistics Canada, 2006h).

Among unattached adult women of all ages, women who never married are the least prone to poverty; they are less disadvantaged than are their widowed, separated, or divorced counterparts (L. McDonald, Donahue, & Moore, 1997; L. McDonald & Robb, 2004; Payne, 1994). In 2003, such women earned 94% as much as never-married men, but married women earned only 65% as much as married men (Statistics Canada, 2006j). However, in 2006, never-married women represented only 5.3% of all female Canadian seniors (Statistics Canada, 2006c). Almost one half of senior women (as compared to less than one fifth of senior men) were widowed, separated, or divorced (Statistics Canada, 2006i).

Arber and Cooper (2000) also argued that the degree of women’s financial difficulties in later life varies due to parenting responsibilities, with single mothers bearing the greatest burden.
Women are likely to be the primary caregivers who raise children, either alone or with another parent, tend to the care of aging relatives, and nurse ailing spouses. In Canada, women raising children by themselves are approximately five times more likely than are child-rearing women with partners to have a low income (Townson, 2009).

Labour force participation among Canadian women with children less than three years of age doubled to 65% during the period between 1976 and 2004 (Statistics Canada, 2006j); this trend ultimately may lead to some reduction of poverty rates. Nevertheless, during their working careers, women not only earn lower wages, they are more likely than are men to work in casual, temporary, or part-time jobs (Government of Canada, 2006a; Public Health Agency of Canada, 2005). As Hooks, LeClerc, and Beaujot (2005) noted, it is common for women to move between full-time and part-time employment, and between permanent and contract employment during the course of their lifetimes. In 2004, in Canada, one quarter of women in the paid labour force worked part-time, as compared to one tenth of men (Statistics Canada, 2006j). As noted in Townson’s 2009 report, in Canada, approximately three times more women than men have temporary part-time jobs that are paid less than $10 an hour, and more than four times more women than men have permanent part-time jobs paid at that rate.

This kind of workforce participation pattern in turn affects women’s receipt of pension benefits and pension amounts, that is, this instability in tenure may result in limited or non-existent private and/or CPP/QPP pension income (Ginn & Arber, 1996; Hooyman, Browne, Ray, & Richardson, 2002; R. W. Johnson, 1999; R. W. Johnson, Sambamoorthi, & Crystal, 1999; Statistics Canada, 2001a; Warren, Rowlingson, & Whyley, 2001). Women with private pensions and CPP/QPP are better prepared financially for retirement (S. Davies & Denton, 2002); however, many women have patterns of workforce participation that suggest they will be heavily dependent on public pensions. What is more, women are also more likely than are men to exhaust their savings (Coyte, Laporte, Baranek, & Croson, 2002; Government of Canada, 2006a).

The indications are that Canada has certain sub-populations that may be financially vulnerable in later life. Poverty may ultimately affect a large number of Canadians because, as stated earlier, the population of Canada is aging. Again, older senior women are the poorest of all groups, and, to repeat, one of the fastest growing age cohorts among seniors are the oldest old, the majority of
whom are women. Without a doubt, there will be many older women, particularly those who are widowed, separated, or divorced, who will have fixed incomes, be without private pensions and/or CPP/QPP, and live longer than women did in the 20th and earlier centuries (M. Denton et al., 2000; Rosenthal, Denton, Martin-Matthews, & French, 2000). What is more, many older women will be negatively affected by public policy changes that will increase the age of eligibility for OAS/GIS benefits from age 65 to age 67 (Government of Canada, 2014).

### 1.2.3 Health status of Canadians

The number of Canadians who suffer premature death or poor health is low compared to the premature death rate of other (industrialized and non-industrialized) countries (Canada's Chief Public Health Officer, 2008). The 2009 CCHS noted that, in mid-life (age 45 to 64), three quarters (76%) of Canadians reported at least good health (Ramage-Morin et al., 2010). Health was defined as self-rated health (including mental health), functional ability, and IADL (instrumental activities of daily living). More than one half (56%) of the seniors who responded to the survey also reported good health.

In the Ramage-Morin et al. (2010) study, 84% of those in mid-life reported that they experienced good health through their own behaviours in four or more of the following categories: physical activity, body mass index, diet, sleep, smoking, oral health, stress, and social participation. It is interesting that an even higher percentage (91%) of seniors also reported that these behaviours contribute positively to the enjoyment of good health. The more actively involved in maintaining their health, the more likely these seniors were to report good health. Female seniors, more than male seniors, were likely to report poor health; this was not the case among non-seniors. As the number of chronic conditions increased, seniors were more likely to report poor health. Furthermore, seniors who had low incomes were more likely to have chronic conditions than those who did not have low incomes (Statistics Canada, 2006f).

In 2005, it was estimated that approximately 82.1% of Canadian women and 74.3% of Canadian men 40 years of age or older had at least one chronic medical condition (Statistics Canada, 2006a). In Canada, in 2011, there were approximately 8.8 million women 40 years of age or older (Statistics Canada, 2011b) and there were 8.1 million men 40 or older; millions of these Canadians have at least one chronic condition. With age, the prevalence of most chronic conditions increases (Statistics Canada, 2006f). Canada's Chief Public Health Officer (2010)
reported that, in 2009, 89% of seniors had at least one chronic condition, and many had more than one. About 25% of seniors aged 65 to 79, and more than one third who were aged 80 or older, had four or more chronic conditions. The most common chronic conditions are arthritis, high blood pressure, diabetes, heart disease, cancer, stroke, Alzheimer’s disease, cataracts, glaucoma, mood disorder, and anxiety disorder. Prevention of the onset of or the slowing of the course of chronic conditions may significantly reduce health care costs in Canada (Ramage-Morin et al., 2010) and reduce the financial strain on the individual (Crystal, Johnson, Harman, Sambamoorthi, & Kumar, 2000).

In light of these demographic changes, the direction of public policy will need to change; otherwise, the cost to society and the cost to the quality of life of individual older Canadians will be high.

1.3 Hypotheses and Historical Overview

This section is an overview of the relevant hypotheses and of the pertinent history related to the thesis’s main premise, that is, the health-income relationship. Presented are a précis of the hypotheses that address the direction of the health-poverty relationship and a history of the study of the relationship between financial circumstances and health, that is, the impact of financial circumstances on health and the impact of health on financial circumstances. These contextual pieces set the stage both for the section on the potential contribution of this thesis as well as the thesis’s next chapter, which is a review of the literature about determinants of income and determinants of health.

1.3.1 Social causation and reverse causation hypotheses

There is evidence that there is a relationship between health and poverty both in Canada and elsewhere. In this regard, it is necessary to refer to the findings of the studies to date. What is known from past studies is that earlier-life income status and health status set the stage for later-life income status and health status; in particular, people who have less material advantages tend to develop poorer health outcomes (Benzeval & Judge, 2001; Buckley, Denton, Robb, & Spencer, 2006; Marmot, 2004). Poverty and poor health are related, and the consensus is that poor health is not as strong a predictor of poverty as poverty is of poor health (J. W. Lynch et al., 2004; Muennig, 2008; Phipps, 2003). Two of the competing causal hypotheses that attempt to unravel the role of poverty as a social determinant of health are social causation and reverse
causation (also known as social selection; George, 2003; Young, 2007). Social causation posits that poverty or lack of poverty determines health. Advocates of the hypothesis of reverse causation, in contrast, posit that poor health leads to adverse social and economic conditions, that is, the direction of causality is from poor health to poverty rather than the opposite, that is, from poverty to poor health (Marmot, 2006). Reverse causation suggests that there is a possibility that poor health hampers an individual's ability to retain gainful employment and thereby affects his or her income and social mobility.

According to health researcher Deaton (2003), “the most difficult issue of all is sorting out the dual causality between income and health” (p. 120). The current and past discourse maintains that, at the individual level, poverty or lack of poverty is a stronger predictor of health than health is of poverty (J. C. Johnson, Cohen, Dohrenwend, Link, & Brook, 1999; Pugliesi, 1995; C. E. Ross & Mirowsky, 1995). Even so, Whitehead and Dahlgren (2006), among others (Cardiff Institute of Society, 2005; McMunn, Breeze et al., 2006; J. P. Smith, 2004), emphasized the need for more research on health as a predictor of poverty.

The relationship between poverty and poor health has been studied for over 100 years. For example, the 1854 Massachusetts Commission on Lunacy (1971) explored the association between poor mental health and poverty, in relation to immigrant status. Rowntree and Lasker (1911) linked alcoholism with job loss. Perrott and Collins (1935) found an association between poor health and loss of income in ten U.S. communities during the Great Depression. Studies by Faris and Dunham (1939) related poor mental health to residence in a poor neighbourhood. Lawrence (1948) study suggested that chronic illness is related to lower SES. Similarly, the notion that diseases are indirectly caused by inequitable access to resources was proposed by Rudolph Virchow, a 19th century German public health activist. He well understood the pathological causes of disease and was unique in his understanding of the political causes of disease (Dahring, 2008) and of the link between health and poverty (Graham, 2007). By the 1970s, it was already clear that genetics, hygiene, and behaviour influence health and some analysts understood that there were social determinants of health.

In the past few decades, there has been a burgeoning interest in the relationship between health and poverty among medical sociologists and other academics in North America and Europe. During the same period, researchers also began to look at demographic factors such as age,
gender, marital status, and race as predictors of health (Hay, 1994). Great Britain’s Black Report (also referred to as the Working Group on Inequalities in Health, 1980) heralded the credo that there is a relationship between poverty and health. The Black Report, the product of an expert committee’s investigations into health inequality, resulted in improved explanations of social and health inequalities (Marmot, 2001). The Black Report also proposed that social causation and reverse causation are both possible mechanisms that influence health disparities related to social class. Concurrent with the release of the Black Report were Great Britain’s Whitehall studies, which examined the social determinants of health (Siegrist & Marmot, 2006). The Whitehall panel studies, which are considered seminal works in this area, looked at the health of civil servants. Although debates arose about the studies’ design and theoretical framework, the measures used, the measurement itself, and the results, the findings significantly shifted thinking in this field (Hay, 1994). The findings sparked decades of research that explored the social determinants of health and found poverty to be a determinant of poor health. Eventually, as observed by Siegrist and Marmot (2006), research into the social determinants of health shifted from descriptive studies to analytical and explanatory studies. In addition, more than one discipline got involved in drawing upon and contributing to this research on pathways related to social causation and reverse causation, for example, economics, epidemiology, occupational medicine, and natural history.

Consistently, over the past three decades, most researchers have concluded that there is a stronger case for social causation than for reverse causation. Still, it is hypothesized that reverse causation and social causation could coexist within a reciprocal relationship (McMunn, Breeze et al., 2006). Marmot (2004), an eminent scholar in this field, contended that social position could be the result of poor health. He cited examples of “health-related social mobility” (p. 59). He cautioned, through references to Bartley and Blane, leading health inequalities researchers, that good health is not a direct result of personal success; instead, personal success leads to social conditions that, in turn, promote good health. It may be the case that the health-poverty relationship is not dualistic; rather, health and material circumstances may interact. George (2003) stated that

There can be reciprocal paths of influence such that social factors are valid risk factors for illness and illness can lead to changes in social risk factors . . . . A critical element for
testing these hypotheses is longitudinal data that measure social factors before and after illness (p. 167-168).

Given these assertions, a research study that addresses some of these queries is indicated.

### 1.4 Problem Definition

This thesis provides evidence on the topic of declines, with or without regain, in income status and health status in a little-studied population, specifically, mid- and later-life Canadian men and women. The focus on this age group of Canadians is central to this thesis. Over the next twenty years, baby boomers, as an age cohort, will be turning age 65 in large numbers (Government of Canada, 2012). Canada’s Chief Actuary reports that those receiving OAS will nearly double in 20 years, from 4.7 million in 2010 to 9.3 million in 2030 with the concomitant government expenditures rising from $36 billion to $110 billion (Government of Canada, 2010). The sample used in this analysis are, at the onset, between the ages of 40 and 59, and, at the conclusion, between ages 54 and 73, and so another key feature of this thesis is the measurement of change over time. There is a paucity of literature using data from a longitudinal survey in a population-based large sample of older adults. This thesis involved testing a hypothesis about changes in income and health in the older adult population. Although similar to earlier studies, this study was unique in that it focused on changes in income and health in a particular population not often studied (Benzeval & Judge, 2001; Buckley et al., 2006; George, 2003; J. C. Johnson et al., 1999; Ki, 2006; J. W. Lynch et al., 2004; J. W. Lynch, Kaplan, & Shema, 1997; McMunn, Bartley, Hardy, & Kuh, 2006; McMunn, Breeze et al., 2006; Muennig, 2008; J. P. Smith, 1999). Other studies have not always employed longitudinal data (especially earlier studies), have excluded deceased respondents in their study sample, and have focussed exclusively on the low-income sub-population. As well, despite academics such as Phillipson (1996) and Minkler (1996) having theorized about blending these perspectives, only a few studies were located that utilized a critical gerontology-life course perspective, for example, Chambers (2005).

In light of the current research, the following issues emerge. What are the costs of not studying these issues? Are there economic costs associated with declines in income status and health status and, if so, do these costs underscore the need for a comprehensive understanding of the concomitant mechanisms?
The next section is a discussion of the research goals for this thesis. This section, in turn, informs the following section, the specific research questions.

1.5 Research Goals

The goals of this thesis’s research study follow from the review of literature and the analysis of the literature’s strengths and weaknesses. This research study investigates the correlates of change in the material well-being and health of mid- and later-life Canadians. It also tests whether and to what degree other factors may contribute to or affect income status change and/or health status change. In specific terms, this thesis is based on a secondary analysis of the National Population Health Survey (NPHS) longitudinal data: specifically the frequency, the determinants, and the temporal order of declines in income status and health status and of subsequent instances of regain of income status and health status. In other words, what factors are associated with income status change and/or health status change? Are these factors financial ones, such as baseline income or wealth, and if so, to what extent? Alternatively, are nonfinancial factors such as health behaviour or sociodemographic characteristics associated with these changes, and, if so, to what extent? If the assumption is made that sociodemographic and health behaviour characteristics are both factors, what is the magnitude of the contribution of health behaviour beyond that of sociodemographic characteristics to income status change and/or health status change? This research attempts to answer these specific questions by attaining the goals named in the following subsection.

The primary goal of this study, as estimated in separate models using logistic regression analyses, is to determine whether income status decline is a stronger determinant of health status decline than health status decline is of income status decline for mid- and later-life Canadians.

The secondary goal is to determine what sociodemographic factors and health behaviour are predictive of changes in income status and health status among mid- and later-life Canadians. Specifically, the goal is to discover the characteristics of those who experience an income status or health status decline, with or without a regain.

A component of this secondary goal is discovery of the extent to which health at the outset predicts income status decline (with or without a subsequent regain) compared to other factors.
Similarly, to what extent does total household income at the outset predict health status decline (with or without a subsequent regain) compared to these same factors?

A third goal of the research is to delineate the frequency distribution, for both sexes together and by sex, of dependent variables and independent variables

1.6 Specific Research Questions

The following research questions were generated utilizing the empirical knowledge from the review of the literature, and the integrated the conceptual framework. Four general types of questions were posed. Each of these types of questions has sub-types of questions, for example, Question 1a, Question 1b, Question 1c, Question 1d, Question 2a, and so on.

The first questions are as follows: During the 14-year period (1994-1995 to 2006-2007), for mid- and later-life Canadians (ages 40 to 59 at the outset) what factors are predictive of no decline in health status and no decline in income status? What factors are predictive of a decline in income status, and no decline in health status? What factors are predictive of a decline in health status, and no decline in income status? What factors are predictive of a decline in both income status and health status?

A second set of questions asks, in the case of a decline in income status and health status, which comes first, a decline in health status or a decline in income status? What factors are predictive of a decline in income status that precedes a decline in health status? What factors are predictive of a decline in health status that precedes a decline in income status? What factors are predictive of a decline in income status that occurs in concert with a decline in health status?

A third set of questions examines the factors that predict an income status decline and a subsequent health status decline, from among those who had an income status decline, with or without any health status decline. Also, examined are the factors that predict a health status decline and a subsequent income status decline from among those who had a health status decline with or without any income status decline.

Fourth and finally, the last research questions, look at status regains. What factors are predictive of a regain in income status? What factors are predictive of a regain in health status?

The models to be estimated to answer these questions are described in the next chapter.
1.7 Contribution of Thesis

This area of scholarship has the potential to flag the need to create progressive policies that address the issues of the aging population. Policymakers need evidence about the Canadians for whom poor health results in a decline in financial status, and/or vice versa. The nature of the health-income relationship could be a guide to systemic solutions to the income status and health status problems of older Canadians. Clarification of the nature of the health-income relationship could serve governments well in their setting of future policy directions; in particular, the clarification could help to resolve issues related to the future plight of older Canadians. These systemic solutions might include customized, relevant, timely, and forward-looking public policies in the areas of pensions and mid-life income security, combined with health and health promotion programs. In addition, the planning and delivery of social programs needs to be at least partially shaped by knowledge of the social determinants of income status and health status. Appropriate policies and programs may thereby offset the potentially devastating effects of some older Canadians’ precarious financial situations and allow them the option of aging in place. Canadians, as a whole, could benefit from a reduction of health care costs through fewer hospitalizations and less homecare.

Given the potential demand for evidence on the topic of declines in income status and health status, this research will generate interest among academics and public sector policymakers, and will add to the Canadian literature on income status and health status. Finally, this thesis confirms and broadens existing viewpoints and awareness, especially with respect to the social causation and reverse causation hypotheses.

1.8 Organization of Thesis

Following chapter 1 is the literature review for the thesis, which is presented in chapter 2. In this chapter, the overall literature search strategy is outlined. The key concepts are defined as well as the rationale for choosing them. The literature relevant to the relationship between income status and health status is critiqued, specifically, the research on the social causation hypothesis and the reverse causation hypothesis. Also examined is what is known and not known about other determinants of income status decline and health status decline. Lastly, the research literature’s overall strengths and weaknesses as they relate to the aims of this research project are detailed.
Chapter 3 lays out the theories that are relevant to this thesis: critical gerontology theory is considered from a life course perspective. The two combine to form a conceptual framework.

Chapter 4, the methods chapter, describes the secondary data analysis used to investigate the relationship between income status decline and health status decline. A description of the NPHS dataset and an explanation of the composition of the sample are provided, along with the statistical, methodological, and other considerations in the development of this longitudinal survey. The study’s inclusion and exclusion criteria in the selection of the study sample as well as the study’s sample size requirements are detailed. The measures for the dependent and independent variables are described. The methods for the univariate and bivariate preliminary data analysis as well as the methods for the multivariate data analysis for each of the four models estimated. The chapter concludes with the study’s delimitations, limitations, and the ethical considerations posed by the research.

Chapter 5, the first of two findings chapters, answers the question “What do the univariate and bivariate data indicate?” For example, the study sample is described, as are changes in income status and health status over the study period. These findings, for each of the thesis’s four models, are identified and analyzed.

Chapter 6, the second of the two findings chapters, answers the question “What do the multivariate data indicate?” For example, findings such as the predictors of change in income status and health status are delineated. These findings, for each of the thesis’s four models, are identified and analyzed.

In chapter 7, the discussion chapter, the findings of the study are summarized, and a comparison is made with the results of other studies with an emphasis on some of the unanticipated results and the potential reasons for these results.

Finally, chapter 8 draws conclusions about the findings. The policy and other implications of the study are summarized with recommendations regarding future directions.

1.9 Chapter Summary

The information presented in chapter 1, the introduction, was primarily contextual. This chapter laid out the issues addressed by the research study, and thereby provided the rationale for the
thesis. The first section of chapter 1 was a synopsis of the research study. The second section detailed the nature of the identified issue that will be address by the study. General sociodemographic and background information was provided as the context for this thesis’s topic--who is affected, the magnitude of the problem, under what conditions it exists, and in which locale it occurs. The third section reviewed past research. The fourth section addressed the major hypotheses that examined the direction of the relationship between poverty and health and a summary of the historical background for the health-poverty relationship discussion was provided. In the sixth section, the potential contribution of the thesis was described. Finally, the seventh section detailed the organization of the thesis.
Chapter 2
Literature Review

2.1 Introduction to the Literature Review

This chapter consists of the literature review for this thesis. The literature review provides a context for this thesis by summarizing the published studies related both directly and indirectly to its specific topic. The literature review focuses on the relationship between income status and health status, in particular, among mid-life and older Canadians. Presented in this chapter are observations on the similarities and differences between relevant studies, and conclusions about the literature’s strengths and weaknesses.

The search strategy for the literature review is outlined at the start of the chapter. In the next section, the thesis’s key concepts are defined, namely, socioeconomic status, income inequality, poverty, health, population health, self-rated health, health behaviour, and age and aging. The literature review is then organized into themes that emanated from the specific problem definition. The chapter reviews the determinants of income and the determinants of health as well as providing a critique of the literature that addresses the health-income relationship. Following that is a discussion of the strengths and weaknesses of the literature, including the ways in which this research advances knowledge in the field. Finally, the chapter is summarized.

2.1.1 Search strategy

This section outlines both the search strategy for the literature review, including its scope and parameters, and the results of the literature search. In essence, the components of the search strategy include the databases explored, the sources searched, and the types of documents studied.

2.1.1.1 Search sources and search terms

For the most part, specialized reference works rather than general reference works were used for this literature search. The following sources were searched: Abstracts in Social Gerontology, Ageline, the Campbell Collaboration, the Cochrane Collaboration, EMBASE, Google Scholar, Health Sciences: SAGE, Medline (Ovid), PubMed, Scholars Portal Search, Social Sciences Abstracts, Social Services Abstracts, Sociological Abstracts, Sociology: SAGE, and Theses Canada.
Both general and advanced key word searches were conducted using the primary and secondary search terms in Table 2-1.

Table 2-1
Terms Used in Literature Search

<table>
<thead>
<tr>
<th>Search concepts</th>
<th>Primary</th>
</tr>
</thead>
<tbody>
<tr>
<td>Health</td>
<td>health status, self-rated health, population health, sick, ill, chronic condition, health behaviour, smoking history, drinking habits, physical activity, obesity, determinants of health, social causation, reverse causation</td>
</tr>
<tr>
<td>Income</td>
<td>income status, material circumstances, financial situation, financial security, income inequality, socioeconomic status (SES), social class, employment status, wealth, assets, homeownership, low income, impoverishment, material circumstances, poor, poverty</td>
</tr>
<tr>
<td>Age</td>
<td>senior, aging, mid-life, old, elderly, later-life, older people, older adults</td>
</tr>
<tr>
<td>Marital status/living arrangement</td>
<td>divorced, separated, widowed, common-law, married, single, unattached, never married, living alone</td>
</tr>
<tr>
<td>Other sociodemographic factors</td>
<td>sex, gender, education, visible minority status, immigrant status, employment, retirement</td>
</tr>
<tr>
<td>Theories/perspectives</td>
<td>life course perspective, critical gerontology perspective, political economy</td>
</tr>
</tbody>
</table>

2.1.1.2 Results of literature search

The following section presents the results of the literature search. The most important search inclusion criterion was relevance to the thesis topic, that is, income status and health status decline (with or without a regain) for older Canadians. Some 1,500 documents were scanned, and approximately 400 of them were reviewed.

The following are general comments about the results of the literature review:

- A wide range of documents fell within the scope of the review, and they appeared in a wide spectrum of publications, but, in general, the literature was from academic, rather than popular publications.
- Publications from government, the broad public sector, policy institutes, and research organizations were reviewed.
- The majority of the journal articles reviewed had undergone peer review.
- The writings emerged from a range of disciplines, such as demography, economics, gerontology, social policy, social work, sociology, and women’s studies.
- Systematic reviews of prior literature on the topic and meta-analyses were given high priority for review.
• The literature reviewed was by authors who had theoretical orientations both similar and
dissimilar to the one that is the basis of this thesis.
• Many of the research studies reviewed had been carried out using similar empirical
approaches. The review focus primarily was quantitative studies, but included a few studies
that used mixed methods or purely qualitative approaches. High priority was given to the
review of studies that used longitudinal data. Studies that employed longitudinal data, as
opposed to cross-sectional data, enabled the testing of causal inferences. Time must elapse to
investigate empirically causal directions.
• The majority of studies were population-based and analyzed secondary data.
• For obvious reasons, information regarding the Canadian context was sought as much as
possible and, therefore, many Canadian studies were reviewed.
• Much of the material reviewed was published after 1990, and most of it between 2000 and
2014.
• Although the focus was on current literature, earlier seminal studies were examined in order
to understand the history of relevant scholarly debates.
• Literature that explained or explored the development of indicators and measures was
scanned.
• Only documents written in English were reviewed.

2.2 Key Concepts

This section clarifies the key concepts associated with this thesis and the concomitant
relationships among them. The concepts are income status, health status, and aging. This thesis
turns on the issue of the association between income status decline (with or without a regain) and
health status decline (with or without a regain) that occur over time, that is, during the aging
process. These concepts are fundamental to the thesis’s conceptual framework and empirical
models (Bryman & Teevan, 2005) and are therefore key. The conceptual framework is based on
these key concepts; they provide the context needed for understanding the conceptual
framework. Similarly, definition of the key concepts is critical for an understanding of the
empirical models. As such, the key concepts appear throughout this thesis. They are employed
in the conceptual framework below, and are made operational as the variables used in this study.
These key concepts are used to determine, for example, the most suitable measures of material
circumstances.
2.2.1 Socioeconomic status, income inequality, financial security, and poverty

Discussed in this section are the key concepts associated with financial circumstances. Socioeconomic status (SES), including definitions of SES, the significance of SES, and common measures of SES, that is, income and wealth, are discussed. Other related key concepts, that is, income inequality and financial security, are also discussed. Finally, apropos the concept of poverty, some current debates about how to measure poverty are outlined.

2.2.1.1 SES

Most societies make distinctions among individuals and groups based on social class or some other type of hierarchy. These distinctions are based on the possession of more or less power (Grabb, 2006). Social class stratification influences life circumstances through the dynamics of power relations. Social class affects the life course of individuals, including their financial and social well-being and their health (Quadagno & Reid, 1999). Graham’s (2007) view is that, at least in the U.K., there is “little evidence the socioeconomic inequalities are withering away. They . . . have become more entrenched . . . empirical studies provide little support for the view that social class in the U.K. is losing its influence on people's lives” (p. 38-39).

Social class is closely tied to SES, and researchers can assess social class indirectly by measuring SES (Hay, 1994). Chapin in 1928 was one of the earliest academics to define SES. He referred to it as the “position that an individual or family occupies with reference to the prevailing average of standards of cultural possessions, effective income, material possessions and participation in group activity in the community” (Chapin, 1928, p. 99). Since that era, there have been various approaches to the conceptualization of the social stratification of the population and of SES. According to Chappell, Gee, McDonald, and Stones (2003), SES refers to “the pattern of interrelated statuses and roles within society . . . that constitute a relatively stable set of social relations” (p. 271).

Most of the research related to social stratification uses educational attainment, income, and/or occupation to indicate SES (American Psychological Association, 2007). SES has been measured by other similar factors, for example, occupation of the main breadwinner, income source, value of the dwelling or housing quality, and neighbourhood characteristics (White, 1980). A Canadian researcher, Veenstra (2001) confirmed that income, together with level of education and occupational status, are most often used as measures of SES. Although income is
not the only indicator of SES, income has been widely accepted as one of the most important components of SES. It is widely held that income is a gauge of SES (Benzeval, Judge, & Shouls, 2001; Black, Davidson, & Townsend, 1988; Blaxter, 1990; Daly, Duncan, McDonough, & Williams, 2002; Wilkinson & Pickett, 2006). Phipps (2003) concurs; she stated unequivocally that the literature argues that income is the best measure of SES. The advantage of using income as an indicator is that it easy to understand, relatively simple to report, and objective. Income “directly measures the material resources component of [SES]” and is “usually measured as household gross income per number of persons depending on this income” (Galobardes, Lynch, & Smith, 2007, p. 7). According to Statistics Canada (1995), income includes

- wages and salaries;
- income from self-employment;
- dividends and interest on bonds, deposits and savings, stocks, mutual funds;
- Employment Insurance;
- Workers’ Compensation;
- benefits from the Canada or Quebec Pension Plan;
- retirement pensions, superannuation and annuities;
- Old Age Security and Guaranteed Income Supplement;
- Child Tax Benefit;
- provincial or municipal social assistance or welfare;
- child support, alimony; and
- other income, for example, rental income, scholarships, or other kinds of government income (p. 18).

Hay (1994), an early Canadian researcher in this field, stated that “income [is] the crucial component of SES related to health” (p. 48).

After income, wealth is frequently used as a determinant of SES. Wealth includes not just income, but also assets, capital, and other resources (Galobardes et al., 2007). The overall worth of a household unit of whatever size is determined by its wealth.

Although measures of income and of wealth, are concrete and specific; calculating wealth is arguably a more difficult and complex process than calculating income because the process
involves the appraisal of assets. The calculation of income is less difficult because it is a simple process, for example, a survey of tax return information.

From these complications, this question arises: Is income alone adequate as a measure of SES? Must wealth be incorporated in the determination of one’s material circumstances? A key issue is whether income by itself, without an accounting of wealth, accurately and reliably reflects people’s financial situations. According to Barr (2004), income is derived from wealth, which may take the form of physical wealth, financial wealth, or human capital. Physical wealth refers to assets such as cars and houses. Financial wealth refers to assets such as stocks and bonds. Human capital refers to an individual’s assets, such as education and natural endowments, which, when employed, yield salaries and wages. In addition, wealth can be derived from income; wealth can increase if income is invested. Similarly, because income may be partially a function of interest earned from wealth, income is also an indication of a person’s wealth. The argument therefore can be made that a person’s income is an indication of a person’s wealth, and so the effort to capture both is redundant. The next logical question therefore is, “Can an argument be made that wealth alone is adequate as a measure of SES”? Buckley, Denton, Robb, and Spencer (2004b) contended that this argument could be made, asserting that wealth is a reflection of a person’s prior income history.

In contrast, Galobardes et al. (2007) asserted that income, as a measure considered in conjunction with wealth, represents material circumstances well. One of the most compelling arguments for including both wealth and income as measures of material circumstances is that including both more completely reveals a person’s material circumstances. The inclusion of both wealth and income as measures of material circumstances creates an authentic picture of a person’s financial situation. According to Galobardes et al. (2007), “income and wealth are the . . . indicators that most directly measure material circumstances” (p. 9).

Statistics Canada (2003a) concurs that assessments of the financial security of, for example, Canada’s seniors, must include their wealth; that is, wealth should be incorporated in the determination of a person’s material circumstances.

It should be noted that, of all the concepts discussed in this section, social class and the measurement of social class are the most problematic in relation to aging people because social
class is closely linked to occupation, earnings, and status, but few older people perform paid work (Estes, 1991). Designations of the social class of older people is complicated because many do not earn a market income (Statistics Canada, 2008c). Therefore, the notion of an older person’s social class may not be easy to define (Statistics Canada, 2006f). Foner (1988) argued that older people’s earlier social class status extends into retirement, even though the majority of older people are not involved in economically productive activities. Foner contended that older people’s status is derived from their wealth, income, and education. Similarly, Blane et al. (1993) accepted the notion that, among the retired, social class is determined by the status of an individual's prior occupation. The inclusion of a calculation of wealth based on homeownership would affect any measurement of poverty, particularly among unattached women, that is, those living either alone or with unrelated others (Siegrist & Marmot, 2006; Statistics Canada, 2005b). Indeed, Siegrist and Marmot (2006) suggested that, in the case of postretirement women, it might be appropriate to include wealth, as represented by income, housing ownership, or assets, in measurements of their financial status.

The conclusion can be drawn that both the concepts of social class and SES and the discussion of income and wealth are germane to this study. The combination of income and wealth contributes to one’s material circumstances, which in turn are related to one’s SES. Income, “jointly with wealth, directly measures the material resources component” of SES (Galobardes et al., 2007, p. 7). The argument can therefore be made that it is important to capture both income and wealth in assessments of material circumstances. However, in this thesis, income and homeownership were the two measures that used, because of the limitations of the dataset used: First, wealth, per se, is not captured in the NPHS. Second, the NPHS dataset does not contain information about debt related to homeownership.

2.2.1.2 Income inequality

This section deals with income inequality, which is relevant to this thesis because numerous related studies employ this concept. In addition, discussing it highlights another one of the various designations that can be used to describe material circumstances.

The notion of income inequality refers to “the way in which personal income is distributed in the population as a whole” (Government of Canada, 2004a, p. 1). What is more, income inequality is an indicator of income variation in a given geographic area (Subramanian & Kawachi, 2004).
The degrees of income inequality are variously defined. One researcher, Wilkinson, an early proponent of the concept, measured income inequality as the share of income belonging to the poorest 70% of households (Wilkinson, 1992a). One measure of income inequality is the Low Income Measure (LIM), which is used in some international comparisons (Canadian Council on Social Development, 2001; Statistics Canada, 2006g). N. A. Ross et al. employed the LIM used by the Organization for Economic Cooperation and Development (OECD) in her work, that is, the “percentage of total household income received by the less well off 50% of households” (2000, p. 898). LIM “explicitly defines low income as being much worse off than average, and it is drawn at one half the median income of an equivalent household” (Canadian Council on Social Development, 2001, para. 25). In other words, income inequality is a relative poverty measure that refers to the share of total household income credited to the poorest 50% of households within a region.

As noted, the mechanisms associated with the effects of income inequality on health status are particularly relevant to this discussion. Discussion of income inequality vis-à-vis health began in research literature during the 1990s (Wilkinson, 1992b), and the discussion continues up to the present day (Fuller-Thomson & Gadalla, 2008; Wilkinson & Pickett, 2006). N. A. Ross et al. (2005) found a correlation between income inequality and mortality (but no correlation between an absolute of income and income inequality), but Deaton did not (2003). Deaton stated, “it is not true that income inequality itself is a major determinant of population health. . . . [I]t is low incomes that are important, not inequality, and there is no evidence that making the rich richer . . . is hazardous to the health of the poor . . .” p. 151.

It was hypothesized by McLeod, Lavis, Mustard, and Stoddart (2003) that income inequality affects health through inequitable access to education and health care, the stress or shame felt by those who are poor, or both. A similar view was that of Mackenbach (2002), who deliberated about whether income inequality was related to how an individual feels about being unequal to others or instead was related to actual inequities in the availability of public (including health care) resources and communal infrastructure. Regardless, whether real or perceived, income inequality may result in greater disadvantage for seniors than for those who are younger, because seniors’ exposure to inequality may have occurred over many years, and as such may be cumulative.
2.2.1.3 Financial security, capability and independence

Any discussion of this nature is incomplete without consideration of the notion of financial security. Auger and Alix (2009) noted that the use of income as a measure fails to take into consideration nonmaterial components such as financial security. Financial security has a variety of meanings, many of which may not be quantifiable and measurable, and may involve indicators other than simply income. Financial security may be related to an individual’s cost of living and annual income, or to the situation of the wider population. Security may also be an emotive, relative, and/or temporal state and possess value-determined associations. For example, one may feel financially secure and objectively not be secure or vice versa. One may compare oneself with people who have access to more resources and feel less secure. In contrast, some people may not care about financial security because they do not value it. Writing in Dutch, Dittmann-Kohli states that through adaptation, one may strengthen one’s sense of security through “a reorganization of one's interpretations and goals concerning self and life” (as cited in Westerhof, Dittmann-Kohli, & Bode, 2003, p. 127). Attitude and personal philosophy affect an individual’s perceptions of financial security, which can be viewed as more or less important depending on one’s life stage and circumstances.

A Nobel Prize winner, Sen (2006) proposed a construct that addresses conflicting arguments in the debate about how to assess financial security. Amartya Sen suggested a capability measure, which takes into account the ability to attain the means to actualize potential and implicitly is the result of social competence or opportunity. A related proposition is that capability is linked to the degree of independence an individual enjoys; therefore, independence and financial security are linked. According to French et al. (2000), “adequate financial resources were defined as sufficient resources to do what one wanted to or needed while living within one's means” (p. 71). French et al.’s (2000) qualitative study of 31 seniors in Hamilton-Wentworth explored the various meanings and determinants of independence. In the study, respondents described independence as a psychological state involving freedom, control of one’s life, the ability to make decisions, the ability to carry out activities, and self-reliance. Independence assumes self-reliance in the activities of daily living. Health problems do affect independence, and this impact may be especially strong for older people, who suffer chronic diseases such as heart disease, cancer, arthritis, osteoporosis, and dementia. As French et al. stated, "The critical contribution that health makes to independence was validated by our respondents, who envisioned health as
more than the absence of disease or disability" (p. 82). Financial security, capability, and independence are thus inseparable.

### 2.2.1.4 Poverty

This section discusses the concept of poverty. In their collection of essays, Grusky and Kanbur (2006) traced the study of poverty to sociology, economics, philosophy, sociology, and, more recently, psychology. The debates about the measurement of poverty, which have been going on for several decades, revolve around income, wealth, education, and/or some combination of all these and/or other factors. An issue that is central to these debates relates to definitions of poverty, that is, the development of a common, universal understanding of what constitutes poverty and how poverty is measured.

According to D. P. Ross, Scott, and Smith (2000), there are two approaches to the measurement of poverty. The first one, an absolute approach, consists of determining, within a certain cultural and social context, a basic standard of living through which human needs can be met. The second one, a relative approach, includes psychological health as well as the concepts of social inclusion and equality. Regardless of the approach, the selection of a method to determine whether a family unit’s income is low is essential to the task of defining poverty.

As stated above, if one’s income is below the LICO, Statistics Canada (2008f) categorizes it as low. Currently, there is no internationally recognized definition of poverty; hence, there is no universally accepted poverty line. Until a widely accepted definition is established, Statistics Canada will be unable to use the LICO to compare the level of poverty in Canada to that in other jurisdictions. One measure of income inequality is the Low Income Measure (LIM), which is used in some international comparisons (Canadian Council on Social Development, 2001; Statistics Canada, 2006g). As stated earlier, N. A. Ross et al. describes the LIM as the “percentage of total household income received by the less well off 50% of households” (2000, p. 898). LIM “explicitly defines low income as being much worse off than average” (Canadian Council on Social Development, 2001, para. 25). A more precise measure is the variable LIM (as opposed to the fixed LIM). It is a relative poverty measure that indicates the share of total household income credited to the poorest 50% of households within a region (Zhang, 2010).
Another more recent measure of poverty that is gaining popularity in Canada and elsewhere is the Market Basket Measure (MBM; Government of Canada, 2009). This measurement of poverty involves the use of market basket measures or "descriptive indicators of actual living circumstances to compare different groups" (Saunders, 2000, p. 18), as opposed to a poverty line. MBM entails ranking households against a range of indicators related to living standards, with those with the lowest ranking considered as the neediest. The challenge in using MBM lies in reaching an agreement about which measures are the most appropriate indicators. The MBM, as a measure, is inherently linked to the cost of living and therefore is more responsive to economic fluctuations and local variation (Hatfield, Pyper, & Gustajtis, 2010). Its flexibility, transparency, and its understandability, mean that it is gaining acceptance, and may become the standard.

A complication in defining low income is the question about whether to consider before- or after-tax income in measurements of poverty. The analysts at least one Canadian organization concerned about poverty, that is, the Canadian Council on Social Development (2001), have stated that before-tax income is a more reliable indicator of poverty because after-tax income may overstate an individual’s financial resources and indicate lower poverty rates. People with lower incomes pay taxes at a lower rate. Canada’s system of progressive taxation on income is based on the ability-to-pay principle, which maintains that those with more financial resources should be taxed at a higher rate (Lightman, 2003). Until a decade ago, Statistics Canada published only the LICO rates based on before-tax income (Giles, 2004). Statistics Canada then argued that after-tax income takes into account financial supplements such as tax credits, which may aid low-income Canadians, and maintained that after-tax income provides a truer account of the financial situation of Canadians (Statistics Canada, 2012e).

The following example demonstrates the results of using different methods of calculation:
According to the after-tax calculation method, 15.5% of unattached seniors had low incomes, per the LICO standard, whereas a before-tax calculation showed the percentage as 35.6 (Government of Canada, 2004b). Similarly, in 2007, for all seniors, the after-tax measure was 4.8%, and the before-tax rate was 12.5% (Government of Canada, 2007). Another example further illustrates the effect of various calculation methods. The most recent before-tax LICO rate is $23,298 for a single person living in a Canadian city of over half a million and the comparable after-tax LICO rate of $19,307 (Statistics Canada continues to publish statistical information based on before-tax and after-tax income data; Statistics Canada, 2012d).
Phipps (2003) weighed in on this discussion. In her literature scan, which focused particularly on poverty among Canada's children, but did discuss poverty reduction among the older adult population, she cited tax and transfer programs as major contributors to poverty reduction among the older adult population. Despite legitimate concerns about the pitfalls of using either before-tax or after-tax income as a sole measure of low-income, Phipps (2003) stated unequivocally that the literature argued that after-tax income and transfers are the best measures of SES, which in turn is the best measure of poverty. According to Phipps, “Taxes and transfers are clearly highly effective in removing elderly Canadians from poverty” (Phipps, 1999, p. 1138). She drew this conclusion from a survey of the poverty rates of seniors based on the Survey of Consumer Finances, a cross-sectional data subsample of Canada’s Labour Force Survey (Statistics Canada, 1998c). The survey measures poverty using data about income collected from all sources, including government transfers and pensions. Phipps’s conclusion has been supported by Picot, Myles, and Pyper. In the chapter “Markets, Families and Social Transfers: Trends in Low-Income Among the Young and Old, 1973-95,” these researchers stated that the “post-tax/post-transfer low-income rate has fallen continuously since 1973, from 25% to less than 4% in 1995” (Statistics Canada, 1998b, p. 13). Phipps (2003) stated that “based only on market income, 70.6% of Canadian seniors would be poor, but state intervention [actions taken by government to effect poverty reduction, for example, increases in welfare rates and minimum wage] reduces the incidence of poverty to 1.9%” (p. 9).

2.2.2 Health, population health, self-rated health, and health behaviour

Fundamental to the discussion in this thesis are the meanings of key concepts related to health. In this section, the basic concept of health is discussed, and, other relevant concepts associated with health, such as population health, self-rated health, and health behaviour, are discussed.

2.2.2.1 Health

Various definitions of health appear in the literature, but one widely accepted and well-known definition is offered by the World Health Organization (WHO). Its definition of health is “a state of complete physical, mental, and social well-being and not merely the absence of disease, or infirmity” (World Health Organization, 1946, para. 1). The health of older people has been distinctively defined, that is, as the absence of one or more of the major contributors to functional disability, for example, stroke, depression, hip fracture, osteoarthritis, or heart disease (Guccione et al., 1994). This definition presents health as the absence of limitations to physical
or mental health. These limitations or long-term health problems restrict daily activities. Similarly, Statistics Canada (2006a) defines ill health as a health condition that physicians expect to last or has already lasted six months or more.

2.2.2.2 Population health

The concept of individual health is distinct from population health, which, put simply, refers to the health of an entire population. Specifically, according to Kindig and Stoddart (2003), population health refers to any group’s health outcomes. It also includes the frequency distribution of the group’s health outcomes. In other words, population health is related to the patterns of the determinants of health and to interventions and policies that tie the two together. According to the Federal, Provincial, Territorial Advisory Committee on Population Health, population health is “the health of a population as measured by health status indicators and as influenced by social, economic and physical environments, personal health practices, individual capacity and coping skills, human biology, early childhood development, and health services” (Health Canada, 1999, p. 7). Population health is most often measured using mortality and morbidity statistics (World Health Organization, 2008).

2.2.2.3 Self-rated health

The concept of health status (as differentiated from health) can be defined by composite measures that categorize health from poor to excellent, including those that calculate health care utilization rates, functional disability, morbidity, mortality, and even body mass index (Godlonton & Keswell, 2005). Self-reporting of health status is one very common measure of health status. The literature generally accepts the measurement of health status through self-reports as reliable (Arber & Ginn, 1991; Shields & Shooshtari, 2001; Statistics Canada, 2006i), despite concerns about subjectivity (now apparently resolved; Bound, 1991). However, it is still important to explain these concerns. The existence of confounding, and, confusion, related to reporting errors, has long been suggested. Referred to as state-dependent errors in reporting (Bound, 1991; J. S. Butler, Burkhauser, Mitchell, & Pincus, 1987; Kerkhofs & Lindeboom, 1995; Manning, Newhouse, & Ware, 1982), these errors are the result of respondents’ overestimation or underestimation of the actual state of their health. For example, “individuals with lower income or education may experience good health . . . (but) may be more inclined to report lower subjective health than higher income individuals, at the same level of ‘true’ health” (J. S. Butler et al., 1987, p. 665). Bias in the findings may result when such errors occur
systematically. Another issue with self-reported health that has been pointed out by Au, Crossley, and Schellhorn (2005) relates to the fact that the variable is endogenous. Be that as it may, Idler and Benyamini’s (1997) systematic review of American and international studies reveals that self-assessed health is consistently an independent predictor of mortality. Because the studies state that self-ratings of health, which can be easily obtained, are strong predictors of survival, even after accepted risk factors that relate to health are taken into account. In this study, self-rated health was employed as a primary indicator of a decline in health status.

Self-reported health is a worthy adjunct to other measures of health such as mortality (Graham, 2007). Indeed, a systematic review by DeSalvo, Bloser, Reynolds, He, and Muntner (2006) concluded that those with poor self-rated health had twice the mortality risk of those with excellent self-rated health. Mossey and Shapiro (1982) study based on the 1971 Manitoba Longitudinal Study on Aging found poor self-rated health a better predictor of mortality than other, more objective measures of poor health, such as lack of satisfaction with life, low income, and male gender. Burström and Fredlund (2001), in a study that used the Swedish Survey of Living Conditions in order to determine the efficacy of self-rated health in predictions of mortality among various SES groups, found that self-rating was equally efficacious among all levels of SES. Some researchers maintain that it is important to consider subjective measures, that is, self-reports, because an association has been found between these reports and both early mortality (Mossey & Shapiro, 1982; Welin et al., 1985) and institutionalization, after controlling for other age and health factors (Shapiro & Tate, 1988).

People experience their health and well-being on a daily basis. Their feelings reflect their evaluation of their satisfaction with life both cognitively, that is, as a thought process, and affectively, as a feeling process. Their determination of their health and well-being is subjective. Lyubomirsky and Dickerhoof (2006) believe that the process of determining well-being or "people's day-to-day feelings and evaluations of their lives [and] satisfaction with life" (p. 166) legitimately can be subjective. This conclusion is also an argument for the use of self-reports as measures of health. It has been suggested that self-reported health status is a helpful addition to direct measures of health such as mortality (Graham, 2007) and to multidimensional measures of health status such as health behaviour.
Finally, apropos this thesis, it is important to note that Shields and Shooshtari (2001) uncovered some differences between men and women’s self-reported health. Male respondents to the Statistics Canada’s 1998/99 NPHS were more likely than females respondents to report their health as very good or excellent (63.0% for male respondents and 60.0% for female respondents), but the difference was statistically significant only in mid-life, that is, among those 45 to 54 years of age.

2.2.2.4 Health behaviour

Health behaviour is often considered another measure of health status. Examples of health behaviour include

- status as a smoker (or previous smoking status);
- alcohol use, for example, heavy, moderate, or none;
- physical activity, for example, three times per week for 15 minutes; and
- normal weight (body mass index [BMI] of 18.5–24.9 kg/m2 (M. S. Kaplan et al., 2008; Ramage-Morin et al., 2010; Shields & Chen, 1999).

For the most part, health behaviour can be controlled by individuals, and, as such, is of great consequence because, as a risk factor, it is modifiable (Aro, Avendano, & Mackenbach, 2005; Davis et al., 1994; Johansson & Sundquist, 1999; Lantz et al., 1998). Indeed, the Romanow Commission’s 2002 report advocated the adoption of health behaviour that may prevent disease and disability (Romanow, 2002). Lifestyle choices and stresses combine with social-structural factors as determinants of health and health inequalities.

2.2.3 Age and aging concepts

This thesis deals with the concepts of age and aging. Morgan and Kunkel (2001) distinguished between the dimensions of aging and categories of age. They define the dimensions of aging as (a) the relationship of the passing of time to physical aging; (b) personality and other psychological changes during adulthood; (c) the meaning of aging, as it originates in attitudes based on assumptions about aging; and (d) the aging of entire populations. Morgan and Kunkel's age categories include (a) chronological age; (b) level of functioning as measured by, for example, the activities of daily living; and (c) life stages or "plateaus of stability" (p. 12).
The dimensions of aging and the categories of age are both germane to this thesis, but the notion of chronological age is most specifically related to this thesis. According to Riley, Huber, and Hess (1988), chronological age is typically used to segment the population according to various life stages, for example, infancy, childhood, and adolescence. Social research and policies have tended to emphasize chronological age, which is a static marker. Social institutions and structures have found this segmentation useful to establish criteria for eligibility for certain benefits. F. T. Denton and Spencer (2000) discussed the arbitrariness of the term *old* and the use of age 65 as its marker. Changes in life expectancy have altered the perception of what it means to be a certain age. F. T. Denton and Spencer also considered the differing definitions of age for men and women that exist irrespective of their chronological ages. They concluded that, for the time being, members of society should continue to associate old with a particular age for both men and women. The fact is that chronological age is a long-standing convention that is easy to understand; it is a convenient marker for social roles. For these reasons, chronological age is selected as a key concept for this thesis. Moreover, the terms *older adults*, *older people*, and *elders* are used to refer to those in *later life*. The terms *aged* and *elderly* have increasingly fallen out of use. The term *senior* is used to refer to those 65 years of age and older. The term *mid-life* is used to refer to those ages 40 to 64.

### 2.3 Determinants of Income Status and Health Status

In this and the following sections, the literature on the association between material circumstances and health, and, in particular, between income status and health status, is reviewed. In the discussion of these associations, the direction and strength of these relationships are noted. Primary themes are identified, and the ongoing debates and controversies are spelled out. The section is structured as follows: First, a brief overview is provided of the hypotheses that treat (a) financial circumstances as a predictor of health (social causation) or (b) health as a predictor of financial circumstances (reverse causation). Second, the literature that deals with social causation is reviewed in depth. Third, discussed are studies of other predictors of health. Fourth, the literature that deals with reverse causation is reviewed in detail. Fifth, research on other factors that are known to predict income is reported. Finally, in the sixth section, the strengths and weaknesses of the related health and poverty literature are reviewed.
As stated above, two of the competing causal hypotheses that attempt to unravel the role of financial circumstances as a social determinant of health are social causation and reverse causation (George, 2003). Advocates of the hypothesis of reverse causation posit that poor health leads to adverse social and economic conditions; that is, the direction of causality is from health to poverty rather than the opposite, that is, from poverty to health (Marmot, 2006). Reverse causation suggests that there is a possibility that poor health hampers an individual's ability to retain gainful employment and thereby affects his or her income. One difficulty with the hypothesis is that, in the process of simultaneous observation of poor health and low income, it is difficult to discern which caused which (Phipps, 2003). One proponent of reverse causation whose views are reviewed is J. P. Smith (1999). Smith found that episodes of poor health among older Americans hurt their financial circumstances. Considered also is Blane et al.’s (1993) suggestion, which goes a step further. Their suggestion is that a person's ability to move from one social class to another may be hampered by poor health; in other words, poor health may affect social mobility.

J. W. Lynch et al.’s (2004) systematic review is also discussed; their study admitted that health does affect income but consider this relationship less important than the opposite one.

### 2.3.1 Social causation

In order to simplify the following complex discussion of social causation, the economic factors that predict health are first sorted into categories by distinguishing between individual income (including length of time in poverty, SES, and social gradient) and income inequality (the degree of variation in income in a given population). The concepts of income and income inequality were discussed at length above in this chapter.

The results of J. W. Lynch et al.’s (1997) Alameda County, California, study indicated an inverse correlation between health and length of time in poverty. The authors’ conceptualization of the health-poverty link is unique. They calculated the subjects’ length of time in poverty rather than, for example, the depth of their poverty. Still, their findings mirrored those of others. J. W. Lynch et al. investigated the cumulative effect of poverty, which was defined as household income (adjusted for household size based on four-person households) that was less than 200% of the U.S. poverty line. A representative sample of adults, ranging from 1,081 to 1,124 participants, with a median age of 65 years in 1994, was studied at three points in time--the mid-
1960s, the mid-1970s, and the mid-1980s. The authors found age- and sex-adjusted associations between the frequency of income that was below the poverty line and all measures of functioning except for social isolation. Those who lived in poverty were much more likely than those who did not live in poverty to have difficulties with the instrumental (or enabling independence) activities of daily living (odds ratio = 3.38), the basic activities of daily living (odds ratio = 3.79), and depression (odds ratio = 3.24) in 1994. In addition, little evidence of reverse causation was found.

Benzeval and Judge (2001), using the British Household Panel Survey from 1991 to 1996-1997 (n = 10,000), with a two-stage stratified clustered design, distinguished between the effect on health of temporary poverty and the influence on health of enduring poverty. To ascertain causation, this study controlled for initial health status. The authors analyzed the results of 16 American, Canadian, German, and Swedish studies that focused on adult health outcomes, measured income longitudinally, and assessed income prior to measurement of health outcomes. They discovered not only that there was a statistically significant relationship between enduring poverty, which had a greater influence than temporary poverty, and health outcomes, but also that the causal relationship was between income and health rather than vice versa. Most important was the discovery that “these findings are consistent with the literature, where all of the studies conclude that the main direction of causation runs from income to health” (p. 1,387). In addition, the authors cite Benzeval, Judge, Johnson, and Taylor (2000); McDonough and Berglund (2003); and Ecob and Smith (1999), as evidence that other research has found the association between income and health stronger for people of pre-retirement age than for those who are older. Possible reasons for this difference might be that the very survival of those who reach a certain age usually indicates that they are healthy or that measurements of income do not include accumulated assets or pension income.

Epidemiologist Mustard (1997) and his collaborators analyzed the health-poverty link by studying the association between poverty, as represented by SES, and health according to age quartile among Manitobans. They employed two common measures of the health of a population--morbidity and mortality. Morbidity was captured from health care treatment records and from 15 categories of disorders, using the International Classification of Diseases and mortality from vital statistics records. In this cross-sectional study, the authors generated a 5% sample of Manitobans by linking 1986 census data with vital statistics and comprehensive
records of the use of health care resources. SES was measured using education and income. For those 65 years of age and older, the three highest rates (> 300 per 1000 population) of treatment among all disorders were for cardiovascular and cerebrovascular disease, and for ear and eye diseases. They also found a negative relationship between mortality and both education and income, but there was no association between SES and the prevalence of treatment for most of the age and disease categories. However, there was a relationship between a higher prevalence of treatment and those with less education or lower incomes. In other words, over a one-year period, poorer and less educated individuals more commonly received treatment for specific medical disorders. Among those between age 30 and 64, a negative relationship was more commonly found between treatment prevalence and income but not between treatment and education. For those 65 and older, a positive relationship was found between treatment prevalence for mental illness and dementia and low income. A strong inverse relationship was found between mortality and education for those 65 and older, after adjustment for income. The authors suggested two explanations for the absence of a monotonic gradient for income and education for all ages, namely, the exclusion of seniors in institutional settings from the study and the compression of morbidity (Fries, 1980); that is short periods of ill health that occur at the end of life may have been at play. The data of those who were institutionalized were not included in the sample, and those who had compression of morbidity were perhaps more robust, since, in their early lives, they survived the risk of having low incomes and educational levels. Mustard et al.’s results mirrored Wilkins, Berthelot, and Ng’s (2002) findings that the greatest income differences among those who die occurred among working-age adults. Finally, Mustard et al. inferred, particularly in relation to the study’s working-age adults that reverse causation played a minor role in explaining the SES-health gradient. This conclusion is gleaned from data that suggested that the subjects’ incomes were not greatly affected by poor health, except for mental illness and chronic obstructive lung disease.

The findings from three other Canadian studies were similar: First, Ferland’s study (reported in French and as cited in Auger & Alix, 2009), used data from a 1987 and a 1998 study carried out in Quebec and found that there was an association, over time, between low income and poor health. Second, findings from Badley et al.’s study, which used the 1994 and 1996 NPHS cross-sectional file and the 1994-96 NPHS longitudinal file, indicated that low income in 1994 had a negative and statistically significant association with self-rated health in 1996 (Badley, Wang,
Cott, & Gignac, 2000). Third, Richard Lessard et al.’s 2002 study of Montrealers indicated that poverty at the neighbourhood level was associated with such factors as life expectancy and mortality rates.

Indeed, Phipps (2003) who examined recent writing on poverty as a determinant of health in Canada and elsewhere in industrialized countries, concluded that poverty, as measured by individual household income, leads to diminished health status, as measured by a variety of gauges of individuals’ health.


SES is a primary determinant of functioning throughout the life course, including functioning in the spheres of health and well-being. Over and above income, wealth and ownership, for example, of a house, are associated with better health (Kington & Smith, 1997). According to Statistics Canada, for most seniors, the asset that they possess that has the greatest value is their home (Statistics Canada, 2003a); in other words, a significant proportion of their wealth is the home they own. A study by Macintyre, Hiscock, Kearns, & Ellaway (2001) indicated that homeownership and other assets are associated with better health. Robert and House’s (1996) study found that wealth was related to health throughout adulthood and old age. In addition, wealth was even more important, relative to income and education, at older ages in relation to some indicators of health. The American Psychological Association task force (2007), contended that, over time, SES is better measured by wealth than it is by a single measure of income; however, the NPHS offers limited measures of wealth, that is, income and homeownership.

The idea of social gradient is particularly relevant to the discussion of the concept of health status decline. According to Chappell et al. (2003), social gradient, simply explained, refers to the fact that those with straitened material resources are likely to have poorer health and that any
change is a gradual process rather than a threshold that must be reached before there is a
difference (Humphries & Van Doorslaer, 2000). Sir Michael Marmot, author of Britain’s two
longitudinal studies that investigated the social determinants of health among adult civil servants
from Whitehall, stated that “health follows a social gradient: the higher the social position, the
better the health” (p. 2). Siegrist and Marmot (2006) used the concept of social gradient to
discuss the health-poverty link. The authors pointed out that, as the findings of a Whitehall study
indicated, male clerical workers had a mortality rate that was four times that of senior managers.
Social gradient is an almost universal phenomenon (Marmot, 2004, 2006). The success of any
research hypothesis is contingent on awareness of the social gradient and of the question about
whether the researcher is looking for reverse causation rather than social causation (Marmot,
2006). Social location determines poor health, and this social gradient, which is the result of
differing social and economic conditions, is at play in most major causes of death, for example,
heart attack, stroke, diseases of the major organs, and even injury. The conclusion may be drawn
that the perspective that defines social location as a major determinant of health shapes the
nature of the problem "socially, scientifically, and politically" (Marmot, 2004, p. 18). This social
gradient, which is generally less steep later in life, is steeper among women (Arber & Thomas,
2001; Siegrist & Marmot, 2006), and varies according to country and medical condition.

Evans, a health economist, and Stoddart, a biostatistician (1990), constructed the concept of
social gradient as follows: Social gradient refers to the decrease in health status, in decrements,
as a function of relatively lower, not absolute income. Relative income refers to one’s income
position relative to the position of others (Phipps, 1999). Equal income distribution results in
better health. The fact that "gradients in mortality and morbidity across socioeconomic social
classes appear to be relatively stable over long periods of time, even though the principal causes
of death have changed considerably, implies that the underlying factors influence susceptibility
to a whole range of diseases" (Evans & Stoddart, 1990, p. 1,355). The writers go on to suggest
that financial success may increase self-esteem and feelings of autonomy, and thereby both
reduce stress and decrease morbidity and mortality.

A study by Wilkins, Berthelot, and Ng (2002), which examined, over a 25-year period, trends in
urban Canada in mortality rates and other factors, including potential years of life lost (PYLLs).
Wilkins et al. found a relationship between income and health in a minimum of 17 Canadian
individual-level income data and in 11 small socioeconomic geographic area-based studies.
Wilkins et al.’s study data were drawn from the Canadian Mortality Data Base and population censuses for 1971, 1986, 1991, and 1996. Wilkins et al. also found that, in 1996, 24% of PYLLs related to differences in income, a percentage higher than that for the years lost due to all injuries or circulatory illnesses. In reference to excess PYLL or the “percentage of total PYLL that was related to [mean neighbourhood] income differences,” Wilkins et al. stated that the “elimination of excess PYLL would result in gains in potential years of life equivalent to eradicating one of the three leading causes of death” (p. 9). Auger, Raynault, Lessard, and Choinière (2004) pointed out that Wilkins et al. looked at the relationship between mortality and average neighbourhood income, not the relationship between mortality and income distribution. In other words, Wilkins et al. did not attempt to link income inequality and health.

According to Mackenbach (2002), “the powerful impact of individual income on mortality has been rediscovered” (p.2). Indeed, there continues to be evidence that income is a predictor of health. J. W. Lynch et al. (2004), leading American, British, and Canadian experts prepared a systematic review that included comprehensive analyses of the European and North American literature on income and income inequality as determinants of health. They stated, “The evidence for a causal effect between individual level of income and individual health seems compelling, albeit through complicated pathways over the lifecourse” (p.4).

McLeod et al.’s (2003) research confirmed that “apart from health status at baseline, household income was the best predictor of future health status” (p. 1,291). McLeod et al.’s research on the relationship of both income inequality and household income to self-reported health used longitudinal data ($n = 6,456$) from a Canadian stratified, multistage survey. The researchers used income status and health status data from the 1994 NPHS, plus health status data from the NPHS’s 1996 and 1998 survey waves. The study’s authors concluded that low household income, but not income inequality, was related to health status.

Using the 1996-1997 NPHS and the 1996 Census of Population, Statistics Canada researchers Hou and Chen (2003) investigated, for those living in various Toronto neighbourhoods, the association between income equality and health. Their findings, which were slightly different from N. A. Ross et al.’s, indicated that, indeed, income inequality and low income were related to poor self-rated health; however, they were not related to chronic diseases or distress.
Drawing from the 1996-1997 Ontario Health Survey, Xi, McDowell, Nair, and Spasoff (2005) found that, at the population level, poor self-rated health was associated with income inequality. This study used the Gini coefficient measure (0 corresponds to perfect equality and 1 means perfect inequality) and controlled for individual income.

Similarly, Humphries and Van Doorslaer (2000), using 1994-1995 NPHS cross-sectional data, found that income inequality and self-rated health were positively associated for the higher income respondents. In addition, income inequality and self-rated health, as in McMaster University’s Health Utilities Index (HUI, an assessment of health; Health Utilities Group, 2006), were positively associated for lower income respondents.

Mullahy, Robert, and Wolfe (2001), in their review of health, income, and inequality, that, in the United States, “those with low levels of income have poorer health than those with more income” (p. 2). Furthermore, they concluded that “while the evidence for a relationship between individual income and health is strong and relatively consistent, the evidence for a relationship between aggregate measures of income inequality and health is weak and controversial” (p. 9).

In order to elaborate on Mullahy et al.’s conclusion, J. W. Lynch et al. (2004) are now cited for a discussion of income inequality’s links to poor health. These scholars, in their systematic review of Western countries’ research, concluded that a strong link between health and income inequality might exist in poor nations, but not in wealthy nations, except for the United States. The understanding that if there is more income inequality, then life expectancy rates are also lower, and mortality rates are higher has been re-examined (Judge, Mulligan, & Benzeval, 1998; J. W. Lynch et al., 2004). J. W. Lynch at al. (2004) cautioned that they have little proof that income inequality directly affects individual health, but

this [statement] should not be interpreted to mean that the factors that drive unequal income distribution at the level of the system are not important to the health of individuals and populations. Reducing income inequality by raising the incomes of more disadvantaged people will improve the health of poor individuals, help reduce health inequalities, and increase average population health (para. 96).

One study in J. W. Lynch et al.’s (2004) systematic review found that the link between income inequality and population health was not strong in Canada and was certainly weaker here than it
was in the United States. In the research by N. A. Ross et al. (2000), the link refers to an inverse relationship between income equality and mortality; again, it is posited that, if income inequality in a nation is higher, then the life expectancy of its citizens is lower. N. A. Ross et al. (2000), using the OECD’s LIM to define income inequality, undertook regression analyses of 1990s U.S. and Canadian cross-sectional census data (and, for the United States only, the U.S. Center for Disease Control’s mortality rates data). In Canada, at both the provincial and metropolitan area levels, no association between income inequality and mortality was found. However, when combined U.S. and Canadian data were used, income inequality was associated with mortality except among the older people. Mackenbach (2002) referred to N. A. Ross et al.’s research to call attention to the re-examination of the income inequality-life expectancy relationship. Mackenbach stated that, a decade after researchers proposed a linkage between inequality and life expectancy, J. W. Lynch et al. (2001) challenged the notion of a linkage, using evidence such as that provided by N. A. Ross et al. (2000). Mackenbach indicated that this challenge was possible because data from many more nations became available. Data for only nine Western nations was originally analyzed, whereas data is now available for 16 Western nations. For example, N. A. Ross et al.’s (2000) findings revealed that Canada had lower income inequality and mortality than the United States, but that links between income inequality and health were found in some U.S. states. The reasons why the link exists in some states in the U.S. and not in Canada may be found in Canada’s definitions of income, labour market, universal health care, and taxation, and in some of Canada’s unique characteristics, such as the social safety net. Evans and Stoddart (2003) agreed that the reasons for such findings are Canada’s social programs and legislative protections.

Notably this difference in findings between Canada and the United States may be related to differences in our respective health care systems. The impact of income inequality on health may be mitigated by Canada’s publicly funded health care system. Indeed, Canadians versus Americans have lower out-of-pocket expenses, that is, those not reimbursed by a health care plan. In 2011, out-of-pocket health care expenditures per capita in Canada versus the United States were respectively US$667 versus US$987 (OECD; 2011a). In 2011, in Canada versus the United States, out-of-pocket expenses were respectively 14.7% versus 11.6% of total health expenditures (Canadian Institute for Health Information, 2013). “High out-of-pocket expenditures may discourage people from accessing preventive or curative care and can
impoverish households that cannot afford needed care” (World Bank, 2012, p. 103). The share of out-of-pocket spending on health care increases with age, with households headed by a senior spending 6.8% of their goods and services budget on health care versus 2.6% in households headed by a person under 30 (Statistics Canada, 2011g).

As well, Canada’s level of public sector funding for health care as compared to the United States’ is higher. In 2011, in Canada versus the United States, public sector funding for health care was respectively 70.4% versus 47.7% (Canadian Institute for Health Information, 2013). Canada’s proportionately high level of public funding of health care may moderate the effect of income inequality, and, in turn, its effect on health.

In 2011, per capita spending on health care in Canada was US$4522, whereas in the United States it was US$8508 (adjusted for purchasing power parity, OECD; 2011b). In 2011, health spending accounted for 11.2% of GDP in Canada, whereas in the United States it accounted for 17.7% (OECD; 2011b).

Auger et al. (2004) drew attention to N. A. Ross et al.’s (2000) findings that the link between income inequality and health was weaker in Canada than it was in the United States. However, Auger et al. cautioned against assuming a direct link between Canada’s public policies that promote income equality and those that promote a healthy population. Auger et al. cited Mackenbach (2002), who argued that the link is probably indirect. According to Mackenbach, in all likelihood, income inequality per se does not result in poor health within a population.

Veenstra (2001) discussed the research on the link between income inequality and population health. He underscored the point that this link is not between national wealth and population health, but between income inequality and population health. Indeed, he agreed that, in Canada, the latter link might be tenuous. He suggested that research findings that indicate that the link may not exist for Canada might be a function of the fact that, in Canada, there is not enough variability in equality to generate a statistically significant relationship. Veenstra explained that, of the concepts that have a bearing on the health-poverty relationship, that is, SES, social class, and social capital, it is the latter concept that is the subject of much recent discourse in Canada. He maintained that social capital or social cohesion is instrumental in achieving a healthier society not just a robust link between income inequality and population health. According to
Bourdieu, social capital is “the aggregate of the actual or potential resources which are linked to possession of a durable network of more or less institutionalized relationships of mutual acquaintance and recognition--or in other words to membership of a group” (as cited in Veenstra, 2001, p. 5).

The literature that addresses income, SES, social gradients, and income inequality as predictors of health was reviewed in this section. Researchers such as Arber and Cooper (2000) have warned that other factors could potentially be the keys to a deeper understanding of the mechanisms related to health inequalities. For example, educational levels and familial structures may play a large part in health inequality, particularly for women.

2.3.2 Other determinants of health status

Some of the factors (relevant to this thesis) beyond poverty that are known to predict health are discussed in this section; it examines the literature that explores the relationship between gender and health, age and health, education and health, and employment status and health. The goal of this section is to uncover the extant evidence about the impact of these factors on health, with a particular focus on mid- and later-life Canadians.

One study, undertaken by M. S. Kaplan et al. (2008), and which used the NPHS, investigated the predictors over a ten-year period (1994–2004) of health, in particular, excellent health, among 2,432 Canadian seniors. Using the HUI as a measure, less than one tenth (8%) of their sample experienced excellent health 10 years after the baseline data were collected. The predictors of exceptional health were being younger at the outset, higher SES, as measured by income, psychosocial factors such as lower distress, not having smoked, and moderate use of alcohol.

Factors that are known to predict health, for example, age, gender, and marital status are discussed. McMunn et al.’s (2006) supported drawing these distinctions because, in the past, most social-determinants-of-health research dealt only with the relationships between health and occupational and social class, health and retirement, and health and education. Age and gender differences were of less concern to academics (Cruikshank, 2003). Development of this thesis’s subject matter necessitated a thorough discussion of the role of gender and age vis-à-vis health.
2.3.2.1 Gender as a determinant of health status

A study by Østbye, Steenhuis, Wolfson, Walton, and Hill (1999) focused on determinants of health. Using the Canadian Study of Health and Aging, Østbye et al. (1999) examined the predictors of mortality for older Canadians. Their sample consisted of 8,949 community-dwelling older people, who were interviewed, and 2,914 older people who underwent a clinical assessment. Employing logistic regression models, the authors determined that being male, being of an advanced age, and having impaired functioning and cognitive abilities predicted death five years after enrolment in the study.

Arber (2000), a sociologist and codirector of the University of Surrey’s Centre for Research on Ageing and Gender, and her fellow researcher, Cooper, have examined gender’s role in health at three stages in the life course, that is, childhood, adulthood, and later life. They explored patterns of health differences by gender and age along the life course. Arber and Cooper (2000) undertook a secondary analysis of the (annual) British General Household Survey data ($n = 10,000$). In 1994-1995, the survey yielded a response rate of 80%. Arber and Cooper found that there were small gender and large occupational social class differences (at all stages of later life) in self-reported health. They also found that, for both men and women, marital status did not have an effect on self-reported health; however, homeownership and income did affect self-reported health. Arber and Cooper believe that, with the exception of occupational social class, the factors affecting the health of older men and women are similar and affect them to a similar degree. They also predicted that this similarity will increasingly be the case, as men’s and women's life courses become more homogeneous.

Researchers M. Denton, Prus, and Walters (2004) were primarily concerned about whether mental and physical health differed according to gender and whether such phenomena could be attributed to the structural context, for example, SES. In other words, their central question was whether “gender differences in health (are) attributable to the differing structural (socioeconomic, age, social support, family arrangement) contexts in which women and men live, and to their differential exposure to lifestyle . . . and psychosocial . . . factors” (p. 2,585). All of the health measures were self-reported: (a) overall health was based on subjects’ own evaluation of their general health; (b) functional health was based on the HUI, and included a description of health; (c) chronic illness was defined as long-term chronic ill health; and (d)
distress was based on scores from a Composite International Diagnostic Interview. M. Denton et al. undertook a multivariate analysis (n = 18,000) using cross-sectional data from Canada’s National Population Health Survey of 1994-1995. They examined three types of factors—behavioural, psychosocial, and social structural (variables such as age, family structure, social support, current main activity, education, occupational status, and income adequacy)—that relate to health determinants.

M. Denton et al. (2004) argued women's health problems often differ from men's health problems. Overall, women’s health is poorer than men’s health, as evidenced by their self-rated health, HUI, distress, and chronic condition scores. Even after controlling for the structural, behavioural, and psychosocial determinants of health, women have higher HUI, distress, and chronic condition scores. The authors concluded from this finding that the differential exposure of men and women to social determinants “cannot completely account for gender differences” (p. 2,592). They concluded instead that gender differences relate to differential vulnerabilities. M. Denton et al. (2004) also concluded that social-structural (and psychosocial) factors determine women’s health more than they do men’s health. The determinants of women's health relate less than men’s health to individual habits and practices, such as smoking and alcohol consumption. Instead, social-structural factors such as income levels, types of employment, family responsibilities, and social networks are the crucial factors for women. Social support and family structure are determinants of health, particularly for women. Unattached women who live alone are more likely than men who live alone and more likely than are women in any other living arrangement to have a chronic health problem. Occupational status, another social-structural factor, is the most powerful determinant of health for women (and men), unattached or not.

2.3.2.2 Age as a determinant of health status

Just as gender plays a role in predicting health, age also plays a role. Health and aging are inextricably linked (Buckley et al., 2004b). In fact, age is central to health: The chances of retaining one’s health diminish as one ages (Buckley, Denton, Robb, & Spencer, 2004a). M. Denton et al. (2004) confirmed that age, as a determinant of health, is important in health outcomes for both men and women. Their conclusion was that older people have poorer functional health and more chronic health problems than younger people do.
Shields and Shooshtari (2001), in Statistics Canada’s publication, *Health Reports*, noted that respondents to the 1998-1999 NPHS who were older were more likely to report fair or poor health. That said, the proportion of Canadian seniors who reported very good or excellent health was greater than the proportion who reported fair or poor health. At ages 65 to 74, 46% reported very good or excellent health. However, Shields and Shooshtari (2001) suggested that the relationship between age and self-rated health often is less a function of age and more a function of SES, health behaviour, physical well-being, and psychosocial factors. There were some notable exceptions, that is, 65 to 74-years-old men, as compared with 35 to 44-years-old men, had higher odds of reporting fair or poor health, and 45 to 54-years-old or 65 to 74-years-old women, as compared with 35 to 44-years-old women, had lower odds of reporting very good or excellent health.

In another report, based on a study that looked at changes in seniors’ health status from 1994-1995 to 1998-1999, using the NPHS longitudinal file, Shields and Chen (1999) determined that those 85 and older were more likely than the rest of the population to experience health status declines. The authors reminded the readers of their research that environmental, social, and physical factors interact in the ways that influence health. They therefore deemed multivariate regression analyses the most appropriate method for analysis of four critical transitions in seniors’ health status, that is, self-reported health, functional status, institutionalization, and mortality. One important conclusion was that declines in health are not necessarily continuously downward. Almost one half of the senior Canadians who called their health fair or poor in 1994-1995 reported an improvement in their health in 1998-1999. The institutionalization rate for all seniors has also declined during the past few decades, and the activity limitation rate declined among younger seniors (age 65 to 74) during the same period. In conclusion, despite increased longevity, many Canadians can expect good health well into their senior years (which may preclude institutionalization) as well as improvements after declines in health.

**2.3.2.3 Marital status as a determinant of health status**

Marital status is not only a predictor of poverty for Canadian men and women (Government of Canada, 2006a), marital status has also long been known as a predictor of mortality (Boyd, 1983; Chen, Wilkins, & Nault, 1996; Gove, 1973; Kalbach & McVey, 1979) and morbidity (N. J. Johnson, Backlund, Sorlie, & Loveless, 2000; LaHorgue, 1960; Verbrugge, 1979). In general, those who are unattached die younger (Hu & Goldman, 1990; R. M. Kaplan & Kronick, 2006;
Manzoli, Villari, Pirone, & Boccia, 2007; Trovato & Lauris, 1989) and experience more disability (Verbrugge, 1979).

The use of U.S. federal health survey age-adjusted data (of noninstitutionalized persons) led to a finding that the health status of separated and divorced individuals was the most compromised (Verbrugge, 1979). They had the highest rates of disability and acute as well as chronic conditions. Widows and widowers had the next poorest health status, and after that came the health status of single persons. The healthiest individuals were married persons, who had low rates of activity limitation and disability. The overall aim of a study by Joung, Stronks, van de Mheen, Poppel, van der Meer, and Mackenbach (1997) was to determine the extent to which psychosocial conditions, material circumstances, and health behaviour contribute to health differences that occur in relation to marital status. Their attempt was to clarify the mechanisms of the relationship between health and material circumstances. Their study, which used logistic regression, and which was part of a larger study of 25 to 74-year-old Dutch men and women (n =3,510) revealed that divorced women’s poor material conditions contributed to their (self-reported) poor health. The measures used were subjective health complaints and a health profile scale that included mobility, pain, energy, sleep, social isolation, and emotional reaction.

One of the earlier studies of the link between marital status and mortality, which was carried out by Trovato and Lauris (1989) used multiple regression analysis on data from Statistics Canada’s Mortality Data Base. They examined, during the 30-year period from 1951 to 1981, the association, for men and women, between transitions in marital status and death from cancer and heart disease. They found that married individuals had a lower mortality rate than those who were not married. With respect to the difference between the sexes, the change of status from unmarried to married was generally more advantageous to men than to women; their risk of death was lessened when they moved from unmarried to married status. Ramage-Morin et al. (2010) in a later Canadian study, advanced these earlier findings. They found that cohabitation (vs. living alone) is positively associated with good health.

Using the U.S. National Longitudinal Mortality Study and employing Cox proportional hazards models, Johnson, Backlund, Sorlie, and Loveless (2000) studied the impact of marital status on mortality for 281,460 men and women who were 45 years of age and older. Those 45 to 64 years of age who were not married were at greater risk of death, as compared to those who were
married. The relative risk for White men was 1.24-1.39; for White women, it was 1.46-1.49; for Black men, it was 1.27-1.57; for Black women, it was 1.10-1.36. Those who were older did not have the *marital advantage*, as compared to those who were younger, except for Black women. Each of the categories of nonmarried persons indicated an increased relative risk of death, as compared to married individuals, and these effects persisted after adjustments were made for other socioeconomic factors.

A meta-analysis by Manzoli, Villari, Pirone, and Boccia (2007), which addressed the magnitude of the well-known link between marital status and mortality, included studies that were written in English from 1994 onward and that employed multivariate analyses. The finding, based on 53 comparative analyses involving approximately 250,000 seniors, was that the overall relative risk (calculated using estimates such as odds ratio) for married versus nonmarried individuals was 0.88. The finding in relation to types of marital status was that the relative risk of death for a widow or widower was 1.11, as compared to the relative risk of a married person. For a divorced or separated person, the relative risk was 1.16, and, for a person who never married, it was 1.11. There were no gender differences; in other words, an older person of either sex was found to live longer if he or she was married.

### 2.3.2.4 Educational status as a determinant of health status

There is much evidence of a positive association between education and health (M. Denton et al., 2004). According to Statistics Canada’s 1999 Portrait of Seniors in Canada (3rd ed.), prepared by Schellenberg and Turcotte for the National Advisory Council on Aging (NACA), seniors with less education and lower SES tend not to live as long and to rate their own health as poor. Tremblay, N. A. Ross, and Berthelot’s (2002) study, which used the 2000-01 Canadian Community Health Survey, found that poor health was related to lower levels of household income and education. Shields and Chen’s (1999) study found that those Canadians 65 and older who were not high school graduates had increased odds of dying, as compared to those who were graduates. These findings were confirmed by Wilkins, Tjepkema, Mustard, and Choiniere’s (2008) study of mortality, which found that mortality rates were the lowest for those with a university education and who were employed. They were highest for those who were not high school graduates. A higher level of education was also positively associated with good health (Ramage-Morin et al., 2010).
Using three years (1996-1998) of longitudinal data from the Survey of Labour and Income Dynamics (SLID), Buckley et al. (2004a) investigated health changes related to education for Canadians 50 years of age or older, and found that the impact of education is quite important. The probability of staying in good health was about 0.09 higher for men in the highest education category (university degree) than for someone in the lowest (less than grade 11 completed). For women, the difference was 0.14.

2.3.2.5 Visible minority status as a determinant of health status

A U.S. study by Kington and Smith (1997) of the association between income, wealth, and health for selected visible minorities used cross-sectional data from a sample from the Health and Retirement Survey. In their study of 9,744 men and women aged 51 to 61, they found that African Americans and Hispanics had higher rates than Whites of hypertension and diabetes, even when controlling for education, income, and wealth. However, the disadvantages imposed on functioning by these diseases were reduced by controlling for SES. In other words, SES played a large role in the ability of those with the diseases to continue functioning.

Canadian researchers Prus and Lin (2005) have examined ethno-cultural differences in health as functions of differences in structural and behavioural factors. The 2000-01 Canadian Community Health Survey \((n = 129,588)\), using three health measures, namely, self-reported health, functional health, and activity restriction, found that certain ethno-cultural groups had better health relative to other groups. Structural factors, for example, SES, and behavioural factors, for example, smoking, were introduced as control variables. They found that health differences among ethno-cultural groups occur partly because of structural and behavioural factors, but the mediating effects of these variables differ from one ethno-cultural group to another. For example, structural and behavioural factors have a mediating effect on the health advantage of Blacks, Filipinos, and Latinos but not on the health disadvantage of Jews and South/East Europeans. The researchers also found that, in general, structural factors are more important than behavioural ones in understanding ethno-cultural differences in health status.

A review by Wilkins et al. (2008) of Canadian mortality, which used census data of the adult population over the ten-year period from 1991 to 2001, discovered that visible minorities had reduced mortality rates, as compared to their counterparts who were not visible minorities.
2.3.2.6 Immigrant status as a determinant of health status

The same study of mortality by Wilkins et al. (2008) also found that the mortality rates of immigrants and, in particular, recent immigrants were lower than the rates of those who were born in Canada. This is referred to as the healthy immigrant effect. Gushulak (2007) offers two explanations for the healthy immigrant effect: First, immigrants to Canada originate from countries in which deleterious health behaviour are less prevalent. Second, Canadian government policy gives preference to potential immigrants who are in good health, young and well educated. This advantage diminished over time; immigrants new to Canada were generally healthier upon immigration, but then experienced a subsequent deterioration of their health (J. T. McDonald & Kennedy, 2012; Ng, 2011). It is notable that Newbold’s (2005) findings regarding the healthy immigrant effect were mixed: Using survival analysis, he found that Canadian-born respondents were, over the same period, less likely to decline from good to poor health. Using logistic regression, he found that immigrants who were healthy at his study’s outset were neither more nor less likely to rate their health as fair or poor within a six-year period.

Ali, McDermott, and Gravel (2004) undertook a review of Canadian research that compared the health of immigrants to Canada with the health of those who were born in Canada. Based on studies using the NPHS, CCHS, and GSS, as well as other surveys, they found that the health and health behaviour of immigrants was comparable to or better than were those of Canadian-born individuals. Likewise, immigrants’ use of the health care system was comparable to or less frequent than that of Canadian-born individuals.

Mikkonen and Raphael (2010) note that, in comparison to immigrants from Europe and Canadian-born residents, non-European immigrants’ health, and, in particular, recent immigrants who were visible minorities, deteriorated over time. Respondents who were non-European immigrants were 50% more likely to make frequent visits to doctors, as were those respondents who were born in Canada. The report also found that new immigrant respondents who were not European were twice as likely as respondents born in Canada to indicate that their health worsened from 1993-94 to 2002-03. Neither the report’s authors nor the literature that cited their report explained these findings.
2.3.2.7 Employment status as a determinant of health status

The literature is limited about employment as a determinant of health status for the population that is the subject of this study. However, there are some studies (Public Health Agency of Canada, 2012) that provide support for the thesis that, in general, employment, particularly unemployment, underemployment, and working conditions (Jackson & Polanyi, 2002), as well as job insecurity (D.-G. Tremblay, 2002), do affect health.

As well, there are studies that discuss the relationship between employment status and health status (as opposed to employment status predicting health status). For example, Wilkins et al. (2008) study of mortality found that mortality rates were the lowest for those who were employed and highest for those who were not employed. Their study tracked the mortality for a ten-year period, from 1991 to 2001, of a 15% sample of Canada’s adult population that had participated in the 1991 long-form census. This sample included approximately 2.7 million people and 260,000 deaths. The fact that persons who were employed were less likely to die is plausible, because mortality rates were lower for younger people than they were for older people, and younger people have employment rates that were higher than were those of older people. In addition, income status was associated with health status, and employment status was associated with income status. Therefore, it is not surprising to find evidence that employability and health status were closely linked. Burström, Holland, Diderichsen and Whitehead’s (2003) longitudinal study (1979-1995) of British and Swedish men and women 25 to 59 years of age revealed differences in employment rates between those who were more and less healthy. Burström et al. (2003) compared the labour market participation of the British and Swedish groups. They found that, of all groups, the most disadvantaged were British unskilled workers, in particular, British women with debilitating chronic illnesses. In the 1990s, their employment rate was below 50% of the rate of their healthier counterparts. Another article based on the same study, Burström, Whitehead, Lindholm, and Diderichsen (2000) suggested that the employment opportunities of those with chronic illnesses that include functional limitations are impacted by certain labour market policies. Indeed, illness affects the ability to sustain employment, and this impact increases along with increases in the unemployment rate. The ability of those who have functional limitations to retain paid employment is also affected by larger macroeconomic trends, government policies regarding labour, and social policy.
2.3.2.8 Health behaviour as determinants of health status

Health behaviours are determinants of health status (Blaxter, 1990; Canadian Institute for Health Information, 2004; M. Denton et al., 2004; M. Denton & Walters, 1999; M. S. Kaplan et al., 2008; Public Health Agency of Canada, 2012; Ramage-Morin et al., 2010; Shields & Chen, 1999).

Health behaviour include one’s status as a smoker, one’s alcohol use, the amount of physical activity one gets, and one’s normal weight (M. S. Kaplan et al., 2008; Ramage-Morin et al., 2010; Shields & Chen, 1999). In a recent study by Manuel, Perez, Bennett, Rosella, Taljaard, and Roberts (2012), it was reported that, on average, adult Ontarians would live 7½ years longer, if they adopted healthier habits related to these four behaviours plus reduced their levels of stress. Sixty percent of Ontarian’s deaths that were premature were related to these factors. Indeed, excessive smoking and drinking, as well as a sedentary lifestyle contributed to more than 50 diseases, including heart disease, cancer, diabetes, and chronic obstructive pulmonary disease. The study also reported that Ontarians who lived in poor neighbourhoods could expect to live 4.5 years less than Ontarians who lived in affluent neighbourhoods. Those Ontarians with lower incomes and less education were more likely to be smokers, drink excessively, and not eat well. Their evidence is consistent with the earlier study by Shields and Chen (1999) which found that smoking, obesity, and the lack of frequent exercise were associated with lower levels of household income and education. The link between health behaviour and health status decline is well established.

2.3.3 Reverse causation

In the context of this thesis, it is important to recognize that reverse causation is an alternative to social causation as a way of understanding the relationship between health and poverty. Reverse causation posits that poor health leads to adverse social and economic conditions. It suggests that poor health may ultimately affect an individual's material well-being. Most studies have examined the effect of income or earnings on health; less common are studies that have examined the effect of health on income or earnings (Gambin, 2004).

Research that discusses the reverse causation hypothesis is addressed in the following section, in chronological order, from the least recent to the most recent. A study by Wolfson, Rowe, Gentleman, and Tomiak (1993), which examined the impact of Canadian men’s earlier health
status on their later-life income, is reviewed. Next, there is a discussion of Blane, Davey Smith, and Bartley’s (1993) work, which suggested that a person's ability to move from one social class to another might be hampered by poor health; in other words, poor health may affect social mobility. Attention is then turned to Clark, Maddox, and Steinhauser’s (1992) and Maddox, Clark, and Steinhauser’s (1994) research that explored both the effect of income dynamics on later-life functional status and the effect of later-life impairment on income dynamics. In specific terms, they posit the existence of a mutual relationship between poverty and health in old age, that is, whether health affects poverty and vice versa. In other words, they explore whether there is both social causation and reverse causation. Similarly, in their U.S. study, C. E. Ross and Mirowsky (1995) examined social causation and reverse causation, but by gender.

British research carried out by Bartley and Owen (1996) investigated the association between health and employment for those at various levels of SES. Thiede and Traub (1997), German researchers, studied the social causation and reverse causation hypotheses. Benzeval et al. (2000), a British research team, examined the effect of prior poor health on wage income. A similar study was undertaken by Contoyannis and Rice (2001), British researchers; however, their study looked the effect of good or poor psychological and self-rated physical health on wages. A study by another researcher who investigated reverse causation is discussed; Smith (1999) examined the impact of episodes of poor health on the financial circumstances on older Americans. Canadian research by L. McDonald and Donahue (2000) that relates to this thesis is discussed. They examined the relationship between poor health and retirement income comparing retirees who retired due to poor health with those who retired for reasons other than poor health. They also explored the relative effect of poor health on income, and the factors that financially buffered poor health. In her review of the literature for the Canadian Institute for Health Information, Phipps (2003), addressed the topic of reverse causation. Gambin (2004) compared women and men’s earnings with respect to the effect of health on income or earnings. A study by Kemp, Rosenthal, and Denton (2005) is discussed which examines the health-related events that influence material circumstances. McMaster University’s Veall (2007) undertook a quantitative analysis that examined liabilities that intersect, that is, sex, immigrant status, marital status, and dependent children. Ki, Sacker, Kelly, and Nazroo (2010), in their study, reviewed whether poor health relates to declines in SES. In the past ten years, a number of other researchers have commented on both hypotheses (Cardiff Institute of Society, 2005; Graham,
2007; McMunn, Breeze et al., 2006); their work is discussed. Finally, discussed is Lynch et al.’s (2004) meta-analysis, the most recent comprehensive review of the literature in this area.

In the study by Wolfson et al. (1993), which examined the impact of Canadian men’s earlier health status on their later-life income, reverse causation is discussed, that is, an association whereby lower SES is a function of higher rates of chronic illness and mortality. Using longitudinal CPP data on 550,000 men who had reached 65 in 1979, their study associated lower mortality with higher pre-retirement income. They concluded, “health selection undoubtedly accounts for the positive association between earnings and survival for some fraction of the population studied here. However, the key question is what fraction?” (p. S176). In other words, they suggested that, although an association may exist, health’s contribution to income might be insubstantial. Their analyses led to the conclusion that increases in income have a greater "protective effect" (p. S175) in terms of longevity and health at lower income levels than at higher ones. They speculated that, in order for reverse causation to be credible, the scenario of lower later-life income must be a reality. There must be “a wide variety of diseases incident at the latest at age 45 to 50 that are neither fatal nor seriously disabling up to age 65, and whose progression is independent of marital status and age at retirement” (p. S176).

Authors Blane et al. (1993) summarized evidence from British studies on the effect of health on a person's social class (Blaxter, 1989; Macintyre & West, 1991; O'Donnell & Propper, 1991; West, 1988, 1991; West, Macintyre, Annandale, & Hunt, 1990; Wilkinson, 1986). Blane et al. (1993) contended that the research demonstrated that health-related social class differences do not occur because of reverse causation. Blane et al. (1993) acknowledged the Black Report (1980), which concluded that health status during one’s paid working years affects social mobility, but also determined that, although health does affect social mobility, its effect on social mobility was not very significant. The authors discussed social mobility during four life stages, that is, childhood, early adulthood, middle age, and post-retirement. They suggested, however, that health-related social class differences could develop earlier in a person’s work history, that is, prior to age 45. Blane et al. (1993) cited evidence by Goldblatt (1989) that indicated that, for men under the age of 45, health might relate to social mobility. They concluded that reverse causation is not a plausible explanation for health-related social class differences among the retired (because retired people are unlikely to move from one social class to another), but that it is possible that advantage (or disadvantage) is cumulative vis-à-vis health and that it mediates
social mobility. Furthermore, Blane et al. (1993) suggested that the concept of indirect reverse causation provides a better explanation of causation than does the concept of direct reverse causation. Indirect reverse causation "does not accept a causal relationship between health and social class and sees some third variable as responsible for their covariation. Factors which cause indirect selection, therefore, must be able to cause variation in both health and social position" (p. 3). To illustrate what they meant by indirect selection, the authors provided the examples of level of schooling, height, and deprivation during childhood.

Using Britain’s 1973-93 general household surveys, Bartley and Owen (1996) investigated the association between health and employment for those at various levels of SES. They compared the employment rates of working-age men from different SES groups who had chronic illnesses that did or did not result in functional limitations. They found that men of higher SES with no longstanding illnesses did not experience a reduction in their chances of being employed as the unemployment rate rose, whereas the opposite was the case for manual labourers. Among those of higher “SES, about 85% of men with such illness were in paid employment in 1979 and 75% by 1993,” and, among those of lower SES, “the equivalent proportions were 70% and 40%” (p. 445). The authors concluded that the negative effects of debilitating illness on the ability to maintain employment were greater for those of lower SES.

Research by Clark et al. (1992) was first presented at the American Sociological Association’s conference in 1992 and was later published by Maddox et al. (1994). The research explored both the effect of SES and income dynamics on later-life functional impairment and the reverse causation hypothesis, that is, “the effect of disabling impairment . . . on . . . poverty status . . . to assess the competing reverse causation perspective” (p. 932). Their theoretical model attempted to explain the association between income and changes in impairment status. The authors analyzed data from the U.S. Social Security Administration’s Longitudinal Retirement History Study. Maddox et al. studied a stratified probability panel (n = 11,000 in 1969 and n = 6,270 in 1979) of initially employed (at the outset of the study) men and unmarried women ages 58 to 63 as they travelled through retirement. They evaluated the probability, given respondents’ functional impairment status, of moving in and out of poverty. Education and income were positive predictors of functional status and changes in functional status, the social causation hypothesis. They evaluated the inverse, that is, the reverse causation hypothesis: Age, education, and impairment were positive predictors of poverty. When a discrete-time-hazard-function
analysis was used, an inverse lagged effect of impairment status on poverty status (reverse causation) existed over time. In contrast, a lagged effect of the inverse (social causation) took place over just a few of the waves. However, they conceded that “both explanations are theoretically plausible, that neither has been definitively assessed, and that a key task for research would turn out to be a further specification of the conditions under which either or both explanations might be true” (p. 934).

Maddox et al. cautioned that such research is difficult because many forces affect SES and functional impairment. Maddox et al.’s research was unique in that it examined the relationship between changes in “rates of time-dependent transitions between levels of impairment” (p. 926) and evidence of movement into and out of poverty status. They measured poverty using the standard, official U.S. poverty line. They state that, as with similar studies, the testing of this type of model, even with longitudinal data, has its limitations. This data could not “resolve the implied complex interaction of biological and social variable which affect the odds of functional impairment in later life . . . (but their) data permitted a limited test of social causation versus social selection . . .” (p. 934). This limitation effectively made the drawing of a definitive conclusion about the direction of the relationship difficult, but, in general, the researchers still came down on the side of the reverse causation hypothesis. Some of the study’s other limitations included the selection of a sample from just one cohort, that is, older adults, the sample’s over-representation of poor Blacks, and the lack of standardized measures of impairment.

C. E. Ross and Mirowsky (1995) tested social causation and reverse causation in their study, which used longitudinal data from the U.S.-based, two-wave panel National Survey of Personal Health Practices and Consequences \((n = 2,436)\). The authors found that, for both men and women separately and together, full-time employment was predictive of slower declines in self-rated health and in functional ability. In a similar way, full-time employment was predictive of slower declines in health status for married and nonmarried women, and White and non-White women. In terms of the inverse, that is, employment predicted by health, for both sexes together, functional abilities improved the chances of securing or maintaining employment. For women, self-rated health positively improved the odds of employment.

Researchers Thiede and Taube (1997) used the German Socio-Economic Panel (GSOEP; \(n = 16,211\)) to explore Fuch's hypotheses, namely, that health predicts poverty and poverty predicts
health. Their study was based on the assumption that, within the context of a system that provides publicly funded health, education, and social security, there is, at least nominally, equal access to publicly funded benefits. These researchers used 1991-94 data drawn from a combination of personal interviews and surveys. Thiede and Traub's structural equation model, which used five GSOEP measures that together serve as indicators of health, examined the mutual relationships among health, income changes, and poverty. Poverty was measured by a poverty line, that is, 50% of the median household (adjusted for size) income. GSOEP, though not a health survey, did include relevant health-related questions. The study found that health status can be linked to income changes and vice versa, but that more research is needed that takes into consideration the complex interrelationships between health and poverty.

The discussion now turns to other research that has focused on health as a predictor of poverty. In their chapter, “Relationships between health, income and poverty over time: An analysis using British Household Panel Survey BHPS and NCDS data” in Jonathan Bradshaw and Roy Sainsbury’s *Experiencing Poverty*, Benzeval et al. (2000) contended, on the basis of the research they undertook, that, for some populations, prior poor health predicts current income. Using two British longitudinal datasets, researchers Benzeval et al. hypothesized that low income predicts poor health and vice versa, and that income status and health status are determined by another factor, for example, education. The authors used two datasets. The first, the National Child Development Study (NCDS), was based on a cohort study of 11,406 individuals born in 1958. After taking into account attrition and incomplete data, this study's sample size was 6,578. The second dataset, the British Household Panel Survey (BHPS), was based on a study of 5,000 households or 10,000 individuals of all ages every year between 1991 and 1995. By 1995, the sample size was 5,548 individuals. The BHPS, like the NCDS, found that, in a number of respects, women's health was worse than men’s health; however, in the BHPS, the age distribution of men and women was not taken into account. The NCDS and the BHPS measured the before-tax household income of 23- and 33-years-olds in quintiles, and the BHPS measured financial hardship, that is, the number years in poverty, including years when the household was able to manage financially. Of particular interest are the results that came from the analysis of the longitudinal data related to poor health as a predictor of low income. Men who were in poor health at age 23 were more than four times more likely than were men in good health to be in the lowest income quintile at age 33. Even when income at age 23 was controlled for, the odds ratio
fell to only 3.65. The reason why this was found for men and not for women was not discussed. Their study drew two main conclusions: First, those with poor health are more likely to experience low incomes, and, second, there is a relationship between both past income and current health and current income and current health.

A study by Contoyannis and Rice (2001), which used longitudinal data from six cycles of the British Household Panel Survey, examined the impact of self-reported psychological and general health on wages. The study authors used panel data and instrumental variable estimators (variables that belong in the explanatory equation and correlate with the endogenous explanatory variables). The authors found that poor psychological health negatively affects men’s wages and that excellent self-reported health positively affects women’s wages.

Another researcher who studied reverse causation is an economist Smith (1999) at RAND, a U.S. think tank. Contrary to others who believe that the causation question has been resolved, he stated that the debate is alive and well. His argument is that health problems interfere with one's capacity to earn a living, and, at least in the United States, may result in high medical expenses. He also believes that the financial instability that results from these health problems should be included in economic models because consideration of such problems is essential in comprehending household spending patterns. Smith estimated the magnitude of the effect of health on poverty. He noted that, across all age groups, health’s impact on poverty and income was comparable to that of education. Using longitudinal data from the Panel Study of Income Dynamics (PSID; Institute for Social Research, 2008), which included a sample of 8,000 U.S. households; Smith calculated that “changes in wealth are also correlated with initial health. Those whose 1984 reported health was worse not only had much lower baseline wealth, but they experienced considerably smaller absolute wealth growth over the ensuing 10 years” (p. 146). Smith reiterated "the chicken and the egg" question: what is the direction of the dynamic? Do higher incomes lead to better health or vice versa? Alternatively, is it more likely that there are some "mutually reinforcing interactions . . . [or] unobserved factor"? (p. 148). In any case, Smith stated that it is difficult to discern the direction of the dynamic; the reality that arguments on both sides are plausible militates against the drawing of any firm conclusions. Smith’s application of the parlance of economics to health suggests that health is an investment whose worth rises incrementally over time. Smith limited his discussion to the United States; therefore, any conclusion he reached must be understood within that context. He cited examples of health
problems that may result in considerable medical expenses or loss of income. Financial resources can be impacted by such setbacks, while, in contrast, good health allows the accumulation of current and future wealth. He stated that “A correlation of retirement income and current health may flow from past health to current retirement income . . . during retirement, however, new health shocks will not alter labor supply by much and income sources . . . will remain fixed” (pp. 149-150).

In a 2004 article, Smith (2004) summarized his more recent research. Using the Health and Retirement Study and (Study of Assets and Health Dynamics among the Oldest Old) AHEAD Survey, data on health transitions and status, medical expenses, labour supply, income, and wealth was collected from approximately 7,600 American households, with persons 51 to 61 years of age first interviewed in 1992 and 1993. These households were studied for five cycles over ten years. Smith examined the impact of major new health events on SES, as indicated by a number of measures, including medical expenses, labour supply, income, and wealth. On average, if a major health event occurred between the first and second cycle, approximately $37,000 in household income was lost by the end of the fifth cycle. This data illustrates how strong the link is between serious health issues and decline in income. When he tested the link between household economic resources and the future onset of either serious or minor disease, he found a weak relationship; however, he did find a statistically significant and strong relationship between level of education and disease.

Using the Panel Study of Income Dynamics, data on household income and its components were collected from approximately 40,000 Americans and the impact on health of SES and vice versa were investigated. With respect to impact of health on SES, Smith found that a new severe blow to health was felt most strongly by those in their 50s or early 60s. With respect to the impact of SES on health, none of the three measures of SES that he used, that is, baseline levels of household wealth, baseline levels of household income, and increases in wealth related stock, were good predictors of future health; however, education was a good predictor of future health. He found similar results when he used the same measures over a longer period in the life course.

L. McDonald and Donahue (2000) study provided support for Smith’s proposition: They examined the relationship between poor health and retirement income among Canadians. The question was, “Does poor health as a reason for retirement affect retirement income?” (p. 495).
L. McDonald and Donahue’s study reviewed relevant Canadian and international literature, and highlighted many of the debates surrounding retirement and health. Their discussion of health as a predictor of retirement income was important especially because it continued a much-needed discussion. They noted recent increased interest in the effect of health on predictions about retirement. Studies in the United States, Canada, and Britain have associated poor health with involuntary retirement. L. McDonald and Donahue compared people who retired because of poor health with those who did so for other reasons. While doing so, they also explored the relative effect of poor health on income and the factors that financially buffer poor health. A multimethod approach was used, including two samples, one from Statistics Canada’s 1994 General Social Survey or GSS \((n = 10,381)\) and one from the Labour Force Survey \((n = 1,495)\), for analysis of secondary data. The GSS is a household survey that interviewed approximately 20,000 Canadian adults in 1994 in order to discover changes in Canadians’ well-being. Its variables reflect living conditions and sociodemographic features, and it uses the Labour Force Survey (LFS) sampling frame. Both the GSS and the LFS have a stratified, multistage design. Another component of the project involved in-depth interviews with a purposive sample \((n = 100)\) of involuntary retirees about their reasons for leaving the workforce. The authors found that retirement for health reasons had a deleterious effect on an individual’s future income. Men who retired for such reasons were less likely than those who retired for other reasons to receive a pension or to benefit from investment income. Almost 50% of all the men surveyed reported worsened financial circumstances since retirement. Among those who reported that they retired for health reasons, 40.7% stated that they were in worse financial circumstances since retirement. However, poor health does not always affect women’s retirement income, because being married and other sociodemographic characteristics often countered the negative effects. The authors noted that recent changes in Western nations’ pension policies might harm older workers who retire for health reasons. L. McDonald and Donahue also found that 25% of Canadians who retired did so because of poor health and that 30.0% of men and 44.8% of women who retired for health reasons lived below the LICO. For men, but not for women, poor health as a reason for retirement had the largest single effect on their retirement income. Retirement because of poor health affects women in the same ways that it affects men, but women’s retirement incomes were even lower, for other reasons. For women, the factors that were most highly associated with their retirement income were education, household income, and marriage, and none of these was a reason for retirement. Women generally have less education and are just as likely as men to be
marriage (the most important factor in determining retirement income) and to depend on
government pensions. While women are working, they are more likely than are men to be in
low-prestige positions, work part time, and do unskilled work, and, as a result, they often do not
enjoy private pensions and CPP/QPP. Women retire earlier (and younger) than men who retire
for health reasons, and women live as retired people longer than men do. Women who retire for
health reasons often face financial hardship because they do not have a private pension and
CPP/QPP; as a result, their retirement income is lower than that of women who leave the
workforce for other reasons.

Phipps (2003) literature scan of the impact of poverty on health cited the major review of the
literature by Benzeval and Judge (2001), mentioned above, which discussed reverse causation.
She acknowledged that, in the process of simultaneous observation of poor health and low
income, it is difficult to discern which causes which. However, she maintained that the Benzeval
and Judge’s review was able to conclude that the larger problem is poverty that results in poor
health rather than vice versa because the review included only research that used longitudinal
data. Phipps (2003) stated that the studies that Benzeval and Judge reviewed "all conclude that
reverse causation is not a serious problem" (p. 13). However, Phipps acknowledged that low
income may result in an activity limitation (as distinct from poor health), or that an activity
limitation may result in low income. Phipps also pointed out that the findings that support the
social causation hypothesis are still only suggestive of causation; there is not enough evidence to
state that the relationship is causal. In other words, the research on the question of whether
poverty causes poor health is equivocal.

Gambin’s (2004) 14-country study of employed 24- to 64-years-olds, using data from the
European Community Household Panel (ECHP). Her study of reverse causation was unusual in
that she examined gender differences in the impact of health on wages. Sex-related
discrepancies in the relationship between health and wages were found for several countries.
Her conclusion was that self-rated health was related to men’s wages more than women’s wages.
However, disability or chronic health conditions were related to women’s wages more than
men’s wages.

One theme of a study by Kemp et al. (2005) was the extent to which health-related events
influence material circumstances. The authors explored the circumstances, namely, the catalysts
or constraints, which contribute to later-life financial planning. Through qualitative research, they examined relevant life events and conditions that demonstrated planning that led to economic security. They based a life course analysis on a convenience sample of 51 men and women 45 to 91 years of age in an urban, industrial southern Ontario city. Several respondents mentioned the relationship of health issues to financial planning. The authors found that "health intersected with financial and family-related motivators" (p. 281). For some participants, health was a catalyst; that is, poor health forced planning for their futures. For others, a constraint or event interfered with their ability to plan. Some conclusions were that varying circumstances affect the ability to save, that there is a positive relationship among education, financial planning, and material circumstances and that men make plans for later life more than women do.

Veall’s (2007) study examined the make-up of the 6% of seniors in Canada who had family incomes below the Low-Income Measure (LIM; low by international standards). Using 4 million income records from the Canada Revenue Agency that contained longitudinal data about those aged 66 or over, Veall, through descriptive and interpretive statistical analysis, determined that individuals included in this 6% were largely women immigrants who had arrived during the past 10 years; furthermore, they were not married, and were supporting dependents. Age did not seem to be a factor except for among women 91 years of age and older.

A journal article by Ki et al. (2010) profiled their study on reverse causation. The authors hypothesized that a possible reason for inequality in health is reverse causation, which they define as the decline in SES of those who are in poor health. In their study, they examined whether poor health caused adverse transitions in SES. Thirteen cycles of the British Household Panel Survey (BHPS) from 1991-2003, which consisted of approximately 41,000 observations from about 7,100 respondents from two consecutive cycles, were analyzed. Multilevel multinominal analysis was used. The effect of health on each transition was measured, while controlling for education and age. The descriptive analysis indicated that poor health was related to downward movement in SES, while upward mobility had the opposite result. Health affected the transitions of both men and women between social classes when they were entering and leaving employment. Health predicted social mobility to a small degree otherwise. These findings caused the authors to conclude that health’s effects were inconsistent during the course of the respondents’ labour force participation, that is, at all stages, from entry to departure. Both
age and health had important roles to play in changes to SES in terms of entry into and out of the work force. Furthermore, education was a predictor of access to higher SES (Ki et al., 2010).

Indeed, in McMunn et al.’s (2006) chapter, “Social determinants of health in older age,” in Marmot and Wilkinson’s book *Social Determinants of Health* (2nd ed.), they agreed that there is some evidence that the health-poverty relationship in old age can exist in both directions, that is, reverse causation and social causation.

Among the various researchers of these topics during the past few decades, there have been few supporters of the reverse causation hypothesis. Although Graham (2007) admitted that illness and the loss of functional ability can interfere with retention of paid work, he, like many medical sociologists, maintained that “the dominant pathway linking social position and health is . . . one which runs from social position to health” (Graham, 2007, p. 108). Just the same, Lynch et al.’s (2004) systematic review, which examined whether income inequality is a determinant of population health, did leave the question open. J. W. Lynch et al. concluded that the stronger relationship is from poverty to health and not vice versa; however, they stated, “This does not exclude reverse causation--poor health does affect earnings--but it is not the primary mechanism behind the association between income and health” (p. 3). In other words, they concluded that health does affect income, but they considered the link less important than the link in the opposite direction. At a joint meeting of the Society for Social Medicine and the Cardiff Institute of Society, Health and Ethics (Cardiff Institute of Society, 2005), Whitehead of the University of Liverpool did make the case for more research on reverse causation.

### 2.3.4 Other determinants of income status

The previous section focused on findings that address health as a predictor of poverty or what may be termed *reverse causation*. The fact that many other factors influence poverty makes a discussion of the dynamics of the sociodemographic predictors of poverty a complex process. In this section, age, gender, and marital status are three demographic factors that are discussed as predictors of income. Educational status, visible minority status, and immigrant status are also discussed. Because this thesis’s research questions relate specifically to predictors of decline in income status (with or without regains), the emphasis was on locating studies that discussed predictors of income status, opposed to poverty alone.
2.3.4.1 Age, gender, and marital status as determinants of income status

The importance of age, gender, and marital status, as they relate to poverty, are examined in this section. L. McDonald and Robb (2004) focused on these three demographic factors as predictors of poverty, but not on health. L. McDonald and Robb (2004) compared separately the levels and sources of income for widowed, separated, divorced, and never-married older Canadian women and identified differences among groups. They measured poverty by “examining the change in after-tax income and the key income sources for each sub-population over the six years to determine how these changes differed by group” (p. 7). They found that, for women, being unattached in later life is a notable predictor of poverty. Poverty disproportionately affects those who are divorced, and separated women are the most prone to poverty of all the groups studied. Working within a life course perspective, L. McDonald and Robb (2004) studied income and its sources, and identified differences according to marital status. The authors used multiple cross-sectional samples of data for 1993 to 1999 from Statistics Canada’s SLID. L. McDonald and Robb (2004) found that low income in old age was most common among unattached women. Of the four categories of unattached women, the separated had the lowest income, divorced women the next lowest, and widowed the next lowest after divorced women. Single women were in the best financial position because they were more likely to have a history of full-time work over their lives. This continuous work history often resulted in access to private pensions and CPP/QPP that provided a stable income. Widows often benefited from their husbands’ estates. The poorest women were more likely to live in Quebec and have less education. For the separated and divorced, public pensions were the main sources of income.

L. McDonald and Robb (2004) recognized that unattached women are a heterogeneous population. The authors maintained that Canada's pension system does not reflect the complexity of women’s lives. They argued that policymakers should customize remedies for these women. Their article pointed to steps that are needed to meet older women’s income needs and to realize the potential of the pension system. The authors pointed out some practical solutions and insisted on the adaptation of government policy to the needs of these at-risk populations; they called for an overhaul of Canada's pension system.

L. McDonald, Donahue, and Moore (2000) explored the reasons why many retired widows have modest incomes and the financial tactics they use to survive. The authors also discussed the
effect of these widows’ incomes on their health and well-being. Their multimethod approach included quantitative bivariate and multivariate analyses of secondary data and qualitative, in-depth interviews for narrative analysis. The quantitative component used data from the 1991 Survey on Aging and Independence. The sample \( n = 2,025 \) consisted of women 45 and older who had worked outside the home but who had retired as of 1990. The authors analyzed the quantitative data by income level, place of birth, household size, education, employment status, duration of the last job, and eligibility for a pension. The qualitative element, which included a convenience sample \( n = 40 \), contextualized the quantitative data regarding the widows.

Poverty was not narrowly defined by L. McDonald et al. (2000); for example, homeownership was factored into their analysis. Subjective ratings of women’s satisfaction with their incomes were included in their analysis. Quantitative data about health was gathered, for example, the existence of a health limitation or health as a reason for retirement. The authors discovered that women who were retired and low income were less likely to have given health as a reason for retirement.

L. McDonald et al. (2000) offered a number of findings about retired widows from their research:

- 49% of retired widows lived below the LICO and were more likely than separated and divorced women to build their savings, but less likely than married and single women;
- widows were more likely than married women to retire later;
- retired widows were less likely than married, separated/divorced, and always-single women to plan for retirement, gather information about retirement, contribute to an RRSP, or make investments;
- retired widows were less likely than all other groups to receive income from investments and from RRSPs;
- widows probably did not manage family finances or plan for retirement;
- widows depended on government and disability pensions;
- widows’ work in the paid labour force or investments did not protect them against falling below the LICO; and
- widows’ longevity made it likely that they would experience diminishing resources.
It seemed that these widows were poor because they did not have full-time jobs outside the home, and their intermittent work did not protect them financially in later life. Retired widows at the highest risk of poverty were Canadian-born, lived alone or with a few others, had little education, and/or had blue-collar occupations with no pension transfer payments, RRSPs, investments, or job-related pensions. L. McDonald et al. (2000) also found that 85% of widows rated their income as meeting needs from adequately to very well, a rating that was perhaps an indication of these women’s modest expectations. The authors’ analyses of widows’ situations related to reduced income make a strong case that policymakers should pay attention to them because they are disproportionately poor. Governments need to be vigilant about poverty among retired widows; their financial status is tenuous and is often a product of their late spouses’ financial status.

Statistic Canada’s Bernard and Li (2006) used the Longitudinal Administrative Databank to study senior men and women who were unmarried because of having been widowed. The 2006 Statistics Canada report, *The Death of a Spouse and the Impact on Income*, indicated that slightly more than half of widowers and almost three quarters of widows experienced a loss of adjusted income five years after their spouses’ deaths. This loss was related mostly to the loss of their partners’ pensions and the reduction in the household’s earnings from employment. An important fact is that, according to the below-LIM measure, almost 9% of widows and approximately 5% of widowers had low incomes five years after their spouses’ deaths. These researchers found that, in a comparison of adjusted income in the year before widowhood to income five years after their spouses’ deaths, female seniors experienced a decline greater than 15%, but male seniors’ adjusted incomes were 5.8% higher. In other words, there was ample evidence that many women who were widowed suffered a loss of income after the deaths of their spouses.

A study by Warren, Rowlingson, and Whley (2001), which used a representative sample of 26,000 households from Great Britain’s 1995-96 Family Resources Survey found that women not only earned less, they also had less opportunity to accumulate wealth, that is, savings, a home, and/or a pension. Over their lives, they experienced a cumulative disadvantage in terms of income and wealth so that they were not assured of a safety net when they became older. At the greatest disadvantage financially were senior women who were divorced or separated from a male partner, despite the fact that they were, on average, approximately five years younger than
were members of the comparator group members, namely, never married and widowed women. This study also examined whether this financial disadvantage could be expected for younger women and concluded that most working-age women had much lower pension assets than men did.

Arber (2004) examined the connections among health resources, later-life material inequality, marital status, and gender. She stated that “analyses of material resources in later life should examine the intersection between gender and marital status to indicate the interaction of these two critical determinants of material well-being rather than treat them as separate additive-variables” (p. 100). Arber found that divorced women were 4.7 times more likely than were married men to have material disadvantages in terms of household income. In addition, gender, but not marital status, was found to have links to equality in health resources.

2.3.4.2 Educational status as a determinant of income status

It is well known that there is a positive correlation between educational attainment and income (Statistics Canada, 2008b; U.S. Census Bureau, 2009). Canada’s 2006 Census figures demonstrated differences in earnings between those without a high school education and those with at least an undergraduate degree (Statistics Canada, 2009b). There are also differences in earnings between those who do not have a high school education and those who do have a high school education; again, the suggestion is that investment in further education is financially beneficial (Statistics Canada, 2009b). These discrepancies were, in absolute terms, even greater among older workers. For example, the median earnings of middle-aged women (45 to 54 years old) with at least a bachelor's degree outstripped by more than $30,000 the earnings of women without a high school education (Statistics Canada, 2009b). A study by Crystal, Shea, and Krishnaswami (1992) also demonstrated that, despite events that occurred during the course of a lifetime, early formal education was at least as strong a predictor of financial outcomes in later life as it was in the period before later life.

To be sure, education also has a positive effect upon employment rates. Data from Statistics Canada’s 2008 Labour Force Survey (LFS) and National Graduates Survey (NGS) indicated that those with a university (4.1%) or college (4.9%) degree were less likely to be not employed, as compared to those who had a high-school education (6.6%) or less (12% ; Statistics Canada, 2009c).
Davies, Avison, and McMullin (2001) studied the relationship between education and income for women, using 1993 SLID data, which included a sample of 11,250 women under the age of 65, plus the 1994-1995 Survey of Unemployment and Mental Health of Families data, which included a sample of 869 women. They determined that “younger women and women with less education are more likely to have low incomes than are older women or better educated women” (p. 36). Indeed, more than 50 years ago, sociological research established that a low educational level is related to living in poverty (Becker, 1964; Becker & Chiswick, 1966; Jencks, 1979; Mincer, 1974; Sorokin, 1927).

The link between SES and academic performance is well known (American Psychological Association, 2007). An article by White about his seminal meta-analysis carried out in 1982 confirmed his earlier findings (1980). In the later article, White detailed his review of approximately 200 studies, which was conducted to uncover the relationship between academic achievement and socioeconomic status (SES). The meta-analysis found that academic achievement and SES were strongly correlated; the correlation was 0.73. Seventy-five percent of the variations in the correlation coefficients could be accounted for by the variables used in the meta-analysis.

A meta-analysis by Sirin (2005) replicated White’s earlier study. Sirin reviewed the literature on the link between academic achievement and SES during the last decade of the 20th century. The meta-analysis covered 74 studies of, cumulatively, more than 100,000 students. The findings demonstrated that there was a medium to strong relationship of academic achievement to SES. This relationship was affected by a variety of measurements and other issues, for example, type of measure, measurement unit, range of the SES variable, visible minority status, school grade level, and location. On average, the correlation between academic achievement and SES was comparable to that in White’s study.

2.3.4.3 Homeownership status as a determinant of income status

Using the 2004 SLID of 15,000 households, the below-LIM rates for currently unmarried seniors (66+) were about 7.6% for those who owned their homes and 13.4% for those who did not own their homes. For couples who were seniors, the corresponding rates were 0.7% for those who owned their homes and 3.6%, for those who did not own their homes. The below-LIM rates were lower for those who owned their own homes (Veall, 2007). However, many senior
homeowners were poor despite their homeownership. Poverty among older people may relate to difficulties with meeting the costs associated with being a homeowner (Kutty, 1998). Homeowners may be at risk of poverty if their incomes in retirement fall short of housing expenses (Munnell, Webb, & Golub-Sass, 2007). In addition, the marital status of a senior plays a role in determining the risk of poverty if the senior is a homeowner. In 2003, among low-income Canadians 65 and older, 42.4% who were unattached and 69.0% who were not, were homeowners (Government of Canada, 2006a). Among Canadians under the age of 65 who were poor, 26.2% who were unattached, and 40.3% who were not, were homeowners. In other words, the rate of homeownership for poor unattached seniors, as compared to poor nonsenior or younger families with attached members, was similar (42.4% and 40.3% respectively; Government of Canada, 2006a). More striking is the fact that, among poor seniors who were in families, 69.0% were homeowners, as compared to nonseniors in families, of whom 40.3% were homeowners. About two thirds of unattached Canadian women 65 years of age and over own their own homes, including almost 60% of those 80 years of age and over (Statistics Canada, 2006a). However, among all senior family types, the net worth, assets, and incomes of unattached women aged 65 and over are the lowest (Statistics Canada, 2003a). Among unattached women, those who are separated or divorced are less likely to own their own homes (Crown, Mutschler, Schulz, & Lowe, 1993; Townson, 1995; Uhlenberg, Cooney, & Boyd, 1990).

2.3.4.4 Visible minority status as a determinant of income status

There is evidence that ethnicity and race are generally associated with income status (Kunz, Milan, & Schetagne, 2000; Statistics Canada, 2001b). Based on the 2006 long-form Census data, Block and Galabuzi (2011) found that, controlling for age and education, visible minority Canadians, on average, earn 81.4% of what White Canadians earn. This association exists during visible minority Canadians’ working life (Canadian Council on Social Development, 2008) and, according to Ornstein (2000), such an association needs to be investigated for those in later life.

Indeed, members of visible minorities have low incomes. In 1995, the incomes of members of visible minorities were $6,000 lower than the incomes of Whites, and the incomes of members of female visible minorities were 70% of those of members of male visible minorities. Members of visible minorities were almost twice as likely as are Whites to have low incomes (even
controlling for age and education). In 1995, 36% of members of visible minorities had incomes below the LICO, and 18% of Whites had incomes below the LICO (Statistics Canada, 2001b).

Members of visible minorities are more likely to be unemployed than Whites. In 1996, approximately two thirds of working-age men were employed; in comparison, three quarters of Whites were employed. The discrepancy is similar for women, that is, 53% in the former category, as compared to 63% in the latter (Statistics Canada, 2001b). Visible minority men are about one-quarter more likely to be not employed than White men, while visible minority women are about two times more likely to be unemployed than White men (Block & Galabuzi, 2011). Visible minority women earn half of what White men earn (Block & Galabuzi, 2011).

As well, there is ample support for the argument that women who are members of visible minorities are disadvantaged compared to Canadian women who are not members of visible minorities. In 2005, the median income all Canadian women was $20,460 whereas the median income of visible minority women was $16,638 (Canadian Association of Social Workers, 2009).

According to Statistics Canada, in 2011, more than 6.3 million Canadians self-identified as members of visible minorities; this total is 19.1% of Canada’s population (Statistics Canada, 2011a). In 2001, visible minorities constituted 13.4% of Canada’s population. In 1996, the percentage was 11.2%, in 1991, 9.4%, and, in 1981, 4.7%. Between 2001 and 2006, the rate of growth of visible minorities was five times faster than the growth rate for Canada’s population as a whole, and three quarters of new immigrants were members of visible minorities (Statistics Canada, 2008a). In 1996, 70% of members of visible minorities were immigrants, and 80% of immigrants to Canada since 2001 have been members of visible minorities (Statistics Canada, 2001b). Jackson (2001) of the Canadian Labour Congress has reported statistics (Statistics Canada, 2001b) that demonstrate that, in Canada, immigrants who are members of visible minorities have, on average, lower incomes than do visible minority nonimmigrants. For example, half of Canada’s recent Black immigrants are poor, and 38% of the members of Canada’s visible minorities have low incomes (Jackson, 2001).

2.3.4.5 Immigrant status as a determinant of income status

researcher Ostrovsky’s (2008) findings on equality of earnings and stability of earnings of immigrants to Canada complements those of Frenette and Morissette’s (2003), who found that recent immigrants’ relative earnings did not increase between 1990 and 2000. In comparisons of the wealth and income of Canadian immigrants with those of Canadian nonimmigrants, during the past 30 years, the relative earnings of Canadian immigrants have declined (Ostrovsky, 2008). The resulting conclusion is that, unless immigrants’ earning can somehow catch up to the earnings of those born in Canada, recent immigrants will need a longer time than earlier immigrants needed to earn at levels equal to those of nonimmigrants. Ostrovsky’s regression analysis, which used the Longitudinal Administrative Databank and Longitudinal Immigration Database, looked at what is less well known, that is, the profiles of various cohorts of immigrants and the core causes of the inequality they experience with respect to their earnings, such as the influence of education abroad, place of birth, and fluency in English or French. The author examined changes in the distribution of the earnings of immigrants over time and found that, both over the short and long term, immigrants’ regions of birth had the greatest impact on equality or nonequality of earnings with nonimmigrants. The ability to speak English or French and being educated outside Canada also had an impact on the equality of earnings. In general, immigrants who have immigrated more recently experienced greater inequality in earnings.

Picot and Sweetman (2005), researchers at Statistics Canada also examined the low-income rates of immigrants versus nonimmigrants in Canada. In the 1990s, the low-income rates of those born in Canada declined, but the rates climbed among those born outside Canada (specifically among recent immigrants, defined as living in Canada five years or less). In 1980, 24.6% of recent immigrants had household incomes below the LICO; in 1990, that proportion was 31.3%, and, in 2000, 35.8%. Among those born in Canada, the proportion was 17.2% in 1980, and, in 2000, 14.3% (Picot & Sweetman, 2005).

In 2000, the rate of low-income for new immigrants was 2.5 times the rate for nonimmigrants (Kerr & Michalski, 2005). Historically, immigrants and nonimmigrants with more education are less likely to be poor. However, it is ironic that newcomers experienced a decline in their relative earnings while, during the same cycle, they were better educated than their predecessors. In 2000, more than twice as many (42%) newcomers as the newcomers in 1980 (19%) had university degrees (Kerr & Michalski, 2005).
Recently arrived immigrants are particularly at risk for poverty. Their low-income rates are higher (Kerr & Michalski, 2005). Related to this risk are the problems that they sometimes experience in the process of settling in Canada, and particularly in finding employment (Government of Canada, 2004a). In addition, there is evidence that members of foreign-born visible minorities earn much less than other Canadians (E. Smith & Jackson, 2002). For example, there are statistics that indicate that, in 2000, immigrants who were male and who worked full-time and for a full-year earned 60% of the earnings of Canadian-born workers. Immigrants earned 84% of the earnings of their Canadian-born counterparts 20 years earlier.

It is important to note, with respect to immigrants who are approaching their senior years, that they must have resided in Canada for 40 years or more from age 18 in order to be eligible for full OAS/GIS. In addition, they may not have enough years of earning to benefit significantly from CPP or QPP.

2.3.4.6 Employment as a determinant of income status

As stated above, in 2008, for Canadian families of two or more, the median after-tax income, after adjusting for inflation, was $63,900. Among unattached individuals, the median income was $24,900. Except for families headed by seniors, most family income is market income and, in 2008, the median for families with mostly market income amounted to $64,900. In 2008, unattached individuals earned $21,300 in market income. Families whose major income earner was a senior had a median market income of $25,500 in 2008 (Statistics Canada). Because market income is directly related to employment, it can be safely assumed that employment is a determinant of income status.

2.4 Gaps in Literature and Response of Research Study

In this section, strengths and weaknesses in the extant literature are identified along with how this research study builds on those strengths and addresses some of those weaknesses. First, discussed are some of the inherent weaknesses in the methods employed in relevant studies as well as factors that have been less frequently included in models that examine determinants of income status and/or health status decline (with or without a regain). Detailed are ways in which this study addresses these weaknesses and capitalize on the strengths identified in the literature. The study’s goals, including the study’s hypotheses and the concomitant models, were fleshed out above. Some of these weaknesses are addressed through the achievement of these goals.
2.4.1 Building on strengths and addressing weaknesses of existing research

The relationship between income status and health status, specifically, income status as a predictor of health status, has been well studied. Health status as a predictor of income status has been studied as well. However, studying the latter and the former in conjunction with each other has occurred less frequently. As well, although the relationship between health and poverty and the determinants of both poverty and health have been discussed at length in the literature, the determinants of income status and health status declines and of declines and regains have not been as thoroughly discussed.

Several years ago, the suggestion was made by Maddox et al. (1994) and J. P. Smith (1999) that improved methodology might change the consensus about the reverse causation hypothesis. The thought was that, if researchers had had data from a comparable longitudinal survey rather than from a cross-sectional survey, the direction of the relationship between ill health and other factors might have been different. Longitudinal data is better than cross-sectional data in their capacity to test the causal hypothesis associated with the debate discussed in this thesis. Furthermore, it is optimal to use longitudinal data to hypothesize a causal relationship between income status and health status decline. One-point-in-time or cross-sectional studies cannot confirm a causal relationship because a determination cannot be made about whether health preceded poverty or vice versa (Auger & Alix, 2009). Many of the recent studies in the literature reviewed have used longitudinal data (Benzeval & Judge, 2001). These studies concentrated on the dynamic reality of respondents’ financial situations and their health status: some provide evidence that health status is a stronger predictor of poverty and others provide evidence for the converse. The reason that this is the case has not been fully explored, but Maddox et al.(1994) observed, “that both explanations are theoretically plausible, that neither has been definitively assessed, and that a key task for research would . . . be a further specification of the conditions under which neither or both explanations might be true” (p. 934). Furthermore, it is notable that Illsley (1990) of the University of Bath, recommended that qualitative studies be undertaken that would extend the knowledge base apropos explanations of the social causation-reverse causation phenomenon. In this review of the literature, few such qualitative studies were encountered.

While employing longitudinal data to test this causal hypothesis represents an improvement over prior approaches, there are still some inherent limitations related to using longitudinal data.
Implicit in studies using longitudinal data that employ social and health-related variables is the fact of complicated interactions that affect study outcomes Maddox et al.(1994). As well, employing study samples of adults over extended periods, as is often the case in these studies, means that, almost by definition, sample respondents will have experienced disease, will have functional limitations, and will have high rates of mortality. This reality, along with respondents’ experience of lifetimes of varying degrees of access to material resources, underline the potential impact of exogenous factors affecting income status and health status in these studies.

Authors Rein and Winship (2000) corroborate the contention that it is problematic to assume that certain factors directly result in particular outcomes. They also caution that, particularly in the social sciences, it is rare that there is strong causality between factors. In reality, the effect size of one variable on another is often small. According to Rein and Winship (2000), “the $R$-square, which measures the total variation in the dependent variable explained by a model . . . often is below 20%" (p. 36). In other words, the variance in the dependent variable is not fully explained by the independent variables.

Rein and Winship also raise another issue: "the direction of causation” (p. 38). Rein and Winship advise that it is difficult to determine which factor leads to the other. Although there has been ample research on the determinants of poverty that are related to SES or income inequality, this study is unique because it predicts the determinants of one particular sequence, that is, health status decline and then income status decline. As well, seemingly absent in the literature is predicting the determinants of another particular sequence, that is, income status decline and then health status decline. What is more, predicting the determinants of income status decline in concert with health status decline does not appear in the literature. This study examines the predictors of health status decline preceding, following, or occurring simultaneously with an income status decline and vice versa. To summarize, this study examines the predictors of two-stage and simultaneous status declines, a method that seemingly has not been previously employed.

The mid-life population is an age group that has not been well studied in either the Canadian health-poverty literature or elsewhere. To date, the research in this area has placed less emphasis on those years before the senior years. This deficit makes a case for the decision to focus on this
age group. In addition, there is a paucity of income-status-Decline studies of the mid-life population. This focus advances knowledge in this field in another respect, that is, the concepts of pre-existing advantage and disadvantage are more fully explored.

In Canada and elsewhere, there has been an intense focus on the poor and their health. Less is known about the other income levels and their health. This focus, which excludes other foci, has resulted in a failure to examine the effect of SES on health at all levels of society (American Psychological Association, 2007). In other words, income status declines (and regains) at all levels of income, heretofore, has been an area not examined thoroughly in the literature. This thesis focuses on Canadians of all income levels.

Descriptive data at the population-level and individual-level data about Canadians’ income status and health status have been analyzed extensively; however, there has been less attention to inferential statistical analyses. The frequency distribution analyses and correlation analyses of relationships are less sophisticated than regression analyses. While regression analyses do not suggest causality, they can build evidence for a predictive model. Correlation analyses do not suggest causality but they do indicate the direction of the relationship. This, in conjunction with the limitations of employing cross-sectional data, underlines the need for employing longitudinal data and regression analyses in testing these hypotheses.

Most of the studies reviewed did not include, among the respondents in the dataset, those who had died. Likewise, most studies did not include among the respondents in the dataset, those who live in institutions. This study did include both of these types of respondents. These data represent a rich source of information, neglected in prior studies.

Although, there has been a great deal of literature generated about factors that are determinants of income status and health status within the Canadian context, there are specific factors that have been less frequently discussed. Failing to include important variables is a limitation of many studies. For example, the models in many studies (including this one) do not include changes in labour market conditions and changes to transfer payments policy as independent variables. There are other factors about which little has been written. Calasanti (2009) talked about intersecting inequalities, for example, aging and gender. Few studies, Canadian or otherwise, have examined concurrently the effects of numerous social demographic factors and
health behaviour on health status decline (with or without a regain) and on income status (with or without a regain). Studies infrequently have included income at the outset, as a predictor, and health at the outset, as a predictor, as well as this particular set of variables, that is, income at the outset, health at the outset, sociodemographic factors, and health behaviour. What is more, many studies have examined the effect of health behaviour on health, but few have examined the effect of health behaviour on income. Further, a primary topic of this thesis, health behaviour as determinants of both income status and health status decline, has been discussed infrequently, neither in the Canadian literature nor in other literature. This thesis fills the gap in these areas of the literature.

In the literature, the question arises regarding which factors related to SES, as a determinant of income status and/or health status decline (with or without a regain), should be employed. In most of the literature, income is used as a proxy for SES (discussed in methods section below). The argument could be made that, because income is just one measure of SES, an analysis of the effects of income on health, after controlling for occupation, might be valuable. However, occupation is a particularly cumbersome variable to employ, and is therefore infrequently used.

It is clear that employment and income status are closely allied, but there is little research on employment as a predictor of income status decline, and employment as a predictor of income status regain after experiencing income status decline. There is some literature on employment as a determinant of health status. What is more, at least one Canadian study looked at the effect of health on employment possibilities. In Au et al. (2005) study that used 1994–1995 NPHS data, the researchers found that, for Canadians 50 to 64 years of age, the effect is statistically significant. However, the literature typically does not focus on employment as a predictor of health status regain after experiencing health status decline. This thesis responds to these two additional gaps in the literature.

Few studies have been carried out, based on this study’s population of interest, which deal with the impact of visible minority status or immigrant status on income status and health status. Likewise, for the same populations, limited literature was located related to employment as a determinant of health status.
2.5 Chapter Summary

This chapter strengthens the linkage between the various components of the thesis’s preceding chapter and its subsequent chapters. It does this by providing the definition of the thesis’s key concepts and explaining how various sociodemographic variables mediate the relationships between income status and health status. This chapter also serves to underscore the reality that, for Canadians, there are a number of determinants of income status and health status. In addition, it makes clear that the pathways that determine income status and health status are complex. It also makes clear, as Mullahy, Robert and Wolfe (2001) suggested, that a variety of factors may be responsible for a link between income status and health status; “no single one seems to consistently stand out as offering the primary path by which income is tied to health” (p. 8). In this chapter, the conclusion is also drawn that the current consensus favours the social causation as opposed to the reverse causation hypothesis. Whatever the mechanism, in Canada, as in most of the Western world, those with low incomes are at a higher risk for most diseases and for nearly all causes of death (Federal Provincial and Territorial Advisory Committee on Population Health, 1999). This literature review underlines the need for Canada’s policymakers to acknowledge that the issues raised may require a host of policy solutions. Analysts worry that future governments may not want to accept responsibility for the fulfillment of older persons’ income requirements and health needs.

Finally, it is apparent that one of the most important potential contributions of the thesis is the utilization of a study design that examines not only experiences of poverty but also declines in income status at all income levels. Therefore, this study, which goes beyond the conventional health-poverty paradigm, has the potential to be far-reaching in its discovery of various kinds of income status and health status dynamics.
Chapter 3
Theory

3.1 Introduction to Theory

This chapter, which discusses the theory relevant to the study, is divided into three sections, not including the introduction and the chapter summary. The first section, the integrated theoretical perspective informs the second section, the conceptual framework. This integrated theoretical perspective was developed using theories or perspectives that help explain or understand the causes and nature of changes in income status and health status, the topic of this thesis. The conceptual framework was generated using the integrated theoretical perspective and the empirical knowledge from the review of the literature, as outlined in the above chapter. This conceptual framework and the integrated theoretical perspective provided the foundation for constructing this study’s research questions.

3.2 Overarching Theoretical Perspective

This study is primarily informed by the critical gerontology theory. The origins, basic principles, and assumptions, the focus, and the component parts of the critical gerontology perspective are outlined in this section. The life course approach, a separate perspective is then described and placed within the critical gerontology perspective.

3.3 Generation of Critical Gerontology Theory

In order to provide some contextual background to the development of critical gerontology theory, this section explains the evolution from the orthodox political economy perspective (mid-1970s) to the political economy of aging perspective. Marshall and Bengtson (2011) and Birren (2007) updates Marshall (1999) and Bengtson, Burgess, and Parrott’s (1997) earlier explanation of the origins of these and other theories in social gerontology (Figure 3-1). Not reflected in this figure is reflexive critical gerontology theory, a later iteration of critical gerontology theory (Powell, 2006). Neither does this figure link critical theory to feminist theory (Marshall & Bengtson, 2011).
It is interesting to note the evolution of the political economy of aging and critical gerontology. They are both based on Marxist views about how political and economic systems influence each other. However, in the case of the former, Marxist thought engendered political economy theory...
which in turn engendered the political economy of aging theory, a third generation of modern theories of aging. In contrast, critical gerontology grew directly from Marxism. These theories have certain features in common: They concern themselves with the influence of structural factors on societies and individuals. The political economy of aging and critical gerontology are distinct from reflexive critical gerontology in that the former advances the notion of human agency (Powell, 2006).

3.3.1 Political economy

The political economy perspective (Caporaso & Levine, 1992; Ramella, 2007) concerns itself with the interaction between economic, political, and social structures. Economic structures refer to the framework within which societies members produce what they need to provide for their necessities. Political structures refer to the fundamental policies and laws of the state’s political system. Social structures refer to conditions inherent in a society that support or constrain the societal position of its individuals, for example, social hierarchy (Maier, 1987). According to Powell (2006), structural conditions create inequalities. Indeed, despite the fact that there may be more than adequate resources to meet the basic requirements to live, our political economic structure prevents an equitable distribution of resources from occurring (Romanyshyn & Romanyshyn, 1971). For example, the current market system generates disparities by allocating goods and services almost solely based on the ability to pay. In other words, society determines the allocation of resources, not according to individual need, but according to the loci of power and social class and through entitlements grounded in various principles. Accordingly, the political economy perspective assumes that state interventions should focus, not on the individual, but on the structure of institutions and public policies. Individualistic approaches should not prevail over broad-based economic and political solutions, and the state, which organizes power, should be the focus of efforts at reform (Quadagno & Reid, 1999). The state, after all, has the capacity to redistribute wealth through social assistance, social insurance, and fiscal welfare (Romanyshyn & Romanyshyn, 1971).

What is more, the political economy perspective holds that sociodemographic factors mediate structural conditions. For example, social structural factors such as gender can affect the resources available to individuals (Mutari, Boushey, & Fraher, 1997). Gender shapes lives by influencing educational and occupational opportunities, and hence many aspects of well-being.
From a political economy perspective, gender is socially constructed. Constructivist social theory maintains that social meaning is not intrinsic and evolves through convention (Gubrium & Holstein, 1999). Socially constructed assumptions about what is gender-appropriate perpetuates traditional gender roles. Socially constructed roles can result in attitudes that perpetuate prejudice or discrimination—helping men and harming women because women generally possess less power in the social hierarchy than men do (Quadagno & Reid, 1999).

3.3.2 Political economy of aging

The political economy perspective as applied to the phenomena of aging is termed the political economy of aging. According to Estes (1991), the nature and importance of differences in how the aged are treated can be explained by applying the political economy perspective to gerontology.

A key feature of the political economy of aging is the significant role that contemporary societal and cultural norms and economics play in the treatment of older people. Proponents of the political economy of aging argue that older people’s situation is the result of economic, political, and social structures. Estes (1991) states that the political economy approach views the "situation of aging as the product of social structural forces rather than natural individual biologic and psychological processes" (p. 21). The approach challenges the prevalent idea that the older people’s problems are individual in nature; it maintains instead that the older people’s dependency and exclusion are structural, as is evident in certain groups’ cumulative disadvantage and financial dependency on the state over the life course.

Basic to the political economy of old age, is the assumption that interventions, rather than focus on the individual, should focus on the structure of institutions and state policies and the economy. In other words, interventions should involve broad-based societal solutions, which are economic and political and social, rather than individualistic in nature. What is more, Estes observes that the day-to-day lives of older people, in particular, women, are more affected by these societal interventions than are younger people. Early in the maturing of the political economy of aging, Estes (1991) highlighted "the differently gendered consequences of aging" (p.27).
As a macro theory, the political economy of aging assumes that context is necessary to ensure understanding of larger social problems and issues. Part of that context is the comprehension, in any analysis of older people, of the position of gender, race, and class. Western government's policies regarding aging address issues of economic status, such as pension policy, more than class and gender. This is problematic because most of the issues of aging are related to class and gender (Estes, 1991). Walker (2006), in the chapter “Reexamining the political economy of aging: understanding the structure/agency tension,” suggests that the discipline of social gerontology is paying attention to the various impacts of class, gender, and ethnicity on the process of aging.

According to Phillipson, in essence, the political economy of aging “emerged as a critical orthodoxy that focused on how the state and its resources and institutions position the experience and life-chances of older people in capitalist Western society” (as cited in Powell, 2006, p. 50). The political economy perspective views the aged as a group whose marginalization is a result of capitalism (Katz, 1996) and other broad trends within Western society (Estes, 1991). Powell (2006) enlarges upon this thinking. He worries that privileges related to being old, that previously were entitlements, have been eroded; therefore, the scarcity of state resources forces the aged to vie for benefits or be otherwise resourceful. Powell’s conclusion is that, although societal trends have moved toward more choices and freedoms for all, those with less privilege have, by definition, fewer choices, and state policies punish these less privileged people.

Political economists of aging object to what Estes (1979) termed the *aging enterprise*, that is, the bevy of experts, organizations, and caregivers that has emerged to take care of older people. The *aging enterprise* concerns itself primarily with the individuals and ignores the sociopolitical context (Katz, 1996). Because it ignores the sociopolitical context, it is unable to fathom the potential for social change and consequently fails to recognize the power in this potential. The opportunity to influence the lives of the aged through large-scale change is thereby lost. Furthermore, older people are disadvantaged by this approach in that there is the implicit assumption that older people should be responsible for what is beyond their control, or in the words of Ryan (1976), it encourages “blaming the victim” (p.3).

In summary, the tenets of the political economy of aging are, first, the main determinants of the older person's position in capitalist society are social, political, and economic structures; second,
there is significant heterogeneity among older people and, dominant structures affect them in different ways; and third, the state determines the allotment of resources to older people (Powell, 2006).

### 3.3.3 Critical gerontology

As stated above, critical gerontology is another offshoot of Marxist theory (Marshall, 1999), and, as such, is closely related to the political economy of aging. From Cruikshank’s (2003) perspective, critical gerontology combines political economy (the influence of economic, political, and social structures on society’s perceptions of older people and on their view of themselves), the humanities (the restoration of moral and spiritual dimensions to aging), and moral economy (the insistence on conformity to norms regarding cultural acceptability and economic activity).

Critical gerontology, a derivative of critical theory, is concerned with critiquing and changing society with a view to freeing older people from strictures that are limiting and disempowering (Atchley, 1972, 1993, 2000; Moody, 1993). The mechanism of this societal change is addressed by Katz (1996) in his explanation of the concept of *critical*: “Ideas become critical when they overflow their contextual boundaries [and] resist theoretical stasis” (p. 20).

Critical gerontology draws from many disciplines and has porous borders (Katz, 2003). Katz views critical gerontologists as neither slaves to theory nor ideologues; rather, they have the capacity to synthesize the material that they harvest from a variety of fields. Katz believes that critical gerontology deliberately addresses issues of age, gender, race, and ethnicity in a creative and significant way. Ageism involves systematically discriminating against older people, and is a result of stereotypes of older people (R. N. Butler, 1969; Loretto, Duncan, & White, 2000). Similarly, sexism is the stereotyping and discrimination against people because of their sex (Bird, 1968). Discrimination such as that exhibited in ageism and sexism are social processes through which people, particularly women, are rendered less powerful.

The interplay between ageism and sexism is now discussed. Like gender, age is socially constructed. The rationale for addressing them holistically is the fundamental connection between them vis-à-vis this thesis. The socially constructed roles of genders, the relationship between genders, and gender as an analytical tool for understanding social processes has been,
by and large, recognized by researchers. Researchers began to examine the complex mixture of issues that is created when age and gender intersect after the sociology of aging and the sociology of women merged (S. A. McDaniel, 2001). Discussing the parallel paths of the evolution of feminism and gerontology, McDaniel invoked Arber and Ginn’s (1991) insight that "Like diners at separate tables, aging theorists and feminist sociologists have been exchanging some meaningful glances but without pooling their conceptual resources" (p. 35). Arber and Ginn’s (1995) viewpoint on aging and gender was that “because older women tend to have lower-social class status, especially in terms of economics . . . they are given less . . . attention" (p. 55). According to this viewpoint, citizens’ access to resources depends on their places in the social hierarchy and the contexts in which they live (Arber & Ginn, 1991). Arber (2004) noted that inequality leads to disadvantage. This perspective has "emphasised (that) social class-related inequalities (are) linked to structural inequalities such as material well-being, income, housing and car ownership, and health disadvantage such as disability" (Arber, 2004, p. 93).

Within the context of the accumulation of advantage (or disadvantage) that is concomitant with the accumulation of years, health in later life must be understood in terms of the numerous influences throughout the life course that determine later-life health (Hertzman & Power, 2006; M. S. Kaplan et al., 2008).

Powell (2006) described reflexive critical gerontology as a view that transforms the political economy stance and pays “more attention to human agency and social class and the way in which individuals both influence the world around them and modify their behaviour in response to information from the world in neoliberal contemporary modernity" (p. 52). Estes, in an autobiographical article, agreed and maintained that she has always asserted that agency exists and that it is a fundamental element of critical gerontology (in this way it is similar to the life course perspective; Estes, 2008). The implication is that theory need not include a deterministic viewpoint; human agency can influence individual outcomes.

The relevance of critical gerontology to this thesis is evident. Critical gerontology is now a mainstream theory that is solid enough to provide a deep understanding of the complex issues of older people (Bass, 2006). In Katz’s reference to Minkler and Estes’s (1999) collection of essays about critical gerontology, he pointed out that critical gerontology is concerned with age-related inequity, injustice, and deprivation. These issues are related to structural factors. The role of structural factors, in turn, is mediated by sociodemographic factors. This thesis suggests that
structural factors, similar to individuals’ behaviour, influence individuals’ lifelong health and income outcomes. Because of the effect that structural factors have on individuals’ social, financial and well-being, they are a focus of the study that informed this thesis.

Critical gerontology is a theory that is capable of accommodating another theoretical approach that is germane to this thesis, that is, the life course perspective. When combined, these perspectives afford a multilayered understanding of the interrelated concepts associated with the income-health status relationship and of the issues that affect men and women across their life course (Bengston, Putney, & Johnson, 2005; George, 1993; Hagestad & Dannefer, 2001). The critical gerontology-life course perspectives ably frame this thesis’s research problem at the micro-, meso- and macro-level, and the linkages among them. In other words, the critical gerontology-life course perspective platform is sufficiently comprehensive that it can speak to the totality of the experience that this thesis addresses. However, the research query is intended to yield macro- or meso-level responses; therefore, given that, it would be inappropriate to employ a micro-level theoretical approach.

3.3.4 Life course perspective

The life course perspective offers the promise of providing a much-needed theoretical analysis of a person’s life. According to Marshall (2011; Marshall & Mueller, 2003), the life course perspective, as espoused by Elder (1985), was first proposed by Cain (1964) and later White Riley (1979) in her seminal book. Elder’s (1985) life course perspective’s key principles are (a) aging is continuous and life-long; (b) the impact of change depends on when, within all of life’s interrelated processes, it occurs; (c) life course development is determined by many factors; (d) the role of human agency is fundamental, that is, the individual affects life outcomes; and (e) lives are lived in the context of historical world events and personal interrelationships, that is, lives are linked. The comprehension of history and social change is, in fact, critical to the understanding of individuals’ life courses (Elder, 1994). People’s lives are socially, historically, economically, and geographically located, defined, and constrained (Elder, 1998). Indeed, the inverse can also be the case; social change may be the result of the collective change experienced by a particular cohort. It follows that the process of understanding historical events and social and environmental changes is a necessary part of the study of the life course of individuals or cohorts.
The life course has been depicted as an upside-down tree, with the "branches" taking root in line with choices made at various junctures. In effect, the choices that are the branches are offshoots from the trunk (McPherson, 1990). Although there is no blueprint for the life course that holds true in all circumstances, the life course perspective includes the view that aging inevitably affects individuals’ health and well-being. Elder (1994) and later Settersten (2003b), both prominent life course scholars, recognized that the life course involves multilevel processes, and these processes are the result of both human agency and age-related social structures. Settersten (2003b) refers to “the life course as actively created by individuals and groups, but within the confines of the social worlds in which they exist; these are models of agency within structure” (p. 30). He observes that social structures enable as well as constrain individuals. While social structures place limitations on the direction of the life course, social structures also act as facilitators in the life course.

According to Arber and Evandrou (1993), the life course perspective focuses on the relationship of events early in life to those that occur later in life, and how relationships vary according to cohort.

. . . [The life course perspective] provides a framework for analyzing the various influences that contribute to the life experience of different groups of individuals at particular stages of their lives. A life course approach emphasizes the linkage between phases of the life course rather than the separateness and isolation of each phase. (p. 9)

Earlier life events influence later outcomes, both proximal and distal; “a single event . . . cannot be understood in isolation from others that surround it” (Settersten, 2003b, p. 25). Settersten differentiates among concepts of "events, transitions, and turning points,” within the context of “trajectories” (2003b, p. 25). Trajectories are lengthy in duration, with multiple trajectories establishing an individual’s life course. On the other hand, events are shorter in duration and involve a relatively sudden change. Transitions involve gradual changes; they are sometimes tied to role changes. A turning point represents a sudden shift in a trajectory. Indeed, Settersten urges researchers to take into consideration not only time, but change when designing their studies. He proposed this because, by definition, aging involves constant change and occurs within the context of a given time period. Along the same vein, Henretta, in his article in Settersten's book Invitation to the Life Course, Henretta (2003), makes a compelling case for using life-course data. His contention is that this allows the researcher to determine the
trajectory of personal historical events and of their development. Indeed, the life course perspective argues for the use of longitudinal data. George (2003) highlights the utility of studies that employ longitudinal data; they enable the empirical testing of causal inferences. Time must elapse to investigate causal directions. Still, even research based on longitudinal studies that follow individuals from childhood through to older ages poses a difficulty; the research does not depict the totality of the life course experience. Hunt (2002) argued that contextual information about the life course such as events, interdependence, individual agency, history, and geography also should be considered when findings are discussed.

Understanding the past can aid in the understanding of the present, especially life course transitions--health or financial issues being among them. Settersten’s (2003b) contention is that the “effect of early advantage and disadvantage often cumulate over time” (p. 29). Indeed, this is the case with economic and health status advantage and disadvantage (Crystal, 2006). Blane (2006) stated that the life course approach assumes that a person's current health status flows from social processes that, in turn, represent the cumulative effect of past advantage or disadvantage. This view conforms to current notions about the effect of accumulated advantage or disadvantage on the prevalence of disease and illness. Moreover, the model proposed by Marmot, Shipley, Brunner, and Hemingway (2001) posit that the effect of early-life social conditions on later-life health is indirect. Early-life economic advantage influences adult-life economic advantage, which in turn affects later-life health advantage. In other words, advantage early in life indirectly results in later-life health advantage. What is more, pre-existing socioeconomic advantage protects individuals from new disadvantages (Blane, 2006). Marmot (2004) also asserted that social position could be the result of health status, that is, “health-related social mobility” (p. 59). Indeed, advantage in one sphere can affect advantage in another.

Some models suggest that there is an accumulation of advantage, but others do not, or are tentative (Willson, Shuey, & Elder, 2007). Moreover, other researchers have analyzed advantage and disadvantage differently. From the perspective of some feminists, disadvantage early in women’s lives may or may not be cumulative; differences in life outcomes are related to differences in social, familial, and work structures (Jaggar, 1983). In other words, the assumption should not be made that life circumstances affect everyone in the same way. The fact that poverty is not a static phenomenon may be evidence of this relationship; during women’s lifetimes, they may enter and then leave the state of poverty more than once
(Government of Canada, 2006a). However, it seems apparent that various events that involve objective changes in status do affect an individual’s circumstances. Phipps’s (2003) literature scan cited evidence that indicated that, for both men and women, lasting poverty is more likely than intermittent or short-term experiences of poverty to result in poor health. Negative changes in SES seem to be more important than fluctuations in income as factors in the determination of health. What is more, the effect of patterns that include negative changes may increase the risk of poverty in later years among women who are in poor health at mid-life. In the literature review above, research indicates that changes in marital status not only may affect income but also health. Indeed, marital status is a predictor of both health and income.

Raphael and Curry-Stevens (2004) recommended the adoption of the life course approach in the study of the effects of social factors on health. Raphael talked in specific terms about the cumulative effect of multiple social determinants on health, for example, “Aboriginal status, early life, education, employment and working conditions, food security, health care services, housing, income and its distribution, the social safety net, social exclusion, and unemployment and employment security” (p. 6). He suggested that social and economic conditions in early life affect the incidence of later-life heart disease. Apropos this thesis, Chappell et al. (2003) made a distinction between the personal determinants of health, such as individual behaviour, and structural ones, such as SES and gender. Indeed, as discussed below in chapter 4, the methods chapter, this distinction is operationalized, in that health behaviours are incrementally included as predictive factors in order to determine their precise effect.

There are some disadvantages associated with the adoption of this life course perspective, the main one being that it is simply a framework and not a theoretical perspective (George, 1996, 2007; Heinz & Marshall, 2003). Hagestad and Dannefer (2001) identify a number of critical issues for this perspective. They suggest that it has yet to articulate a clear conception of social structure, with the effect that--despite its basic tenets of the perspective--research has tended to be micro-oriented with the role of macro-factors, such as social policy, being downplayed. In addition, some researchers have registered skepticism about the life-stage principle--the effects of social change depend on the age of individuals. Settersten (1999) also argues that the life course perspective has not paid attention to how individuals shape or change structures. Finally, the perspective has been criticized as not representing everyone’s life chronologically--life courses vary by cultures (Settersten, 1999, 2003a).
Critical gerontology theory addresses some of these limitations of the life course perspective and vice versa (Grenier, 2012; Marshall & Bengtson, 2011). Critical gerontology’s focus on structural analysis strengthens the life course perspective. The life course perspective, because it is a framework, implies the absence of a specific theory regarding which factors are important. In contrast, critical theory indicates what factors are important. In addition, much emphasis has been placed on the life course perspective’s relationship-oriented micro-level concepts, as opposed to its macro-level and societal-focused concepts. By its very nature, the life course perspective speaks to human existence at the individual-level, but does not emphasize the influence of social structure on human experience (George, 1990; Grenier, 2012). Critical gerontology addresses this lack of emphasis on the macro-level in the life course perspective. Nonetheless, the life course perspective informs (a) constructionist approaches that speak to the interaction between individual agency and context over the life course (Cohler & Hostetler, 2003; Kelley-Moore, 2010), and (b) the structural approach that emphasizes the order and occurrence of life course changes, as a result of the interplay between policy and individuals (Leisering, 2003; Leisering & Leibfried, 1999; V. W. Marshall, 2009).
3.4 Conceptual Framework

In this section, the conceptual framework is explained. A sketch of the conceptual framework that utilizes the critical gerontology-life course perspectives and that contains the thesis’s major concepts is depicted in Figure 3-2.

**Figure 3-2.** Conceptual framework of determinants of income and health from a critical gerontology-life course perspective. Dashed line and double-headed arrow indicates the reciprocal nature of the relationship between income status and health status as well as between these statuses and sociodemographic and other factors. Adapted from figure “The Main Determinants of Health” in “Policies and Strategies to Promote Equity in Health,” by G. Dahlgren and M. Whitehead, 2007, Background Document to WHO-Strategy Paper for Europe, Stockholm: Institute for Future Studies.

Several of the concepts of the conceptual framework are drawn from Dahlgren and Whitehead (2006) The Main Determinants of Health model (Figure 3-3). Dahlgren and Whitehead (2007) discuss the four influences that determine health, that is, general socioeconomic, cultural, and environmental conditions, living and working conditions, social and community networks and individual and lifestyle factors. Policy interventions can affect change through these influences. This study’s framework was utilized to determine the particular variables employed in the
models in the study for this thesis and its relationship with critical gerontology and the life course perspectives.


The central feature of this conceptual framework is that critical gerontology theory is combined with the life-course perspective. The critical gerontology perspective is a framework that, by housing the life course perspective, can, over time, address economic, political, and sociocultural issues (George, 2011). Employing this integrated framework enables a rational response to study questions about what influences health and financial security over latter parts of the life course. This framework recognizes the unique contribution of the life course perspective and critical gerontology in understanding issues of income status and health status decline that confront mid- and later-life Canadians.

The critical gerontology perspective is depicted by an elliptical figure that signifies the critical gerontology perspective’s emphasis on economic, political, and sociocultural factors. The framework assumes that structural conditions create inequalities in these three spheres; these inequalities are manifest throughout the life course. From the critical gerontology point of view, the spotlight is on older people and economic, political, and sociocultural factors, most of which are closely linked to occupation, earnings, and status.

The life course perspective’s most salient feature, the passage of time, is depicted in Figure 3-2 by a striped one-ended arrow. In addition, in Figure 3-2 depicted by rectangles, are the major
components in the life course. These rectangles represent the various developmental stages associated with the life course. Portrayed are the normative biological stages that are common to humans, including the stages of physical maturation, that is, childhood, adolescence, and so on.

This study examines factors (represented by elongated lightly shaded rectangular boxes or “planks”) that predict income status and health status (represented by darkly shaded planks). The planks in Figure 3-2 depict status, for example, educational status. A status is not a stage because neither is it predictable nor does it occur before or after the other, or concurrently: a structural variable, it measures SES. Its commencement, timing, sequence, and even occurrence, is therefore highly variable. A status may be distinct, but not mutually exclusive, for example, one’s educational status may have a bearing on one’s becoming employed. One’s status may be of one’s choosing, for example, married. It may be not of one’s choosing, for example, visible minority status. One status may influence another status, for example, income status may influence homeownership status. Figure 3-2 illustrates that income status and health status are influenced by these factors. As well, there is a known relationship between income status and health status, and this is illustrated in Figure 3-2 by a double-headed arrow. To elaborate further about this framework: There is considerable variability in income status and health status throughout the life course. Variability in income status and health status throughout the life course is depicted as straight lines but in fact, their trajectories vary.

This conceptual framework addresses the role of income status and health status in the context of aging but from the viewpoint of the critical gerontology perspective. It also addresses the role of health behaviour, as another indicator of health status. Furthermore, the conceptual framework provides an explanation of the role of income status in health outcomes.

The research questions were derived from the literature review and this study’s conceptual framework, a framework that integrates critical gerontology theory and the life course perspective. The responses to each of the four research questions are meant to shed light on the mechanisms and processes underlying the health-income dynamic for a particular segment of the Canadian population. The conceptual framework of what and the theoretical perspective of what combined are foundational to this study’s research questions.
3.5 Chapter Summary

In this chapter, the theoretical and conceptual frameworks that guide this study are presented. First, the stage is set for the remaining chapters through a description of the theories relevant to the thesis. The thesis’s primary theoretical underpinnings are discussed, namely, critical gerontology and the life course perspective. Second, a conceptual framework allows for the integration of these perspectives. Third, guided by the results of the literature review, the discussion of the theories that inform this thesis and the conceptual framework chosen, the research questions were developed. These research questions dictate the contents of the methods chapter, chapter 4.
4.1 Introduction to Methods

In this chapter, the methods that were employed for the study are discussed. This chapter’s first section describes the design of the study including its scope. The study dataset, which was derived from a secondary data source, is also described. As well, this section deals with model development and preliminary data preparation, which includes selection of the study sample and decisions regarding the disposition of missing values. It also discusses the determination of sample size requirements and the weighting of the sample.

The construction of the independent and dependent variables is dealt with in the chapter’s second section. The different variables and the process for transforming them for data analyses are delineated. The study’s key concepts that predict outcomes are represented by the independent variables. The study’s key concepts that measure change in income status and health status are represented by the dependent variables. The third section deals with preliminary data analysis and the concomitant two types of analytical methods employed, that is, univariate and bivariate. The fourth section discusses model development, the study’s four models and their accompanying components along with the analytical method employed, that is, multivariate analysis. The assumptions for the particular data analyses undertaken are detailed, and there is a discussion of multicollinearity, outliers, and the model estimates. In the fifth section, ethical considerations are discussed. In the sixth section, considered are the parameters of the study’s design, that is, its limitations and delimitations. The final section summarizes the chapter and comments on the effectiveness of the methods employed.

4.2 Study Design

The study used a subsample of secondary data from a large survey project, Statistics Canada’s NPHS Household Component. Using secondary data precludes the need to design and validate measures; however, it is often necessary to customize measures. A primary reason for employing the NPHS dataset was that its data were appropriate given the study hypotheses. The data from the NPHS were sufficiently comprehensive such that it was able to respond to the study’s research questions. To illustrate, two other possible Statistics Canada’s sources for data also were considered as data sources for this study, that is, the SLID and the CCHS. However, neither the SLID nor the CCHS yielded data appropriate for this study. SLID does not contain
the level of detailed health information appropriate for carrying out the analyses necessary for this study. For example, the SLID does not include data on self-rated health, drinking habits, or smoking history. Although the CCHS has detailed health information, it does not employ longitudinal data. These shortcomings precluded employing either datasets. In contrast, the NPHS has health-related, income-related, and longitudinal data. In addition, given the study hypothesis, which addresses the phenomenon of change over time, NPHS data were appropriate because they were collected for several cycles.

A longitudinal approach to data collection was a key requirement for the data for this study. Because longitudinal designs clarify the direction of causal impact, inferences can be made about the first observation’s effect on a subsequent observation (Bryman & Teevan, 2005). The study design required that data be panel data, and that they be gathered at Time 1 and then at least once again—enabling the analysis of fluctuations in income status and health status, and thereby testing the study’s main hypothesis.

A longitudinal approach was also important because it was compatible with the theoretical framework of the study. The study design was informed by critical gerontology theory as well as the life course approach. Critical gerontology makes the link between critiques of society and social action; it focuses on analyzing and changing society to ensure social justice for older people. Moreover, the life course perspective examines the issues that affect men and women across their life course within the context of political and other realities. In effect, the perspectives that underpin this study are directly linked to the component parts of this study’s methodology. The following example describes the operationalization, in this study, of these perspectives. The basic principles of these perspectives are evidenced in the choice of the study’s key concepts, which in turn determined the construction of the study’s variables and the study’s four models. For example, a key concept, change in material circumstances, necessitated an income-status-decline measure (derived indirectly from the LICO, Statistic Canada’s low-income measure). This measure was integral to the study’s four models.

Ultimately, the model findings shed light on what may ensure improved material circumstances for this population, specifically factors that predict status declines and regains. They point to how to improve the status of economically disadvantaged mid-life and older Canadians. In sum, this study’s perspectives are directly linked to the component parts of this study. Critical
gerontology advocates remedying inequalities, which research studies such as this may highlight. This study highlights, through its use of longitudinal data, not only the aged, but the lifelong process of aging, a critical feature of the life course perspective. In the transition from the theoretical framework and the research questions to the initial phases of the development of the study design, consideration was given to the appropriate unit of analysis, precise measures, requisite data, and suitable analytical techniques (Singleton & Straits, 2004).

4.2.1 Scope

This study examined declines and regains in the income status and health status of Canadians 40 to 59 years of age: the association between independent variables at baseline (1994-1995) and changes in income status and/or health status. The subsample for this study was collected over seven cycles, a fourteen-year period, from the first cycle of data collection in 1994-1995 to the cycle in 2006-2007. The 14-year time span, within which there were seven two-year cycles, was of sufficient duration to detect important changes in income status and/or health status. Other comparable studies were mostly of a shorter duration, ranging from two years to ten years of data, although there was one study that analyzed twenty-five years of data (Benzeval, Judge et al., 2000; Benzeval et al., 2001; Benzeval, Taylor, & Judge, 2000; Burström et al., 2003; Contoyannis & Rice, 2001; Haveman, Wolfe, Kreider, & Stone, 1994; Thiede & Traub, 1997; Wilkins, Berthelot, & Ng, 2002).

4.2.2 Description of dataset used

In 1991, upon the recommendation of Canada’s National Health Information Council, the NPHS was created. The NPHS measured the health status of Canadians as well as the sociodemographic correlates of health. The NPHS, a voluntary biennial household survey, in its first cycle (1994-1995) captured data from 17,276 randomly selected persons 12 years of age and older. This was the number of persons who were eligible to complete the NPHS’s detailed health questionnaire after NPHS’s first cycle. The subjects were to be interviewed in all cycles, with the sample not being renewed over time. The NPHS was completed after nine cycles (2010-2011).

The NPHS employed Canada’s Labour Force Survey and Quebec’s 1992-1993 Enquête sociale et de santé’s sampling frame, that is, random, stratified, multi-stage samples. Areas in all provinces were categorized as major urban centres, urban towns, or rural areas, and were then
further stratified geographically or socioeconomically. Next was the creation of clusters, typically Census Enumeration Areas, which were based on randomized probability-proportional-to-size (PPS) sampling. Finally, the dwellings sample list was obtained, and individual households were selected from this sample list (Statistics Canada, 1995).

The Household Component of the NPHS was the dataset used for this study. The original NPHS dataset included household residents in the ten Canadian provinces and excluded persons living on Indian Reserves and Crown Lands, residents of health care institutions, full-time members of the Canadian Forces Bases, and resident of some remote areas in Ontario and Quebec (Statistics Canada, 2008e). From 1994-1995 to 2002-2003, respondents who were in or who moved to health care institutions would have been surveyed in the NPHS Health Institutions Survey (Statistics Canada, 2007a). Respondents who were surveyed as part of the Household Component of the NPHS and who moved to a health care institution continued to be surveyed as part of the Household Component of the NPHS (Statistics Canada, 2007a).

To ensure the equitable representation of large households, Statistics Canada increased the representation of parents and youths in the panel by screening out households without members younger than 25 years of age (Statistics Canada, 2008e). Sample sizes were increased by Statistics Canada to compensate for the reduction in the number of households that would be caused by this screening criterion (Forbes, 1999).

Although unweighted and weighted data were used for analyses in this study, only results of weighted data were reported per Statistic Canada’s policy (Statistics Canada, 2007c). The weighted findings provide accurate population estimates. Specifics of the weighting process are detailed below.

4.2.3 Survey instrument

For each NPHS cycle, academic researchers, and representatives of Statistics Canada, Health Canada, and provincial ministries of health collaborated to create the questionnaire. This process involved adapting extant survey instruments and developing new ones. For each cycle, field tests on the questionnaire were conducted face-to-face by Statistics Canada's interviewers in order to ascertain respondents' reactions, determine the need for changes in content, estimate the time required to respond, examine the rate of response, and assess interviewer training. The
questionnaire development process involved the organization of focus groups and field tests to evaluate the questions for quality, assess the duration of the responses to the questions, and estimate response rates (Statistics Canada, 1995).

4.2.4 Data collection and screening

This section details the measures undertaken to ensure the quality of the study’s data; resolving any such issues means that its findings are less likely to be flawed (Bryman & Teevan, 2005; Neuman, 2006; Singleton & Straits, 2004).

Data were collected quarterly, and with follow up during another collection period for those who did not respond in one of the quarters in the prior year. Every cycle, each panel member received a letter that reported the start of the data collection and provided information about the survey, including the current results. The NPHS used Computer Assisted Interviewing (CAI) for collection of demographic, socioeconomic, and health-related data. Designers of the CAI questionnaire configured it with a view to the specific type of answer expected, the possible maximum and minimum values, and the possibility of non-responses. The computer application for the CAI was thoroughly tested to correct program sequencing and other errors. Editing was first conducted online while the data were collected and then during data processing at Statistic Canada’s Head Office (Statistics Canada, 1995).

After the first cycle, 95% of the approximately one-hour interviews were carried out by telephone; however, personal interviews were conducted upon request for those in health care institutions and for those without telephones. Some information about the health of all members of the households surveyed was gathered via proxy interview, but only one member of each household surveyed was selected randomly for in-depth interviews over successive cycles. Usually the same person who participated in the Time 1 (Cycle 1) interview participated in subsequent interviews. Those who could not be interviewed because they were ill or incapacitated had proxy interviews (Statistics Canada, 1995). The data of both proxy and non-proxy respondents was included in the NPHS sample (Tolusso & Brisebois, 2003).

J. Pantalone (personal communication, April 11, 2011) of Health Statistics Division, Statistics Canada provided the overall proxy response rates for respondents 12 years of age and older who participated in Cycles 1-7 (Statistics Canada, 2011f) is provided in Table 4-1. A proxy response
rate less than 6% in all cycles is low enough that the data may be deemed reliable (Buckley et al., 2004b). It is not possible to assess the possible influence of proxy reporting on data accuracy for this study’s particular dataset because the precise proxy response rates for this study’s samples were not calculated for all models and submodels.

Table 4-1
Proxy Interview Rates (N = 17,276; Cycle 1)

<table>
<thead>
<tr>
<th>Cycle</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>4.2</td>
</tr>
<tr>
<td>2</td>
<td>2.0</td>
</tr>
<tr>
<td>3</td>
<td>2.7</td>
</tr>
<tr>
<td>4</td>
<td>4.7</td>
</tr>
<tr>
<td>5</td>
<td>4.8</td>
</tr>
<tr>
<td>6</td>
<td>3.8</td>
</tr>
<tr>
<td>7</td>
<td>5.9</td>
</tr>
</tbody>
</table>

Note. Statistics Canada, National Population Health Survey, Cycles 1-7; population aged 12 and over who provided proxy responses.

Another quality control measure also included measures to ascertain the reliability of the data collection techniques. The possibility of bias was reduced through the employment of experienced interviewers. In order to minimize the number of non-responses, interviewers attempted to make contact at various times of the day. If a person refused to be interviewed, another interviewer would make a second attempt. The data of those who did not respond in Cycle 1 were expunged from the sample, except for a small number of cases that were used to assess the procedures that were developed for tracing (Statistics Canada, 1995). The questionnaires were available in seven languages in order to improve their accessibility and thereby increase response rates (Statistics Canada, 1995).

The response rate was 83.6% for Cycle 1 (based on 20,095 in-scope persons), 92.8% for Cycle 2 (for this and subsequent cycles, based on the 17,276 persons who form the longitudinal panel), 88.3% for Cycle 3, 84.9% for Cycle 4, 80.8% for Cycle 5, 77.6% for Cycle 6, and 77.0% for Cycle 7 (Statistics Canada, 2008e).

In surveys, non-response is one of the main reasons for non-sampling errors (Statistics Canada, 2008e). Toluoso and Brisebois (2003) of Statistics Canada prepared a working paper that had as one its goals the extent of and reasons for non-responses in the NPHS. “Non-response” can mean partial non-response or total non-response. There are a number of reasons for non-responses. These reasons may include inability to locate a participant, who, for example, has
moved and left no forwarding address; absence or unavailability of person who could provide the information at the time the survey request was made; or refusal to participate in the survey. In the NPHS, the extent of partial non-response was small. The working paper indicated that refusal is the chief reason for non-response. Refusals constituted 49% of Cycle 2 non-responses, 56% of Cycle 3 non-responses, and 61% of Cycle 4 non-responses. Tolusso and Brisebois (2003) stated that two types of refusals rates were calculated; one was based on all participants in the sample at the outset ($n = 17,276$), and the other was based only on those participants whose records were sent out for each collection cycle. For the former, the refusal rate was as follows: For Cycle 2, it was 3.1%; for Cycle 3, it was 6.2%; for Cycle 4, it was 8.9%. For the latter, the refusal rate was as follows: For Cycle 2, it was 3.1%; for Cycle 3, it was 3.6%; for Cycle 4, it was 6.3%. The frequency of non-responses by reason was not provided for each variable in the study.

The cumulative attrition rate, that is, the percentage of the sample size that was lost due to non-response, was 9.3% for Cycle 2, 15.3% for Cycle 3, 21.3% for Cycle 4, 27.3% for Cycle 5, 32.7% for Cycle 6, and 36.4% for Cycle 7 (Statistics Canada, 2008e). Although refusal to provide information was the most common reason for non-response throughout all cycles (Tolusso & Brisebois, 2003), a certain proportion of the Cycle 1 respondents would have died by Cycle 7.

4.2.5 Model development

In this section, the development of the model is discussed within the context of the study that informs this thesis. Because this study’s research questions cover four main areas of investigation, four models were developed to answer the questions. Each of these four main areas of investigation was made operational through two to four respective submodels. A description of the models as well as the particular analyses undertaken with respect to each submodel is provided in this chapter.

The purpose of model development is the construction of a model that successfully estimates the relationship between the predictors and the prediction, and, in the process, takes into consideration any potentially modifying effects of other (control) variables in the study. Hypothetically, a model “would provide an exact fit of expected frequencies to observed frequencies if only the right set of predictors were measured” (Tabachnick & Fidell, 2007, p.
However, it is a given that a perfect model is never a possibility; the goal then becomes the creation of a model that contains most of the relevant predictors that predict group membership. The optimal approach for the achievement of this model is the production of a “plan for selecting the variables for the model [and] a set of methods for assessing the adequacy of the model both in terms of its individual variables and its overall fit” (Hosmer & Lemeshow, 2000, p. 91). Among the large number of variables that could possibly be included in a model, the most appropriate ones are selected through model testing. Testing models involves the use of available data in the form of variables to predict future outcomes and the examination of the impact of variables on each other. The process of building a model is an iterative one (Hosmer & Lemeshow, 2000; Singleton & Straits, 2004). A basic principle of model building is that any model should be as parsimonious as possible; that is, the minimum number of variables is used to explain the data. However, a variable may be included in the model even if it is not statistically significant.

The first step in the development of each model was selection of the variables; this meant, for continuous variables, an analysis of the correlation matrix. For categorical variables, it meant an examination of the cross-tabulations and assessment of the significance of the chi-square statistic was undertaken. Variables with $p$ values of < .25 or variables with known clinical or practical importance were selected (Hosmer & Lemeshow, 2000). After the variables were selected, each model was fitted through examination of the findings of the binary logistic regression analysis. Per usual, the model was improved by deleting, refitting, and verifying variables. Some variables were removed because they neither changed important relationships nor improved the fit of the model in terms of obtaining estimates that were more precise.

The analytical method for modelling was logistic regression analysis. The criterion used to measure decline or regain in income status or health status is a change in values for, respectively, self-rated health or total household income. All predictor variables were drawn from the baseline data, that is, 1994-1995, and all dependent variables from the follow-up data, that is, 1996-2007.

The method used was the block method, a procedure for variable selection in which two sets of variables are entered in “blocks.” One set of variables is entered in the first step, and then the remaining variables are entered in the second step. The block method was employed to
determine the incremental impact of the health behaviour-related independent variables on the dependent variables (Gadalla, 2006; IBM SPSS Statistics, 2009). One common reason for use of the block method relates to the current state of knowledge in a subject area. It is ideal for studies like this one that rely on a well-established body of research—the potential predictors have been established, and therefore the number of variables is limited, that is, a subset of variables “that includes only statistically significant predictors” (Wright, 2004, p. 240).

In this study, the following variables measured at Cycle 1 were the first block: total household income, self-rated health, age group, marital status, educational status, homeownership status, visible minority status, immigrant status, and employment status. In Model 4 only, health status declines before or during the same cycle as income status declines and income status declines before or during the same cycle as health status declines were also included as independent variables. The second block included smoking history, drinking habits, physical activity, and obesity. The logistic regression analysis involved determining the Cycle 1 predictors of a decline in income status and/or health status as well as predictors of a decline in health status preceding a decline in income, a decline in income preceding a decline in health status, and a simultaneous decline in health status and income. This same process was used to determine predictors of an income status regain after experiencing an income status decline as well as a health status regain after experiencing a health status decline.

Figure 4-1 summarizes the methodology employed in this study.
Figure 4-1. Methodological steps in the analysis for study. Adapted from *Factors influencing patient care seeking behaviour in primary care* (p. 51) by M. Mathews, 2000, Toronto, University of Toronto.
4.2.6 Selection of study sample

The following sections detail the criteria for including and excluding respondents in the study sample and the rationale for the criteria. At each step, the number of respondents who were excluded (and the number who were included) is noted until the final number in the study sample is reached. Of the 17,276 respondents participating in the first cycle, 2,368 were selected for inclusion in this study. This disposition of the sample is represented in Figure 4-2 (all counts were weighted numbers).

Figure 4-2. Selection of sample for analysis: National Population Health Survey Cycle 1 (N = 17,276).
4.2.6.1 Inclusion and Exclusion Criteria: Age

Because the study’s focus is on mid- and later-life Canadians, respondents selected for the study were 40 to 59 years of age at Time 1 of this study. At the conclusion of this study, after 14 years of participating in the NPHS, the respondents were ages 54 to 73.

Removed at the outset were 12,936 respondents who were younger than 40 years of age or older than 59 years of age. Precisely 4,340 respondents were 40 to 59 years of age. The process of identifying the exact age range that is considered as constituting mid-life is somewhat arbitrary because there are a number of definitions of mid-life or middle age (Kinsella & He, 2009; U.S. Census Bureau, 1995). One range that Statistics Canada uses as a designation of those who are in middle age or mid-life is the span from 45 to 64 years of age (Martel, Bélanger, Berthelot, & Carrière, 2005; Statistics Canada, 2008e). There are also various definitions of later life (Erikson, 1980; Kinsella & He, 2009; Martel et al., 2005; U.S. Census Bureau, 1986), but, in Canada, it is generally accepted that a person reaches later life, that is, becomes a senior, at the age of 65.

4.2.6.2 Inclusion and Exclusion Criteria: Health

Removed next from the dataset were 721 respondents who were in poor or fair health at the outset of the survey, that is, in the first cycle. This left 3,619 respondents who were in good or better-than-good health in the study sample. For the respondents who were in poor or fair health already, there was less possibility of a decline in health status. It follows that if respondent’s health was poor or fair at Time 1, then the argument could be made that an income status decline was not a result of the subsequent failure of the respondent’s health. Since the respondent’s health was already poor or fair, there was no change in health status that could be associated with a decline in income status.

4.2.6.3 Inclusion and Exclusion Criteria: Missing Values

The determination of how missing values are handled is a necessary part of data analysis (Rothman, Greenland, & Lash, 2008). The extent to which values are missing must be determined, followed by rational decisions about their disposition. For a particular respondent, part or all data values may be missing. More data values can be missing for one variable and fewer for another. Missing values can be problematic; if a large number of values are missing, the potential exists to render the results of inferential data analysis as suspect (Tabachnick &
Fidell, 2007). In particular, large numbers of missing values for dependent variables might mean that inferences cannot be drawn about causal relationships. Depending on the extent, pattern, and type of missing values, the appropriate alternative can be deleting cases or estimating missing values using a data correlation matrix or expectation maximization (Tabachnick & Fidell, 2007).

The issue of missing values was addressed variously: Cycle 1 was the cycle against which all other cycles were compared with respect to the dependent variables. In other words, a decline was said to have taken place if there was a decline between Cycle 1 and another later cycle. For this reason, if respondents had missing income data or missing health data in Cycle 1 they were excluded ($n = 142$). The disposition of missing values is depicted in Table 4-2 and Figure 4-1.

<table>
<thead>
<tr>
<th>Original NPHS Sample</th>
<th>Excluded Freq.</th>
<th>Included Freq.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Other than ages 40-59 in Cycle 1</td>
<td>12,936</td>
<td>Age 40-59</td>
</tr>
<tr>
<td>Poor or fair health</td>
<td>721</td>
<td>Good or better health</td>
</tr>
<tr>
<td>Missing income status data or missing health status data in Cycle 1</td>
<td>142</td>
<td>No missing income status data or health status data in Cycle 1</td>
</tr>
<tr>
<td>Income status or health status data missing two cycles in a row between Cycle 2 and Cycle 7</td>
<td>1,041</td>
<td>Income status or health status data missing for maximum of one observation</td>
</tr>
<tr>
<td>Health status or income status data missing in two or more cycles regardless of whether they are missing two cycles in a row</td>
<td>68</td>
<td>Health status or income status data missing in maximum of one cycle; nonmissing data employed in univariate and bivariate analyses</td>
</tr>
<tr>
<td>Missing independent variable data</td>
<td>148</td>
<td>Nonmissing data employed in logistic regression analyses</td>
</tr>
<tr>
<td>Total</td>
<td>15,156</td>
<td></td>
</tr>
</tbody>
</table>

**Note.** Data from Statistics Canada, National Population Health Survey, Cycles 1-7.

Certain patterns of missing data for total household income and self-rated health, the variables from which the dependent variables were derived, created a lapse between observations such that conclusions about declines were rendered suspect. To illustrate, a respondent could have had a decline in income status between the first and fourth cycle. It is possible that no income status data were available in between because the data were missing. Therefore, it would be difficult to argue that there was a causal relationship between the respective independent variables and the
income status decline because the lapse in time (six years) was too great. Furthermore, an income status decline or a health status decline could have occurred, but it would not be possible to determine which occurred first, the income status decline or health status decline.

Consequently, respondents who were missing one cycle of income status data \((n = 233)\) and/or one cycle of health status data \((n = 220)\) were included in the analysis. However, respondents \((n = 1,041)\) with two consecutive cycles of observations of missing income status or health status data were excluded. This criterion meant that 2,436 respondents who had less than two missing observations of income status and health status data were included.

Also excluded were respondents whose income status or health status data were missing in any two or more cycles \((n = 68)\), regardless of whether the cycles were missing in a row. The study sample included 2,368 respondents--those who had income status or health status data missing in a maximum of one cycle. The nonmissing sample size after eliminating all respondents with missing values for one or more predictor variables was 2,220.

Missing total household income or self-rated health values are discussed from another perspective. The need to maximize the sample size had to be balanced with the convention of excluding cases with any missing values (for total household income and self-rated health, the variables from which the dependent variables were derived). The decision was made to include respondents with incomplete data in some cycles for these variables. By applying a less stringent standard, the number of cases available for data analysis increased by 754 (data not shown).

Another issue, with respect to missing data, is the disposition of randomly missing data. The random occurrence of missing data is a less serious issue, in terms of assumptions about generalizability, than the occurrence of missing data in a nonrandom way (Tabachnick & Fidell, 2001). Allison (2002) further clarified this point when he said that “If you are estimating a logistic regression model, listwise deletion can tolerate either nonrandom missingness on the dependent variable or nonrandom missingness on the independent variable (but not both)” (p. 85). By default, in SPSS’s logistic regression function, if a respondent has a missing value for any variable, that respondent’s data is excluded from the entire analysis (Field, 2000). Binary logistic regression’s nonlinear model needs a full set of data. For that reason, SPSS deletes (listwise) cases with missing values, with only the full dataset being used to estimate the
parameters (Garson, 2009; IBM SPSS Statistics, 2009). Allison (2002) confirmed that listwise deletion is the best option—it avoids the need to impute values for data points and the exclusion of cases on a pairwise basis in all cycles, neither of which are optimal solutions (Allison, 2002; Field, 2000). Therefore, the dependent and independent variable data of those who, in Cycle 1, partially responded or failed to respond to survey questions were not included in the study’s binary logistic regression analyses.

4.2.6.4 Inclusion and Exclusion Criteria: Deceased Respondents

Respondents whose status was deceased were deemed to have had a health status decline. The rationale for this decision was as follows: It was argued that respondents who died at some point between Cycle 2 and Cycle 7 experienced a health status decline, even though they did not self-report as such. This step thus improved the potency of the models and increased the sample size. Without the inclusion of the deceased, the total usable observations would have been 2,215. Had they been excluded, 153 respondents’ data would have been rendered unusable (data not shown).

For those who died at a point from Cycle 2 to Cycle 7, the health status was coded as poor. Poor health was deemed the last observed value and replaced the missing value. Thus, if from Cycle 2 to Cycle 7, health was self-rated as fair or poor, or death occurred, respondents were judged to have experienced a health status decline. The occurrence of death, of course, meant that there was no change in these values over time.

Data of those who died (n = 153) were also included for analyses related to income status decline. Income status data for the deceased was coded as the last available income status data; that is, they were assigned the income status that they had before they died. Again, there was the assumption that there was no change in the data values over time.

The data of deceased respondents were part of the sample of those whose income status and/or health status declined, but not of the sample of those whose income status and/or health status declined and then regained (the fourth model). It could not be reasonably argued that respondents could experience status declines and/or regains after they died.

Data of 153 deceased respondents were included in Models 1, 2 and 3. Data of 50 of those deceased respondents (data not shown) would have been included in Model 4, had there not been the aforementioned stipulation. Of those 50 respondents, prior to their death, 31 did not
experience status regains, while the remainder did. It could have been argued that respondents who experienced status regains prior to their deaths should have been included in the sample. However, all data of deceased respondents were excluded from the sample, regardless of whether or not the respondents experienced status declines and/or regains.

In addition, two features of the NPHS increase the reliability of its dataset. First, the NPHS linked its survey data on deaths with administrative data, that is, the Canadian Vital Statistics Database. Second, the cause of death coding is the International Statistical Classification of Diseases and Related Problems (ICD-10; Statistics Canada, 1995).

4.2.6.5 Inclusion and Exclusion Criteria: Institutionalized Respondents

As stated above, institutionalized respondents participated in another NPHS survey, the NPHS Health Institutions Survey, until the survey wound down after Cycle 5. Many of the respondents died during the survey’s duration. The data of those who were surveyed during the first five cycles of the NPHS using the Health Institutions questionnaire (Statistics Canada, 2007a) and were still alive were not migrated to the NPHS Household Survey dataset. Respondents of the NPHS Household Survey who became institutionalized were interviewed as part of the NPHS Household Survey. In this study, the methodology was not constructed in a way that would treat those who went to live in a health care institution between Cycle 2 and Cycle 7 as having experienced *health status declines*. If they suffered health status declines, their data would have been collected in the same manner as the data of any other respondent. As stated earlier, all respondents in this study had good, very good, or excellent health at the outset, that is, Cycle 1. It is to be noted that residents of institutions were not automatically excluded at the outset because of an assumption that they were in poor or fair health. They would have been excluded only if they self-reported their health as fair or poor.

It is noteworthy that the number of institutionalized respondents by Cycle 7 was very small. However, findings regarding the frequency of respondents who were institutionalized are not reported because the frequency was fewer than 30, less than the Statistics Canada’s minimum cell size for public reporting.
4.2.7 Fulfillment of sample size requirements for estimation

An examination of the NPHS dataset was conducted to determine whether the sample sizes for this study’s statistical analyses were adequate; that is, the sample sizes were more than the minimum required for logistic regression analyses. The rule of thumb is that the variable that is being regressed, that is, the outcome variable, must have at least 10% of the sample size in one of the two categories. Per the following tally, this minimum was met for all except one model (Model 3b; Table 4-3).
Table 4-3
Frequencies and Percentages of Occurrence and Sequence of Respondents’ Declines and Regains (N = 2,368)

<table>
<thead>
<tr>
<th>Model</th>
<th>Outcomes</th>
<th>Both sexes</th>
<th>Male respondents</th>
<th>Female respondents</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Freq. Target Group</td>
<td>Freq. Subsample</td>
<td>Valid %</td>
</tr>
<tr>
<td>1a</td>
<td>Neither income status nor health status declined</td>
<td>783</td>
<td>2,368</td>
<td>33.0</td>
</tr>
<tr>
<td>1b</td>
<td>Income status declined and not health status</td>
<td>902</td>
<td>2,368</td>
<td>38.1</td>
</tr>
<tr>
<td>1c</td>
<td>Health status declined and not income status</td>
<td>302</td>
<td>2,368</td>
<td>12.8</td>
</tr>
<tr>
<td>1d</td>
<td>Both income status declined and health status declined</td>
<td>382</td>
<td>2,368</td>
<td>16.1</td>
</tr>
<tr>
<td>2a</td>
<td>Income status declined before health status declined</td>
<td>230</td>
<td>382</td>
<td>60.4</td>
</tr>
<tr>
<td>2b</td>
<td>Income status declined and health status declined during same cycle</td>
<td>96</td>
<td>382</td>
<td>25.2</td>
</tr>
<tr>
<td></td>
<td>Health status declined and then income status declined</td>
<td>55</td>
<td>382</td>
<td>14.5</td>
</tr>
<tr>
<td>2b</td>
<td>Combined: Health status declined first and then income status, and income status &amp; health status declined during same cycle</td>
<td>151</td>
<td>382</td>
<td>39.6</td>
</tr>
<tr>
<td>3a</td>
<td>Income status declined before health status declined (among respondents with income status decline)</td>
<td>230</td>
<td>1,283</td>
<td>17.9</td>
</tr>
<tr>
<td>3b</td>
<td>Health status declined before income status declined (among respondents with health status decline)</td>
<td>55</td>
<td>684</td>
<td>8.0E</td>
</tr>
<tr>
<td>4a</td>
<td>Income status regained after experiencing income status decline</td>
<td>728</td>
<td>1,028</td>
<td>70.8</td>
</tr>
<tr>
<td>4b</td>
<td>Health status regained after experiencing health status decline</td>
<td>328</td>
<td>400</td>
<td>82.0</td>
</tr>
</tbody>
</table>

Note. Data from Statistics Canada, National Population Health Survey, Cycles 1-7. — Following Statistics Canada guideline, estimate cannot be reported because of insufficient cases. Statistics Canada allowed disclosure of findings only if the number of observations was ≥30. Numbers may not add up due to rounding. E findings from logistic regression analyses are to be used with caution: less than minimum requisite sample distribution.
4.2.7.1 Weighting of the sample

The household surveys that Statistics Canada undertakes use complicated sample designs, which involve stratification, multistage selection, and selections with unequal probabilities. Weighting ensures accurate estimation and ameliorates sample bias—the result of survey design. Sample bias can come from “over/under sampling population sub-groups, response bias, data collection and processing operations” (Statistics Canada, 2007c, p. 25). If the intention is to be able to extrapolate the data from the samples to the population, weighted data must be used in these analyses. Put simply, the reason why weighted data were used in the study sample was to ensure that each respondent represented not only oneself, but also several others not in the sample, and thereby reflected the larger Canadian population. The weighted findings from the sample \( N = 2,368 \) could conceivably be generalized to the approximately seven million Canadians who by 2010, fifteen years later, were 55 to 74 years of age (Statistics Canada, 2009a).

The observations were weighted according to the sampling method that Statistics Canada employed to collect data from the population; this weighting allowed the generation of population-level inferences (but only for weighted results). In the NPHS, there was an unequal probability of the selection of a particular respondent; thus, the responses had unequal weights. Therefore, weighted data were used in all estimates and analyses, which thereby reflected the sex and age distribution of the household population in Canada from 1994-1995 through 2006-2007. The weighting employed was the Longitudinal Square; that is, all panel members were included regardless of their response patterns, and the weighted sample size was thereby maximized (Statistics Canada, 2008e). The NPHS sampling weights were adjusted in a way that took into account the particularities of the survey, for example, addressing nonrespones. These adjustments were made using longitudinal data from prior cycles (Statistics Canada, 2008d). The longitudinal weights employed were computed using the subset of respondents who partially or fully responded in all cycles.

A sampling weight for the study sample was calculated to reflect the population weight for the Longitudinal Square weighting. As well, because the model subsamples were different sizes, they were each weighted. These adjusted weights incorporated the relative contribution of each case, but did not artificially inflate the sample size.
4.3 Construction of Variables

Decisions about the construction of this thesis’s variables was guided by discussions about the key concepts (as laid out above in chapter 2), which, in turn, were guided by the research literature. These variables ably represent the thesis’s key concepts, in that they provide an authentic and comprehensive interpretation of them. Among the key concepts selected, and hence the variables constructed, were income status and health status. Specifically, changes in a respondent’s financial situation were measured by changes in total household income, and changes in a respondent’s health status were measured by changes in self-rated health.

A review of the NPHS questionnaires facilitated the selection of this study’s variables of interest (Statistics Canada, 1995). Regarding such selection, Singleton and Straits (2004) cautioned that, when dealing with secondary data, it is sometimes tempting to use measures that are not the most appropriate just because they are available. To heed Singleton and Straits’s warning, care was taken to use variables that were “appropriate for the task at hand” (p. 360). This section reports about the decisions taken in constructing the study’s variables and the justification for taking them. Background is provided about the construction of the dependent and independent variables: the types of variables employed, what they mean, what they do, and how they are constructed. This discussion of the construction of variables includes details about the recoding of variables and the respective documentation.

Variables were constructed after taking into consideration the following: First, too many categories in a categorical variable make the analyses unwieldy. Relatively fewer categories make understanding outputs easier; it facilitates the interpretation of the odds ratio. Second, combining categories may provide data at the level of interest in this study. Third, combining categories may increase the number of observations for each value of the variable, and this increase is often important for methodological reasons. Still, there are some drawbacks to this kind of reductionist approach. For example, the reduction of multiple categories to two categories means that potentially valuable information may be lost (Humphries & Van Doorslaer, 2000).

Another preliminary task was creating dichotomous dependent variables by coding the target group as 1 (meaning the outcome had occurred). The reference group was coded as 0 (the outcome had not occurred; Tabachnick & Fidell, 2007; Wright, 2004).
Creating the independent variables involved, for each variable, defining the reference group (the one of lesser interest or the one to which others are compared) and coding it as 0 (Garson, 2009). The group that is not the reference group (the most important, the largest membership, or the norm) was coded as 1 (Field, 2000; Wright, 2004). Female was the reference group, therefore, for the variable sex, female respondents were coded as 0 for and male respondents were coded as 1.

A data dictionary was generated which identifies the variables’ names, ranges, coding, and the scale of measurement. The dictionary contains the variables’ definitions, interrelationships, derivation, and derivatives (G. McDaniel & International Business Machines Corporation, 1994; Neuman, 2006). In addition, the variables’ syntax is documented.

### 4.3.1 Construction of independent variables

An independent variable is the variable in a regression analysis that is the regressor. It predicts the outcome variable (Dodge, Kendall, & International Statistical Institute, 2003). In binary logistic regression, the independent variables may be continuous or categorical. In this study, categorical dichotomous variables were employed in all cases except for one, specifically, total household income. Creating these derivative variables required the coding of new variables or the recoding of old variables. All variables, including variables with more than two values or attributes, were coded with values of 0 or 1.

As stated above, choices regarding the construction of independent variables were informed partly through the review of the literature; it provided clues about the explanation for certain outcomes, for example, income status decline (Alford, 1998). For a variety of reasons, some of the independent variables that were originally going to be employed were not employed. For example, it was unnecessary to factor in household size in the construction of the *decline in income status* variable because the variable is based on the Household Income Ratio, which, in turn, factors in household size. Other potential exogenous variables were work history and occupation. The decision not to include these variables was based on the degree of difficulty involved in unravelling the complexities of and the lack of data on the former and the relative value of the inclusion of the latter. Age, a continuous variable, was grouped into categories to assess the difference between broad categories of age. In addition, various options were explored with respect to whether a variable would be a three- or two-category variable, and
whether recoding a variable would result in too few cases in one of the levels. The determination was made that the study would use age group: respondents who were younger (40 to 46 years of age), middle-aged (47 to 53 years of age), or older (54 to 59 years of age) instead of just two groups younger and older, because the latter usage would result in a loss of valuable information. Younger refers those who are members of the relatively youngest group of the three age groups, and so on. A variable for marital status with three categories was created and tested, but decided against, because one of the categories had too few cases to enable the performance of analyses that would allow solid inferences. Instead, a two-category variable for marital status was created. Similarly, a three-category variable for immigrant status was explored. The categories would have been an immigrant to Canada, an immigrant with less than ten years of residence, and an immigrant with more than ten years of residence. Because a three-category variable would have meant too few cases, a two-category variable was employed.

The independent variables predicted income status decline (and regain) and health status decline (and regain). Eight independent variables were created to make sociodemographic characteristics operational, and four independent variables were created to make health behaviour operational. In addition, two independent variables were created to operationalize whether a decline occurred before or during the same cycle as another decline for the models that relate to income status regain after experiencing income status decline and to health status regain after experiencing health status decline. The independent variables are listed by type in Table 4-4.

Table 4-4
Independent Variables

<table>
<thead>
<tr>
<th>Sociodemographic</th>
<th>Economic</th>
<th>Health</th>
<th>Selected Variables</th>
<th>Sequence of Decline</th>
</tr>
</thead>
<tbody>
<tr>
<td>sex</td>
<td>employment status</td>
<td>self-rated health</td>
<td>total household income</td>
<td>(in addition to variables in Model 1 and Model 2)</td>
</tr>
<tr>
<td>age group</td>
<td>homeownership status</td>
<td>smoking history</td>
<td>self-rated health</td>
<td>health status declined before or during the same cycle as</td>
</tr>
<tr>
<td>marital status</td>
<td>status</td>
<td>drinking habits</td>
<td>age group</td>
<td>income status declined</td>
</tr>
<tr>
<td>educational status</td>
<td>total household income</td>
<td>physical activity</td>
<td>educational status</td>
<td>income status declined before or during the same cycle as</td>
</tr>
<tr>
<td>visible minority status</td>
<td>income</td>
<td>obesity</td>
<td>smoking history</td>
<td>health status declined</td>
</tr>
<tr>
<td>immigrant status</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note. All variables were derived from variables in the Statistics Canada, National Population Health Survey, Cycles 1-7.

* both sexes together  
** male respondents and female respondents (sex is not a variable in Model 2)  
^ independent variables with strongest effect from among variables found statistically significant in multinomial logistic regression analyses.
4.3.1.1 Total household income

The variable total household income, a derived variable, is discussed in this section. This variable indicated the respondent’s total household income during Cycle 1. Total household income refers to an estimate of the total income, before taxes and other deductions, of all household members from all sources during the past 12 months (Statistics Canada, 1995).

Total household income data were captured by Statistics Canada as categorical data in Cycle 1 and Cycle 2. From Cycle 3 onward, income data were collected as numerical dollar values provided by the respondents. Data from Cycle 1 and Cycle 2 were later converted to numerical dollar estimates of respondents’ total household income (Statistics Canada, 2002a, pp. 78-82, 2002b, p. 52).

Total household income was also rescaled (Table 4-5) because the values associated with the total household incomes were too large and thus confounded the logistic regression findings. High values for the variable, compared to the values of the other independent variables, “swamped” the effect of the low numerical value variables. This rescaling was achieved by transforming the income numbers. For example, $70,000 was rescaled to 70.0. The previous ranges of total household income were also rationalized so that the income amounts then represented the mid-point of the ranges.

Table 4-5
Key to Recoding of Total Household Income

<table>
<thead>
<tr>
<th>Original Code</th>
<th>Recoded ($'000s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 = $0</td>
<td>0</td>
</tr>
<tr>
<td>2 &lt; $5,000</td>
<td>2.5</td>
</tr>
<tr>
<td>3 = $5,000-$9,999</td>
<td>7.5</td>
</tr>
<tr>
<td>4 = $10,000-$14,999</td>
<td>12.5</td>
</tr>
<tr>
<td>5 = $15,000-$19,999</td>
<td>17.5</td>
</tr>
<tr>
<td>6 = $20,000-$29,999</td>
<td>25.0</td>
</tr>
<tr>
<td>7 = $30,000-$39,999</td>
<td>35.0</td>
</tr>
<tr>
<td>8 = $40,000-$49,999</td>
<td>45.0</td>
</tr>
<tr>
<td>9 = $50,000-$59,999</td>
<td>55.0</td>
</tr>
<tr>
<td>10 = $60,000-$79,999</td>
<td>70.0</td>
</tr>
<tr>
<td>11 = $80,000 and more</td>
<td>≥ 90.0</td>
</tr>
</tbody>
</table>

Note: Data from Statistics Canada, National Population Health Survey, Cycle 1. The total household income variable was recoded from Statistics Canada’s 11 ranges to the mid-points of these ranges.

Another issue arose with respect to total household income for Cycle 1. There was a question regarding the disposition of income data for those whose total household income was $100,000+. With respect to the 11th and final category, the income amount was listed as $80,000 to $99,999 (Statistics Canada, 2008d). Because there was no category for those respondents whose incomes
were $100,000 or more, a question arose about what happened to the data of respondents whose total household incomes were above $100,000. One thought was that the data had been top-coded for reasons of confidentiality. According to Statistics Canada, the total household income was incorrectly listed as $80,000 to $99,999; it should have been listed as $80,000 plus. Statistics Canada’s processing manager confirmed that the data were accurate; the only issue was that the category was mislabelled. However, this error created a problem for the coding, as explained above. The final category therefore does not represent a mid-point total household income for those whose incomes were between $80,000 and $99,999, that is, $90,000. Instead, it represents any respondent whose total household income was $80,000 or more.

Commencing in Cycle 6 and for all further cycles, the final two categories are $80,000 to less than $100,000 and $100,000 or more (Statistics Canada, 2009e, p. 76). However, this change does not affect the data analyses for this thesis. Only Cycle 1 data were used for the purposes of the binary logistic regression analyses.

4.3.1.2 Self-rated health

This section discusses the variable self-rated health, a dichotomous independent variable that refers to the health of the respondents. It was derived from the NPHS variable titled “Health Description Index” (HDI), a five-level scale of self-rated health ranging from poor, fair, good, very good to excellent (Statistics Canada, 2009e). Only three of the categories (good, very good, and excellent) were employed in the study’s baseline cycle. The reference category was the last group, excellent health. In total, 721 respondents who were in poor or fair health, in the first cycle were removed from the dataset at the outset.

4.3.1.3 Sex

This section discusses the variable sex, which was not a derived variable, and was not created specifically for this study. This variable was part of the NPHS dataset (Statistics Canada, 2008d). In terms of this variable, respondents were categorized as either male respondent or female respondent. The female respondent group was the reference category, and, as such, was coded as 0. The male respondent group was coded as 1.

Sex was employed in two ways; sex was used as a predictor in statistical analyses, and, in models that were stratified by sex, comparisons by sex highlighted the role of sex in the model findings.
4.3.1.4 Age group

This section discusses the variable *age*, a derived independent variable created for this study, and refers to the age of respondents. Age was calculated by subtracting a respondent’s year of birth from the reference year (Statistics Canada, 2008d). Using a three-category variable, respondents were grouped into the following categories of respondents: The age of the *younger group*, at baseline or Cycle 1, was from 40 to 46 years of age; the age of the *middle group* was from 47 to 53 years of age; the age of the *older group* was from 54 to 59 years of age. This last group, the older group, was the reference category.

4.3.1.5 Marital status

This section discusses the variable *marital status*, a variable created for this study, which refers to an individual’s current marital status, as of Cycle 1. Marital status, a derived dichotomous independent categorical variable, refers to a respondent whose current marital status is married, that is, one who is now married, in a common-law relationship, or living with a partner, or another type of marital status (Statistics Canada, 2008d). This thesis compares those whose marital status was married, common-law, or living with a partner with those who were single (never married), separated, divorced, or widowed. Members of the latter group were also sometimes referred to as *unattached*, that is, living by themselves or with unrelated others (Statistics Canada, 2005b; Townson, 2000). Statistics Canada specifies that an unattached individual is defined as “a person living either alone or with others to whom he is or she is unrelated such as roommates or a lodger” (Statistics Canada, 2005b, para. 5). In terms of marital status, respondents were categorized as either *married* or *another marital status*. Another marital status was the reference category and, as such, was coded as 0; married was coded as 1.

4.3.1.6 Educational status

This section discusses the variable *educational status*, a derived, dichotomous independent variable. A variable created for this study, it refers to the level of educational credential attained (Statistics Canada, 2008d). Educational status was classified according to two possible categories, that is, *high school graduate*, yes, or no. The no group was the reference category and, as such, was coded as 0; the yes group was coded as 1.

In this thesis, a person’s level of educational attainment was used to assess the person’s education (Swanson, Siegel, & Shryock, 2004; United Nations, 2009). According to Swanson et
al. (2004), the convention is to determine a person’s highest level of educational credential “not by the number of calendar years that a person has spent in school but by the highest grade completed (Swanson et al., 2004, p. 222). The fact has been established that the effects of education are “discontinuous, with jumps in positive outcomes occurring at points in the educational process when degrees are conferred” (American Psychological Association, 2007, p. 10). There is evidence that “education is described significantly better by a trichotomy (represented by less than a high school diploma, a high school diploma or greater but no college diploma, or a college diploma or greater) than by a simple linear function for both men (p < 0.0001 for lack of fit) and women (p = 0.006 for lack of fit).” (Backlund, Sorlie, & Johnson, 1999, p. 1373). However, because 71.8% of the respondents had a secondary education, it was important to determine the effect on outcome variables of the disadvantage of not having a secondary education. Therefore, two levels were used, that is, high school graduate or not a high school graduate.

4.3.1.7 Homeownership status

The variable homeowner status, a derived dichotomous independent variable created for this study, refers to whether the respondent’s dwelling was owned by a household member (Statistics Canada, 2008d), even if it was still being paid for, that is, the home had a mortgage. In terms of homeownership status, respondents were categorized as either yes (homeowner) or no (not a homeowner). This latter group, the not a homeowner group, was the reference category, and, as such, was coded as 0; the homeowner group was coded as 1.

4.3.1.8 Visible minority status

This section discusses the variable visible minority status, that is, the visible minority group to which a respondent belongs. Visible minorities are “persons, other than Aboriginal peoples, who are non-Caucasian in race or non-White in colour” (Department of Justice Canada, 1995, c. 44). Visible minority status, a derived dichotomous independent variable created for this study, indicated which visible minority status a respondent would self-identify as his or her own (Statistics Canada, 2008d). In terms of visible minority status, respondents were categorized as either non-White or White. The categorization was derived from identification of the racial term that best described the individual’s race or colour, and is distinct from ethnicity, which refers to the cultural or ethnic group to which a person’s ancestors belonged (Jackson, 2001; Statistics
Canada, 1995). The White group was the reference category and, as such, was coded as 0; the non-White group was coded as 1.

4.3.1.9 Immigrant status

The variable *immigrant status* refers to whether or not the respondent was an immigrant to Canada. Immigrant status, a dichotomous independent variable created for this study, indicated whether the respondent was an immigrant to Canada (Statistics Canada, 2008d). In terms of immigrant status, respondents were categorized as either yes (immigrant to Canada) or no (not an immigrant to Canada). The no group was the reference category and, as such, was coded as 0; the yes group was coded as 1.

4.3.1.10 Employment status

The variable *employment status*, a derived dichotomous independent variable created for this study, refers to a respondent’s current labour force status, that is, whether the respondent was employed as opposed to not being employed. In terms of employment status, respondents were categorized as either employed or not employed, that is, unemployed, not working, retired, or otherwise not in the labour force. This latter group was the reference category and, as such, coded as 0; the employed group was coded as 1.

It should be noted that retired was included as one of the reasons for not being in the labour force. In addition, to be noted is that, with respect to the variables used to create the employment status variable, the definition of employed did not differentiate between full-time and part-time work. As well, the definition of unemployed was not working for pay or profit (Statistics Canada, 2009e).

A number of options were considered regarding the way this variable would be configured. Ultimately, it was determined that the above terms would constitute the employment status variable. There would have been some advantages to the inclusion of retired as a separate category of the variable; however, the fact that fewer than 5% of the respondents in Cycle 1 were retired was problematic. This percentage was not large enough to ensure a reliable logistic regression analysis. Likewise, although it would have been valuable to have included “unpaid caregiver” as one of the categories, that too would have been problematic for similar reasons. There were also attempts to create various permutations of variables that distinguished among those who were employed, unemployed and looking for work, not in the labour force.
(unemployed and not looking for work), not retired and not in the labour force, and retired and in the labour force. The reason these attempts were not successful was that there was an inordinate degree of complexity involved in constructing such variables. For example, for Cycle 1, the concept employed was “current main activity,” and the question was “What do you consider to be your current main activity?” For Cycles 2 through 7, the concept employed was “reason for not working” and the question was about the main reason why the respondent was currently not working for pay or profit. Another issue was that, for the same cycle, a respondent legitimately could have been both retired and employed; therefore, there would have been an issue with frequency overlap. Another solution attempted was the creation of two variables; one would be related to retirement status (specifically retired and not retired), and the other would be related to employment status. However, this would have led to concerns about sample size and double counting. These and other options were considered but dismissed before the conclusion was reached that the variable employment status would be used as detailed above.

4.3.1.11 Smoking history

The variable smoking history, a derived dichotomous independent variable created for this study, categorized respondents as belonging to one of two groups, according to their history of smoking. The respondents were classified as never having smoked, in contrast with having smoked 20 or more cigarettes daily, having smoked less than 20 cigarettes daily, or having been a smoker (Shields & Shooshtari, 2001; Statistics Canada, 2008d). The latter group, the never smoked group, was the reference category, and, as such, was coded as 0; the ever-smoked group was coded as 1.

4.3.1.12 Drinking habits

The variable drinking habits, a derived dichotomous independent variable created for this study, categorized respondents into two groups based on their drinking habits. The respondents were classed as either nondrinkers or moderate drinkers, as distinguished from those who were heavy drinkers. The definition of the heavy drinker category for men is different from the definition for women. A man who has a problem with drinking drinks three or more drinks daily. A woman who consumes two or more drinks daily is considered a problem drinker. The latter group, the nondrinker or moderate drinker group, was the reference category, and, as such, was coded as 0; the heavy drinker group was coded as 1.
4.3.1.13 Physical activity

The variable *physical activity*, a derived dichotomous independent variable created for this study, categorized respondents as belonging to one of two groups based on their levels of physical activity (Statistics Canada, 2008d, 2009e). The respondents were classified as either active or inactive. The former group, the *active* group, was the reference category, and, as such, was coded as 0; the *inactive* group was coded as 1.

The rating of respondents’ physical activity was based on the expenditure of energy. Energy expenditure was determined by asking questions about the frequency, the length, and the intensity of the physical activity undertaken over the past year. Intensity was classified through use of the metabolic energy cost, and a respondent, for the purposes of this study, was considered either active, which meant that more than 1.5 kcal/kg/day were used, or inactive, which meant that less than 1.5 kcal/kg/day were used. An active person’s level of physical activity leads to cardiovascular health benefits. A moderately physically active person benefits in terms of general health, but achieves little gain in terms of cardiovascular health. An inactive person achieves neither general health benefits nor cardiovascular benefits.

4.3.1.14 Obesity

The variable *obesity*, a derived dichotomous independent variable created for this study, categorized respondents into two groups based on Body Mass Index (BMI), as either obese or not obese. BMI was calculated as weight (kg)/height (m²). In other words, the respondents who were not obese were distinguished from those who were obese. This former group, the *not obese* group, was the reference category, and, as such, was coded as 0; the *obese* group was coded as 1. A respondent who was categorized as obese had a BMI that was greater than or equal to 30, whereas a respondent who was categorized as not obese had a BMI that was less than 30.

4.3.1.15 Health status decline before or during the same cycle as income status decline

The variable, *health status decline before or during same cycle as income status decline*, a derived dichotomous independent variable, was employed only in the first submodel of Model 4, that is, Model 4a. It categorized respondents into two groups based on whether or not their health status declined before or during the same cycle as income status declined. The group, health status declined before or during the same cycle as income status declined was the target
category and, as such, was coded as 1; the reference category was coded as 0. This variable was created to predict a regain in income status.

4.3.1.16 Income status decline before or during the same cycle as health status decline

The variable *income status decline before or during same cycle as health status decline*, a derived dichotomous independent variable was employed only in Model 4b. The variable categorized respondents into two groups based on whether or not their income status declined before or during same cycle as their health status declined. The income status declined before or during same cycle as their health status, declined group was coded as 1. The reference category was coded as 0. This variable was created to predict a regain in health status.

4.3.2 Construction of dependent variables

A dependent variable is the variable in a regression analysis against which the independent variable is being regressed. It is the observed outcome variable (Dodge et al., 2003). In binary logistic regression, it must be a dichotomous variable, and is coded with a value of 0 or 1.

Dependent variables are operationalized such that they meet the study’s goals. Fundamental to the configuration of this study’s dependent variables was the idea of *change* in income status or health status. The measures indicated declines or regains in income status or health status enabling the measurement of change over time. Implicit was the assumption that a decline in one status could potentially influence the other status, another key feature of this thesis. Cycle 1 was the baseline cycle: Respondents could experience a decline between Cycle 2 and Cycle 7 and a regain between Cycle 3 and Cycle 7. The study’s 10 dependent variables that measured change will be discussed below.

4.3.2.1 Change in financial status

In this section, change in financial status, that is, income status decline as well as income status regain, are discussed. Change in financial status was utilized as the outcome measure of material circumstances.

The standard that income status change was based on was calculated using the Household Income Ratio (HIR). Change in income status was constructed as a decline or regain in the HIR, a variable derived from the variable total household income. The HIR was based on an estimate of the total income of all household members from all sources in the past 12 months, before taxes
and other deductions. The HIR was created by first classifying Canadians’ income into one of five levels or categories, starting with the lowest and ending with the highest. Each category includes approximately one fifth of the Canadian population and “is based on the ratio of Canadians’ total household income to their corresponding after-tax Low Income Cut-Off (LICO)” (Statistics Canada, 2009e, p. 81). The HIR refers to “a household with a ratio below 1 is more likely to be in a difficult financial situation because its spending on necessities is likely to be, in percentage, at a high level of its income” (Statistics Canada, 2009e, p. 192). Therefore, this measure is a gauge of one’s household income relative to the household incomes of all others.

In the construction of the outcome measure of material circumstances, a standard for what constitutes change, that is, decline or regain, was established through testing various possibilities. Consideration was given to the adoption of any degree of decrease or increase in the HIR or of a predetermined change in HIR as a standard for change. For example, a 2.0-point, 1.0-point, or 0.5-point decline in the HIR could constitute a change. Similarly, a certain percentage (25%) change in HIR was considered as an alternative. Also considered was a pre-established cut-off point, for example, a change in the HIR that brought the HIR to 1 point or below. These possibilities could not achieve the standard for a minimum sample distribution for logistic regression, that is, at least 10% of the total sample size in one of the two outcome categories. Another possibility was a measure similar to one that Orpana, Lemyre, and Gravel (2009) used in which HIR was employed to create a categorical variable that represented lower and higher income. Those respondents whose HIR was 1.5 or less were deemed of lower-income status, and respondents whose HIR was more than 1.5 were deemed of higher-income status. For various reasons, none of these possibilities would have yielded a suitable outcome measure. Another measure of changes in HIR was adopted, that is, a 0.5-point decline or regain in HIR. This measure had several strengths: The argument can be made that, because this represents a change of 50%, the degree of change was substantial. Because it involved a simple rule of thumb, it was easy to comprehend. Another advantage of this measure was that there was no need to adjust for inflation between Time 1 and Time 2, because the categories are neither in current or constant dollars; they represent ratios (A. MacKenzie, personal communication, August 6, 2009). In addition, it was unnecessary to factor household size into the construction of the decline in income status variable because the variable was based on the HIR, which factors in household
size. The measure also obviated the need to refer to an official poverty line. Finally, the HIR was able to measure change over time, specifically that a decline in income status could potentially ultimately affect health status, not only of those with low incomes but also of all others.

There were some limitations to this outcome measure: The HIR does not indicate an individual’s absolute income; instead, it indicates an individual’s income relative to the incomes of others. Because decline rather than some benchmark of poverty was the gauge, a decline in the income status of those who have high income was viewed in the same way as a decline in the income status of those who have low incomes. This way of measuring may be seen as a shortcoming of the HIR; indeed, a high-income person whose income was reduced by one-half might still have a comfortable lifestyle, whereas a person whose income was low would not have such a lifestyle.

In addition, the HIR does not measure whether individuals are poor, the depth of their poverty, the period during which they have been poor, or the time of their lives when they are poor. This measure utilizes only before-tax income data and does not consider after-tax income; therefore, it does not take into account the part of an individual’s income that includes, for example, tax credits and benefits. The HIR does not ascertain whether an individual regularly incurred substantial out-of-pocket medical expenses (Crystal et al., 2000), which erode an individual’s disposable income if health services are not publicly funded. There was no measure of accumulated debt. As well, the HIR does not take into account wealth per se. Another measure was employed as one indicator of wealth, that is, homeownership status. However, change in homeownership status was not used to measure change in financial status because its inclusion in the construction of the dependent variable would have been unwieldy. Household size was factored into the calculation of the HIR; however, the advantages of the ability to share resources were not fully taken into account, and neither were the ways resources were shared equally within families. The HIR does not consider the amount of effort required for an individual to accrue income, as determined, for example, by a person’s hourly wage. Finally, an individual’s income can fluctuate substantially from year to year, but the HIR was measured at one point in time in a given year.

4.3.2.1.1 Decline in income status

Decline in income status was the variable that measured a decline in respondents’ HIR during any cycle. Using the .5 point standard, if the respondent’s income status had declined between
Cycle 1 and Cycle 2, the change was designated *income status declined between Cycle 1 and Cycle 2*. If there was no income status decline between Cycle 1 and Cycle 2, a comparison was made between Cycle 1 and 3. If there was an income status decline, it was designated *income status decline between Cycle 1 and Cycle 3*, and so on. The information was summarized in the variable *income status decline from Cycle 2 through Cycle 7*. The group that did not experience a decline in income status, in any cycle, was the reference category, and, as such was coded as 0. The group that experienced a decline in income status from Cycle 2 through Cycle 7 was coded as 1.

4.3.2.1.2 Regain in income status

Regain in income status, a dichotomous dependent variable, provided information on respondents, who, during any cycle, experienced a half-point income status change, specifically, a regain in their Household Income Ratio. As stated above, the income status of respondents was compared, and a determination was made, using the standard already described, about whether it had declined and regained between Cycle 2 and Cycle 3. If it had, it was designated *income status regain after experiencing income status decline between Cycle 2 and Cycle 3*. If there was no income status regain after experiencing income status decline between Cycle 2 and 3, a comparison was made between Cycle 2 and Cycle 4. If there was an income status regain after experiencing income status decline, it was designated *income status regain after experiencing income status decline between Cycle 2 and Cycle 4*, and so on. The information was summarized in the variable *income status regain after experiencing income status decline from Cycle 3 through Cycle 7*. The group that did not experience a regain in income status in any cycle was the reference category, and, as such, was coded as 0; the group that experienced a regain in income status from Cycle 3 through Cycle 7 was coded as 1.

4.3.2.2 Change in health status

The primary health-related outcome measure, change in health status is discussed in this section. Change in health status was constructed as a decline or regain in self-rated health, or its proxy, deceased. Self-rated health was derived from an independent variable, Health Description Index (HDI), and was based on a five-level scale of self-rated health.

Various options for measuring changes in self-rated health were considered: One option considered as the standard for change in health status was the presence of any change at all.
Another option was based on the criterion used by Fuller-Thomson, George, and Noack (2011), Shields and Shooshtari (2001) Idler and Benyamini (1997) was a 2-point change in self-rated health. A third option was the setting of a standard for change that involved a pre-established cut-off point, below which a respondent’s health would have to fall to be considered a decline. This option was selected primarily because of the inclusion of deceased respondents. It was necessary to deem anyone whose health status declined to the extent that they fell into the category of fair health, poor health, or deceased as having experienced a health status decline.

There are a few strengths to this measure: Using the standard selected, the degree of change was substantial. For example, it is difficult to dispute that a decline from excellent to poor constitutes a health status decline. One other strength is that the information about health status change is easy to comprehend. This is because the standard for decline and the variable’s fundamental nature are uncomplicated.

In addition to the respondents’ determination of self-rated health, health behaviours were also employed as measures of health status (but not outcome measures). Another facet of health status, health behaviours, provided more detailed information than that provided by self-rated health alone.

4.3.2.2.1 Decline in health status

Decline in health status, a dichotomous dependent variable, was calculated using the following criteria: If the status of a respondent’s health changed from healthy, that is, excellent, very good, or good to unhealthy, that is, fair, poor, or deceased between Cycle 1 and a later cycle they were deemed to have experienced a decline in health status.

If there was no health status decline between Cycle 1 and 2, a comparison was made between Cycle 1 and 3 and so on. The group that did not experience a decline in health status, in any cycle, was the reference category, and, as such, was coded as 0; the group that experienced a decline in health status from Cycle 2 through Cycle 7 was coded as 1.

4.3.2.2.2 Regain in health status

Regain in health status, a dichotomous dependent variable, provided information about respondents who, between Cycle 3 through Cycle 7, experienced a health status regain after experiencing health status decline, specifically, a change from unhealthy to healthy. The group
that did not experience a regain in health status in any cycle was the reference category, and, as such, was coded as 0; the group that experienced a regain in health status from Cycle 3 though Cycle 7 was coded as 1.

4.4 Models

As stated earlier, this study’s research questions entailed four main areas of investigation, which necessitated the development of four models. These four models were made operational through respective submodels, that is, Model 1a, Model 1b, and so on. In all models, respondents experienced the outcome (1) or they did not, and were therefore members of the reference group (0). In the following sections, explained are the steps of the analyses (Figure 4-1), the respective dependent and independent variables (Table 4-6), and the submodels (Figure 4-3, Figure 4-4, Figure 4-5, and Figure 4-6).
## Table 4-6
**Submodel Sample Sizes and Variables**

<table>
<thead>
<tr>
<th>Model</th>
<th>Dependent Variables</th>
<th>$N$</th>
<th>Independent Variables</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>sex</td>
</tr>
<tr>
<td>1</td>
<td>Neither income status nor health status declined</td>
<td>2,368</td>
<td>✓</td>
</tr>
<tr>
<td>1a</td>
<td>Income status declined and not health status</td>
<td>2,368</td>
<td>✓</td>
</tr>
<tr>
<td>1b</td>
<td>Health status declined and not income status</td>
<td>2,368</td>
<td>✓</td>
</tr>
<tr>
<td>1c</td>
<td>Both income status declined and health status declined</td>
<td>2,368</td>
<td>✓</td>
</tr>
<tr>
<td>1d</td>
<td></td>
<td></td>
<td>both sexes together and male and female respondents separately</td>
</tr>
<tr>
<td>2</td>
<td>Health status declined and then income status declined</td>
<td>382</td>
<td>✓</td>
</tr>
<tr>
<td>2a</td>
<td>Income status declined and health status declined during same cycle</td>
<td>382</td>
<td>✓</td>
</tr>
<tr>
<td>2b</td>
<td>Income status declined and then health status declined</td>
<td>382</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td>Combined: Health status declined first and then income status, and income status &amp; health status declined during same cycle</td>
<td>382</td>
<td>✓</td>
</tr>
<tr>
<td>2b</td>
<td></td>
<td></td>
<td>male and female respondents separately; from among the Model 1d respondents whose both health status and income status declined</td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
<td>both sexes together; from among respondents whose income status declined and health status declined</td>
</tr>
</tbody>
</table>


<table>
<thead>
<tr>
<th>Model</th>
<th>Dependent Variables</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>sex</td>
</tr>
<tr>
<td>3a</td>
<td>Income status declined before health status declined (among respondents with income status decline)</td>
<td>1,283</td>
</tr>
<tr>
<td>3b</td>
<td>Health status declined before income status declined (among respondents with health status decline)</td>
<td>684</td>
</tr>
<tr>
<td>4</td>
<td>both sexes together; respondents whose income status regain after experiencing an income status decline and health status regained after experiencing a health status decline</td>
<td>1,028</td>
</tr>
<tr>
<td>4a</td>
<td>Income status regained after experiencing income status decline</td>
<td>400</td>
</tr>
<tr>
<td>4b</td>
<td>Health status regained after experiencing health status decline</td>
<td>1,028</td>
</tr>
</tbody>
</table>

Note. All variables were derived from variables in the Statistics Canada, National Population Health Survey, Cycles 1-7. Regressions were carried out without and with health behaviours.
4.4.1 Model 1

Model 1 (Figure 4-3) examined which factors, that is, total household income, self-rated health, age group, marital status, educational status, homeownership status, visible minority status, immigrant status, employment status, smoking history, drinking habits, physical activity, and obesity were predictive of

- *neither income status declined nor health status declined* (Model 1a);
- *income status declined and not health status* (Model 1b);
- *health status declined and not income status* (Model 1c); or
- *income status declined and health status declined* (Model 1d).

In this study, the independent variables were entered in two blocks in the binary logistic regression analyses in order to determine any increase in explanatory value provided by the final four variables, all of which are related to health behaviour. In the first block, the independent variables were included were total household income, self-rated health, age group, marital status, educational status, homeownership status, visible minority status, immigrant status, and employment status. Smoking history, drinking habits, physical activity, and obesity, that is, the variables related to health behaviour, were entered in the second block. In all submodels of Model 1, analyses for the entire sample and for male respondents and female respondents separately were undertaken.
4.4.2 Model 2

While Model 1d specified the factors that were related to a decline in both income status and/or health status, it did not address the sequence in which income status and health status declined. Model 2 (Figure 4-4) examined the factors that predicted the sequence of status decline from among respondents who experienced declines in both income status and health status (Model 1d). Model 2’s submodels were

- *income status declined before health status declined, among respondents with income status decline and health status decline (Model 2a)*; and
- *health status declined before income status declined, and income status and health status declined during same cycle, among respondents with income status decline and health status decline (Model 2b)*.

Due to small cell sizes, in Model 2b, two types of decline were combined into one dependent variable.

The analyses for Model 2 were conducted only for male respondents and female respondents separately, not for both sexes together. Like Model 1, they were entered in two blocks.

*Figure 4-4. Flowchart of binary logistic regression analyses: (Model 2; N = 382).*
The modal lag time analysis, that is, the frequency and percentage of which came first, a decline in income status, a decline in health status, or a decline of both in the same cycle helped to disentangle the links between income status and health status. The responses to the questions “Which of these three cases is the most numerous: an income status decline first, a health status decline first, or an income status decline and health status decline during the same cycle?” suggest possible causation.

4.4.3 Model 3

Model 3 (Figure 4-5) involved an analysis that examined income status decline and health status decline, but from a different perspective. It answered the question: “What factors predicted two-status decline (in a particular sequence) rather than just one status decline”? Given this thesis’s focus on causation, this is an important model.

Not all of the predictor variables that were employed in the previous two models were employed in Model 3. Five variables were selected from among those statistically significant variables that predicted both an income status decline and health status decline using multinomial logistic regression analysis. They were total household income, self-rated health, age group, educational status, and smoking history. This cap of five variables was put in place to ensure that the minimum sample distribution threshold could be met. The minimum sample distribution threshold for logistic regression was met for Model 3a but not Model 3b. Again, the independent variables were entered in two blocks (without and then with the health behaviour variable) in the binary logistic regression analyses. The analyses for Model 3 were conducted for both sexes together.

Model 3’s submodels were

- *income status declined before health status declined, among respondents with income status decline* (Model 3a); and

- *health status declined before income status declined, among respondents with health status decline* (Model 3b).
Model 3a focused on the factors that predicted an income status decline first and a subsequent health status decline among respondents with a decline in income status (in some cases in conjunction with a health status decline and in some cases not). The respondents in Model 3a consisted of a subsample of respondents with an income status decline, regardless of whether they had a health status decline. It included respondents who had no decline in health status, those whose health status declined preceding their income status declines, and those whose income status decline occurred during the same cycle as their health status decline.

Model 3b focused on the factors that predicted a health status decline first and a subsequent income status decline among respondents with a decline in health status (in some cases in conjunction with an income status decline and in some cases not). The respondents in Model 3b consisted of a subsample of respondents with a health status decline, regardless of whether they had an income status decline. It included respondents who had no decline in income status, those whose income status declined preceding their health status decline, and those whose health status decline occurred during the same cycle as their income status decline.

4.4.4 Model 4

Like previous models, Model 4 (Figure 4-6) focused on respondents with declines in both income status and in health status; however, it examined income status regains after experiencing income status declines and health status regains after experiencing health status declines. The analyses compared respondents with a regain between the second cycle and the subsequent five cycles to respondents with a decline and factors that were associated with an income status regain versus a health status regain.
The analyses for Model 4 were conducted for both sexes together, thereby meeting the minimum sample distribution threshold for logistic regression. Model 4 teased out the predictors of income status decline with a subsequent regain of income status, and the predictors of health status decline with a subsequent regain of health status. For the reasons explained above, the data of those respondents who were listed as deceased was excluded from the subsample, and therefore the analyses. The modal lag time data for Model 4 could not be used because of the complexities involved in pinpointing the exact cycle in which there was a regain.

Model 4’s submodels were

- *income status regained after experiencing income status decline (excluding deceased; Model 4a)*; and
- *health status regained after experiencing health status decline (excluding deceased; Model 4b).*
Model 4a focused on the predictors of an income status regain after experiencing an income status decline, among the subset of respondents who experienced an income status decline. The respondents in Model 4a consisted of a subsample of respondents with an income status decline, regardless of whether they had an income status regain after experiencing an income status decline. Model 4b focused on the predictors of a health status regain after experiencing a health status decline, among the subset of respondents who experienced a health status decline. The respondents in Model 4b consisted of a subsample of respondents with a health status decline, regardless of whether they had a health status regain after experiencing a health status decline.

The predictor variables employed were the same as the ones that were employed in Model 1 and Model 2. However, for Model 4a, an additional predictor variable, *health status decline before or during the same cycle as income status decline*, was included. This variable was included in order to ascertain the effect on the dependent variable of the occurrence of a health status decline (and in a particular sequence). For Model 4b, an additional predictor variable *income status decline before or during the same cycle as health status decline* was included. This variable was included in order to ascertain the effect on the dependent variable of an occurrence of income status decline (and in a particular sequence). Again, in the binary logistic regression analyses, the independent variables were entered in two blocks with the additional variables being entered in the first block of variables.

### 4.5 Data Analysis

This section outlines the methods used in the univariate, bivariate, and multivariate analyses of this study. This study was carried out in steps, which, as stated above, are depicted in Figure 4-2 and are summarized below. Analyses were undertaken after the study sample was selected; that is, the data were cleaned, screened, filtered (using the inclusion and exclusion criteria), and weighted. The NPHS variables were recoded into the respective independent and dependent variables. Subsamples were selected from the total sample, and each of the models was estimated separately. To undertake the various analyses, the software application SPSS Version 17 was employed (IBM SPSS Statistics, 2009).
4.5.1 Univariate analysis

Univariate analyses of statistics was undertaken to highlight certain results, to determine the extent to which information was missing, and to determine whether the data in the file were free of errors and input accurately (Bryman & Teevan, 2005; Tabachnick & Fidell, 2007).

For continuous variables, the examination of graphs and tables provided clues about whether: (a) the data was high quality; (b) means, medians, and standard deviations were plausible; and (c) there were out-of-range values or outliers. Minimum and maximum values were observed, but for reasons of confidentiality, Statistics Canada does not permit the reporting of these values.

For categorical variables, analyses of frequency distribution and valid percentages were undertaken to assess the (a) quality of the data, (b) patterns such as change over time, (c) effect on sample size of the inclusion of deceased respondents, and (d) effect on sample size of the inclusion of incomplete income status and health status data.

4.5.2 Bivariate analysis

Bivariate analyses included correlation analyses, cross-tabulations, and chi-square tests of categorical variables, the specifics of which are detailed below.

4.5.2.1 Correlation

Correlation analyses measure the linear relationship between two variables indicating a positive or negative correlation (the sign + or –), the strength of the relationship (value of $r$), whether they are highly correlated ($r > .5$), and whether they qualify as statistically significant ($p$ value; Schroeder, Sjoquist, & Stephan, 1986; Witte & Witte, 2004). No more than 20% of the cells should have frequencies of less than five. If the correlation is inflated, there is overlap in the composition of variables (multicollinearity); instead of using both variables, one should be used (Neuman, 2006). If the correlation is deflated, it may be that there was a small range of sampled cases or “uneven splits in the categories of dichotomous variables” (Tabachnick & Fidell, 2001, p. 58). Correlation analyses cannot shed light on causality or the relative importance of a number of variables for a given outcome (Alford, 1998), but they can suggest whether logistic regression analyses are warranted.
4.5.2.2 Cross-tabulations and chi-square analyses

Cross-tabulations with chi-square tests enable the analyses of the frequencies of categorical variables (IBM SPSS Statistics, 2009). Cross-tabulations indicate the degree to which one variable’s values are associated with another variable’s values. Chi-square test statistics indicate whether there is a statistically significant relationship between the two variables. The Pearson chi-square test criterion for statistical significance was $p < .05$. The chi-square test assumptions are as follows: the observations must be independent, and no more than 20% of the cells should have frequencies of less than five.

Chi-square tests were employed to determine whether there were statistically significant relationships between dependent and categorical independent variables, statistically significant relationships between independent and independent variables, and statistically significant differences between males and females. The tests were conducted to aid in the construction of the study’s models.

4.5.3 Regression analysis

The regression analysis involved binary logistic regression as well as multinomial logistic regression. Binary logistic regression analyses were carried out in Models 1 to 4; the analyses involved determining the predictors of the outcome variables. In addition, multinomial logistic regression analyses were employed for Model 1. Multinomial logistic regression analyses are a type of regression in which the independent variable predicts a dependent variable that has more than two categories (Garson, 2009). Multinomial logistic regression analyses were carried out for two main reasons: first, to verify that the Model 1 findings from the binary logistic regression analyses and the multinomial logistic regression analyses were comparable and second, to select for use in Model 3, five variables from among those that predicted both an income status decline and health status decline.

4.5.3.1 Binary logistic regression

Binary logistic regression was the primary multivariate analysis used in the models in this study. The objective of binary logistic regression is to predict the presence of an outcome, which must be a single dependent variable from the values of a set of independent or predictor variables. Binary logistic regression allows the analysis of the effect of either or both continuous or categorical variables on a dichotomous, that is, categorical variable (Garson, 2009). Binary
logistic regression assumes a causal interrelationship that either is independent or occurs through another factor (Alford, 1998).

The dependent variable is the variable that is being predicted, and the independent variable is the variable that is the predictor. The predicted variable or outcome variable is expressed as a probability and is binary, that is, it has only two possible values. Binary logistic regression is only possible when the outcome variable is categorical, that is, it must be binary (dichotomous). All dependent variables were recoded into dichotomous variables (coded 0 or 1). In binary logistic regression, the variable of interest is a dichotomous variable with value of 1 (Pr1) or of 0 (Pr0), for example, the dependent variables, income status decline and health status decline.

When a given variable’s value is known, binary logistic regression allows the prediction of the value of another variable. Binary logistic regression enables the assessment of the odds of membership in a group, given the combination of values of the independent variables in the model being regressed. A logistic function is fitted to the 1s and 0s, and the probability associated with each value is estimated. In other words, binary logistic regression enables the prediction of the probability of group membership.

Binary logistic regression is the most appropriate choice for this study’s data analyses. It is flexible and easy to interpret (Rothman et al., 2008). Straightforward explanations of the odds ratios as extensions of the log odds and model parameters are possible. In many of the studies on this topic, when multivariate analyses were conducted, binary logistic regression was the analysis method of choice. This choice allowed ready comparisons of results. Binary logistic regression is particularly well suited to social and behavioural research such as this study because it uses dichotomous, nonlinear relationships and categorical as well as continuous variables (Walsh & Ollenburger, 2001). Certain features of binary logistic regression add to its appeal. It is less restrictive than is linear regression (Wright, 2004). Although the dependent variable must be categorical, a mix of categorical and continuous independent variables (Tabachnick & Fidell, 2007) is allowed. What is more, there is no requirement that there be a linear relationship between the dependent and independent variable; it may be linear or nonlinear. There is no requirement that the frequency distribution be normal (Garson, 2009). There is no assumption of an equal variance between independent variables. In general, the requirements are less rigorous than are those of some other types of analyses.
4.5.3.1.1 Assumptions of binary logistic regression

Diagnostics were carried out on the variables to ascertain whether the relevant assumptions were met, and, if they were not appropriate solutions were developed. There are five assumptions associated with binary logistic regression (Wright, 2004). The first assumption is that the outcome variable is a dichotomous variable with value of 1 (Pr1) or (Pr0) of 0. The second assumption is called independence of outcomes and refers to the fact that the “outcomes must be statistically independent . . . a single case can be represented in the data set only once” (Wright, 2004, p. 220). Only one response can be reported for a respondent (Garson, 2009; Tabachnick & Fidell, 2007). The third assumption is called the specificity assumption. It refers to the assumption that all relevant predictors including theoretically important predictors must be included in the model. If important predictors are ignored, or if irrelevant predictors are used, the logistic regression coefficients will not be reliable. Inaccurate estimates of logistic regression coefficients will result. The fourth assumption is that observations must be mutually exclusive and collectively exhaustive: A respondent’s response cannot be in the same outcome category at the same time, and there must be at least one response in the outcome category. Finally, the fifth assumption is that a larger sample is required than is the case for linear regression (Norman & Streiner, 2000; Wright, 2004). If the sample size is not large enough, then the results cannot be generalized to the population (Tabachnick & Fidell, 2007).

4.5.3.1.2 Multicollinearity

Problems with estimation arise when the independent variables are too highly correlated; that is, there is multicollinearity (Schroeder et al., 1986). According to Field (2000), “multicollinearity is a situation in which two or more variables are very closely linearly related” (p.738). The extent to which one independent variable is a linear function of one or another independent variable can be assessed using collinearity diagnostics (IBM SPSS Statistics, 2009). This assessment helps determines whether to use one variable in the model rather than another or others that are similar. Multicollinearity can be determined by either checking the tolerance statistic or checking the variance inflation factor. The tolerance statistic should be > 0.4, and, if it is not, there is multicollinearity. Per Field (2000), the tolerance statistic should be > 0.1. Alternately, the Variance Inflation Factor should be < 10, and, if it is not, there is multicollinearity. Tests for multicollinearity in logistic regression were carried out (Tabachnick & Fidell, 2007).
Multicollinearity was assessed between the self-rated health variable and other health related variables, using the variance inflation factor (VIF). In the case of the variables visible minority status and immigrant, the VIF was 1.267. Because the VIF was less than 10, multicollinearity is not a concern (Field, 2000). Similarly, in the case of the variables related to the four health behaviours and self-rated health, the VIF was less than 10. For the history of smoking variable, it was 1.011. For the drinking habits variable, it was 1.004. For the level of physical activity variable, it was 1.009, and for the obesity variable, it was 1.010. Again, there was no evidence of multicollinearity between the self-rated health variable and health behaviour variable.

4.5.3.1.3 Outliers

Another issue to be considered was the effect that extreme values of independent variables, that is, outliers, had on the model, and whether they ought to be removed (Tabachnick & Fidell, 2007). Outliers can substantially affect results; they may distort the logistic regression coefficient and other results. As such, standardized residuals should be analyzed with a view to considering removing them or modeling them separately.

The criterion for exclusion of outliers was whether the results were sensitive to their exclusion. In other words, if undertaking the analyses with and without including the outliers yielded essentially identical results, then it was determined that there was no need to remove them.

The following determination about the disposition of outliers was made, based on an assessment of the data and the given research design: Because almost all the variables were categorical, for the most part, this analysis was not relevant. For the continuous variable, carrying out the analysis with and without the outliers yielded similar results, there was no advantage to removing the values of the respective outliers.

4.5.3.1.4 Logistic regression coefficient

The logistic regression coefficient is alternatively referred to as the parameter estimate (or B coefficient). It is an indication of the degree to which the dependent variable changes when there is a change in the independent variable (Schroeder et al., 1986). The logistic regression coefficient is used to quantify the relationship between the predictor and the outcome. In binary logistic regression, an effect is not determined solely by the logistic regression coefficient; it is also determined by whether there is a positive or negative value associated with the logistic
regression coefficient. The direction of the relationship is indicated in the logistic regression coefficient statistic. For example, if there is a positive relationship (+0.59) between educational level and the outcome variable neither income status decline nor health status decline, then high school graduates were more likely to experience neither an income status decline nor a health status decline, as compared to those who were not high school graduates. Given that the value of the odds ratio is more intuitive than the value of the regression coefficient, in interpreting results, it is more helpful to focus on its value.

4.5.3.1.5 Odds ratio

Coefficients in binary logistic regression allow the estimation of odds ratios for each of the independent variables in the model (IBM SPSS Statistics, 2009). The logistic regression coefficient answers the question of whether respondents with a particular characteristic are more or less likely to experience the event that is being analyzed (Wright, 2004). The odds ratio answers the question, “What is the likelihood of a particular outcome?” An odds ratio is a measure of effect size (Garson, 2009); it expresses the effect of a certain variable and refers to the estimated change in the odds of membership in the target group.

The odds ratio or exponent (B) is used to predict likelihood. If the odds ratio is greater than 1, the relationship between the variable and outcome is direct; in descriptions of this relationship, it is appropriate to use terms such as “higher odds,” “higher risks,” “more likely,” “the likelihood of experiencing the event is higher,” or “the chances of experiencing the event are higher” (Statistics Canada, 2009f, p. 2). If the odds ratio is less than 1, the relationship between the variable and outcome is inverse; in descriptions of this relationship, it appropriate to use terms such as “lower odds,” “lower risks,” “less likely,” “the likelihood of experiencing the event is lower,” or “the chances of experiencing the event are lower” (Statistics Canada, 2009f, p. 2). If the odds ratio equals one, then the predictor may not have much effect on the dependent variable.

4.5.3.1.6 Statistical significance

Binary logistic regression analyses were conducted to determine whether predictions could be made about the types of respondents whose income status declined and health status declined, for example, during the seven cycles of the study. While this kind of association does not ensure that there is a causal relationship, it suggests possible causation (Sprinthall, 2000). Using binary logistic regression, a determination was made about which predictors played the most important
roles in the larger population, that is, were statistically significant (Tabachnick & Fidell, 2007). If there is no difference between the two groups in the models being compared, that is, no independent variables’ findings are statistically significant, for example, income status decline or health status decline versus no income status decline or health status decline, then it can be said that nothing differentiates them in the larger population. Expressed positively, statistically significant findings for the independent variables indicate that the two groups in the model being compared are likely to be different in the population. The reason why a finding is not statistically significant may be that there is no relationship in the population; the sample’s variation is not great enough, or the sample size is too small to make effective estimates.

In this thesis, the criterion for a finding being statistically significant is $p < .05$. In some academic circles, there has been a discussion about whether or not $p < .051$ to $p < .054$ could be considered marginally statistically significant, based on an argument that the criterion of $p < .05$ was too rigid (Dallal, 2008; D. Knoke, personal communication, April 5, 2005; Stigler, 2008). As well, there is debate about whether or not a $p$ value equal to .05 should be considered statistically significant. Views on this issue tend to vary along disciplinary lines. While many in the social sciences accept $p \leq .05$ as statistically significant, biostatisticians are more likely to consider a $p$ value as statistically significant only if it is less than .05. Therefore, for this study, only findings with a $p$ value of less than .05 were considered statistically significant.

Through interpretation of the values of the logistic regression coefficient and the odds ratio, and through a determination about whether there is statistical significance, it is possible to rank the relative importance of independent variables (Garson, 2009).

4.5.3.1.7 Nagelkerke $R^2$

In testing the hypothesis, that is, the contribution of the independent variables that predict the dependent variable, a coefficient of determination, $R^2$ is examined (Green & Salkind, 2008). In binary logistic regression, the one most reported is the statistic Nagelkerke $R^2$ (Garson, 2009). The statistic indicates the level of effectiveness of the combination of independent variables in the prediction of the dependent variable. The Nagelkerke $R^2$ shows the improvement from the null model to the fitted model, represented as a ratio, which must be between 0 and 1. This ratio indicates the extent to which the model parameters better the prediction of the null model.
However, while the Nagelkerke $R^2$ bears a resemblance to the $R^2$ generated in an ordinary least squares regression model, it cannot be interpreted in the same way, and thus is considered a pseudo $R^2$ measure. Broad comparisons of pseudo $R^2$ are not valid. Still, a pseudo $R^2$ value can be compared with another pseudo $R^2$ value of the same kind, on the same data, if the same outcome is being predicted (Institute for Digital Research and Education, 2014).

4.6 Ethical Considerations

The University of Toronto’s Health Science Research Ethics Board (REB) granted approval to the research study under the REB’s delegated authority rather than the full review process because, in its data collection, Statistics Canada follows protocols that guarantee high standards of ethical practice. Statistics Canada’s National Population Health Survey data were accessed in the secure setting of the Toronto Region’s Research Data Centre (RDC). In order to meet the requirements of the Statistics Act, including its rules about confidentiality, RDC researchers are deemed employees of Statistics Canada (Statistics Canada, 2009g).

For reasons of confidentiality, only when the cell sizes of findings, for example, frequencies, cross-tabulations, or samples, total 30 or more, does Statistics Canada allow disclosure of them for public consumption. In other words, if the number of missing values is less than 30, the finding is considered too small to report. However, the statistic does not have to be expunged if it is 0. In the reporting of these statistics, some levels in categories were combined so that all cell sizes were 30 or more. Finally, the combination of categories was possible in some situations, but there were instances in which the numbers in the descriptive findings remained too small to report.

4.7 Delimitations and Limitations of Study

This section explains what was included and what was not included in the study design and the related rationale. The first and most important point is that this study not only addressed the link between poverty and health status, it also addressed the strength and direction of the relationship between income change and health change. Second, change in income was measured for those at all levels of household income, not just those who experienced declines below the LICO. Third, change in health was measured using a pre-established benchmark, that is, from healthy to unhealthy or vice versa. The degree of change in both income status and health status that were measured was substantial. Fourth, respondents who experienced gains in income status and
health status were both considered and not considered, as part of the thesis’s models. Gains were considered in that respondents who experienced gains were among those who experienced regains, and therefore were examined as part of that group (Model 4). However, those who had gains, that is, improvements without a previous decline, were not segregated and analyzed separately. Similarly, among those respondents who did not experience declines in income status or health status (Model 1a, Model 1b and Model 1c), absolute gains and gains beyond the benchmark established for a regain were not examined. The models were not designed to detect and analyze respondents who experienced a gain. Doing so would have resulted in understanding the factors that predict gains and the consequent policy implications, but was beyond the scope of the study’s research goals. Fifth, links among the dependent variables and the presence or absence of a chronic condition, the type of chronic condition, activity restrictions related to health, the cause of a health problem, and the source of the health-related problem, that is, whether it was in a physical or mental condition, were not examined. The reason for these exclusions was that the aforementioned health information did not necessarily relate to the severity of the condition or to any resultant functional limitations. The measure that was utilized, that is, self-rated health, has been found to be adequate as a measure of health. In addition, given that there was already a measure of health, that is, self-rated health there would be issues with multicollinearity, for example, between it and the presence of chronic conditions. Sixth, any consideration of the relationship between income status and social forces, for example, the economic climate, was absent from this study. An example of this is that an economic downtown might result in an income status decline. Income status decline is a relative measure; however, such events have a differential effect on various subgroups. Similarly, history and social change, and life course principles were not transformed into and included as variables. Although the use of independent variables that address these issues might have been valuable, such use may have been problematic because of the complexity associated with fashioning such a variable. Seventh, the respondents’ places of residence, that is, geographic location and region, were outside the scope of this study. The reason for this exclusion was that these factors were not directly relevant, given the study’s purpose and scope as outlined above. Eighth, other independent variables that could possibly have been included were not. Because the study relied on a secondary data analyses, it was not possible to include every potentially important variable. Excluded were a number of arguably relevant variables, for example, age upon immigration, language/s spoken, retirement status, labour force participation history,
presence in the household of dependent children or other dependent relatives, and type of living arrangement, for example, unattached and living alone. Moreover, for the statistical analysis undertaken, that is, logistic regression analysis, the number of independent variables had to be limited. The number of predictor variables had to be kept to a minimum in order to meet the model’s minimum sample size requirements. In sum, it was not feasible to include all pertinent independent variables. Ninth, gender comparisons were not included in this study for all of the models. The reason for this was as follows: The process of making a comparison by sex would have rendered the sample size too small for a robust logistic regression analysis in some of the models. There would have been insufficient cases to meet the sample size requirements given the narrow study scope, that is, Canadians 40 to 59 years of age who experienced declines (and regains) in health status and/or income status. Tenth, it should be noted that, in one model, Model 2, logistic regression analyses that included the sex variable were undertaken but not reported. This was because there was an interaction effect related to the analyses by both sexes together. Eleventh and finally, the independent variable marital status was defined in terms of marital status at the outset, in other words, in Cycle 1. This definition, of course, did not take into account the fact that the respondent may have had a change in marital status over the course of the NPHS cycles studied. Indeed, during the life cycle, marital status may change a few times, and this change could potentially be a factor in income status decline and health status decline. Income status and health status have complex interactions with marital status and subsequently influence later-life status. Because of the difficulty involved in incorporating marital status changes over a 14-year period, the construction of an independent variable that could potentially include several changes in marital status was not feasible. Likewise, the same decision was made for educational status, homeownership status, and employment status. In other words, over the 14-year period, these other statuses of the respondents could also have changed, with similar repercussions.

4.8 Chapter Summary

Chapter 4, the chapter on methods, reported the details of the procedures that were used in the formation of the research study. This chapter was both procedural and contextual in nature; it described the important processes and their associated concepts for this study. This chapter also detailed the methodological characteristics that establish parameters on how the study’s results may be interpreted (Punch, 2005).
The study design for this thesis involved a secondary analysis of longitudinal survey data. The approach chosen had to address the unique aspects of the questions, including change over time and fluctuations in income status and health status, that is, decline (with or without a regain) in income status and health status. A design that used longitudinal data was better able to infer that Time 2 effects may be causally related to Time 1’s independent variables. The use of panel data or measurements of the same individuals over time were an acknowledgment of the depth and breadth of the life course perspective (Settersten 2003).

This study used a sample of respondents interviewed in NPHS’s Cycle 1 (1994-1995) through Cycle 7 (2006-2007; Statistics Canada, 1995). As stated above, 17,276 respondents participated in Cycle 1. The number of respondents with data that could be used for the analysis for this study was 2,368. The results of the filtering process can be summarized as follows: Respondents who were outside the age range of 40 to 59 years of age in Cycle 1 were excluded \((n = 12,936)\). In addition, respondents with poor or fair health status in Cycle 1 were excluded \((n = 721)\). Respondents with missing income status data or missing health status data in Cycle 1 were excluded \((n = 142)\). Respondents with two-cycles-of-observations-in-a-row of missing values were excluded \((n = 1041)\). Income status or health status data that was missing in two or more cycles, regardless of whether it was missing for two cycles in a row, was excluded \((n = 68)\). Respondents' data were included if fewer than two observations of income data or health data were missing in Cycle 2 through 7. If only one cycle of income status data were missing, the respondent's data were included \((n = 233)\), and, if only one cycle of health status data were missing, the respondent's data were included \((n = 220)\). The proxy data of those who were deceased \((n = 158)\) were included for analyses related to income status decline and health status decline; that is, health data for the deceased was coded as poor, and income data for the deceased was coded as the last available income data. The proxy data of those who were deceased \((n = 158)\) was excluded for analyses related to income status regain after experiencing income status decline, and health status regain after experiencing health status decline. The disposition of data for analysis and corresponding frequencies, that is, the selection of the sample was represented by Figure 4-1.

This chapter also discussed a variety of empirical indicators that could potentially have measured the concepts explored by this study. Given the particular study design, certain variables were employed, and others were not. Ultimately, the decision regarding the construction of the
various variables was informed by methodological, empirical, and theoretical knowledge (Alford, 1998). The study’s major concepts were made operational as dependent and independent variables. At that point, the measurements employed in this thesis were discussed, that is, changes in financial status, as measured by income status decline (and regain), as well as changes in health status, as measured by health status decline (and regain). The final section of this chapter discussed the analytical methods used in the light of some of the considerations in the development of the model. Multivariate analyses using logistic regression were undertaken. Given the way these models were constructed, the dependent variable was always dichotomous; therefore, binary logistic regression could be used.

This study design involved explanatory research. The study was based on established theories and built on pre-existing hypotheses that have yielded empirical evidence; it also attempted to explain income status and health status based on the underlying data and tested new hypotheses (Neuman, 2006).
5.1 Introduction to Univariate and Bivariate Findings

In this first of two chapters on findings, a summary of the univariate statistics as well as any important bivariate statistics are reported for each of the study’s four models as well as for their respective submodels. The standard descriptive statistics for the dependent and independent variables are detailed: their frequency, their valid percent, and, where appropriate, their mean and standard deviation. As well, in this section, cross-tabulations (frequency and valid percent), chi-square test statistics, and the respective statistical significance are reported. These chi-square test analyses were undertaken before the logistic regression analyses to examine relationships between variables. A few independent variables were examined to determine whether there was evidence of underlying relationships between them. The chapter summary synthesizes the key results and points to the ones that will be interpreted in the discussion chapter.

In the next chapter, chapter 6, the multivariate findings are presented for each of the study’s four models as well as for their respective submodels.

5.2 Model 1 Findings

5.2.1 Univariate findings

5.2.1.1 Dependent variables

In this section, the univariate statistics for the dependent variables in Model 1 are reported. The process of filtering to achieve this sample was explained above, where the results of filtering, that is, the size of the weighted sample, that is, N = 2,368. The breakdown by income status and health status decline for the NPHS Cycle 1 (1994-1995) through Cycle 7 (2006-2007) is depicted in Figure 5-1.
Occurrence of decline in income status and/or health status: National Population Health Survey Cycles 1 to 7 ($N = 2,368$).

Table 4-3 depicts the number and percentage of respondents who had a health status decline and not an income status decline, that is, 12.8%, an income status decline and not a health status decline 38.1%, and neither an income status decline nor health status decline, that is, 33.0%. Approximately one third of all respondents had neither an income status nor a health status decline. Most respondents (67.0%) experienced a decline in income status or health status or both. More than one half of the respondents (54.2%) experienced a decline in income status and more than one quarter of the respondents (28.9%) experienced a decline in health status. Almost twice as many respondents experienced an income status decline as compared with a health status decline.

Table 4-3 depicts the number and percentage of respondents who experienced a decline in both income status and health status. From Cycle 2 to Cycle 7, 16.1% of respondents experienced a decline in both income status and health status. Approximately one sixth of all respondents had both an income status and health status decline. In this group, 4.1% of respondents experienced an income status decline and health status decline during the same cycle, 9.7% of respondents experienced an income status decline and then a health status decline, and 2.3% of respondents experienced a health status decline and then an income status decline. Almost twice as many respondents experienced an income status decline before a health status decline as the inverse; the fewest number of respondents experienced declines of income status and health status during the same cycle.

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**Figure 5-1.** Occurrence of decline in income status and/or health status: National Population Health Survey Cycles 1 to 7 ($N = 2,368$).
The breakdown for male respondents and female respondents is indicated in Table 4-3. A larger proportion of female respondents than male respondents (41.3% vs. 35.0%) experienced an income status decline and not a health status decline. As well, a larger proportion of female respondents than male respondents (29.4% vs. 21.3%) experienced an income status decline and a health status decline during the same cycle. The opposite was the case with respect to male respondents versus female respondents experiencing a health status decline and not an income status decline (14.7% vs. 10.8%). Similarly, a larger proportion of male respondents versus female respondents experienced an income status regain (74.6% vs. 67.4%) and a health status regain (84.6% vs. 79.4%).

5.2.1.2 Independent variables

5.2.1.2.1 Household income

As indicated in Table 5-1, respondents’ mean total household income in Cycle 1 (1994-1995) was $53,984.

Table 5-1
Sociodemographic and Health Behaviour Characteristics of Respondents (N = 2,368)

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Both sexes (N = 2,368)</th>
<th>Male respondents (n = 1,210)</th>
<th>Female respondents (n = 1,158)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total household income: mean (sd)</td>
<td>$53,984 ($25,677)</td>
<td>$55,125 ($25,614)</td>
<td>$52,792 ($25,700)</td>
</tr>
<tr>
<td>Health</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Good</td>
<td>28.9%</td>
<td>27.6%</td>
<td>30.2%</td>
</tr>
<tr>
<td>Very good</td>
<td>43.7%</td>
<td>44.4%</td>
<td>42.9%</td>
</tr>
<tr>
<td>Excellent</td>
<td>27.4%</td>
<td>27.9%</td>
<td>26.9%</td>
</tr>
<tr>
<td>Age</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Younger</td>
<td>44.3%</td>
<td>45.9%</td>
<td>42.7%</td>
</tr>
<tr>
<td>Middle</td>
<td>33.8%</td>
<td>34.4%</td>
<td>33.2%</td>
</tr>
<tr>
<td>Older</td>
<td>21.9%</td>
<td>19.7% ^a,*</td>
<td>24.1%</td>
</tr>
<tr>
<td>Married or common-law</td>
<td>81.7%</td>
<td>85.1% ^b,*</td>
<td>78.2%</td>
</tr>
<tr>
<td>High school graduate</td>
<td>71.8%</td>
<td>69.4%</td>
<td>74.2% ^c,*</td>
</tr>
<tr>
<td>Homeowner</td>
<td>82.8%</td>
<td>83.0%</td>
<td>82.6%</td>
</tr>
<tr>
<td>Visible minority</td>
<td>6.7%</td>
<td>8.2% ^d,*</td>
<td>5.2%</td>
</tr>
<tr>
<td>Immigrant</td>
<td>19.2%</td>
<td>21.7% ^e,*</td>
<td>16.5%</td>
</tr>
<tr>
<td>Employed</td>
<td>80.2%</td>
<td>87.5% ^f,*</td>
<td>72.5%</td>
</tr>
<tr>
<td>Smoker/have smoked</td>
<td>28.1%</td>
<td>31.7% ^g,*</td>
<td>24.4%</td>
</tr>
<tr>
<td>Heavy drinker</td>
<td>20.7%</td>
<td>22.0%</td>
<td>19.3%</td>
</tr>
<tr>
<td>Physically inactive</td>
<td>60.8%</td>
<td>60.4%</td>
<td>61.3%</td>
</tr>
<tr>
<td>Obese</td>
<td>15.4%</td>
<td>14.9%</td>
<td>16.0%</td>
</tr>
</tbody>
</table>

Note. Data from Statistics Canada, National Population Health Survey, Cycle 1. At Cycle 1, the age of the younger group was 40 to 46, the middle group was 47 to 53, and the older group was 54 to 59. Married included legally
married, common-law, or living with a partner; another marital status means single, widowed, separated, or divorced.  a Male respondents were statistically significantly less likely to be older than female respondents were.  b Male respondents were statistically significantly more likely to be married than female respondents were.  c Female respondents were statistically significantly more likely to be a high school graduate than male respondents.  d Male respondents were statistically significantly more likely to be non-White than female respondents were.  e Male respondents were statistically significantly more likely to be immigrants than female respondents were.  f Male respondents were statistically significantly more likely to be employed than female respondents were.  g Male respondents were statistically significantly more likely to have a history of smoking than female respondents were.  

As indicated in Table 5-2, when total household income was transformed to categorical variables (per above, all incomes for the categorical variables are listed as their mid-points), the frequency distribution of total household income showed a pattern similar to the findings for total household income as a continuous variable. In Cycle 1, almost 60% (57.5%) of these respondents had total household incomes that were $35,000 to $70,000.

Table 5-2
Frequencies and Percentages of Total Household Income of Respondents ($N = 2,368$)

<table>
<thead>
<tr>
<th>$</th>
<th>Freq.</th>
<th>Valid %</th>
<th>Cumulative</th>
<th>Freq.</th>
<th>Valid %</th>
<th>Freq.</th>
<th>Valid %</th>
</tr>
</thead>
<tbody>
<tr>
<td>$&lt;7500</td>
<td>74</td>
<td>3.1</td>
<td></td>
<td>32</td>
<td>2.7</td>
<td>42</td>
<td>3.6</td>
</tr>
<tr>
<td>12,500</td>
<td>82</td>
<td>3.4</td>
<td>6.6</td>
<td>38</td>
<td>3.1</td>
<td>44</td>
<td>3.8</td>
</tr>
<tr>
<td>17,500</td>
<td>110</td>
<td>4.6</td>
<td>11.2</td>
<td>54</td>
<td>4.5</td>
<td>55</td>
<td>4.8</td>
</tr>
<tr>
<td>25,000</td>
<td>219</td>
<td>9.3</td>
<td>20.5</td>
<td>115</td>
<td>9.5</td>
<td>105</td>
<td>9.0</td>
</tr>
<tr>
<td>35,000</td>
<td>283</td>
<td>11.9</td>
<td>32.4</td>
<td>142</td>
<td>11.8</td>
<td>140</td>
<td>12.1</td>
</tr>
<tr>
<td>45,000</td>
<td>338</td>
<td>14.3</td>
<td>46.7</td>
<td>152</td>
<td>12.5</td>
<td>186</td>
<td>16.0</td>
</tr>
<tr>
<td>55,000</td>
<td>323</td>
<td>13.6</td>
<td>60.3</td>
<td>162</td>
<td>13.4</td>
<td>161</td>
<td>13.9</td>
</tr>
<tr>
<td>70,000</td>
<td>420</td>
<td>17.7</td>
<td>78.1</td>
<td>239</td>
<td>19.8</td>
<td>181</td>
<td>15.6</td>
</tr>
<tr>
<td>90,000+</td>
<td>520</td>
<td>21.9</td>
<td>100.0</td>
<td>275</td>
<td>22.8</td>
<td>244</td>
<td>21.1</td>
</tr>
<tr>
<td>Total</td>
<td>2,368</td>
<td>100.0</td>
<td>100.0</td>
<td>1,210</td>
<td>100.0</td>
<td>1,158</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Note. Data from Statistics Canada, National Population Health Survey, Cycle 1. Statistics Canada allowed disclosure of findings only if the number of observations was ≥30. The frequencies from the first three levels were amalgamated to meet this requirement; therefore, nine levels are depicted rather than 11. Cumulative percentages may not add up due to rounding.

The standard deviation of $25,677 (Table 5-1) represents the fact that there was a high degree of variability/dispersion in the distribution of income data. As Table 5-2 indicates, a number of respondent households were at the lower end of the income spectrum. More than one in 10 or 11.2% had incomes of $17,500 or less. There were also a number of respondent households at the higher end of the income spectrum. More than two in 10 or 21.9% had incomes of $90,000 or more.
The findings for the male and female respondents’ results for the categorical variables were similar to the male and female respondents’ results for the continuous variables. Men’s total household incomes, more than women’s have, were on average, in the higher income categories. For example, 19.8% of men and 15.6% of women had total household incomes of $70,000. In the comparison of the male and female respondents, male respondents’ total household incomes were higher than female respondents’ were. As indicated in Table 5-2, male respondents’ mean total household income in Cycle 1 (1994-1995) was $55,125 (SD = $25,614). Female respondents’ mean total household income for the same period was $52,792 (SD = $25,700).

Similarly, the household income ratio (HIR) in Cycle 1 was 2.61 for male respondents and 2.53 for female respondents (Table 5-3). In Cycle 7, the HIR was 3.48 for male respondents and 2.63 for female respondents, a statistically significant difference. Over the study period, although, on average, the HIR increased for both sexes together, men’s HIR increased more than women’s did.

Table 5-3
Comparison of Cycle 1 Versus Cycle 7: Sample Sizes, Means, and Standard Deviations of Household Income Ratio of Respondents (N = 2,368)

<table>
<thead>
<tr>
<th>Household income ratio</th>
<th>Both sexes</th>
<th>Male respondents</th>
<th>Female respondents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cycle 1</td>
<td>N: 2,368</td>
<td>M: 2.57</td>
<td>SD: 1.38</td>
</tr>
<tr>
<td>Cycle 7</td>
<td>N: 2,009</td>
<td>M: 3.06</td>
<td>SD: 2.30</td>
</tr>
<tr>
<td>% Δ</td>
<td>-15.2</td>
<td>19.3</td>
<td>66.9</td>
</tr>
</tbody>
</table>

Note. Data from Statistics Canada, National Population Health Survey, Cycle 1 versus Cycle 7. Household Income Ratio is a relative measure of total household income expressed as a ratio. † Male respondents were statistically significantly more likely to have a higher HIR than were female respondents.

5.2.1.2.2 Self-rated health

As stated above, the variable that is termed self-rated health is derived from the variable in the NPHS titled the Health Description Index (HDI). Because some of descriptive findings for two of the levels of categories, that is, poor and fair, were less than 30, the findings were merged into one category. In addition, as stated above, for the variable self-rated health, 721 respondents who were in poor or fair health in the first cycle were removed from the dataset. As such, in Cycle 1, only those respondents are reported whose self-rated health was good, very good, or excellent.

As indicated in Table 5-4, in Cycle 1 (1994-1995), among all respondents, 28.9% experienced good health (as measured by HDI), 43.7% experienced very good health, and 27.4% experienced
excellent health. In total, 71.1% of respondents reported either very good or excellent health. The most frequent rating was very good health, with approximately the same number of respondents reporting good health and excellent health. Because of sample attrition or question non-response, over the seven cycles of data collection, from Cycle 1 to Cycle 7, the sample size went from 2,368 to 2,140, a reduction of approximately 10%.

Table 5-4  
Sample Sizes and Percentages of Self-Rated Health of Respondents

<table>
<thead>
<tr>
<th>Cycle</th>
<th>Both sexes</th>
<th>Male respondents</th>
<th>Female respondents</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(N)</td>
<td>(n)</td>
<td>(n)</td>
</tr>
<tr>
<td>1</td>
<td>2,368</td>
<td>1,210</td>
<td>1,158</td>
</tr>
<tr>
<td>2</td>
<td>2,333</td>
<td>1,189</td>
<td>1,144</td>
</tr>
<tr>
<td>3</td>
<td>2,286</td>
<td>1,165</td>
<td>1,121</td>
</tr>
<tr>
<td>4</td>
<td>2,271</td>
<td>1,158</td>
<td>1,114</td>
</tr>
<tr>
<td>5</td>
<td>2,240</td>
<td>1,132</td>
<td>1,108</td>
</tr>
<tr>
<td>6</td>
<td>2,193</td>
<td>1,114</td>
<td>1,079</td>
</tr>
<tr>
<td>7</td>
<td>2,140</td>
<td>1,079</td>
<td>1,061</td>
</tr>
</tbody>
</table>

Self-rated health | Valid % | Valid % | Valid % | Valid % | Valid % | Valid % | Valid % |
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Poor</td>
<td>5.0</td>
<td>4.9</td>
<td>5.1</td>
<td>10.1</td>
<td>5.1</td>
<td>10.1</td>
<td>5.1</td>
</tr>
<tr>
<td>Fair</td>
<td>7.9</td>
<td>5.6</td>
<td>5.4</td>
<td>10.1</td>
<td>5.4</td>
<td>10.1</td>
<td>5.4</td>
</tr>
<tr>
<td>Good</td>
<td>27.6</td>
<td>25.5</td>
<td>25.7</td>
<td>28.7</td>
<td>25.7</td>
<td>28.7</td>
<td>25.7</td>
</tr>
<tr>
<td>Very good</td>
<td>44.4</td>
<td>42.3</td>
<td>44.8</td>
<td>43.9</td>
<td>44.8</td>
<td>43.9</td>
<td>44.8</td>
</tr>
<tr>
<td>Excellent</td>
<td>27.9</td>
<td>27.4</td>
<td>27.7†</td>
<td>26.4†</td>
<td>22.3†</td>
<td>18.6</td>
<td>16.7</td>
</tr>
</tbody>
</table>

Note: Data from Statistics Canada, National Population Health Survey, Cycles 1-7. Respondents who were in poor or fair health in Cycle 1 were removed from the dataset. Numbers may not add up due to rounding. † Male respondents statistically significantly more likely to have excellent health than female respondents (p < .05).

Even by Cycle 7, few respondents were at the lower end of the self-rated health scores spectrum: Approximately one in 10 or 10.7% had health scores of poor or fair. Most respondents (72.5%) had good or very good health in Cycle 7; this is approximately the same proportion as in Cycle 1.
In total, 16.8% of respondents had excellent health in Cycle 7--fewer than had excellent health in Cycle 1.

In a comparison of male and female respondents, men had a higher percentage of health ratings in the poor and fair categories than did women. For example, as indicated in Table 5-4, in Cycle 7, 12.0% of men’s and 9.4% of women’s health was poor or fair. Male and female respondents’ health ratings in the categories good, very good, or excellent in Cycle 7 were comparable. A large percentage of both male and female respondents’ health for this period was good, very good, or excellent. Most male respondents (88.0%) had good, very good, or excellent health in Cycle 7. In the same cycle, most female respondents (90.6%) also had good, very good, or excellent health. However, only for Cycle 3, Cycle 4, and Cycle 5, was there a statistically significant difference between male and female respondents, with more male respondents than female respondents who described their health as excellent.

5.2.1.2.3 Sex

Of the respondents in Cycle 1, 51.1% were male respondent and 48.9% were female respondent. There were more male respondents in the sample.

5.2.1.2.4 Age

In Cycle 1, the mean age of this sample was 48.14 years, and the standard deviation was 5.63. Age was transformed to a categorical variable representing age groups (Table 5-1). Almost 45% (44.3%) or 1,049 of the respondents were in the younger group in Cycle 1, that is, 40 to 46 years of age. In total, 33.8% were in the middle group, that is, 47 to 53 years of age, and 21.9% were in the group of older respondents, that is, 54 to 59 years of age. The majority (55.7%) of the respondents were 47 years of age and older, but the younger group, the group containing those 40 to 46 years of age, was the largest of the three groups. There were decrementally fewer respondents in each of the age groups, with twice as many respondents in the younger group as in the older group.

For male respondents, 45.9% of the respondents were in the younger group in Cycle 1, that is, 40 to 46 years of age. In total, 34.4% were in the middle group, that is, 47 to 53 years of age, and 19.7% were in the older group, that is, 54 to 59 years of age (Table 5-1). For female respondents, almost 43% (42.7%) or 495 of the respondents were in the younger group in Cycle
1, that is, 40 to 46 years of age. In total, 33.2% were in the middle group, that is, 47 to 53 years of age, and 24.1% were in the group of older respondents, that is, 54 to 59 years of age. In total, 57.3% of female respondents were in the middle group and the older group compared with 54.1% of male respondents in the middle group and the older group. At Cycle 1, the age distribution for male respondents was statistically significantly different from the age distribution for female respondents, with male respondents being younger.

5.2.1.2.5 Marital status

There were 2,368 respondents in Cycle 1; 81.7% were categorized as married, including those living common-law or with a partner, and 18.3% were categorized as having another marital status, that is, single, widowed, separated, or divorced (Table 5-1). By Cycle 7, there were 2,141 respondents in the sample, 78.8% of whom were married, and 21.2% of whom had another marital status. In all cycles, more respondents were married, including those living common-law or with a partner, compared with those with another marital status.

Over the seven cycles, there was a slight increase (2.9%) in those with another marital status, with a greater increase among female respondents (4.7%) compared with male respondents (1.1%; Table 5-5). In Cycle 1, 85.1% of the male respondents were married, and 14.9% had another marital status. In Cycle 1, 78.2% of the female respondents were married, and 21.8% had another marital status. In comparison, by Cycle 7, 84.0% of the male respondents were married, and 16.0% had another marital status. By Cycle 7, 73.5% of the female respondents were married, and 26.5% had another marital status. A statistically significantly greater proportion of male respondent respondents than female respondents were married for Cycle 1 to Cycle 7.

Table 5-5
Sample Sizes and Percentages of Marital Status of Respondents

<table>
<thead>
<tr>
<th>Cycle</th>
<th>Both sexes (N)</th>
<th>Married</th>
<th>Married</th>
<th>Married</th>
<th>Married</th>
<th>Married</th>
<th>Married</th>
<th>Married</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(N)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>2,368</td>
<td>81.7</td>
<td>18.3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>2,337</td>
<td>80.8</td>
<td>19.2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>2,287</td>
<td>80.1</td>
<td>19.9</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>2,273</td>
<td>80.1</td>
<td>19.9</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>2,241</td>
<td>78.8</td>
<td>21.2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>2,192</td>
<td>78.7</td>
<td>21.3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>2,141</td>
<td>78.8</td>
<td>21.2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Male respondents (n)</th>
<th>Married</th>
<th>Married</th>
<th>Married</th>
<th>Married</th>
<th>Married</th>
<th>Married</th>
</tr>
</thead>
<tbody>
<tr>
<td>1,210</td>
<td>81.7</td>
<td>18.3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1,193</td>
<td>80.8</td>
<td>19.2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1,166</td>
<td>80.1</td>
<td>19.9</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1,159</td>
<td>80.1</td>
<td>19.9</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1,132</td>
<td>78.8</td>
<td>21.2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1,114</td>
<td>78.7</td>
<td>21.3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1,079</td>
<td>78.8</td>
<td>21.2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
160

<table>
<thead>
<tr>
<th>Cycle</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Married</td>
<td>85.1†</td>
<td>83.9†</td>
<td>83.6†</td>
<td>83.6†</td>
<td>83.0†</td>
<td>83.6†</td>
<td>84.0†</td>
</tr>
<tr>
<td>Another marital status</td>
<td>14.9</td>
<td>16.1</td>
<td>16.4</td>
<td>16.4</td>
<td>17.0</td>
<td>16.4</td>
<td>16.0</td>
</tr>
</tbody>
</table>

Female respondents

| (n) | 1,158 | 1,144 | 1,121 | 1,114 | 1,109 | 1,078 | 1,062 |

Marital status

<table>
<thead>
<tr>
<th>Valid %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Married</td>
</tr>
<tr>
<td>Another marital status</td>
</tr>
</tbody>
</table>

Note. Data from Statistics Canada, National Population Health Survey, Cycles 1-7. Married included legally married, common-law, or living with a partner; another marital status means single, widowed, separated, or divorced. † Male respondents statistically significantly more likely to be married than female respondents ($p < .05$).

5.2.1.2.6 Educational status

There were 2,362 respondents in Cycle 1; 71.8% respondents were categorized as high school graduates, and 28.2% were categorized as not being high school graduates (Table 5-6). By Cycle 7, there were 2,120 in the sample, 73.7% of whom were high school graduates, and 26.3% of whom were not high school graduates. Almost three quarters of the respondents were high school graduates with a greater proportion of the respondents being high school graduates in Cycle 7 as compared with Cycle 1.

Table 5-6
Sample Sizes and Percentages of Educational Status of Respondents

<table>
<thead>
<tr>
<th>Cycle</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Both sexes</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(N)</td>
<td>2,362</td>
<td>2,337</td>
<td>2,287</td>
<td>2,258</td>
<td>2,233</td>
<td>2,184</td>
<td>2,120</td>
</tr>
<tr>
<td>Educational status</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Valid %</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>High school graduate</td>
<td>71.8</td>
<td>72.0</td>
<td>72.8</td>
<td>72.9</td>
<td>73.1</td>
<td>73.2</td>
<td>73.7</td>
</tr>
<tr>
<td>Not a high school graduate</td>
<td>28.2</td>
<td>28.0</td>
<td>27.2</td>
<td>27.1</td>
<td>26.9</td>
<td>26.8</td>
<td>26.3</td>
</tr>
</tbody>
</table>

Male respondents

| (n) | 1,207 | 1,193 | 1,166 | 1,150 | 1,128 | 1,108 | 1,065 |
| Educational status | | | | | | | |
| Valid % | | | | | | | |
| High school graduate | 69.4 | 69.5 | 70.3 | 70.4 | 70.7 | 71.4 | 71.5 |
| Not a high school graduate | 30.6 | 30.5 | 29.7 | 29.6 | 29.3 | 28.6 | 28.5 |

Female respondents

| (n) | 1,156 | 1,144 | 1,121 | 1,109 | 1,105 | 1,077 | 1,055 |
| Educational status | | | | | | | |
| Valid % | | | | | | | |
| High school graduate | 74.2‡ | 74.5‡ | 75.3‡ | 75.4‡ | 75.6‡ | 75.2‡ | 75.9‡ |
| Not a high school graduate | 25.8 | 25.5 | 24.7 | 24.6 | 24.4 | 24.8 | 24.1 |

Note. Data from Statistics Canada, National Population Health Survey, Cycles 1-7. ‡ Female respondents statistically significantly more likely to be a high school graduate than male respondents ($p < .05$).
In Cycle 1, 69.4% of the male respondents were high school graduates, and 30.6% were not high school graduates. In Cycle 1, 74.2% of the female respondents were high school graduates, and 25.8% were not high school graduates. In comparison, by Cycle 7, 71.5% of the male respondents were high school graduates, and 28.5% were not high school graduates. By Cycle 7, 75.9% of the female respondents were high school graduates, and 24.1% were not high school graduates. In all cycles, a statistically significantly greater proportion of female respondents, as compared with male respondents, were high school graduates.

5.2.1.2.7 Homeownership status

In Cycle 1, providing information about homeownership status, were 2,366 respondents; in Cycle 7, that number was 2,139 respondents (Table 5-7). In Cycle 1, 82.9% were homeowners; by Cycle 7, 84.4% were homeowners.

Table 5-7
Sample Size and Percentages of Homeownership Status of Respondents

<table>
<thead>
<tr>
<th>Cycle</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Both sexes</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(N)</td>
<td>2,366</td>
<td>2,336</td>
<td>2,301</td>
<td>2,273</td>
<td>2,240</td>
<td>2,191</td>
<td>2,139</td>
</tr>
<tr>
<td>Homeownership status</td>
<td>Valid %</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Homeowner</td>
<td>82.8</td>
<td>83.2</td>
<td>83.6</td>
<td>83.3</td>
<td>83.2</td>
<td>82.9</td>
<td>84.4</td>
</tr>
<tr>
<td>Not a homeowner</td>
<td>17.2</td>
<td>16.8</td>
<td>16.4</td>
<td>16.7</td>
<td>16.8</td>
<td>17.1</td>
<td>15.6</td>
</tr>
<tr>
<td>Male respondents</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(n)</td>
<td>1,209</td>
<td>1,194</td>
<td>1,175</td>
<td>1,159</td>
<td>1,131</td>
<td>1,112</td>
<td>1,077</td>
</tr>
<tr>
<td>Homeownership status</td>
<td>Valid %</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Homeowner</td>
<td>83.0</td>
<td>84.5</td>
<td>85.0</td>
<td>84.6</td>
<td>84.2</td>
<td>83.7</td>
<td>85.6</td>
</tr>
<tr>
<td>Not a homeowner</td>
<td>17.0</td>
<td>15.5</td>
<td>15.0</td>
<td>15.4</td>
<td>15.8</td>
<td>16.3</td>
<td>14.4</td>
</tr>
<tr>
<td>Female respondents</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(n)</td>
<td>1,157</td>
<td>1,142</td>
<td>1,125</td>
<td>1,114</td>
<td>1,109</td>
<td>1,079</td>
<td>1,061</td>
</tr>
<tr>
<td>Homeownership status</td>
<td>Valid %</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Homeowner</td>
<td>82.6</td>
<td>81.8</td>
<td>82.1</td>
<td>81.9</td>
<td>82.1</td>
<td>82.0</td>
<td>83.2</td>
</tr>
<tr>
<td>Not a homeowner</td>
<td>17.4</td>
<td>18.2</td>
<td>17.9</td>
<td>18.1</td>
<td>17.9</td>
<td>18.0</td>
<td>16.8</td>
</tr>
</tbody>
</table>

Note. Data from Statistics Canada, National Population Health Survey, Cycles 1-7. Homeownership signifies that dwelling is owned by a household member.

More than four fifths of respondents were homeowners, with the rate being higher for male respondents as compared with female respondents. In Cycle 1, 83.0% of the male respondents were homeowners, and 17.0% were not homeowners. In Cycle 1, 82.6% of the female...
respondents were homeowners, and 17.4% were not homeowners. In comparison, by Cycle 7, 85.6% of the male respondents were homeowners, and 14.4% were not homeowners. By Cycle 7, 83.2% of the female respondents were homeowners, and 16.8% were not homeowners. These differences between male and female respondents were not statistically significant. For both sexes together and for each sex, the rate of homeownership was higher in each successive cycle as compared with Cycle 1.

5.2.1.2.8 Visible minority status

Visible minority status information was available for 2,360 respondents. In Cycle 1, 93.3% of the respondents were White, and 6.7% were non-White (Table 5-1). Almost 92% (91.8%) of the male respondents were White, and 94.8% of the female respondents were White. Almost 10% (8.2%) of the male respondents were non-White, and 5.2% of the female respondents were non-White. Statistically significantly, more male respondents, as compared to female respondents, were non-Whites.

5.2.1.2.9 Immigrant status

Immigration information was available for 2,368 respondents (Table 5-1). In Cycle 1, 19.2% of the respondents were immigrants, and 80.8% were nonimmigrants. Almost 22% (21.7%) of the male respondents were immigrants, and 16.5% of the female respondents were immigrants. Almost 80.0% (78.3%) of the male respondents were nonimmigrants, and 83.5% of the female respondents were nonimmigrants. Approximately one fifth of respondents were immigrants, but one sixth of the respondents were female immigrants. At Cycle 1, the results indicate a statistically significant difference between male and female respondents in the proportions who were immigrants, with male respondents being more likely to have been immigrants.

5.2.1.2.10 Employment status

In Cycle 1, 2,332 respondents provided information about their employment status; in Cycle 7, 2,108 respondents provided that information (Table 5-8). In Cycle 1, 80.2% were employed. By Cycle 7, 56.9% were employed. In Cycle 1, 19.8% were not employed. By Cycle 7, 43.1% were not employed. This constitutes a large change, between Cycle 1 and Cycle 7, in the rate of employment.
Table 5-8
Sample Sizes and Percentages of Employment Status of Respondents

<table>
<thead>
<tr>
<th>Cycle</th>
<th>Both sexes</th>
<th>Employment status</th>
<th>Valid %</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(N)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>2,332</td>
<td>Employed</td>
<td>80.2</td>
</tr>
<tr>
<td>2</td>
<td>2,310</td>
<td>Not employed</td>
<td>19.8</td>
</tr>
<tr>
<td>3</td>
<td>2,299</td>
<td></td>
<td>78.8</td>
</tr>
<tr>
<td>4</td>
<td>2,278</td>
<td></td>
<td>75.0</td>
</tr>
<tr>
<td>5</td>
<td>2,257</td>
<td></td>
<td>70.9</td>
</tr>
<tr>
<td>6</td>
<td>2,234</td>
<td></td>
<td>66.2</td>
</tr>
<tr>
<td>7</td>
<td>2,108</td>
<td></td>
<td>61.1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Cycle</th>
<th>Male respondents</th>
<th>Employment status</th>
<th>Valid %</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(n)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>1,194</td>
<td>Employed</td>
<td>87.5†</td>
</tr>
<tr>
<td>2</td>
<td>1,183</td>
<td>Not employed</td>
<td>12.5</td>
</tr>
<tr>
<td>3</td>
<td>1,179</td>
<td></td>
<td>87.1†</td>
</tr>
<tr>
<td>4</td>
<td>1,161</td>
<td></td>
<td>83.1†</td>
</tr>
<tr>
<td>5</td>
<td>1,149</td>
<td></td>
<td>77.8†</td>
</tr>
<tr>
<td>6</td>
<td>1,132</td>
<td></td>
<td>72.8†</td>
</tr>
<tr>
<td>7</td>
<td>1,060</td>
<td></td>
<td>68.4†</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Cycle</th>
<th>Female respondents</th>
<th>Employment status</th>
<th>Valid %</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(n)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>1,138</td>
<td>Employed</td>
<td>72.5</td>
</tr>
<tr>
<td>2</td>
<td>1,127</td>
<td>Not employed</td>
<td>27.5</td>
</tr>
<tr>
<td>3</td>
<td>1,120</td>
<td></td>
<td>70.2</td>
</tr>
<tr>
<td>4</td>
<td>1,117</td>
<td></td>
<td>66.6</td>
</tr>
<tr>
<td>5</td>
<td>1,108</td>
<td></td>
<td>63.7</td>
</tr>
<tr>
<td>6</td>
<td>1,101</td>
<td></td>
<td>59.4</td>
</tr>
<tr>
<td>7</td>
<td>1,047</td>
<td></td>
<td>53.6</td>
</tr>
</tbody>
</table>

Note. Data from Statistics Canada, National Population Health Survey, Cycles 1-7. Not employed signifies unemployed, not working, retired, or otherwise not in the labour force. † Male respondents statistically significantly more likely to be employed than female respondents (p < .05).

The employment rate in all cycles for male respondents was higher than was the employment rate for female respondents. In Cycle 1, 87.5% of the male respondents were employed, and 12.5% were not employed. In Cycle 1, 72.5% of the female respondents were employed. During the same cycle, 27.5% were not employed. In comparison, by Cycle 7, 66.3% of the male respondents were employed, and 33.7% were not employed. By Cycle 7, 47.3% of the female respondents were employed, and 52.7% were not employed. Male respondents and female respondents had different employment rates, with male respondents being statistically significantly more likely to be employed.

5.2.1.2.11 Smoking history

In Cycle 1, 28.1% of the respondents smoked or had smoked, and 71.9% had never smoked (Table 5-1). In Cycle 1, 31.7% of the male respondents smoked or had smoked, and 24.4% of the female respondents smoked or had smoked. In Cycle 1, 68.3% of the male respondents had never smoked and 75.6% of the female respondents had never smoked. Approximately 3 out of ten respondents had a history of smoking, with male respondents having been statistically significantly more likely to have a history of smoking than were female respondents.
5.2.1.2 Drinking habits

In Cycle 1, 20.7% of the respondents were heavy drinkers, and 79.3% were nondrinkers or moderate drinkers (Table 5-1). In Cycle 1, 22.0% of the male respondents were heavy drinkers, and 19.3% of the female respondents were heavy drinkers. In Cycle 1, 68.3% of the male respondents were nondrinkers or moderate drinkers, and 80.7% of the female respondents were nondrinkers or moderate drinkers. Approximately one fifth of respondents were heavy drinkers, with male respondents having been more likely than were female respondents to be heavy drinkers.

5.2.1.2.13 Physical activity

In Cycle 1, 39.2% of the respondents were physically active, and 60.8% were not active (Table 5-1). In Cycle 1, 39.6% of the male respondents were active, and 38.7% of the female respondents were active. In Cycle 1, 60.4% of the male respondents were not active, and 61.3% of the female respondents were not active. About 4 out of ten respondents were physically active, with male respondents having been very slightly more likely than were female respondents to be physically active.

5.2.1.2.14 Obesity

In Cycle 1, 15.4% of the respondents were obese, and 84.6% were not obese (Table 5-1). In Cycle 1, 14.9% of the male respondents were obese, and 16.0% of the female respondents were obese. In Cycle 1, 85.1% of the male respondents were not obese, and 84.0% of the female respondents were not obese. Approximately one sixth of respondents were obese, with female respondents having been very slightly more likely than were male respondents to be obese.

5.2.2 Bivariate findings

5.2.2.1 Cross-tabulations and chi-square tests

The following findings relate specifically to the relationships between the dependent and the independent variables. The frequencies, valid percentages, and statistical significance of the predictors of the occurrence of income status decline and health status decline are provided in Table 5-9.
Table 5-9

Frequencies, Percentages, and Statistical Significance From Pearson Chi-Square Tests: Respondents’ Decline
Outcomes by Independent Variables (N = 2,368)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Neither income status nor health status declined</th>
<th>Income status declined and health status declined</th>
<th>Income status declined and not health status declined</th>
<th>Health status declined and not income status</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Valid Freq.</td>
<td>Valid %</td>
<td>Valid Freq.</td>
<td>Valid %</td>
</tr>
<tr>
<td>Self-rated health ***</td>
<td>Good</td>
<td>170</td>
<td>21.7</td>
<td>175</td>
</tr>
<tr>
<td></td>
<td>Very good</td>
<td>372</td>
<td>47.6</td>
<td>145</td>
</tr>
<tr>
<td></td>
<td>Excellent</td>
<td>240</td>
<td>30.7</td>
<td>61</td>
</tr>
<tr>
<td>Sex **</td>
<td>Male</td>
<td>415</td>
<td>53.0</td>
<td>194</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>368</td>
<td>47.0</td>
<td>188</td>
</tr>
<tr>
<td>Age groups ***</td>
<td>Younger</td>
<td>450</td>
<td>57.5</td>
<td>114</td>
</tr>
<tr>
<td></td>
<td>Middle</td>
<td>228</td>
<td>29.2</td>
<td>147</td>
</tr>
<tr>
<td></td>
<td>Older</td>
<td>104</td>
<td>13.3</td>
<td>121</td>
</tr>
<tr>
<td>Marital status ***</td>
<td>Married</td>
<td>617</td>
<td>78.8</td>
<td>315</td>
</tr>
<tr>
<td></td>
<td>Another marital status</td>
<td>166</td>
<td>21.2</td>
<td>67</td>
</tr>
<tr>
<td>Educational status ***</td>
<td>High school graduate</td>
<td>608</td>
<td>78.1</td>
<td>251</td>
</tr>
<tr>
<td></td>
<td>Not a high school graduate</td>
<td>171</td>
<td>21.9</td>
<td>129</td>
</tr>
<tr>
<td>Homeownership status ***</td>
<td>Homeowner</td>
<td>628</td>
<td>80.3</td>
<td>313</td>
</tr>
<tr>
<td></td>
<td>Not a homeowner</td>
<td>154</td>
<td>19.7</td>
<td>68</td>
</tr>
<tr>
<td>Visible minority status ***</td>
<td>White</td>
<td>728</td>
<td>93.4</td>
<td>358</td>
</tr>
<tr>
<td></td>
<td>Non-White</td>
<td>52</td>
<td>6.6</td>
<td>—</td>
</tr>
<tr>
<td>Immigrant status</td>
<td>Yes</td>
<td>156</td>
<td>20.0</td>
<td>79</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>626</td>
<td>80.0</td>
<td>303</td>
</tr>
<tr>
<td>Employment status ***</td>
<td>Employed</td>
<td>644</td>
<td>83.1</td>
<td>288</td>
</tr>
<tr>
<td></td>
<td>Not employed</td>
<td>131</td>
<td>16.9</td>
<td>90</td>
</tr>
<tr>
<td>Smoking history ***</td>
<td>Never smoked</td>
<td>607</td>
<td>77.9</td>
<td>250</td>
</tr>
<tr>
<td></td>
<td>Smoker/have smoked</td>
<td>172</td>
<td>22.1</td>
<td>132</td>
</tr>
<tr>
<td>Drinking habits</td>
<td>Nondrinker or moderate drinker</td>
<td>639</td>
<td>81.6</td>
<td>293</td>
</tr>
<tr>
<td></td>
<td>Heavy drinker</td>
<td>144</td>
<td>18.4</td>
<td>89</td>
</tr>
<tr>
<td>Physical activity</td>
<td>Inactive</td>
<td>304</td>
<td>40.8</td>
<td>137</td>
</tr>
<tr>
<td></td>
<td>Active</td>
<td>441</td>
<td>59.2</td>
<td>227</td>
</tr>
<tr>
<td>Obesity</td>
<td>Not obese</td>
<td>666</td>
<td>85.1</td>
<td>315</td>
</tr>
<tr>
<td></td>
<td>Obese</td>
<td>117</td>
<td>14.9</td>
<td>67</td>
</tr>
</tbody>
</table>

Note. Data from Statistics Canada, National Population Health Survey, Cycles 1-7. Following Statistics Canada guideline, estimate cannot be reported because of insufficient cases. Statistics Canada allowed disclosure of findings only if the number of observations was ≥30. At Cycle 1, the age of the younger group was 40 to 46, the middle group was 47 to 53, and the older group was 54 to 59. Another marital status signifies single, widowed, separated, or divorced; Married included legally married, common-law, or living with a partner. Homeownership signifies that dwelling is owned by a household member. Not employed signifies unemployed, not working, retired, or otherwise not in the labour force.

*p < .05. **p < .01. ***p < .001.

The results of the statistical significance testing show some notable findings: There was a statistically significant relationship between Model 1 outcomes and all sociodemographic variables, except immigrant status. There was no statistically significant relationship between three of the four health behaviours and Model 1 outcomes; the exception was smoking history. These findings highlight the relationship of sociodemographic factors to income status and health.
status declines. They also highlight the greater import of sociodemographic factors relative to health behaviours.

The frequencies, valid percentages, and statistical significance of the predictors of the sequence of income status decline and health status decline are provided in Table 5-10.

Table 5-10
Frequencies, Percentages, and Statistical Significance From Pearson Chi-Square Tests: Respondents’ Sequence of Decline Outcomes by Independent Variables (N = 382)

<table>
<thead>
<tr>
<th></th>
<th>Income status declined and health status declined during same cycle</th>
<th>Income status declined and then health status declined</th>
<th>Health status declined and then income status declined</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Freq.</td>
<td>Valid %</td>
<td>Freq.</td>
</tr>
<tr>
<td>Self-rated health ***</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Good</td>
<td>52</td>
<td>54.2</td>
<td>88</td>
</tr>
<tr>
<td>Very good</td>
<td>38</td>
<td>39.1</td>
<td>98</td>
</tr>
<tr>
<td>Excellent</td>
<td>—</td>
<td>6.7</td>
<td>44</td>
</tr>
<tr>
<td>Sex</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>41</td>
<td>42.7</td>
<td>121</td>
</tr>
<tr>
<td>Female</td>
<td>55</td>
<td>57.3</td>
<td>109</td>
</tr>
<tr>
<td>Age groups</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Younger</td>
<td>—</td>
<td>25.8</td>
<td>69</td>
</tr>
<tr>
<td>Middle</td>
<td>41</td>
<td>42.2</td>
<td>86</td>
</tr>
<tr>
<td>Older</td>
<td>31</td>
<td>32.0</td>
<td>75</td>
</tr>
<tr>
<td>Marital status</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Married</td>
<td>82</td>
<td>84.6</td>
<td>192</td>
</tr>
<tr>
<td>Another marital status</td>
<td>—</td>
<td>15.4</td>
<td>38</td>
</tr>
<tr>
<td>Educational status</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>High school graduate</td>
<td>65</td>
<td>67.0</td>
<td>152</td>
</tr>
<tr>
<td>Not a high school graduate</td>
<td>32</td>
<td>33.0</td>
<td>76</td>
</tr>
<tr>
<td>Homeownership status</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Homeowner</td>
<td>75</td>
<td>77.4</td>
<td>197</td>
</tr>
<tr>
<td>Not a homeowner</td>
<td>—</td>
<td>22.6</td>
<td>33</td>
</tr>
<tr>
<td>Visible minority status</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>White</td>
<td>91</td>
<td>94.8</td>
<td>213</td>
</tr>
<tr>
<td>Non-White</td>
<td>—</td>
<td>5.2</td>
<td>—</td>
</tr>
<tr>
<td>Immigrant status</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>—</td>
<td>24.7</td>
<td>49</td>
</tr>
<tr>
<td>No</td>
<td>73</td>
<td>75.3</td>
<td>182</td>
</tr>
<tr>
<td>Employment status</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Employed</td>
<td>72</td>
<td>74.8</td>
<td>173</td>
</tr>
<tr>
<td>Not employed</td>
<td>—</td>
<td>25.2</td>
<td>55</td>
</tr>
<tr>
<td>Smoking history</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Never smoked</td>
<td>70</td>
<td>72.2</td>
<td>150</td>
</tr>
<tr>
<td>Smoker/have smoked</td>
<td>—</td>
<td>27.8</td>
<td>81</td>
</tr>
<tr>
<td>Drinking habits</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nondrinker or moderate drinker</td>
<td>78</td>
<td>80.4</td>
<td>171</td>
</tr>
<tr>
<td>Heavy drinker</td>
<td>—</td>
<td>19.6</td>
<td>59</td>
</tr>
<tr>
<td>Physical activity</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inactive</td>
<td>33</td>
<td>34.6</td>
<td>84</td>
</tr>
<tr>
<td>Active</td>
<td>62</td>
<td>65.4</td>
<td>136</td>
</tr>
<tr>
<td>Obesity</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not obese</td>
<td>79</td>
<td>81.6</td>
<td>193</td>
</tr>
<tr>
<td>Obese</td>
<td>—</td>
<td>18.4</td>
<td>37</td>
</tr>
</tbody>
</table>

Note. Data from Statistics Canada, National Population Health Survey, Cycles 1-7. Following Statistics Canada guideline, estimate cannot be reported because of insufficient cases. Statistics Canada allowed disclosure of findings only if the number of observations was ≥30. At Cycle 1, the age of the younger group was 40 to 46, the middle group was 47 to 53, and the older group was 54 to 59. Married included legally married, common-law, or living with a partner; another marital status means single, widowed, separated, or divorced. Homeownership signifies that dwelling is owned by a household member. Not employed signifies unemployed, not working, retired, or otherwise not in the labour force.

*p < .05. **p < .01. ***p < .001.
Among the variables tested in Table 5-10, it is noteworthy that there was a statistically significant relationship between Model 2 outcomes and only one variable, that is, self-rated health. This indicates that of all the variables tested, only one (health at the outset), has a relationship to the temporal order of respondents’ status declines.

The following findings relate specifically to the relationships between independent and dependent variables, as well as independent variables and independent variables. These analyses were undertaken because the relationships were of particular interest given this thesis’s research objectives. From a number of cross-tabulations that were undertaken, only the most relevant are reported, for example, the frequency and valid percentage of any income status decline between Cycles 2 and 7 by income bracket (low, middle, or high). One fifth (20.9%) of respondents in the low-income bracket experienced an income status decline, as compared to 52.5% of respondents in the middle-income bracket and 73.0% of respondents in the high-income bracket (Figure 5-2). Put another way, almost four fifths (79.1%) of respondents in the low-income bracket did not experience an income status decline, as compared to 47.5% of respondents in the middle-income bracket and 27.0% of respondents in the high-income bracket.

It is to be noted that the rate of income status decline in any cycle is affected by the degree of decline in the previous cycle because, as stated earlier, the only decline in income status that is measured in this particular study design is the first decline. For this reason, income status declines were marked between Cycle 1 and Cycle 2, and between Cycle 2 and Cycle 3. Subsequent declines were not marked, for example, those between Cycle 3 and Cycle 4.

There was a statistically significant relationship between total household income and the cycle in which the income status declined, $\chi^2 (12, N = 2,368) = 377.36, p < .05$. This analysis determined that higher household income at the outset corresponded to the earlier cycle in which the income status declined.
Figure 5-2. Percentage of National Population Health Survey study sample with decline in income status by income bracket ($N = 2,368$).

Figure 5-3 presents the valid percentage of health status decline between Cycles 2 and 7 in terms of health status (good, very good, or excellent). One half (48.8%) of respondents in the good health status category experienced a health status decline, as compared to 23.1% of respondents in the very good health status category and 17.1% of respondents in the excellent health status category. Almost one third (28.9%) of respondents experienced a health status decline. Expressed another way, one half (51.2%) of respondents in the good health status category did not experience a health status decline, as compared to 76.9% of respondents in the very good health status category and 82.9% of respondents in the excellent health status category. There was a statistically significant relationship between self-rated health and the experience of a health status decline, $\chi^2 (12, N = 2,369) = 218.76$, $p = .001$ $p < .05$. This analysis determined that, among respondents, relatively poorer health at the outset corresponds to health status decline.
As stated in the introduction to this chapter, further analyses of the relationship between selected independent variables were also undertaken.

The frequency and valid percentage of the three categories of age groups (younger, middle, and older) according to income bracket (low, middle, or high) are presented in Table 5-11.

Table 5-11

<table>
<thead>
<tr>
<th>Total household income</th>
<th>Younger group</th>
<th>Middle group</th>
<th>Older group</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low income: $0-$29,999</td>
<td>194</td>
<td>154</td>
<td>137</td>
<td>485</td>
</tr>
<tr>
<td></td>
<td>40.0%</td>
<td>31.8%</td>
<td>28.2%</td>
<td>20.5%</td>
</tr>
<tr>
<td>Middle income: $30,000-$59,999</td>
<td>443</td>
<td>302</td>
<td>199</td>
<td>944</td>
</tr>
<tr>
<td></td>
<td>46.9%</td>
<td>32.0%</td>
<td>21.1%</td>
<td>39.9%</td>
</tr>
<tr>
<td>High income: $60,000 and over</td>
<td>413</td>
<td>345</td>
<td>181</td>
<td>939</td>
</tr>
<tr>
<td></td>
<td>44.0%</td>
<td>36.7%</td>
<td>19.3%</td>
<td>39.7%</td>
</tr>
<tr>
<td>Total</td>
<td>1,050</td>
<td>801</td>
<td>517</td>
<td>2,368</td>
</tr>
</tbody>
</table>

Note: Data from Statistics Canada, National Population Health Survey. At Cycle 1, the age of the younger group was 40 to 46; the middle group was 47 to 53; the older group was 54 to 59.

Figure 5-4 illustrates that there was a high proportion of younger respondents in the three income levels. The highest proportion of older respondents was at the lowest income level. One fifth
(19.3%) of respondents in the high-income bracket were older respondents, as compared to 36.7% of respondents in the middle-aged group and 44.0% of younger respondents.

There was a statistically significant relationship between age and income, $\chi^2 (4, N = 2,368) = 19.63, p < .001.$

![Income level by age group](image)

**Figure 5-4.** Percentage of younger, middle, and older respondents within each income bracket: National Population Health Survey study sample ($N = 2,368$).

The intersection of sex, visible minority status, and immigrant status becomes important in the interpretation of the models used in this study. In the study sample, with respect to non-White immigrants of both sexes together, there were 314 immigrants (69.6%) who were White and 137 (30.4%) who were non-White. The Pearson chi-square test indicated that there was a statistically significant relationship between being an immigrant and being non-White, $\chi^2 (1, N = 2,368) = 495.87, p = .001$. In the study sample, with respect to the valid percentage of non-White immigrants by sex, there were 92 (35.4%) male immigrants who were non-Whites and 45 (23.7%) female immigrants who were non-Whites. In other words, there were more than twice as many male non-White immigrants as female non-White immigrants.
5.2.2.2 Correlation

The correlation between age (as a continuous variable) and HIR at Cycle 1 for both sexes together was \( r = .05 \), and the statistical significance was \( p = .023 \). For male respondents, the correlation was \( r = .10 \), and the statistical significance was \( p < .0005 \); this was the strongest (positive) Pearson correlation coefficient. For female respondents, the relationship between age and HIR and its direction was negative (\( r = -.01 \)); however, the relationship was not statistically significant (\( p = .818 \)).

5.3 Model 2 Findings

The univariate statistics are presented for the dependent variables for both sexes together and by sexes.

5.3.1 Univariate findings

5.3.1.1 Dependent variables

In this section, the univariate statistics for the dependent variables for Model 2 are reported. As stated above, from Cycle 2 to Cycle 7, 16.1% of all respondents experienced a decline in both income status and health status (Table 4-3). Note that, as stated above, for the purposes of the logistic regression analysis, it was necessary to combine two variables, that is, health status declined first and then income status, and income status plus health status declined during the same cycle. Table 4-3 depicts this amalgamation by indicating, for this subsample, the combined variable’s frequency and (relative) valid percentage (39.6%). The breakdown by type of decline for male and female respondents is also indicated (including the percentage of respondents).

The modal lag times were calculated for respondents with a decline in income in any cycle between Cycle 2 and 7 and for respondents with a decline in health in any cycle between Cycle 2 and 7, for both sexes together and by sex (Table 5-12). It is important to note that the modal lag time was measured over five cycles. The measurement occurs this way because there first had to be a status decline that occurred during one of the six cycles.
Table 5-12
Modal Lag Time Between Respondents’ Income Status Decline and Health Status Decline (Model 2; N = 382)

<table>
<thead>
<tr>
<th>Modal lag time</th>
<th>Both sexes</th>
<th>Male respondents</th>
<th>Female respondents</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Freq.</td>
<td>%</td>
<td>Freq.</td>
</tr>
<tr>
<td>Income status declined 1-5 cycles after health status declined</td>
<td>55</td>
<td>14.4</td>
<td>31</td>
</tr>
<tr>
<td>Income status and health status declined in the same cycle</td>
<td>96</td>
<td>25.3</td>
<td>41</td>
</tr>
<tr>
<td>Health status declined 1-5 cycles after income status declined</td>
<td>230</td>
<td>60.4</td>
<td>121</td>
</tr>
<tr>
<td>Total</td>
<td>382</td>
<td>100</td>
<td>194</td>
</tr>
</tbody>
</table>

Note. Data from Statistics Canada, National Population Health Survey, Cycles 2-7. — Following Statistics Canada guideline, estimate cannot be reported because of insufficient cases. Statistics Canada allowed disclosure of findings only if the number of observations was ≥30. The difference between males and females was not statistically significant at the .05 level.

Three fifths (60.4%) of respondents experienced an income status decline before a health status decline (Table 5-12). In other words, for 230 respondents, their health status declined between one and five cycles after their income status declined. Fourteen percent (14.4%) of respondents experienced a health status decline before an income status decline. In other words, for 55 respondents, their income status declined between one and five cycles after their health status declined. Approximately 25% of respondents experienced an income status and health status decline during the same cycle. In other words, for 96 respondents, income status and health status declined during the same cycle.

Almost two thirds (62.7%) of the male respondents and 57.9% of the female respondents experienced an income status decline before a health status decline. In total, 16.0% of male respondents and 12.7% of female respondents experienced a health status decline before an income status decline. Approximately one fifth (21.3%) of the male respondents and almost one third (29.4%) of the female respondents experienced an income status decline and a health status decline during the same cycle. This difference between male and female respondents was not statistically significant.

Within the first two of the total possible five cycles, 135 out of 382 respondents experienced a health status decline after their income status declined. Most respondents had a health status decline one or two cycles after their income status declined. In line with Statistics Canada’s policy, a comparable reporting of those whose income status declined after their health status declined was not possible because of the size of the subsample.
To summarize, for respondents (both sexes together and by sex) whose income status and health status declined over the five cycles, the most common result, in descending order, was that their

- income status declined before their health status declined,
- income status and health status declined during the same cycle, and
- health status declined before their income status declined.

### 5.3.2 Bivariate findings

#### 5.3.2.1 Cross-tabulations and chi-square tests

As stated above, the frequency and valid percentage of the predictors of the occurrence and sequence of income status decline and health status decline are provided in Table 5-9 and Table 5-10. Discussed are the results of the associated Pearson chi-square tests of categorical independent variables that achieved a significance of $p < .05$. These tables are referenced at this point because they contain information related to Model 2a and Model 2b. For male respondents, income status declined, and then health status declined and, for female respondents, health status declined, and then income status declined. There was a statistically significant relationship between age and, for male respondents, income status and health status declined during the same cycle and, for male respondents and female respondents, income status declined and then health status declined.

### 5.4 Model 3 Findings

The findings in Model 3 were not disaggregated by sex--the size of the subsample divided by sex did not meet the minimum requirements for a viable logistic regression analyses. For this reason, the findings are presented for the sexes combined.

#### 5.4.1 Univariate findings

##### 5.4.1.1 Dependent variables

In this section, the univariate statistics for the dependent variables for Model 3a and Model 3b are reported (Table 4-3). These statistics include information on respondents who were deceased. From Cycle 2 to Cycle 7, Model 3a’s target group was 230 respondents, all of whom experienced an income status decline first and then a health status decline. The reference group, from whom the target group was selected, was respondents with any type of an income status decline. Over the same period, Model 3b’s target group was 55 respondents, all of whom experienced a health status decline first and then an income status decline. The reference group,
from whom the target group was selected, was respondents with any type of a health status decline.

5.4.2 Bivariate findings

5.4.2.1 Cross-tabulations and chi-square tests

As stated above, the frequency and valid percentage of the predictors of the occurrence and sequence of income status decline and health status decline are provided in Table 5-9 and Table 5-10. Discussed are the results of the associated Pearson chi-square tests of categorical independent variables that achieved a significance of \( p < 0.05 \). These two tables are referenced at this point because they contain information related to Model 3a and Model 3b. They have been discussed above.

5.5 Model 4 Findings

Although in previous models, the declines included deceased respondents, in this model both the declines and the regains exclude deceased respondents. Therefore, the following statistics do not include information on respondents who were deceased.

Per above, the same independent variables as were used in all of the previous models were employed in Model 4a and Model 4b, with two additions. Model 4a includes a variable titled health status declines before or at same time as income status decline. Model 4b includes a variable titled income status declines before or at same time as health status decline.

5.5.1 Univariate findings

5.5.1.1 Dependent variables

In this section, the univariate statistics for the variables from a more select group are reported--those respondents who had both an income status and health status decline and a subsequent regain. In other words, this section reports on those who experienced income status and health status regains given declines in both income status and health status. The analysis of the frequency and percentage of those who regain their income status or health status between Cycle 3 and Cycle 7 is noteworthy. Of the 382 respondents out of 2,368 respondents who experienced an income status decline and health status decline, the largest proportion, that is, 136 (53.6%; Figure 5-5 and Table 5-13) experienced both an income status regain and health status regain. However, of the 2,368 respondents in the original sample, those who experienced both an income status regain and health status regain was only 6.1%.
During the study period, 3.0% of all respondents experienced a health status regain after experiencing a health status decline and not an income status regain (Table 5-13). Over the same period, 1.6% of all respondents experienced an income status regain after experiencing an income status decline, and not a health status regain. Finally, 0.8% (<30) of all respondents experienced a regain in neither income status nor health status.

Table 5-13
Frequencies, and Percentages of Respondents’ Regains After Experiencing Two-Fold Declines (Model 4a)

<table>
<thead>
<tr>
<th>Regain in Income Status and Regain in Health Status</th>
<th>Valid %</th>
<th>% of original sample</th>
<th>Freq. b</th>
</tr>
</thead>
<tbody>
<tr>
<td>Income status regained and health status regained</td>
<td>53.6%</td>
<td>6.1</td>
<td>136</td>
</tr>
<tr>
<td>Health status regained and not income status</td>
<td>26.3%</td>
<td>3.0</td>
<td>66</td>
</tr>
<tr>
<td>Income status regained and not health status</td>
<td>13.6%</td>
<td>1.6</td>
<td>34</td>
</tr>
<tr>
<td>Neither income status nor health status regained</td>
<td>6.6%</td>
<td>0.8</td>
<td>—</td>
</tr>
<tr>
<td>Total</td>
<td>100.0%</td>
<td>11.5</td>
<td>—</td>
</tr>
</tbody>
</table>

Note. Data from Statistics Canada, National Population Health Survey, Cycles 3-7; sample is from subsample of both income status declined and health status declined; — Following Statistics Canada guideline, estimate cannot be reported because of insufficient cases. Statistics Canada allowed disclosure of findings only if the number of observations was ≥30.

a Statistics Canada’s guideline disallows reporting of this sample size. b Excludes deceased respondents.

As well, in this section, the univariate statistics for the dependent variables for Model 4a and 4b are reported. Model 4a involves a regression of respondents with income status decline without
subsequent regain (0) against respondents who regained their income (1). From Cycle 2 to Cycle 7, Model 4a’s target group was 728 respondents, all of whom experienced an income status decline and then regained their previous income status (Table 4-3). The reference group, from whom the target group was selected, was respondents with any type of an income status decline whether it be in conjunction with health status or by itself.

Model 4b involves a regression of respondents with health status decline without subsequent regain (0) against respondents who regained their health (1). Over the same period, Model 4b’s target group was 328 respondents, all of whom experienced a health status decline and then a health status regain. The reference group, from whom the target group was selected, was respondents with any type of a health status decline whether it be in conjunction with income status or by itself.

5.5.1.2 Independent variables

The frequencies, valid percentages, and statistical significance of the predictors of income status decline and health status regain (Model 4a and Model 4b) are provided in Table 5-14.
Table 5-14  
Frequencies and Percentages of Independent Variables by Respondents’ Regain Outcomes (Model 4a, N = 1,028; and Model 4b, N = 400)

Occurrence of income status regain and health status regain

<table>
<thead>
<tr>
<th></th>
<th>Model 4a</th>
<th></th>
<th>Model 4b</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Income status regained</td>
<td>Income status declined and did regain</td>
<td>Health status declined but did not regain</td>
<td>Health status declined and did regain</td>
</tr>
<tr>
<td></td>
<td>Freq.</td>
<td>Valid %</td>
<td>Freq.</td>
<td>Valid %</td>
</tr>
<tr>
<td>Self-rated health</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Good</td>
<td>87</td>
<td>29.1</td>
<td>187</td>
<td>25.7</td>
</tr>
<tr>
<td>Very good</td>
<td>131</td>
<td>43.7</td>
<td>314</td>
<td>43.2</td>
</tr>
<tr>
<td>Excellent</td>
<td>82</td>
<td>27.2</td>
<td>227</td>
<td>31.1</td>
</tr>
<tr>
<td>Sex**</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>125</td>
<td>58.2</td>
<td>368</td>
<td>49.5</td>
</tr>
<tr>
<td>Female</td>
<td>175</td>
<td>41.8</td>
<td>360</td>
<td>50.5</td>
</tr>
<tr>
<td>Age groups*</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Younger</td>
<td>57</td>
<td>19</td>
<td>346</td>
<td>47.5</td>
</tr>
<tr>
<td>Middle</td>
<td>149</td>
<td>49.6</td>
<td>221</td>
<td>30.3</td>
</tr>
<tr>
<td>Older</td>
<td>94</td>
<td>31.4</td>
<td>162</td>
<td>22.2</td>
</tr>
<tr>
<td>Marital status</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maried</td>
<td>253</td>
<td>84.2</td>
<td>631</td>
<td>86.6</td>
</tr>
<tr>
<td>Not married</td>
<td>47</td>
<td>15.8</td>
<td>97</td>
<td>13.4</td>
</tr>
<tr>
<td>Educational status</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>High school graduate</td>
<td>210</td>
<td>70.2</td>
<td>554</td>
<td>76.2</td>
</tr>
<tr>
<td>Not a high school graduate</td>
<td>89</td>
<td>29.8</td>
<td>174</td>
<td>23.8</td>
</tr>
<tr>
<td>Homeownership status</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Homeowner</td>
<td>273</td>
<td>91.2</td>
<td>642</td>
<td>88.1</td>
</tr>
<tr>
<td>Not a homeowner</td>
<td>—</td>
<td>—</td>
<td>87</td>
<td>11.9</td>
</tr>
<tr>
<td>Visible minority status*</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>White</td>
<td>291</td>
<td>96.9</td>
<td>683</td>
<td>93.7</td>
</tr>
<tr>
<td>Non-White</td>
<td>—</td>
<td>—</td>
<td>46</td>
<td>6.3</td>
</tr>
<tr>
<td>Immigrant status</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Immigrant</td>
<td>47</td>
<td>15.8</td>
<td>138</td>
<td>18.9</td>
</tr>
<tr>
<td>Not an immigrant</td>
<td>253</td>
<td>84.2</td>
<td>591</td>
<td>81.1</td>
</tr>
<tr>
<td>Employment status</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Employed</td>
<td>242</td>
<td>81.7</td>
<td>586</td>
<td>81.8</td>
</tr>
<tr>
<td>Not employed</td>
<td>54</td>
<td>18.3</td>
<td>131</td>
<td>18.2</td>
</tr>
<tr>
<td>Smoking history*</td>
<td>Freq.</td>
<td>Valid %</td>
<td>Freq.</td>
<td>Valid %</td>
</tr>
<tr>
<td>------------------</td>
<td>-------</td>
<td>---------</td>
<td>-------</td>
<td>---------</td>
</tr>
<tr>
<td>Never smoked</td>
<td>237</td>
<td>79.0</td>
<td>520</td>
<td>71.4</td>
</tr>
<tr>
<td>Smoked</td>
<td>63</td>
<td>21.0</td>
<td>208</td>
<td>28.6</td>
</tr>
<tr>
<td>Drinking habits*</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nondrinker or moderate drinker</td>
<td>249</td>
<td>82.9</td>
<td>563</td>
<td>77.3</td>
</tr>
<tr>
<td>Heavy drinker</td>
<td>51</td>
<td>17.1</td>
<td>165</td>
<td>22.7</td>
</tr>
<tr>
<td>Physical activity</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Active</td>
<td>112</td>
<td>38.6</td>
<td>286</td>
<td>40.9</td>
</tr>
<tr>
<td>Nondrinker or moderate drinker</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Heavy drinker</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Obesity*</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not obese</td>
<td>178</td>
<td>61.4</td>
<td>413</td>
<td>59.1</td>
</tr>
<tr>
<td>Obese</td>
<td>251</td>
<td>83.7</td>
<td>623</td>
<td>85.6</td>
</tr>
<tr>
<td>Health status declines before or at same time as income status decline</td>
<td>236</td>
<td>78.7</td>
<td>567</td>
<td>77.8</td>
</tr>
<tr>
<td>Income status declines before or at same time as health status decline**</td>
<td>64</td>
<td>21.3</td>
<td>162</td>
<td>22.2</td>
</tr>
</tbody>
</table>

Note. Data from Statistics Canada, National Population Health Survey, Cycle 1. — Following Statistics Canada guideline, estimate cannot be reported because of insufficient cases. Statistics Canada allowed disclosure of findings only if the number of observations was ≥30. At Cycle 1, the age of the younger group was 40 to 46, the middle group was 47 to 53, and the older group was 54 to 59. Married included legally married, common-law, or living with a partner; another marital status means single, widowed, separated, or divorced. Homeownership signifies that dwelling is owned by a household member. Not employed signifies not working, retired, or otherwise not in the labour force.

*p < .05. **p < .01. ***p < .001.
Table 5-14 depicts the univariate statistics for the independent variables for Model 4a. Male respondents comprised 50.5% and female respondents comprised 49.5% of those who experienced an income status regain. A statistically significantly higher proportion of male respondents than female respondents experienced an income status regain. Furthermore, 86.6% were married and 76.2% were high school graduates. Moreover, 88.1% were homeowners. In addition, 93.7% were White, 18.9% were immigrants, and 81.8% were employed. Of the respondents who experienced an income status regain after experiencing an income status decline, 71.4% had never smoked (vs. 28.6% who had smoked or who currently smoke). Among those with this outcome, 77.3% were nondrinkers or moderate drinkers (vs. 22.7% who were heavy drinkers). What is more, 59.1% were not physically active, and 85.6% were not obese.

There were a few notable findings from the statistical significance testing reported in Table 5-14: A statistically significant relationship existed between small number of sociodemographic variables, that is, sex, age, and visible minority status, and income status declines and regains. Two health behaviour variables were statistically significant, that is, smoking history and drinking habits.

Other analyses of the relationship between selected independent variables were undertaken: The Pearson chi-square test indicated that, among respondents who experienced an income status regain, there was a statistically significant relationship between having a high school education and sex $\chi^2 (1, N = 1,028) = 5.14, p = .023$. As well, there was a statistically significant relationship between having a high school education and age $\chi^2 (1, N = 1,028) = 33.72, p < .001$, high school education and visible minority status $\chi^2 (1, N = 1,028) = 7.20, p = .007$, high school education and immigrant status $\chi^2 (1, N = 1,028) = 22.42, p < .001$, high school education and employment status $\chi^2 (1, N = 1,028) = 18.72, p < .001$ and high school education and smoking history $\chi^2 (1, N = 1,028) = 6.60, p = .010$.

Table 5-14 also depicts the univariate statistics for the independent variables for Model 4b. Overall, the univariate statistics are similar, with the following notable exceptions: Of the respondents who experienced a health status regain after experiencing a health status decline, 79.4% were married and 66.0% were high school graduates. Moreover, 74.5% were employed.
A finding of note was that the sociodemographic variables for which there were statistically significant relationships were different for health status declines and regains than for income status declines and regains. For the former, the variables were immigrant status and employment status. Similar to income status declines and regains, smoking history was statistically significant, but dissimilar to income status declines and regains, obesity was statistically significant. Finally, there was a statistically significant relationship between health status declines and regains and the sequence of income status declines.

Other analyses of the relationship between selected independent variables were undertaken: The Pearson chi-square test indicated that, among respondents who experienced a health status regain, there was a statistically significant relationship between having a high school education and age $\chi^2 (2, N = 400) = 20.10, p < .001$. As well, there was a statistically significant relationship between having a high school education and visible minority status $\chi^2 (1, N = 400) = 4.20, p = .040$, high school education and immigrant status $\chi^2 (1, N = 400) = 30.37, p < .001$, and high school education and employment status $\chi^2 (1, N = 400) = 6.10, p < .008$.

### 5.5.2 Bivariate findings

#### 5.5.2.1 Cross-tabulations and chi-square tests

Cross-tabulations for the variables from the group that had both income status and health status declines are provided: the frequency and valid percentage of the predictors (Cycle 1) of the occurrence of an income status regain after experiencing an income status decline and a health status regain after experiencing a health status decline are reported in Table 5-15.

**Table 5-15**

<table>
<thead>
<tr>
<th></th>
<th>Neither income status nor health status regained</th>
<th>Income status regained and health status regained</th>
<th>Income status regained and not health status regained</th>
<th>Health status regained and not income status regained</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Self-rated health</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Good</td>
<td>— 50.8</td>
<td>59 49.3</td>
<td>— 52.6</td>
<td>31 47.5</td>
</tr>
<tr>
<td>Very good</td>
<td>— 32.7</td>
<td>39 33</td>
<td>— 41.9</td>
<td>— 37.3</td>
</tr>
<tr>
<td>Excellent</td>
<td>— 16.5</td>
<td>— 17.7</td>
<td>— 5.5</td>
<td>— 15.2</td>
</tr>
<tr>
<td><strong>Sex</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>— 51.3</td>
<td>59 49.3</td>
<td>— 64.2</td>
<td>32 50.3</td>
</tr>
<tr>
<td>Male</td>
<td>— 48.7</td>
<td>60 50.7</td>
<td>— 35.8</td>
<td>32 49.7</td>
</tr>
<tr>
<td><strong>Age groups</strong>*</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Younger</td>
<td>— 20.4</td>
<td>48 40.4</td>
<td>— 31.2</td>
<td>— 9.5</td>
</tr>
<tr>
<td>Middle</td>
<td>— 47.1</td>
<td>42 35.6</td>
<td>— 42.2</td>
<td>— 45.6</td>
</tr>
<tr>
<td></td>
<td>Neither income status nor health status regained</td>
<td>Income status regained and health status regained</td>
<td>Income status regained and not health status regained</td>
<td>Health status regained and not income status regained</td>
</tr>
<tr>
<td>------------------------</td>
<td>------------------------------------------------</td>
<td>--------------------------------------------------</td>
<td>------------------------------------------------------</td>
<td>------------------------------------------------------</td>
</tr>
<tr>
<td></td>
<td>Freq.</td>
<td>Valid %</td>
<td>Freq.</td>
<td>Valid %</td>
</tr>
<tr>
<td>Older</td>
<td>32.5</td>
<td>24</td>
<td>26.6</td>
<td>44.9</td>
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<tr>
<td>Marital status</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Married</td>
<td>76.1</td>
<td>95</td>
<td>79.8</td>
<td>31</td>
</tr>
<tr>
<td>Another marital status</td>
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<td>20.2</td>
<td>9.3</td>
<td>11.3</td>
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<tr>
<td>Educational status***</td>
<td></td>
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<td></td>
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<tr>
<td>High school graduate</td>
<td>46.4</td>
<td>90</td>
<td>76.2</td>
<td>30</td>
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<tr>
<td>Not a high school graduate</td>
<td>53.6</td>
<td>23.8</td>
<td>10.8</td>
<td>42.4</td>
</tr>
<tr>
<td>Homeownership status</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Homeowner</td>
<td>74.3</td>
<td>101</td>
<td>84.6</td>
<td>73</td>
</tr>
<tr>
<td>Not a homeowner</td>
<td>25.7</td>
<td>15.4</td>
<td>27</td>
<td>9.2</td>
</tr>
<tr>
<td>Visible minority status</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>White</td>
<td>95.7</td>
<td>110</td>
<td>92.6</td>
<td>30</td>
</tr>
<tr>
<td>Non-White</td>
<td>4.3</td>
<td>7.4</td>
<td>12.6</td>
<td>5.4</td>
</tr>
<tr>
<td>Immigrant***</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>15.6</td>
<td>19.5</td>
<td>48.8</td>
<td>15.1</td>
</tr>
<tr>
<td>No</td>
<td>84.4</td>
<td>96</td>
<td>80.5</td>
<td>51.2</td>
</tr>
<tr>
<td>Employment status***</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Employed</td>
<td>71.5</td>
<td>97</td>
<td>81.7</td>
<td>46.3</td>
</tr>
<tr>
<td>Not employed</td>
<td>28.5</td>
<td>18.3</td>
<td>53.7</td>
<td>22.1</td>
</tr>
<tr>
<td>Smoking history*</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Never smoked</td>
<td>51.3</td>
<td>81</td>
<td>68</td>
<td>64.2</td>
</tr>
<tr>
<td>Smoked</td>
<td>48.7</td>
<td>38</td>
<td>32</td>
<td>35.8</td>
</tr>
<tr>
<td>Drinking habits</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nondrinker or moderate drinker</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Heavy drinker</td>
<td>34.5</td>
<td>30</td>
<td>24.9</td>
<td>24.9</td>
</tr>
<tr>
<td>Physical activity**</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Active</td>
<td>0</td>
<td>47</td>
<td>42.6</td>
<td>46.2</td>
</tr>
<tr>
<td>Inactive</td>
<td>100</td>
<td>63</td>
<td>57.4</td>
<td>53.8</td>
</tr>
<tr>
<td>Obesity**</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not obese</td>
<td>83</td>
<td>106</td>
<td>88.8</td>
<td>63.4</td>
</tr>
<tr>
<td>Obese</td>
<td>17</td>
<td>11.2</td>
<td>36.6</td>
<td>21.6</td>
</tr>
</tbody>
</table>

**Note.** Data from Statistics Canada, National Population Health Survey, Cycle 1; sample is from subsample of both income status declined and health status declined. Following Statistics Canada guideline, estimate cannot be reported because of insufficient cases. Statistics Canada allowed disclosure of findings only if the number of observations was ≥30. At Cycle 1, the age of the younger group was 40 to 46, the middle group was 47 to 53, and the older group was 54 to 59. Another marital status signifies single, widowed, separated, or divorced; Married included legally married, common-law, or living with a partner. Homeownership signifies that dwelling is owned by a household member. Not employed signifies not working, retired, or otherwise not in the labour force.

Highlights of this table are as follows: Of the 136 respondents (6.1%) who experienced a decline in both income status and health status and subsequent regain in income status and health status from Cycle 3 to Cycle 7, 79.8% were married (vs. 20.2% who were not), 76.2% were high school graduates (vs. 23.8% who were not), 84.6% were homeowners (vs. 15.4% who were not), 92.5% were White (vs. 7.4% were not), 19.5% who were immigrants (vs. 80.5% who were not), and 81.7% were employed (vs. 18.3% who were not employed). Furthermore, 69.0% had never
smoked (vs. 32.0% who had smoked or who currently smoke). What is more, 75.1% were nondrinkers or moderate drinkers (vs. 24.9% who were heavy drinkers), 57.4% were physically active (vs. 42.6% who were not physically active), 88.8% were not obese (vs. 11.2% who were).

There was a statistically significant relationship between four of the sociodemographic variables and Model 4 outcomes. Age, educational status, and employment status were related to Model 4 outcomes. The relationship between immigrant status and regains in income status and health status was also statistically significant (there was no statistically significant relationship between immigrant status and declines in income status and health status). These findings suggest the import of these variables in terms of reclaiming not only income but also health. Dissimilar to Model 1 findings, in which, among the health behaviour variables, there was only one statistically significant relationship, there was a statistically significant relationship between three of the four health behaviours and Model 4 outcomes. In both models, smoking history was statistically significant, and in neither models were drinking habits statistically significant.

5.6 Chapter Summary

This chapter reports on the univariate and bivariate analyses undertaken for each model. The following is a summary of the univariate statistics for the demographic variables for Model 1: The study sample was comprised of approximately equal representation of male respondents and female respondents. In the comparison of the male and female respondents, men’s total household incomes and HIR were higher than women’s were. In Cycle 1, more respondents were in the younger age group, as compared with the middle age groups and older age groups (Table 5-1). This proportion declined as the age of that group increased. There were slightly more female respondents, compared to male respondents, in the older age group. In Cycle 1, four fifths of respondents (Table 5-5) were married, were living common-law, or were with a partner, with the rate being higher for male respondents than for female respondents. By Cycle 7, the rate of marriage decreased for both male and female respondents. Moreover, three quarters of the female respondents were married, were living common-law, or were with a partner. More than seven out of ten respondents had completed high school (Table 5-6), with the rates being higher for female respondents than male respondents. More than eight out of ten respondents were homeowners (Table 5-7), with the rates being slightly higher for male respondents than for female respondents, and in Cycle 7 as compared with Cycle 1. The majority (nine out of ten) of the sample were White (Table 5-1); a slightly higher proportion of
female respondents, compared to male respondents, were White. Approximately one fifth of the respondents were immigrants (Table 5-1); a higher proportion of these immigrants were male respondents as compared with female respondents. Approximately 80% of the respondents were employed in Cycle 1 (Table 5-8). However, there were a larger percentage of employed male respondents (87.5%) compared with employed female respondents (72.5%). What is more, there were large decreases in the rate of employment between Cycle 1 and Cycle 7, from approximately 80.2% to 56.9%. In Cycle 7, male respondents’ employment rate was 63.3% and female respondents’ employment rate was 47.3%.

There were statistically significant differences between male respondents and female respondents in the proportion of those who had excellent health, were younger, were married, were high school graduates, were non-Whites, were immigrants, were employed, had a history of smoking, and had experienced an income status regain. In all cycles, for the variables tested, there were statistically significant male-female differences for marital status and educational status. In some cycles, for the variables tested, there were statistically significant male-female differences for self-rated health and employment status. Male respondents had statistically significant higher prevalence than did female respondents with the exception of high school graduation. There were also statistically significant male-female differences for income status regain and for HIR.

While there were differences between male respondents and female respondents in the prevalence of those who had higher total household incomes, were homeowners, had a drinking habit, were physical active, and were obese, the differences were not statistically significant.

The following is a summary of the univariate statistics for the health behaviour variables: In descending order, the percentage frequency, in Cycle 1, of the health behaviour variables were physical inactive (60.8%; Table 5-1), history of smoking (28.1%; Table 5-1), heavy drinker (20.7%; Table 5-1), and obese (15.4%; Table 5-1).

The following is a summary of the bivariate analyses undertaken: Discussed are the results of Pearson chi-square tests of categorical independent variables and status outcomes, eight out of nine sociodemographic independent variables were associated with Model 1 outcomes; they were self-rated health, sex, age, marital status, educational status, homeownership status, visible minority status, and employment status. Likewise, there was a statistically significant relationship between a respondent’s smoking history and these same four status outcomes, with
no other health behaviour variable having a statistically significant relationship with any of the other status outcomes. These findings demonstrate the relationship between sociodemographic factors on income status and health status declines and the relatively stronger relationship of sociodemographic factors relative to health behaviours.

An analysis of total household income at Cycle 1 determined that there was a relationship between respondents having higher household income at the outset and having their income status decline (Figure 5-2). An analysis of health status decline by self-rated health at Cycle 1 determined that there was a relationship between poorer respondent’s health at the outset and health status decline (Figure 5-3). An analysis of visible minority status by immigrant status revealed a statistically significant relationship between non-White status and immigrant status. HIR and age were significantly but weakly correlated. In all three analyses, the relationships were statistically significant.

Finally, with respect to statistically significant relationships, the findings of note were as follows: There was a relationship between the temporal order of respondents’ status declines and only one variable, that is, self-rated health. There was a relationship between income status declines and regains and only a few variables, that is, sex, age, and visible minority status. The statistically significant sociodemographic variables were different for income status regains, as compared to health status regains. One health behaviour variable, that is, smoking history, was statistically significant in all models tested except one, Model 2.
Chapter 6  
Multivariate Findings

6.1 Introduction to Multivariate Findings

In this chapter, the multivariate findings are reported. The results of the logistic regression analyses are detailed, including the binary findings and, for Model 1, the multinomial findings. All the statistical findings are summarized and presented in tables. The statistics that are reported are the adjusted odds ratio, the statistical significance (noted with an asterisk if the \( p \) value is less than .05), and the Nagelkerke \( R^2 \) value for each model.

The chapter summary synthesizes the key results and points to the ones that will be interpreted in the subsequent chapter.

6.2 Model 1 Findings

6.2.1 Multivariate findings

6.2.1.1 Binary logistic regression models

As stated earlier, Model 1 has four submodels that were assessed using binary logistic regression. The four submodels estimate respectively the predictors of: (Model 1a) no income status decline and no health status decline, (Model 1b) income status decline, and no health status decline, (Model 1c) health status decline, and no income status decline, and (Model 1d) both health status decline and income status decline.

6.2.1.1.1 Model 1a

Table 6-1 depicts the binary logistic regression findings for the absence of declines in both income status and health status, using block entry, first without including the four indicators of health behaviour, and then, a second-layer analysis, including them, for both sexes together and then disaggregated by sex. Four predictors were statistically significant (for both sexes together, both without and with health behaviours): They were total household income, self-rated health, age group, and educational status.
Table 6-1
Binary Logistic Regression Outcomes From Models Predicting Neither Income Status Decline nor Health Status Decline (Model 1a; N = 2,368)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Both sexes</th>
<th>Male respondents</th>
<th>Female respondents</th>
<th>Both sexes</th>
<th>Male respondents</th>
<th>Female respondents</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>OR ± 95% CI</td>
<td>OR ± 95% CI</td>
<td>OR ± 95% CI</td>
<td>OR ± 95% CI</td>
<td>OR ± 95% CI</td>
<td>OR ± 95% CI</td>
</tr>
<tr>
<td>Total household income</td>
<td>0.97 ***</td>
<td>0.98 0.97 0.98 ***</td>
<td>0.97 0.98 0.97 ***</td>
<td>0.96 0.97 0.97 ***</td>
<td>0.97 0.97 0.98 ***</td>
<td>0.97 0.97 0.96 ***</td>
</tr>
<tr>
<td>Self-rated health (good)</td>
<td>0.45 ***</td>
<td>0.33 0.60 0.37 ***</td>
<td>0.24 0.57 0.55 **</td>
<td>0.36 0.83 0.48 ***</td>
<td>0.36 0.65 0.38 ***</td>
<td>0.25 0.59 0.59 *</td>
</tr>
<tr>
<td>Self-rated health (very good)</td>
<td>0.98</td>
<td>0.77 1.25 0.82</td>
<td>0.58 1.15 1.18</td>
<td>0.83 1.67 1.02</td>
<td>0.79 1.30 0.83</td>
<td>0.59 1.18 1.22</td>
</tr>
<tr>
<td>Male</td>
<td>1.01</td>
<td>0.82 1.25</td>
<td></td>
<td>1.06</td>
<td>0.86 1.32</td>
<td></td>
</tr>
<tr>
<td>Age: 40-46</td>
<td>3.00 ***</td>
<td>2.23 4.05 3.70 ***</td>
<td>2.34 5.85 2.79 ***</td>
<td>1.86 4.19 3.15 ***</td>
<td>2.33 4.27 3.76 ***</td>
<td>2.36 5.99 3.05 ***</td>
</tr>
<tr>
<td>Age: 47-53</td>
<td>1.61 **</td>
<td>1.17 2.21 1.86 *</td>
<td>1.14 3.04 1.44</td>
<td>0.94 2.22 1.63 *</td>
<td>1.18 2.24 1.83 *</td>
<td>1.12 3.00 1.52</td>
</tr>
<tr>
<td>Married</td>
<td>1.33</td>
<td>1.00 1.77 1.83 **</td>
<td>1.16 2.89 1.14</td>
<td>0.78 1.68 1.30</td>
<td>0.97 1.74 1.86 **</td>
<td>1.17 2.96 1.09</td>
</tr>
<tr>
<td>High school graduate</td>
<td>1.81 ***</td>
<td>1.40 2.33 1.75 **</td>
<td>1.23 2.48 1.84 **</td>
<td>1.27 2.67 1.68 ***</td>
<td>1.30 2.17 1.63 **</td>
<td>1.14 2.32 1.74 **</td>
</tr>
<tr>
<td>Homeowner</td>
<td>1.18</td>
<td>0.88 1.59 1.23</td>
<td>0.79 1.91 1.15</td>
<td>0.76 1.73 1.06</td>
<td>0.78 1.44 1.14</td>
<td>0.72 1.79 1.02</td>
</tr>
<tr>
<td>Non-White</td>
<td>1.07</td>
<td>0.67 1.71 1.02</td>
<td>0.54 1.91 1.20</td>
<td>0.60 2.43 1.06</td>
<td>0.66 1.72 1.11</td>
<td>0.58 2.13 1.11</td>
</tr>
<tr>
<td>Immigrant</td>
<td>1.15</td>
<td>0.85 1.55 1.35</td>
<td>0.89 2.04 0.99</td>
<td>0.64 1.54 1.11</td>
<td>0.82 1.50 1.11</td>
<td>0.84 1.94 0.97</td>
</tr>
<tr>
<td>Employed</td>
<td>1.30</td>
<td>0.99 1.72 0.96</td>
<td>0.59 1.57 1.42 *</td>
<td>1.00 2.02 1.33</td>
<td>1.00 1.77 1.03</td>
<td>0.62 1.70 1.40</td>
</tr>
<tr>
<td>Ever smoked</td>
<td>0.54 ***</td>
<td>0.42 0.70 0.59 **</td>
<td>0.41 0.83 0.48 ***</td>
<td>0.33 0.70</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Heavy drinker</td>
<td>0.78</td>
<td>0.59 1.02 0.68 *</td>
<td>0.47 0.99 0.89</td>
<td>0.60 1.32</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Physically inactive</td>
<td>0.88</td>
<td>0.71 1.09 0.8</td>
<td>0.59 1.09 1.00</td>
<td>0.73 1.36</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Obese</td>
<td>1.03</td>
<td>0.77 1.37 1.23</td>
<td>0.81 1.88 0.86</td>
<td>0.57 1.29</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nagelkerke R²</td>
<td>.18</td>
<td>.18</td>
<td>.20</td>
<td>.20</td>
<td>.20</td>
<td>.20</td>
</tr>
<tr>
<td>∆R²</td>
<td>.02</td>
<td>.02</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note. Data from Statistics Canada, National Population Health Survey, Cycles 1-7. WO = without health behaviour or W = with health behaviour. OR = odds ratio; CI = confidence interval; OR ± 95% CI; LL = lower limit; UL = upper limit. Independent variables: self-rated health: good = 1 if good, very good = 1 if very good (reference group is excellent); male respondent = 1 if male respondent; age group: 40-46 years = 1 if 40-46 years, 47-53 years = 1 if 47-53 years (reference group is 54-59 years); married = 1 if married (reference group is another marital status); high school graduate = 1 if high school graduate; homeowner = 1 if homeowner; non-White = 1 if non-White; immigrant = 1 if immigrant; employed = 1 if employed; ever smoked = 1 if ever smoked; heavy drinker = 1 if heavy drinker; physically inactive = 1 if physically inactive; obese = 1 if obese.

*p < .05. **p < .01. ***p < .001.
The odds ratio provides more information about the relationship between these predictors and the outcome variable. First, however, by way of background, it is important to reiterate that the total household income variable was re-scaled to eleven units to facilitate the interpretation of the coefficient and odds ratio (Table 4-5). When this re-scaled variable was used, for each $1000 increase in total household income, the odds of respondents experiencing neither an income status decline nor a health status decline were reduced by a factor of slightly less than one, controlling for other variables in the model. In other words, it was more likely that the respondents who had lower total household income at Time 1 experienced neither an income status decline nor a health status decline. Self-rated health was another statistically significant variable. Respondents, whose health at Time 1 was good, as compared to excellent, were less likely to experience this outcome. The odds of this outcome were 3.00 times greater \( (p < .001) \) and 1.61 times greater \( (p = .003) \) respectively if the respondents were in the younger group (40 to 46 years of age) or the middle group (47 to 53 years of age), as contrasted with the older group (54 to 59 years of age). The odds that a respondent experienced this outcome were 1.81 times greater \( (p < .001) \) if a respondent was a high school graduate rather than not a high school graduate.

The inclusion of one of the four health behaviour variables improved the fit of the model for both sexes together; an increase in the Nagelkerke \( R^2 \) to .20 resulted. The odds that respondents experienced neither an income status decline nor a health status decline were about twice as low for respondents who were smokers or had ever smoked compared to those who never smoked \( (p < .001) \). In addition, the odds that respondents experienced neither an income status decline nor a health status decline were about one and one-half times as high for respondents who were employed as the odds for those who were not employed \( (p = .048) \).

Male-female differences were evident in the findings. First, without the inclusion of health behaviours in the modelling, being employed was statistically significant for female respondents \( (p = .047) \) but not for male respondents. The odds that female respondents experienced neither an income status decline nor a health status decline were 1.42 times greater for those who were employed than the odds for those in the group whose status was other than employed. The odds that male respondents experienced neither an income status decline nor a health status decline were 1.86 times greater \( (p = .009) \) for respondents who were married than the odds for
respondents with another marital status. The inclusion of health behaviours indicated other differences. For example, drinking habits was statistically significant for male respondents \((p = .044)\) and not for female respondents. The likelihood of experiencing neither an income status decline nor a health status decline was lower for male respondents who were heavy drinkers than it was for those who were nondrinkers or moderate drinkers.

6.2.1.1.2 Model 1b

The next query deals with the factors that predict, in any cycle, a decline in income status and not in health status. Table 6-2 depicts the binary logistic regression findings for income status declined and not health status, again using block entry as per above. The findings for both sexes together were that six predictors were statistically significant in the outcome (without the inclusion of the indicators of health behaviour). The variables were total household income, health (good), health (very good), sex, age group, and educational status. For each one-unit ($1,000) increase in total household income, the odds of respondents experiencing an income status decline and not a health status decline were 1.03 times greater \((p < .001)\). In other words, it was slightly more likely that the respondents who experienced an income status decline and not a health status decline had higher total household income at Time 1, rather than lower total household income at Time 1. Respondents whose health was good and very good at Time 1 as compared to excellent, face lower odds of experiencing an income status decline and not a health status decline. The likelihood of an income status decline and not a health status decline was lower \((p = .002)\) for men than it was for women. The likelihood of an income status decline and not a health status decline was less \((p = .001)\) if the respondents were members of the younger group (40 to 46 years of age) rather than of the older group (54 to 59 years of age). The odds that respondents experienced an income status decline and not a health status decline were lower \((p = .001)\) for respondents who were high school graduates rather than not high school graduates.
Table 6-2

Binary Logistic Regression Outcomes From Models Predicting Income Status Decline and Not Health Status (Model 1b; N = 2,368)

<table>
<thead>
<tr>
<th>Variable</th>
<th>OR ± 95%</th>
<th>Male respondents OR ± 95%</th>
<th>Female respondents OR ± 95%</th>
<th>OR ± 95%</th>
<th>Male respondents OR ± 95%</th>
<th>Female respondents OR ± 95%</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>LL</td>
<td>UL</td>
<td>LL</td>
<td>UL</td>
<td>LL</td>
<td>UL</td>
</tr>
<tr>
<td>Total household income</td>
<td>1.03 ***</td>
<td>1.03 1.04 1.04 ***</td>
<td>1.03 1.04 1.04 ***</td>
<td>1.03 1.04 1.03 ***</td>
<td>1.03 1.04 1.04 ***</td>
<td>1.03 1.05 1.03 ***</td>
</tr>
<tr>
<td>Self-rated health (good)</td>
<td>0.45 ***</td>
<td>0.35 0.6 0.46 ***</td>
<td>0.31 0.69 0.41 ***</td>
<td>0.28 0.61 0.45 ***</td>
<td>0.34 0.59 0.46 ***</td>
<td>0.31 0.70 0.41 ***</td>
</tr>
<tr>
<td>Self-rated health (very good)</td>
<td>0.79 *</td>
<td>0.62 1.00 0.88</td>
<td>0.63 1.23 0.70 *</td>
<td>0.50 0.98 0.78 *</td>
<td>0.62 0.99 0.9</td>
<td>0.64 1.27 0.70 *</td>
</tr>
<tr>
<td>Male</td>
<td>0.73 **</td>
<td>0.59 0.89</td>
<td>0.72 **</td>
<td>0.59 0.89</td>
<td>0.72 **</td>
<td>0.59 0.89</td>
</tr>
<tr>
<td>Age: 40-46</td>
<td>0.64 **</td>
<td>0.49 0.83 0.79</td>
<td>0.53 1.17 0.51 ***</td>
<td>0.35 0.73 0.66 **</td>
<td>0.50 0.86 0.86</td>
<td>0.58 1.29 0.50 ***</td>
</tr>
<tr>
<td>Age: 47-53</td>
<td>0.89</td>
<td>0.68 1.16 0.86</td>
<td>0.57 1.29 0.93</td>
<td>0.64 1.35 0.90</td>
<td>0.69 1.19 0.89</td>
<td>0.59 1.34 0.92</td>
</tr>
<tr>
<td>Married</td>
<td>0.83</td>
<td>0.62 1.12 0.57 *</td>
<td>0.36 0.89 1.07</td>
<td>0.72 1.60 0.83</td>
<td>0.62 1.12 0.55</td>
<td>0.35 0.87 1.10</td>
</tr>
<tr>
<td>High school graduate</td>
<td>0.67 **</td>
<td>0.53 0.85 0.74</td>
<td>0.54 1.03 0.6 **</td>
<td>0.42 0.86 0.69 **</td>
<td>0.54 0.88 0.77</td>
<td>0.55 1.08 0.61 **</td>
</tr>
<tr>
<td>Homeowner</td>
<td>1.20</td>
<td>0.88 1.64 1.21</td>
<td>0.76 1.92 1.24</td>
<td>0.81 1.90 1.22</td>
<td>0.89 1.67 1.19</td>
<td>0.74 1.90 1.27</td>
</tr>
<tr>
<td>Non-White</td>
<td>0.77</td>
<td>0.48 1.25 1.44</td>
<td>0.75 2.76 0.35 **</td>
<td>0.16 0.74 0.68</td>
<td>0.42 1.11 1.01</td>
<td>0.51 1.98 0.36 **</td>
</tr>
<tr>
<td>Immigrant</td>
<td>0.75</td>
<td>0.56 1.00 0.73</td>
<td>0.48 1.11 0.72</td>
<td>0.47 1.08 0.75</td>
<td>0.56 1.01 0.78</td>
<td>0.51 1.2 0.73</td>
</tr>
<tr>
<td>Employed</td>
<td>1.08</td>
<td>0.82 1.42 1.11</td>
<td>0.67 1.85 1.13</td>
<td>0.81 1.57 1.05</td>
<td>0.80 1.38 1.04</td>
<td>0.62 1.74 1.12</td>
</tr>
<tr>
<td>Ever smoked</td>
<td>1.03</td>
<td>0.81 1.30 0.95</td>
<td>0.69 1.32 1.20</td>
<td>0.85 1.70</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Heavy drinker</td>
<td>1.31 *</td>
<td>1.02 1.68 1.69 **</td>
<td>1.19 2.39 0.94</td>
<td>0.65 1.37</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Physically inactive</td>
<td>1.23 *</td>
<td>1.00 1.51 1.66 **</td>
<td>1.22 2.27 0.97</td>
<td>0.72 1.29</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Obese</td>
<td>0.76</td>
<td>0.57 1.01 0.63 *</td>
<td>0.41 0.97 0.95</td>
<td>0.65 1.40</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$\Delta R^2$</td>
<td>.01</td>
<td>.03 .00</td>
<td>.01 .03 .00</td>
<td>.00 .00 .00</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note. Data from Statistics Canada, National Population Health Survey, Cycles 1-7. WO = without health behaviour or W = with health behaviour. OR = odds ratio; CI = confidence interval; OR ± 95% CI; LL = lower limit; UL = upper limit. Independent variables: self-rated health: good = 1 if good, very good = 1 if very good (reference group is excellent); male respondent = 1 if male respondent; age group: 40-46 years = 1 if = 40-46 years, 47-53 years = 1 if = 47-53 years (reference group is 54-59 years); married = 1 if married (reference group is another marital status); high school graduate = 1 if high school graduate; homeowner = 1 if homeowner; non-White = 1 if non-White; immigrant = 1 if immigrant; employed = 1 if employed; ever smoked = 1 if ever smoked; heavy drinker = 1 if heavy drinker; physically inactive = 1 if physically inactive; obese = 1 if obese.

*p < .05. **p < .01. ***p < .001.
The inclusion of two statistically significant health behaviour variables did not improve the fit of the model for both sexes together; the Nagelkerke $R^2$ statistic remained at .22. The odds of respondents experiencing only an income status decline were 1.31 times higher ($p = .034$) for respondents who were heavy drinkers rather than nondrinkers or moderate drinkers. The odds that respondents experienced an income status decline and not a health status decline were 1.23 times greater ($p = .048$) for respondents who were not physically active rather than active.

As in Model 1a, male-female differences were evident in the findings. The odds that male respondents, without and with the health behaviours in the model, experienced an income status decline and not a health status decline were lower if the respondents’ self-rated health at Time 1 was good. The odds that male respondents experienced an income status decline and not a health status decline were more than twice as low ($p = .011$) for respondents who were married, living common-law or with a partner rather than had another marital status (single, widowed, separated, divorced). The odds that male respondents experienced an income status decline and not a health status decline were 1.69 times greater ($p = .004$) if the respondents were heavy drinkers rather nondrinkers or moderate drinkers. The odds that male respondents experienced an income status decline and not a health status decline were 1.66 times greater ($p = .001$) if the respondents were not physically active rather than physically active. The odds that male respondents experienced an income status decline and not a health status decline were lower ($p = .036$) if respondents were not obese rather than obese.

In contrast, the odds that female respondents, without and with the health behaviour variables in the model, experienced an income status decline and not a health status decline were lower if the respondents’ self-rated health at Time 1 was good or very good (vs. excellent). The odds that female respondents experienced an income status decline and not a health status decline were lower ($p < .001$) if the respondents were members of the younger group (40 to 46 years of age) rather than of the older group (54 to 59 years of age). The odds that female respondents experienced an income status decline and not a health status decline were almost twice as low ($p = .005$) if the respondents were high school graduates rather than not high school graduates. Both without ($p = .006$) and with ($p = .009$) the health behaviour variables, visible minority status was statistically significant for females but not for males. The odds that female
respondents experienced an income status decline and not a health status decline were lower if the respondents were non-White rather than White.

6.2.1.1.3  Model 1c

What factors predict, in any cycle, a decline in health status and not in income status? Table 6-3 depicts the binary logistic regression findings for health status declined and not income status, again using block entry. Without inclusion of the indicators of health behaviour, the finding was that, for both sexes together (and for males and females separately) two predictors were statistically significant in the outcome, that is, total household income and self-rated health. For each one-unit ($1,000) increase in total household income, the odds of respondents experiencing a health status decline and not an income status decline were reduced by a factor of slightly less than one ($p < .001$). In other words, it was more likely that the respondents who experienced a health status decline and not an income status decline had lower total household income at Time 1, rather than higher total household at Time 1. Respondents at Time 1, whose self-rated health was good, as compared to excellent, face higher odds ($p < .001$) of experiencing a health status decline and not an income status decline. For both sexes together, two other predictors were statistically significant in the outcome, that is, sex, and visible minority status. The likelihood of a health status decline and not an income status decline was higher ($p = .015$) for men than it was for women. The odds that respondents experienced a health status decline and not an income status decline were higher ($p = .038$) if the respondents were non-White.
Table 6-3
Binary Logistic Regression Outcomes From Models Predicting Health Status Decline and Not Income Status (Model 1c; N = 2,368)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Both sexes</th>
<th>Male respondents</th>
<th>Female respondents</th>
<th>Both sexes</th>
<th>Male respondents</th>
<th>Female respondents</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>OR</td>
<td>OR ± 95% CI</td>
<td>OR ± 95% CI</td>
<td>OR</td>
<td>OR ± 95% CI</td>
<td>OR ± 95% CI</td>
</tr>
<tr>
<td>Total household income</td>
<td>0.96 ***</td>
<td>0.95 0.97 0.95 ***</td>
<td>0.94 0.96 0.96 ***</td>
<td>0.95 0.97</td>
<td>0.95 0.97 0.95 ***</td>
<td>0.94 0.96 0.96 ***</td>
</tr>
<tr>
<td>Self-rated health (good)</td>
<td>3.22 ***</td>
<td>2.12 4.88 3.78 ***</td>
<td>2.07 6.91 2.75 ***</td>
<td>1.52 4.98</td>
<td>3.06 *** 2.00 4.69 3.47 ***</td>
<td>1.87 6.45 2.72 *** 1.48 5.00</td>
</tr>
<tr>
<td>Self-rated health (very good)</td>
<td>0.99</td>
<td>0.64 1.54 1.16</td>
<td>0.62 2.16 0.86</td>
<td>0.45 1.63</td>
<td>0.98 0.63 1.52 1.14</td>
<td>0.63 2.16 0.86 0.45 1.65</td>
</tr>
<tr>
<td>Male</td>
<td>1.47 *</td>
<td>1.08 2.01</td>
<td></td>
<td>1.42 *</td>
<td>1.04 1.95</td>
<td></td>
</tr>
<tr>
<td>Age: 40-46</td>
<td>0.91</td>
<td>0.62 1.33 0.52 *</td>
<td>0.31 0.89 1.55</td>
<td>0.88 2.73</td>
<td>0.83 0.56 1.22 0.48 **</td>
<td>0.28 0.82 1.48 0.83 2.63</td>
</tr>
<tr>
<td>Age: 47-53</td>
<td>0.76</td>
<td>0.51 1.15 0.48 *</td>
<td>0.27 0.87 1.20</td>
<td>0.66 2.17</td>
<td>0.72 0.47 1.09 0.48 *</td>
<td>0.26 0.87 1.15 0.63 2.10</td>
</tr>
<tr>
<td>Married</td>
<td>1.30</td>
<td>0.88 1.92 1.25</td>
<td>0.71 2.18 1.39</td>
<td>0.79 2.46</td>
<td>1.33 0.90 1.96 1.20</td>
<td>0.68 2.11 1.43 0.80 2.53</td>
</tr>
<tr>
<td>High school graduate</td>
<td>1.17</td>
<td>0.83 1.65 1.51</td>
<td>0.93 2.45 0.99</td>
<td>0.60 1.64</td>
<td>1.23 0.87 1.74 1.63</td>
<td>0.99 2.68 1.02 0.61 1.69</td>
</tr>
<tr>
<td>Homeowner</td>
<td>0.88</td>
<td>0.60 1.29 0.98</td>
<td>0.58 1.66 0.79</td>
<td>0.45 1.37</td>
<td>0.99 0.67 1.45 1.22</td>
<td>0.71 2.10 0.82 0.47 1.45</td>
</tr>
<tr>
<td>Non-White</td>
<td>1.90 *</td>
<td>1.03 3.49 1.46</td>
<td>0.61 3.51 3.00 *</td>
<td>1.30 6.94</td>
<td>2.27 1.22 4.21 1.85</td>
<td>0.75 4.60 3.24 * 1.39 7.56</td>
</tr>
<tr>
<td>Immigrant</td>
<td>0.93</td>
<td>0.59 1.45 0.65</td>
<td>0.34 1.26 1.32</td>
<td>0.71 2.42</td>
<td>1.00 0.64 1.56 0.75</td>
<td>0.39 1.47 1.32 0.71 2.44</td>
</tr>
<tr>
<td>Employed</td>
<td>0.91</td>
<td>0.64 1.30 1.03</td>
<td>0.58 1.84 0.92</td>
<td>0.57 1.49</td>
<td>0.89 0.62 1.28 0.96</td>
<td>0.54 1.71 0.93 0.57 1.50</td>
</tr>
<tr>
<td>Ever smoked</td>
<td>1.76 **</td>
<td>1.27 2.43 2.21 **</td>
<td>1.41 3.45 1.36</td>
<td>0.83 2.22</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Heavy drinker</td>
<td>0.70</td>
<td>0.47 1.02 0.55 *</td>
<td>0.31 0.97 0.92</td>
<td>0.53 1.58</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Physically inactive</td>
<td>0.96</td>
<td>0.70 1.33 1.02</td>
<td>0.65 1.61 0.93</td>
<td>0.59 1.48</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Obese</td>
<td>1.44</td>
<td>0.97 2.15 1.69</td>
<td>0.95 3.02 1.14</td>
<td>0.64 2.01</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nagelkerke $R^2$</td>
<td>.24</td>
<td>.30</td>
<td>.20</td>
<td>.25</td>
<td>.33</td>
<td>.20</td>
</tr>
<tr>
<td>$\Delta R^2$</td>
<td>.01</td>
<td>.03</td>
<td>.00</td>
<td>.01</td>
<td>.03</td>
<td>.00</td>
</tr>
</tbody>
</table>

Note. Data from Statistics Canada, National Population Health Survey, Cycles 1-7. WO = without health behaviour or W = with health behaviour. OR = odds ratio; CI = confidence interval; OR ± 95% CI; LL = lower limit; UL = upper limit. Independent variables: self-rated health: good = 1 if good, very good = 1 if very good (reference group is excellent); male respondent = 1 if male respondent; age group: 40-46 years = 1 if 40-46 years, 47-53 years = 1 if 47-53 years (reference group is 54-59 years); married = 1 if married (reference group is another marital status); high school graduate = 1 if high school graduate; homeowner = 1 if homeowner; non-White = 1 if non-White; immigrant = 1 if immigrant; employed = 1 if employed; ever smoked = 1 if ever smoked; heavy drinker = 1 if heavy drinker; physically inactive = 1 if physically inactive; obese = 1 if obese.

*p < .05. **p < .01. ***p < .001.
The inclusion of the health behaviours slightly improved the fit of the model for both sexes together; an increase in the Nagelkerke $R^2$ to .25 was the result. The odds that respondents experienced a health status decline and not an income status decline were 1.76 times greater ($p = .001$) for respondents who were smokers or had ever smoked, than for respondents who had never smoked. Moreover, for male respondents, the inclusion of the health behaviours improved the fit of the model by increasing the Nagelkerke $R^2$ from .30 to .33. The odds that male respondents experienced a health status decline and not an income status decline were 2.21 times greater ($p = .001$) for respondents who were smokers or had ever smoked than the odds for respondents who had never smoked. The odds that male respondents experienced a health status decline and not an income status decline were less ($p = .038$) for respondents who were heavy drinkers than the odds for respondents who were nondrinkers or moderate drinkers. The Nagelkerke $R^2$ statistic suggests that this model fit better for males respondents than for female respondents (given that its value increased for the former and decreased for the latter).

6.2.1.1.4 Model 1d

Table 6-4 depicts the binary logistic regression findings for income status decline and health status decline, again using block entry. For this submodel (excluding health behaviour indicators), four predictors were statistically significant in the outcome. They were total household income, self-rated health, age, and educational status. For each $1000 increase in total household income, the odds of respondents experiencing an income status decline and a health status decline were increased ($p < .001$) by a factor of slightly more than one. In other words, it was slightly more likely that the respondents who had higher total household income at Time 1, rather than lower total household at Time 1 experienced an income status decline and a health status decline. Moving on to another statistically significant variable, respondents whose self-rated health at Time 1 was good ($p < .001$) or very good, ($p = .002$) as compared to excellent, were more likely to experience an income status decline and a health status decline. The odds of an income status decline and a health status decline were lower ($p < .001$) if the respondents were members of the younger group (40 to 46 years of age) rather than of the older group (54 to 59 years of age). The odds that a respondent experienced an income status decline and a health status decline were lower ($p = .016$) if the respondent was a high school graduate rather than not a high school graduate.
Table 6-4
Binary Logistic Regression Outcomes From Models Predicting Income Status Decline and Health Status Decline (Model 1d: N = 2,368)

<table>
<thead>
<tr>
<th>Variable</th>
<th>WO</th>
<th>W</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Both sexes</td>
<td>Male respondents</td>
</tr>
<tr>
<td></td>
<td>OR ± 95% CI</td>
<td>OR ± 95% CI</td>
</tr>
<tr>
<td>Total household income</td>
<td>1.01 ***</td>
<td>1.01 1.02 1.01 ***</td>
</tr>
<tr>
<td>Self-rated health (good)</td>
<td>3.86 ***</td>
<td>2.71 5.52 4.62 ***</td>
</tr>
<tr>
<td>Self-rated health (very good)</td>
<td>1.72 **</td>
<td>1.21 2.44 2.12 **</td>
</tr>
<tr>
<td>Male</td>
<td>1.13</td>
<td>0.88 1.45</td>
</tr>
<tr>
<td>Age: 40-46</td>
<td>0.47 ***</td>
<td>0.35 0.65 0.39 ***</td>
</tr>
<tr>
<td>Age: 47-53</td>
<td>0.82</td>
<td>0.61 1.11 1.03 *</td>
</tr>
<tr>
<td>Married</td>
<td>0.72</td>
<td>0.50 1.02 0.79</td>
</tr>
<tr>
<td>High school graduate</td>
<td>0.71 *</td>
<td>0.53 0.94 0.58 **</td>
</tr>
<tr>
<td>Homeowner</td>
<td>0.87</td>
<td>0.61 1.24 0.75</td>
</tr>
<tr>
<td>Non-White</td>
<td>0.83</td>
<td>0.48 1.45 0.54</td>
</tr>
<tr>
<td>Immigrant</td>
<td>1.28</td>
<td>0.92 1.79 1.20</td>
</tr>
<tr>
<td>Employed</td>
<td>0.76</td>
<td>0.56 1.04 1.43</td>
</tr>
<tr>
<td>Ever smoked</td>
<td>1.43</td>
<td></td>
</tr>
<tr>
<td>Heavy drinker</td>
<td>1.13</td>
<td>0.84 1.52 0.97</td>
</tr>
<tr>
<td>Physically inactive</td>
<td>0.92</td>
<td>0.71 1.19 0.75</td>
</tr>
<tr>
<td>Obese</td>
<td>1.21</td>
<td>0.87 1.67 1.06</td>
</tr>
<tr>
<td>Nagelkerke $R^2$</td>
<td>.11</td>
<td>.13</td>
</tr>
<tr>
<td>$\Delta R^2$</td>
<td>.01</td>
<td>.01</td>
</tr>
</tbody>
</table>

Note. Data from Statistics Canada, National Population Health Survey, Cycles 1-7. WO = without health behaviour or W = with health behaviour. OR = odds ratio; CI = confidence interval; OR ± 95% CI; LL = lower limit; UL = upper limit. Independent variables: self-rated health: good = 1 if good, very good = 1 if very good (reference group is excellent); male respondent = 1 if male respondent; age group: 40-46 years = 1 if 40-46 years, 47-53 years = 1 if 47-53 years (reference group is 54-59 years); married = 1 if married (reference group is another marital status); high school graduate = 1 if high school graduate; homeowner = 1 if homeowner; non-White = 1 if non-White; immigrant = 1 if immigrant; employed = 1 if employed; ever smoked = 1 if ever smoked; heavy drinker = 1 if heavy drinker; physically inactive = 1 if physically inactive; obese = 1 if obese.

*p < .05. **p < .01. ***p < .001.
The inclusion of one statistically significant health behaviour variable did not improve the fit of the model for both sexes together; the Nagelkerke $R^2$ statistic remained at .11. The odds that respondents experienced an income status decline and a health status decline were higher for respondents who were smokers or had ever smoked than the odds for respondents who never smoked.

Male-female differences were evident in the findings. First, without and with the inclusion of health behaviours in the model, good health was statistically significant for both male respondents ($p < .001$) and female respondents ($p < .001$). With the inclusion of health behaviours, the odds that male respondents experienced an income status decline and a health status decline were 2.05 times greater ($p = .006$) if their health was very good at Time 1 rather than excellent at Time 1. Without and with the inclusion of health behaviours in the model, the odds that female respondents experienced an income status decline and a health status decline were lower (respectively $p = .044$ and $p = .032$) if they were members of the middle group at Time 1 rather than of the older group at Time 1. Employment status was statistically significant for female respondents but not for male respondents without ($p = .003$) and with ($p = .004$) the inclusion of the health behaviours in the model. The odds that female respondents experienced an income status decline and a health status decline were lower if they were employed than the odds for female respondents who were other than employed. With the inclusion of health behaviours in the model, a history of smoking was statistically significant ($p = .027$) for female respondents but not for male respondents.

6.2.1.2 Multinomial logistic regression

The findings of the binary logistic regression analyses were outlined above in detail; the comparable multinomial logistic regression analyses results are presented in Table 6-5.

It is important to note that, in the multinomial logistic regression analyses, there were no findings related to the reference group, that is, no decline in income status and health status. The members of this group were absent because the analysis of the reference group is automatically omitted in multinomial logistic regression. The reason for the differences in statistically significant predictors between the multinomial and binary regression was that the multinomial regression compares each category to the reference group, that is, no decline in either, whereas
each of the individual logistic regression analyses compares each category to the odds of being in any other group.

With respect to the univariate statistics related to the multinominal logistic regression findings, of note is the fact that, with the exception of the frequency of non-Whites in the sample, the proportion of all levels of all the variables was greater than 10%. In other words, all the independent variables had a frequency of occurrence of at least ten percent, with the exception of the visible minority variable where the value non-White has a frequency of occurrence of less than ten percent and therefore, these results may be invalid.
Table 6-5
Multinomial Logistic Regression Outcomes From Models Predicting (a) Income Status Decline and Not Health Status Decline, (b) Health Status Decline and Not Income Status Decline, and (c) Income Status Decline and Health Status Decline (N = 2,368)

<table>
<thead>
<tr>
<th>Variable</th>
<th>OR Both sexes</th>
<th>OR Male respondents</th>
<th>OR Female respondents</th>
<th>OR Both sexes</th>
<th>OR Male respondents</th>
<th>OR Female respondents</th>
<th>OR Both sexes</th>
<th>OR Male respondents</th>
<th>OR Female respondents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Income</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
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<td>1.05 ***</td>
<td>0.99 **</td>
<td>0.98 ***</td>
<td>0.99</td>
<td>1.04 ***</td>
<td>1.03 ***</td>
<td>1.05 ***</td>
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<tr>
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</tr>
<tr>
<td>Good</td>
<td>0.88</td>
<td>1.00</td>
<td>0.74</td>
<td>3.29 ***</td>
<td>3.89 ***</td>
<td>2.74 **</td>
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<td>6.00 ***</td>
<td>3.33</td>
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<td>0.89</td>
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<tr>
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</tr>
<tr>
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<td>0.27 ***</td>
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<td>0.78</td>
<td>0.23 ***</td>
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<td>0.58 *</td>
<td>0.67</td>
<td>0.59 *</td>
<td>0.42 **</td>
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<td>0.62 *</td>
<td>0.65</td>
<td>0.52 *</td>
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<tr>
<td>Another marital status</td>
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<td>1.98 **</td>
<td>1.08</td>
<td>0.91</td>
<td>1.01</td>
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<td>1.46</td>
<td>1.45</td>
<td>1.69</td>
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<tr>
<td>Educational status</td>
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</tr>
<tr>
<td>Not a high school graduate</td>
<td>2.08 ***</td>
<td>1.91 **</td>
<td>2.24 ***</td>
<td>1.43 *</td>
<td>1.29</td>
<td>1.51</td>
<td>2.06 ***</td>
<td>2.27 ***</td>
<td>1.84 *</td>
</tr>
<tr>
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<td>0.87</td>
<td>0.79</td>
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<td>0.90</td>
<td>1.30</td>
<td>1.19</td>
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<td>Visible minority status</td>
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<tr>
<td>White</td>
<td>1.17</td>
<td>0.85</td>
<td>2.20</td>
<td>0.32 ***</td>
<td>0.34 **</td>
<td>0.29 **</td>
<td>1.02</td>
<td>1.25</td>
<td>0.94</td>
</tr>
<tr>
<td>Immigrant status</td>
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</tr>
<tr>
<td>Not an immigrant</td>
<td>1.32</td>
<td>1.40</td>
<td>1.22</td>
<td>1.12</td>
<td>1.50</td>
<td>0.78</td>
<td>0.98</td>
<td>1.20</td>
<td>0.84</td>
</tr>
<tr>
<td>Employment status</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unemployed</td>
<td>1.32</td>
<td>1.09</td>
<td>1.37</td>
<td>1.63 **</td>
<td>1.45</td>
<td>1.49</td>
<td>1.71 **</td>
<td>0.88</td>
<td>2.32 ***</td>
</tr>
<tr>
<td>Smoking history</td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Never smoked</td>
<td>0.61 ***</td>
<td>0.65</td>
<td>0.53 **</td>
<td>0.36 ***</td>
<td>0.30 ***</td>
<td>0.45 **</td>
<td>0.45 ***</td>
<td>0.51 **</td>
<td>0.37 ***</td>
</tr>
<tr>
<td>Drinking habits</td>
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<td></td>
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<td></td>
</tr>
<tr>
<td>Nondrinker</td>
<td>0.68 **</td>
<td>0.54 **</td>
<td>0.92</td>
<td>1.03</td>
<td>1.17</td>
<td>0.84</td>
<td>0.73</td>
<td>0.78</td>
<td>0.69</td>
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<td>Physical activity</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not active</td>
<td>0.85</td>
<td>0.67 *</td>
<td>1.08</td>
<td>0.94</td>
<td>0.76</td>
<td>1.19</td>
<td>0.98</td>
<td>1.04</td>
<td>0.96</td>
</tr>
<tr>
<td>Obesity</td>
<td>1.09</td>
<td>1.25</td>
<td>0.90</td>
<td>0.67 *</td>
<td>0.63</td>
<td>0.72</td>
<td>0.80</td>
<td>0.90</td>
<td>0.74</td>
</tr>
</tbody>
</table>

Note. Data from Statistics Canada, National Population Health Survey, Cycles 1-7. WO = without health behaviour or W = with health behaviour. OR = odds ratio; CI = confidence interval; OR ± 95% CI; LL = lower limit; UL = upper limit. The reference category is “neither income status nor health status declined.” At Cycle 1, the age of the younger group was 40 to 46, the middle group was 47 to 53, and the older group was 54 to 59. Another marital status signifies single, widowed, separated, or divorced; Married included legally married, common-law, or living with a partner. Homeownership signifies that dwelling is owned by a household member. Not employed signifies unemployed, not working, retired, or otherwise not in the labour force. Independent variables: self-rated health: good = 1 if good, very good = 1 if very good (reference group is excellent); female respondent = 1 if female respondent (reference group is male); age group: 40-46 years = 1 if = 40-46 years, 47-53 years = 1 if = 47-53 years (reference group is 54-59 years); other marital status = 1 if other marital status (reference group is married); not a high school graduate = 1 if not a high school graduate (reference group is high school graduate); not a homeowner = 1 if not a homeowner (reference group is homeowner); White = 1 if White (reference group is non-White); not an immigrant = 1 if not an immigrant (reference group is immigrant); not employed = 1 if not employed (reference group is employed); never smoked = 1 if never smoked (reference group is smoker); nondrinker = 1 if heavy nondrinker (reference group is drinker); physically active = 1 if physically active (reference group is active); not obese = 1 if not obese (reference group is obese).

*p < .05. **p < .01. ***p < .001.
The findings of the binary logistic regression analyses are, in general, consistent with the findings of the multinomial logistic regression analysis. Table 6-6 depicts the differences and similarities between the binary and multinomial logistic regression findings, with the cells with the darkly shaded design highlighting differences. In the cases where both logistic and the multinomial analyses were statistically significant, both cells are lightly shaded. These findings, in particular, can be reported with confidence. The narrative that follows Table 6-6 provides further details on these findings.
Table 6-6
Comparison of Binary Logistic Regression and Multinomial Logistic Regression Findings

<table>
<thead>
<tr>
<th>Income status declined and not health status</th>
<th>Health status declined and not income status</th>
<th>Income status declined and health status declined</th>
</tr>
</thead>
<tbody>
<tr>
<td>BS M F</td>
<td>BS M F</td>
<td>BS M F</td>
</tr>
<tr>
<td><strong>Total household income</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Good self-rated health</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Very good self-rated health</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Sex</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Younger age group</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Middle age group</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Marital status</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Educational status</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Homeownership status</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Visible minority status</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Immigrant status</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Employment status</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Smoking history</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Drinking habits</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Physical activity</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Obesity</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note. Data from Statistics Canada, National Population Health Survey, Cycles 1-7. At Cycle 1, the age of the younger group was 40 to 46 and the middle group was 47 to 53. BS = respondents of both sexes. M = male respondents. F = female respondents. Bi = binary logistic regression. Mu = multinomial logistic regression. Lightly shaded areas = statistically significant findings. □ = depicts a difference between binary and multinomial findings.
The following examines the binary and multinomial logistic regression findings in more depth:

Total household income was statistically significant overall (with one exception). Arguably, linked to total household income are employment status and homeownership status. Employment status was statistically significant in both binary and multinomial analyses only for female respondents whose income status and health status both declined. This suggests that women’s employment status, that is, being employed protects against two-fold status declines. Homeownership status was not statistically significant in any of these outcomes, which suggests that homeownership was not related to status declines and may point to a weak link between income and homeownership.

For both sexes together, sex, age (younger), and educational status, were statistically significant for the binary and multinomial findings for one outcome: income status only declined. What is more, for female respondents, age (younger and middle), was statistically significant for the binary and multinomial findings for one other outcome: income status and health status declined. This suggests that, for women, being younger protects against income status only declines, and income status and health status declines. As well, for female respondents, educational status was statistically significant for binary and multinomial findings for one outcome, that is, income status only declined. For women, having graduated from high school protects against income status only declines. In addition, for male respondents, marital status was statistically significant for binary and multinomial findings for the outcome income status only declined. Overall, it appears that sociodemographic variables were linked to income status declines.

Smoking history was statistically significant for both sexes together for binary and multinomial findings for two outcomes: health status only declined and income status declined and health status declined. This indicates that, as expected, a history of smoking has a deleterious effect on health.

For male respondents, drinking habits was statistically significant for the binary and the multinomial findings for the outcome income status only declined. It is surprising that there was a relationship between this variable and that particular outcome, and not, as might be expected, the outcome of health status only declined.
Interestingly, the greatest congruity, that is, the fewest differences, between the binary and multinomial findings was for the outcome income status declined and health status declined. This indicates that the findings for this outcome, in particular, are robust.

6.3 Model 2 Findings

Model 2’s multivariate findings are not presented for both sexes together. The direction of the association varied for male and female respondents; therefore, the findings for one sex obfuscated the findings for the other sex when both sexes were combined.

6.3.1 Multivariate findings

6.3.1.1 Binary logistic regression model

As stated above, Model 2, which was made operational in Model 2a and Model 2b, further analyzes those respondents with both income status decline and health status decline. This model responded to the two following questions: Among those with an income status decline and health status decline, what factors are associated with an income status decline first and a subsequent health status decline (Model 2a)? Among those with an income status decline and health status decline, what factors are associated with the following combined groups, a health status decline first and a subsequent income status decline as well as with an income status decline and health status decline during the same cycle (Model 2b)? In addition, respondents whose income status declined before their health status declined are compared to those whose health status declined before their income status and to those whose income status declined and health status declined during the same cycle.

6.3.1.1.1 Model 2a

Table 6-7 depicts the binary logistic regression findings for income status decline before health status decline (among respondents with income status decline and health status decline), again using block entry. In the first submodel (without health behaviours), three predictors were statistically significant in the outcome. For male respondents, the predictor was immigrant status, \( p = .048 \). The odds of male respondents experiencing an income status decline before health status decline were lower if they were immigrants. For female respondents, the predictors were self-rated health and age. If female respondents’ health was good \(( p < .001)\) or very good \(( p = .002)\), as compared to excellent at Time 1, they were less likely to experience an income
status decline before a health status decline. The odds of an income status decline before health status decline were lower ($p = .024$) if the female respondents were members of the younger age group (40 to 46 years of age) rather than of the older group (54 to 59 years of age).

Table 6-7

<table>
<thead>
<tr>
<th>Variable</th>
<th>Male respondents</th>
<th>Female respondents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total household income</td>
<td>1.01 1.00 1.03 1.00</td>
<td>0.98 1.02 1.01 1.00</td>
</tr>
<tr>
<td>Self-rated health (good)</td>
<td>0.51 0.19 1.38 0.08</td>
<td>0.02 0.30 0.44 0.16</td>
</tr>
<tr>
<td>Self-rated health (very good)</td>
<td>2.14 0.73 6.29 0.13</td>
<td>0.03 0.48 1.92 0.64</td>
</tr>
<tr>
<td>Age: 40-46</td>
<td>1.42 0.55 3.70 0.38</td>
<td>0.16 0.88 1.27 0.47</td>
</tr>
<tr>
<td>Age: 47-53</td>
<td>0.68 0.30 1.52 0.81</td>
<td>0.35 1.86 0.61 0.26</td>
</tr>
<tr>
<td>Married</td>
<td>0.63 0.23 1.73 1.09</td>
<td>0.43 2.77 0.56 0.20</td>
</tr>
<tr>
<td>High school graduate</td>
<td>0.75 0.36 1.60 1.68</td>
<td>0.72 3.91 0.84 0.39</td>
</tr>
<tr>
<td>Homeowner</td>
<td>1.55 0.61 3.94 1.36</td>
<td>0.49 3.79 1.89 0.71</td>
</tr>
<tr>
<td>Non-White</td>
<td>1.88 0.36 9.75 3.71</td>
<td>0.84 16.42 2.08 0.38</td>
</tr>
<tr>
<td>Immigrant</td>
<td>0.40 * 0.16 0.99 1.03</td>
<td>0.42 2.56 0.37 0.14</td>
</tr>
<tr>
<td>Employed</td>
<td>1.81 0.62 5.27 0.82</td>
<td>0.40 1.70 0.81 0.61</td>
</tr>
<tr>
<td>Ever smoked</td>
<td>1.63 0.78 3.40 0.89</td>
<td>0.41 1.93 8.1 0.81 4.42</td>
</tr>
<tr>
<td>Heavy drinker</td>
<td>1.01 0.43 2.39 1.89</td>
<td>0.81 4.42</td>
</tr>
<tr>
<td>Physically inactive</td>
<td>1.24 0.61 2.51 0.73</td>
<td>0.36 1.48</td>
</tr>
<tr>
<td>Obese</td>
<td>1.80 0.64 5.03 0.72</td>
<td>0.30 1.73</td>
</tr>
<tr>
<td>Nagelkerke $R^2$</td>
<td>.20 .18 .20 .21</td>
<td></td>
</tr>
<tr>
<td>$AR^2$</td>
<td>.00 .03</td>
<td></td>
</tr>
</tbody>
</table>

Note: Data from Statistics Canada, National Population Health Survey, Cycles 1-7. WO = without health behaviour or W = with health behaviour. OR = odds ratio; CI = confidence interval; OR ± 95% CI = upper limit. Independent variables: self-rated health: good = 1 if good, very good = 1 if very good (reference group is excellent); male respondent = 1 if male respondent; age group: 40-46 years = 1 if 40-46 years, 47-53 years = 1 if 47-53 years (reference group is 54-59 years); married = 1 if married (reference group is another marital status); high school graduate = 1 if high school graduate; homeowner = 1 if homeowner; non-White = 1 if non-White; immigrant = 1 if immigrant; employed = 1 if employed; ever smoked = 1 if ever smoked; heavy drinker = 1 if heavy drinker; physically inactive = 1 if physically inactive; obese = 1 if obese.

In the model that included health behaviours, for female respondents, the predictor was self-rated health. If female respondents’ health was good ($p < .001$) or very good ($p = .002$), as compared to excellent at Time 1, they were less likely to experience an income status decline before a health status decline.
6.3.1.1.2 Model 2b

As stated above, the two variables, health status decline before income status decline and income status and health status decline during the same cycle were combined into one variable.

Table 6-8 depicts the binary logistic regression findings for health status decline before income status decline plus income status and health status decline during the same cycle (among respondents with income status decline and health status decline), again using block entry. For this submodel (excluding health behaviour indicators), two predictors were statistically significant in predicting the outcome. For female respondents, the predictors were self-rated health and age. If female respondents’ health was good ($p < .001$) or very good ($p = .003$), as compared to excellent, at Time 1 they were more likely to experience these outcomes. The odds of these outcomes were higher ($p = .029$) if the female respondents were members of the younger group (40 to 46 years) rather than of the older group (54 to 59 years). For the model that included health behaviours, for female respondents, the statistically significant predictor was again health. If female respondents’ health was good ($p < .001$) or very good ($p = .002$), as compared to excellent, at Time 1 they were more likely to experience this decline.
Table 6-8
Binary Logistic Regression Outcomes From Models Predicting Health Status Decline Before Income Status Decline & Income Status and Health Status Decline during the Same Cycle (Among Respondents with Income Status Decline and Health Status Decline; Model 2b; N = 382)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Male respondents WO</th>
<th>Female respondents WO</th>
<th>Male respondents W</th>
<th>Female respondents W</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>OR ± 95% CI</td>
<td>OR ± 95% CI</td>
<td>OR ± 95% CI</td>
<td>OR ± 95% CI</td>
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<tr>
<td></td>
<td>LL</td>
<td>UL</td>
<td>LL</td>
<td>UL</td>
</tr>
<tr>
<td>Total household income</td>
<td>0.99</td>
<td>1.00</td>
<td>0.98</td>
<td>1.00</td>
</tr>
<tr>
<td>Self-rated health (good)</td>
<td>1.96</td>
<td>3.18</td>
<td>3.18</td>
<td>5.44</td>
</tr>
<tr>
<td>Self-rated health (very good)</td>
<td>0.47</td>
<td>0.25</td>
<td>0.25</td>
<td>0.47</td>
</tr>
<tr>
<td>Age: 40-46</td>
<td>0.70</td>
<td>2.63</td>
<td>0.70</td>
<td>2.63</td>
</tr>
<tr>
<td>Age: 47-53</td>
<td>1.47</td>
<td>3.38</td>
<td>1.47</td>
<td>3.38</td>
</tr>
<tr>
<td>Married</td>
<td>1.58</td>
<td>4.48</td>
<td>1.58</td>
<td>4.48</td>
</tr>
<tr>
<td>High school graduate</td>
<td>1.33</td>
<td>2.88</td>
<td>1.33</td>
<td>2.88</td>
</tr>
<tr>
<td>Homeowner</td>
<td>0.65</td>
<td>1.69</td>
<td>0.65</td>
<td>1.69</td>
</tr>
<tr>
<td>Non-White</td>
<td>0.53</td>
<td>2.93</td>
<td>0.53</td>
<td>2.93</td>
</tr>
<tr>
<td>Immigrant</td>
<td>2.47</td>
<td>6.26</td>
<td>2.47</td>
<td>6.26</td>
</tr>
<tr>
<td>Employed</td>
<td>0.55</td>
<td>1.67</td>
<td>0.55</td>
<td>1.67</td>
</tr>
<tr>
<td>Ever smoked</td>
<td>0.55</td>
<td>1.67</td>
<td>0.55</td>
<td>1.67</td>
</tr>
<tr>
<td>Heavy drinker</td>
<td>0.99</td>
<td>2.39</td>
<td>0.99</td>
<td>2.39</td>
</tr>
<tr>
<td>Physically inactive</td>
<td>0.81</td>
<td>1.68</td>
<td>0.81</td>
<td>1.68</td>
</tr>
<tr>
<td>Obese</td>
<td>0.56</td>
<td>1.61</td>
<td>0.56</td>
<td>1.61</td>
</tr>
</tbody>
</table>

Nagelkerke $R^2$ .18 .20 .20 .22
$\Delta R^2$ .02 .02

Note. Data from Statistics Canada, National Population Health Survey, Cycles 1-7. WO = without health behaviour or W = with health behaviour. OR = odds ratio; CI = confidence interval; OR ± 95% CI = lower limit; UL = upper limit. Independent variables: self-rated health: good = 1 if good, very good = 1 if very good (reference group is excellent); male respondent = 1 if male respondent; age group: 40-46 years = 1 if = 40-46 years, 47-53 years = 1 if = 47-53 years (reference group is 54-59 years); married = 1 if married (reference group is another marital status); high school graduate = 1 if high school graduate; homeowner = 1 if homeowner; non-White = 1 if non-White; immigrant = 1 if immigrant; employed = 1 if employed; ever smoked = 1 if ever smoked; heavy drinker = 1 if heavy drinker; physically inactive = 1 if physically inactive; obese = 1 if obese.

* $p < .05.$ ** $p < .01.$ *** $p < .001.$

6.4 Model 3 Findings

As stated above, the findings in Model 3 are not separated by sex--the size of the subsample divided by sex did not meet the minimum requirements for a viable logistic regression analyses. For this reason, the findings are presented for the sexes combined.

6.4.1 Multivariate findings

6.4.1.1 Binary logistic regression model

As stated above, four variables, total household income, self-rated health, age, and high school graduation were employed for Model 3, which was made operational in Model 3a and Model 3b.
These four variables were selected from among those statistically significant variables that predicted both an income status decline and health status decline based on Model 1’s multinomial findings. This model responded to two questions: Among those with a decline in income status, what factors are associated with an income status decline first and a subsequent health status decline (Model 3a), and, among those with a decline in health status, what factors are associated with a health status decline first and a subsequent income status decline (Model 3b)? Furthermore, respondents whose income status declined before their health status declined are compared, in the final chapter, to those whose health status declined before their income status declined.

6.4.1.1.1 Model 3a

Table 6-9 depicts the binary logistic regression findings for income status decline before health status decline (among respondents with income status decline), using block entry, first without including one indicator of health behaviour and then including it, for both sexes together. For the first submodel (excluding health behaviour indicators), two predictors were statistically significant in predicting the outcome, that is, self-rated health and age. The odds ratio provides more information about the relationship between these predictors and the outcome variable: Respondents whose health at Time 1 was good ($p < .001$) or very good ($p = .040$), as compared to excellent, were more likely to experience this outcome. The odds of this outcome were 2.11 times greater and 1.50 times greater, respectively, if the respondents’ health was good or very good. The odds of this outcome were lower if the respondents were members of the younger group (40 to 46 years of age) rather than of the older group (54 to 59 years of age). The inclusion of one of the four health behaviour variables improved the fit of the model for both sexes together, resulting in a slight increase in the Nagelkerke $R^2$. Three predictors were statistically significant in predicting the outcome: good health ($p = .001$), age ($p = .012$), and smoking history ($p = .015$). The odds that respondents experienced this outcome were almost 50% higher for respondents who were smokers or had ever smoked than the odds for respondents who never smoked.
Table 6-9

Binary Logistic Regression Outcomes From Models Predicting Income Status Decline Before Health Status Decline (Among Respondents With Income Status Decline; Model 3a; N = 1,283)

<table>
<thead>
<tr>
<th>Variable</th>
<th>WO</th>
<th>OR ± 95% CI</th>
<th>W</th>
<th>OR ± 95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>LL</td>
<td>UL</td>
<td>LL</td>
<td>UL</td>
</tr>
<tr>
<td>Total household income</td>
<td>0.99</td>
<td>0.99 1.00 1.00</td>
<td>0.99</td>
<td>1.00</td>
</tr>
<tr>
<td>Self-rated health (good)</td>
<td>2.11 *** 1.40 3.16 2.04 **</td>
<td>1.35 3.06</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Self-rated health (very good)</td>
<td>1.50 * 1.02 2.20 1.47</td>
<td>1.00 2.16</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age: 40-46</td>
<td>0.65 * 0.45 0.94 0.62 *</td>
<td>0.42 0.90</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age: 47-53</td>
<td>0.78</td>
<td>0.55 1.12 0.77</td>
<td>0.54 1.11</td>
<td></td>
</tr>
<tr>
<td>High school graduate</td>
<td>0.92</td>
<td>0.66 1.27 0.94</td>
<td>0.68 1.31</td>
<td></td>
</tr>
<tr>
<td>Ever smoked</td>
<td>1.48 *</td>
<td>1.08 2.03</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nagelkerke $R^2$</td>
<td>0.04</td>
<td>0.04</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$\Delta R^2$</td>
<td>0.01</td>
<td>0.01</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note. Data from Statistics Canada, National Population Health Survey, Cycles 1-7. WO = without health behaviour or W = with health behaviour. OR = odds ratio; CI = confidence interval; OR ± 95% CI; LL = lower limit; UL = upper limit. Independent variables: self-rated health: good = 1 if good, very good = 1 if very good (reference group is excellent); age group: 40-46 years = 1 if 40-46 years, 47-53 years = 1 if 47-53 years (reference group is 54-59 years); high school graduate = 1 if high school graduate; ever smoked = 1 if ever smoked.

*p < .05. **p < .01. ***p < .001.

6.4.1.1.2 Model 3b

Table 6-10, which deals with health status decline before income status decline (among respondents with health status decline), depicts the binary logistic regression findings for health status decline before income status decline (among respondents with income status decline), using block entry, first without including one indicator of health behaviour and then including it, for both sexes together. One predictor was statistically significant in the outcome. Respondents whose health at Time 1 was very good ($p = 0.045$), as compared to excellent, were less likely to experience this outcome. The inclusion of the health behaviours did not improve the fit of the model; no increase in the Nagelkerke $R^2$ resulted.
Table 6-10

Binary Logistic Regression Outcomes From Models Predicting Health Status Decline Before Income Status Decline
(Among Respondents With Health Status Decline; Model 3b; N = 684)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Both sexes</th>
<th>WO</th>
<th>OR ± 95% CI</th>
<th>W</th>
<th>OR ± 95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total household income</td>
<td>1.00</td>
<td>0.99</td>
<td>1.02</td>
<td>1.00</td>
<td>0.99</td>
</tr>
<tr>
<td>Self-rated health (good)</td>
<td>1.12</td>
<td>0.53</td>
<td>2.40</td>
<td>1.16</td>
<td>0.54</td>
</tr>
<tr>
<td>Self-rated health (very good)</td>
<td>0.39 *</td>
<td>0.15</td>
<td>0.98</td>
<td>0.40</td>
<td>0.16</td>
</tr>
<tr>
<td>Age: 40-46</td>
<td>1.18</td>
<td>0.55</td>
<td>2.53</td>
<td>1.25</td>
<td>0.58</td>
</tr>
<tr>
<td>Age: 47-53</td>
<td>1.81</td>
<td>0.88</td>
<td>3.70</td>
<td>1.85</td>
<td>0.90</td>
</tr>
<tr>
<td>High school graduate</td>
<td>0.81</td>
<td>0.45</td>
<td>1.47</td>
<td>0.79</td>
<td>0.43</td>
</tr>
<tr>
<td>Ever smoked</td>
<td></td>
<td></td>
<td></td>
<td>0.68</td>
<td>0.37</td>
</tr>
<tr>
<td>Nagelkerke $R^2$</td>
<td>.05</td>
<td></td>
<td>.05</td>
<td></td>
<td>.01</td>
</tr>
</tbody>
</table>

Note. Data from Statistics Canada, National Population Health Survey, Cycles 1-7. WO = without health behaviour or W = with health behaviour. OR = odds ratio; CI = confidence interval; OR ± 95% CI; LL = lower limit; UL = upper limit. Independent variables: self-rated health: good = 1 if good, very good = 1 if very good (reference group is excellent); age group: 40-46 years = 1 if = 40-46 years, 47-53 years = 1 if = 47-53 years (reference group is 54-59 years); high school graduate = 1 if high school graduate; ever smoked = 1 if ever smoked. *p < .05. **p < .01. ***p < .001.

6.5 Model 4 Findings

As stated above, although in previous sections, the declines included deceased respondents, in this section, both the declines and the regains exclude deceased respondents. Therefore, the following models do not include respondents who were deceased.

Per above, the same independent variables as were used in all of the previous models were employed in Model 4a and Model 4b, with two additions. Model 4a includes a variable titled health status declines before or at same time as income status decline. Model 4b includes a variable titled income status declines before or at same time as health status decline.

6.5.1 Multivariate findings

6.5.1.1 Binary logistic regression model

As stated above, 15 variables were employed for Model 4 (and were made operational in Model 4a and Model 4b). This model responded to two questions: Among respondents with an income status decline, what factors are associated with an income status regain after experiencing an income status decline (Model 4a), and, among respondents with a health status decline, what factors are associated with a health status regain after experiencing a health status decline (Model
4b)? Furthermore, respondents whose income status regained after experiencing an income status decline are compared to those whose health status regained after experiencing a health status decline.

6.5.1.1.1 Model 4a

Table 6-11 depicts the binary logistic regression findings for an income status regain after experiencing an income status decline, using block entry, first without including the four indicators of health behaviour and then including them, for both sexes together. For this submodel (excluding health behaviour indicators), five predictors were statistically significant in the outcome. They were total household income, sex, age, marital status, and educational status. Without including health behaviour indicators, another predictor, that is, homeownership was statistically significant in the outcome. The odds ratio provides more information about the relationship between these predictors and the outcome variable: For each one-unit ($1,000) increase in total household income, without and with the inclusion of health behaviour, the odds of respondents experiencing this outcome were reduced by a factor of slightly less than one, controlling for other variables in the model. In other words, respondents who had lower total household income at Time 1, rather than higher total household at Time 1 were more likely to experience this outcome. The odds of this outcome, without and with the inclusion of health behaviour, were respectively 1.75 times greater \((p < .001)\) and 1.72 times greater \((p = .001)\) if a respondent’s sex was male respondent rather than female respondent. The odds of this outcome, without and with the inclusion of health behaviour, were respectively 4.27 times greater \((p < .001)\) and 4.16 times greater \((p < .001)\) if the respondents were members of the younger group (40 to 46 years of age) rather than of the older group (54 to 59 years of age). The odds of this outcome, without and with the inclusion of health behaviour, were respectively 1.94 times greater \((p = .005)\) and 1.96 times greater \((p = .005)\) if a respondent’s marital status was married rather than another marital status. The odds of an income status regain, without and with the inclusion of health behaviour, were respectively 1.61 times greater \((p = .011)\) and 1.65 times greater \((p = .007)\) if a respondent was a high school graduate rather than not a high school graduate. The odds of an income status regain, without the inclusion of health behaviour, was lower \((p = .048)\) if a respondent was a homeowner rather than not a homeowner.
Table 6-11
Binary Logistic Regression Outcomes From Models Predicting Income Status Regain After Experiencing Income Status Decline (Model 4a; N = 1,028)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Both sexes</th>
<th>WO</th>
<th>W</th>
<th>OR ± 95% CI</th>
<th>OR ± 95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total household income</td>
<td></td>
<td></td>
<td></td>
<td>0.98 ***</td>
<td>0.98 ***</td>
</tr>
<tr>
<td>Self-rated health (good)</td>
<td></td>
<td></td>
<td></td>
<td>0.74</td>
<td>0.73</td>
</tr>
<tr>
<td>Self-rated health (very good)</td>
<td></td>
<td></td>
<td></td>
<td>0.85</td>
<td>0.84</td>
</tr>
<tr>
<td>Male</td>
<td></td>
<td></td>
<td></td>
<td>1.75 ***</td>
<td>1.62</td>
</tr>
<tr>
<td>Age: 40-46</td>
<td></td>
<td></td>
<td></td>
<td>4.27 ***</td>
<td>4.64</td>
</tr>
<tr>
<td>Age: 47-53</td>
<td></td>
<td></td>
<td></td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td>Married</td>
<td></td>
<td></td>
<td></td>
<td>1.94 **</td>
<td>1.81</td>
</tr>
<tr>
<td>High school graduate</td>
<td></td>
<td></td>
<td></td>
<td>1.61 *</td>
<td>1.79</td>
</tr>
<tr>
<td>Homeowner</td>
<td></td>
<td></td>
<td></td>
<td>0.59 *</td>
<td>0.62</td>
</tr>
<tr>
<td>Non-White</td>
<td></td>
<td></td>
<td></td>
<td>1.66</td>
<td>1.78</td>
</tr>
<tr>
<td>Immigrant</td>
<td></td>
<td></td>
<td></td>
<td>1.18</td>
<td>1.25</td>
</tr>
<tr>
<td>Employed</td>
<td></td>
<td></td>
<td></td>
<td>0.82</td>
<td>0.83</td>
</tr>
<tr>
<td>Ever smoked</td>
<td></td>
<td></td>
<td></td>
<td>1.18</td>
<td>1.18</td>
</tr>
<tr>
<td>Heavy drinker</td>
<td></td>
<td></td>
<td></td>
<td>1.25</td>
<td>1.25</td>
</tr>
<tr>
<td>Physically inactive</td>
<td></td>
<td></td>
<td></td>
<td>1.14</td>
<td>1.14</td>
</tr>
<tr>
<td>Obese</td>
<td></td>
<td></td>
<td></td>
<td>1.03</td>
<td>1.03</td>
</tr>
<tr>
<td>Health status declines before or at same time as income status declined</td>
<td></td>
<td></td>
<td></td>
<td>1.19</td>
<td>1.20</td>
</tr>
<tr>
<td>Nagelkerke $R^2$</td>
<td></td>
<td>.18</td>
<td>.18</td>
<td>.00</td>
<td>.00</td>
</tr>
</tbody>
</table>

Note. Data from Statistics Canada, National Population Health Survey, Cycles 1-7. WO = without health behaviour or W = with health behaviour. OR = odds ratio; CI = confidence interval; OR ± 95% CI; LL = lower limit; UL = upper limit. Model excludes the deceased. Independent variables: self-rated health: good = 1 if good, very good = 1 if very good (reference group is excellent); male respondent = 1 if male respondent; age group: 40-46 years = 1 if = 40-46 years, 47-53 years = 1 if = 47-53 years (reference group is 54-59 years); married = 1 if married (reference group is another marital status); high school graduate = 1 if high school graduate; homeowner = 1 if homeowner; non-White = 1 if non-White; immigrant = 1 if immigrant; employed = 1 if employed; ever smoked = 1 if ever smoked; heavy drinker = 1 if heavy drinker; physically inactive = 1 if physically inactive; obese = 1 if obese; health status declined before or at same time as income status declined = 1 if health status declined before or at same time as income status declined.

6.5.1.1.2 Model 4b

Table 6-12 depicts the binary logistic regression findings for health status regain after experiencing health status decline (among respondents with health status decline), using block entry, first without including the four indicators of health behaviour and then including them, for both sexes separately. For this submodel (excluding health behaviour indicators), three predictors were statistically significant in the outcome. They were total household income,
immigrant status, and income status decline before or at same time as health status decline. The odds ratio provides more information about the relationship between these predictors and the outcome variable. For each one-unit ($1,000) increase in total household income, the odds ($p = .004$) that the respondents experienced a regain in health were increased by a factor of slightly more than one, controlling for other variables in the model. In other words, the respondents who had higher total household income at Time 1, rather than lower total household at Time 1 had almost equal odds of experiencing this outcome. The odds of a health status regain after experiencing a health status decline were decreased if the respondent was an immigrant ($p = .007$). Those respondents whose income status declined before or at the same time as their health status declined face lower odds of experiencing a health status regain after experiencing a health status decline ($p < .001$).

For this submodel (excluding health behaviour indicators), five predictors were statistically significant in the outcome. They were total household income, educational status, immigrant status, smoking history, and drinking habits. For each one-unit ($1,000$) increase in total household income, the odds that the respondents experienced this outcome were increased by a factor of slightly more than one ($p = .005$). The odds of a health status regain were decreased ($p = .048$) if the respondent was a high school graduate. The odds of a health status regain were decreased if the respondent was an immigrant ($p = .006$). The odds of a health status regain were decreased if the respondent was a smoker or has smoked ($p < .001$) or was a heavy drinker ($p = .009$).
Table 6-12

Binary Logistic Regression Outcomes From Models Predicting Health Status Regain After Experiencing Health Status Decline (Model 4b; N = 400)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Both sexes</th>
<th>WO</th>
<th>OR ± 95% CI</th>
<th>W</th>
<th>OR ± 95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>1.02 **</td>
<td>1.01 1.04</td>
<td>1.02**</td>
<td>1.01 1.04</td>
</tr>
<tr>
<td>Total household income</td>
<td></td>
<td>1.01 1.04</td>
<td>1.01 1.04</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Self-rated health (good)</td>
<td>0.40</td>
<td>0.14 1.17</td>
<td>0.15 1.31</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Self-rated health (very good)</td>
<td>0.41</td>
<td>0.13 1.29</td>
<td>0.13 1.32</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>1.18</td>
<td>0.63 2.19</td>
<td>0.63 2.29</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age: 40-46</td>
<td>0.79</td>
<td>0.36 1.75</td>
<td>0.44 2.33</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age: 47-53</td>
<td>0.76</td>
<td>0.35 1.65</td>
<td>0.41 2.04</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Married</td>
<td>0.62</td>
<td>0.27 1.44</td>
<td>0.27 1.54</td>
<td></td>
<td></td>
</tr>
<tr>
<td>High school graduate</td>
<td>0.56</td>
<td>0.27 1.18</td>
<td>0.46 0.99</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Homeowner</td>
<td>1.68</td>
<td>0.79 3.59</td>
<td>0.70 3.22</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-White</td>
<td>1.08</td>
<td>0.37 3.13</td>
<td>0.27 2.54</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Immigrant</td>
<td>0.37</td>
<td>0.18 0.76</td>
<td>0.15 0.72</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Employed</td>
<td>1.87</td>
<td>0.96 3.64</td>
<td>0.94 3.76</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ever smoked</td>
<td></td>
<td>0.21***</td>
<td>0.10 0.46</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Heavy drinker</td>
<td></td>
<td>0.42**</td>
<td>0.22 0.81</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Physically inactive</td>
<td></td>
<td>1.60 7.6</td>
<td>0.76 3.34</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Obese</td>
<td></td>
<td>0.70 3.7</td>
<td>0.37 1.34</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Income status declined before or at same time as health status decline</td>
<td>0.23 ***</td>
<td>0.11 0.48</td>
<td>0.69 1.46</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nagelkerke $R^2$</td>
<td></td>
<td>.19 .23</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$\Delta R^2$</td>
<td></td>
<td>.04</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note. Data from Statistics Canada, National Population Health Survey, Cycles 1-7. WO = without health behaviour or W = with health behaviour. OR = odds ratio; CI = confidence interval; OR ± 95% CI; LL = lower limit; UL = upper limit. Model excludes the deceased. Independent variables: self-rated health: good = 1 if good, very good = 1 if very good (reference group is excellent); male respondent = 1 if male respondent; age group 40-46 years = 1 if = 40-46 years, 47-53 years = 1 if = 47-53 years (reference group is 54-59 years); married = 1 if married (reference group is another marital status); high school graduate = 1 if high school graduate; homeowner = 1 if homeowner; non-White = 1 if non-White; immigrant = 1 if immigrant; employed = 1 if employed; ever smoked = 1 if ever smoked; heavy drinker = 1 if heavy drinker; physically inactive = 1 if physically inactive; obese = 1 if obese; income status declined before or during same cycle as health status declined = 1 if income status declined before or during same cycle as health status declined.

* $p < .05$. ** $p < .01$. *** $p < .001$.

6.6 Chapter Summary

This chapter reports, model by model, on the multivariate analyses undertaken. The relationships between dependent and independent variables, along with the relationships between independent variables and independent variables also were explored. With respect to the former,
the relationships between income status decline and health status decline were examined from various perspectives: the occurrence of status decline, the sequence of status decline, and the occurrence of status regain after decline. These analyses, employing binary logistic regression, permit examinations of the predictors of the outcomes as specified in Models 1 through 4.

The following is a summary of the multivariate binary logistic regression analyses undertaken for Models 1 through 4. In all models, income status and self-rated health at the outset were frequent predictors of outcomes. Among the demographic predictors, age and educational status were frequent predictors of outcomes. Among the health behaviour predictors, smoking history was a frequent predictor of outcomes.

Model 1 examined the predictors of the following outcomes: neither income status decline nor health status decline, income status decline and no health status decline, health status declined and not income status, and income status declined and health status declined. Figure 6-1 graphically depicts, in a brief summary (but not separated by sex), the predictors of decline in income status and/or health status.

<table>
<thead>
<tr>
<th>Model 1a</th>
<th>Predictors of No Income Status Decline and No Health Status Decline</th>
</tr>
</thead>
<tbody>
<tr>
<td>n = 782/2,368</td>
<td></td>
</tr>
<tr>
<td>More likely</td>
<td></td>
</tr>
<tr>
<td>Lower income at outset</td>
<td></td>
</tr>
<tr>
<td>Younger or middle age group</td>
<td></td>
</tr>
<tr>
<td>High school graduate</td>
<td></td>
</tr>
<tr>
<td>Employed</td>
<td></td>
</tr>
<tr>
<td>Less likely</td>
<td></td>
</tr>
<tr>
<td>Good health at outset</td>
<td></td>
</tr>
<tr>
<td>Smoker or has smoked</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Model 1b</th>
<th>Predictors of Income Status Decline Only</th>
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<td>Lower income at outset</td>
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<td>High school graduate</td>
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Figure 6-1. Predictors of decline in income status and/or health status with the inclusion of health behaviour variables not stratified by sex: National Population Health Survey Cycles 1-7 (Model 1; N = 2,368)
In the case of Model 2, first, the predictors of income status decline before health status decline (among respondents with a decline in both income status and health status) are examined. Second, the predictors of health status decline before income status decline as well as respondents with income status and health status decline during same cycle (among respondents with a decline in both income status and health status) are examined. In Figure 6-2 (Model 2), the predictors of the temporal order of the decline in income status and health status (among respondents who had a decline in income status and health status) by sex are depicted.

In the case of Model 3, first the predictors of the outcome, income status decline before health status decline (among respondents with income status decline) are examined. Second, the predictors of the outcome, health status decline before income status decline (among respondents with health status decline) are examined. In Figure 6-3 (Model 3), the predictors of the specified sequence of the decline in income status (among respondents who had a decline in income status) and the predictors of the specified sequence of the decline in health status (among respondents who had a decline in health status) are depicted.
Figure 6-3. Predictors of sequence of decline in income status and predictors of sequence of decline in health status with the inclusion of health behaviour variables given occurrence of income or health status decline: National Population Health Survey Cycles 1-7 (Model 3a, \( N = 1,283 \); Model 3b, \( N = 684 \)). Very good health (vs. excellent) is statistically significant without the inclusion of health behaviour variables. Respondents with very good health were less likely to experience the Model 3b outcome.

In the case of Model 4, first, the predictors of an income status regain after experiencing an income status decline are examined. Second, the predictors of health status regain after experiencing health status decline (excluding deceased) are examined. In Figure 6-4 (Model 4), the predictors of the regain in income status and health status are depicted.

Figure 6-4. Predictors of regain in income status and health status with the inclusion of health behaviour variables: National Population Health Survey Cycle 3 to 7 (Model 4a, \( N = 1,028 \); Model 4b, \( N = 400 \)).
Chapter 7
Discussion

7.1 Introduction to Discussion

In this chapter, the responses to the study’s research questions are interpreted. These interpretations are a result of an examination of the mechanisms and processes underlying the health-income dynamic.

The research questions that were posed are answered through the four models that formed the crux of this thesis’s analyses. For each model, discussed are the frequency distributions of variables and, whenever relevant, changes between Cycle 1 and Cycle 7. The frequency distributions provide context to the logistic regression statistics, and hence aid in their interpretation. The logistic regression statistics discussed are the statistical significance of variables ($p$ value), the strength of association as represented by effect size values (odds ratio) and the values of the Nagelkerke $R^2$, the measures of how well future outcomes are likely to be predicted by the model. Model 1’s logistic regression analyses were completed for both sexes together and separately for male and female respondents. Model 2’s analyses were completed separately for male and female respondents. Model 3 and Model 4’s analyses were not stratified by sex; they were only completed for both sexes together. Contrasted are the findings when health behaviours were included in the models and when they were not. To contextualize and interpret the findings, they are compared with various related studies. For each model, discussed is whether the study’s goals were met and the research questions were answered. The chapter concludes with, first, a variable-by-variable summary, second, a model-by-model summary, and third, a summary of the extent to which the social causation versus reverse causation hypotheses apply.

7.2 Expected and Unexpected Findings

Discussed in this chapter is the extent to which results match expectations given current theoretical understandings and/or prior studies in various literatures. In general, findings are expected or unexpected. It was expected that the variables in the models would promote or prevent an income status change, a health status change, or a particular sequence of a status change. For example, it was expected that older people would be more likely to experience a health status decline. The change in frequency distribution of independent variables after some respondents withdrew from the study was expected. No change in status over the seven cycles of the study was likely or possible for the sex, visible minority status, and immigrant status variables. Still other changes may be a result of actions taken by the
respondents: Between Cycle 1 and Cycle 7, it was expected that changes in life circumstances would result in differences in the values of some variables, for example, marital status, homeownership status, and employment status.

Finally, some findings were unexpected; there was no obvious explanation for them. It was not expected, based on the literature, that higher total household income would be associated with an income status decline. Some unexpected changes may be the result of exogenous changes that were not reported or measured in the study but which affected the respondents. Unexpected changes also could be the result of interactions between or among the independent variables. These unanticipated results are interpreted in light of the current literature.

7.3 Model 1

This section is a discussion of the first of four models; first, it entails an interpretation of findings vis-à-vis frequency distributions and income status decline and/or health status decline. Next, discussed are factors predictive of no decline in both income status and health status (Model 1a), a decline in income status only (Model 1b), a decline in health status only (Model 1c), and a decline in income status and health status (Model 1d).

7.3.1 Model 1: frequency of total household income, HIR, and income status decline

Univariate statistics were generated for total household income (Table 5-1 and Table 5-2) and the ratio of household income to LICO, that is, Household Income Ratio (HIR; Table 5-3). The average total household income for respondents at Cycle 1 was $53,984. More than two in ten respondents or 21.9% had household incomes of $90,000 or more and this represented the most frequently reported category of all categories. One possible explanation for this seemingly high frequency of high income is that many respondents were members of dual-earner households. In Canada, in 2008 (one point in time during the study period), the average annual income of dual-earner couples was comparable, that is, $92,040 (K. Marshall, 2009).

Although HIR was not employed per se as a variable, it was employed in the construction of the dependent variables income status decline (and regain), and therefore it is instructive to examine the descriptive findings for HIR for Cycles 1 to 7. Over the seven cycles of data collection, the sample reporting HIR declined from 2,368 to 2,009 (Table 5-3), a 15.2% decrease.
From Cycles 1 to 7, the HIR increased incrementally in every cycle except for two (Cycle 2 and Cycle 5). In Cycle 1, for both sexes together, the HIR was 2.57. In Cycle 7, for both sexes together, the HIR was 3.06. Over the seven cycles, the study sample’s mean HIR increased by approximately twenty percent while the majority (54.2%; Table 4-3) of respondents had an income status decline in the study period. Given the relatively high proportion of all respondents who had at least one decline in their income status, a decline in mean HIR for all respondents was anticipated. Over the life course, incomes decline (Duncan, 1988; Williams, 2010). Duncan’s (1988) analyses of data from the U.S. Panel Study Income Dynamics, for example, indicated that over a span of 11 years about one third of respondents experienced declines of more than 50% in the ratio of income to needs. A possible explanation for the 19.3% increase in HIR is as follows: While total household income declined, it also regained (70.8% regained their total household income after experiencing a decline)--respondents had a higher HIR than they did at Cycle 1 by the end of Cycle 7.

There were differential income changes for male respondents versus female respondents in the study. More female respondents compared with male respondents had an income status decline: 57.4% versus 51.0% (Table 4-3). There is literature that supports the finding that female respondents, more than male respondents, experience income status declines (Beach, Finnie, & Gray, 2010). Female respondents (vs. male respondents) not only had higher rates of income status decline (Cycles 1 to 7), they had lower average household income (Cycle 1), and lower HIR means (Cycle 1 and Cycle 7). The average household income of male respondents was higher than for female respondents: $55,125 compared with $52,792 respectively in Cycle 1. There were differences in the HIR between male respondents and female respondents in Cycle 1 and in their relative changes by Cycle 7: In Cycle 1, the average HIR for male respondents was 2.61 compared with 2.53 for female respondents. In Cycle 7, the corresponding average HIR scores were 3.48 for male respondents and 2.63 for female respondents, a statistically significant difference. The HIR increased by 33.6% for male respondents, but by only 4.2% for female respondents. There are various possible reasons for this statistically significant male-female difference: The reality is that women in Canada are more susceptible to poverty than are men. Indeed, throughout their lives, women have higher rates of poverty than men do (Statistics Canada, 2008f). This discrepancy occurs largely because of the nature of women's participation in the paid labour force and their family responsibilities. During their working careers, women often have casual, temporary, or part-time jobs (Public Health Agency of Canada, 2005); therefore, earn less than men (Government of
Canada, 2006a). Women are also likely to be primary caregivers raising children, tending to aging relatives, or nursing ailing spouses, hindering full-time, continuous employment. This workforce participation pattern affects women’s entitlement to private and some public pension benefits and the amounts. Women are more likely than men are to exhaust their savings (Government of Canada, 2006a). It is possible that female respondents’ HIR did not increase as much as male respondents because more female respondents than male respondents were living alone and therefore female respondents’ total household incomes were lower--their incomes were not augmented by virtue of co-habitation. Finally, it is possible that the remaining female respondents in the study in Cycle 7 were mostly poor and the remaining male respondents were not. This attrition would have a differential effect on their respective rates of HIR increase.

7.3.2 Model 1: frequency of health rating, health behaviours, and health status decline

With respect to the breakdown of the univariate statistics related to self-rated health, the following were the findings (Table 5-4): In Cycle 1, the most frequent rating or 43.7% was very good. About equal numbers of respondents reported either good or excellent health. Almost three quarters or 71.1% of respondents reported very good or excellent health (vs. good).

In this study, in 1998-1999, the proportion of male respondents reporting very good/excellent health was only slightly greater than the proportion of female respondents (respectively 69.7% vs. 69.1%; Table 5-4), but it was statistically significant. Shields and Shooshtari’s (2001) analyses of a cross-sectional sample of the 1998-1999 NPHS revealed that men reported very good/excellent health more often than women did (63% vs. 60%); however, there was a statistically significant difference only between male and female respondents for those aged 45 to 54. Comparisons between Shields and Shooshtari’s (2001) study and this study were hampered by the fact that dissimilar age groups were examined. In this study, the age groups were 40 to 46, 47 to 53, and 54 to 59 years of age; in Shields and Shooshtari’s (2001) study, they were 25 to 34, 35 to 44, 45 to 54, 55 to 64, 65 to 74 and over 75 years of age. It is to be noted that male-female differences in ratings may be a result of the different approaches male and female respondents use to rate their health (Shields & Shooshtari, 2001). When rating their health, women are more likely to consider emotional factors and the presence of less serious illnesses than are men: women, more than men, rate their health as poor. Moreover, studies by Denton and Walters (1999), Verbrugge (1989b), and Macintyre, Hunt, and Sweeting (1996) indicated that sex differences in
patterns of morbidity are not as clear-cut as previously held. Sex differences in morbidity vary according to the person’s age and the nature of their illness. Because of the dissimilar age groups and these other factors, it is not known whether Shields and Shooshtari’s (2001) findings support or are inconsistent with the findings for this study. At minimum, their findings do not dispute this study’s findings.

Among all respondents remaining in Cycle 7, 10.7% (Table 5-4) had fair or poor health by the end of Cycle 7. The proportion of respondents whose health was good or very good remained about the same as in Cycle 1: 72.5%. The proportion reporting excellent health status declined between Cycle 1 and Cycle 7, from 27.4% to 16.8%, a decrease of 10.6%. This was not entirely the result of attrition. It was estimated that, at minimum, 2.6% of the decrease was the result of factors other than attrition. By Cycle 7, slightly more female respondents than male respondents had excellent health. For males, the proportion declined from 27.9% to 16.7%, a decrease of 11.2%. For female respondents, the proportion declined from 26.9% to 17.0%, a decrease of 9.9%. It was estimated that the decrease, for reasons other than attrition, for male respondents was a minimum of 2.2% and the decrease, for reasons other than attrition, for female respondents was a minimum of 3.0%. These findings may be reviewed together with another of this study’s findings. Over the course of seven cycles, a higher proportion of male respondents compared with female respondents had a health status decline: 30.7% versus 26.9% (Table 4-3). The literature suggests that male respondents, more than female respondents, experience health status declines: Although there is not a consensus about gender differences in morbidity rates (Crimmins, Kim, & Sole-Aura, 2011), men do have higher mortality rates compared to women (Oksuzyan, Brannum-Hansen, & Jeune, 2010; Verbrugge, 1989a).

Apropos these findings and their relationship to health behaviours, the frequency distribution of health behaviours is examined. In Cycle 1, 60.8% of respondents reported that they were physically inactive (Table 5-1); 28.1% had a history of smoking (Table 5-1); 20.7% were heavy drinkers (Table 5-1), and 15.4% reported that they were obese (Table 5-1). Male respondents were significantly more commonly smokers or had smoked (31.7% vs. 24.4%; Table 5-1) or heavy drinkers (22.0% vs. 19.3%; Table 5-1), whereas female respondents were more commonly inactive (61.3% vs. 60.3%; Table 5-1) or obese (16.0% vs. 14.9%; Table 5-1). The rates of these risk factors for male and female respondents were similar to those reported by Denton and Walters (1999) with one exception. This study found that
women had a higher rate of obesity than men did, whereas their study found the opposite. Denton and Walters’s (1999) research was also based on the NPHS; however, their study sample included those age 20 and over. It is likely that because the age of respondents in this study’s sample was older, women’s rates of obesity were greater than the men’s rates. This is consistent with findings in the report *Obesity in Canada* (Public Health Agency of Canada, Canadian Institute for Health Information, 2009).

It is reasonable to conclude that male (vs. female) respondents’ higher rates of health status decline (Cycles 1 to 7), higher rates of fair or poor health (Cycle 7), higher rates of smoking (Cycle 1), higher rates of heavy drinking (Cycle 1), and higher mortality rates are interrelated.

7.3.3 Model 1: frequency of income status decline versus health status decline

From Cycle 2 to Cycle 7, two thirds of respondents had a decline in either health status or income status, or both (Table 4-3). More importantly, however, of all respondents with a health status decline, more than half (55.8%) also had an income status decline. In comparison, of all respondents with an income status decline, 29.8% also had a health status decline. Again, not only were health status declines of any kind less frequently observed than income status declines, health status declines only were much less frequent than income status only declines (Figure 5-1). One eighth of respondents had a decline in health status only. In comparison, more than three times as many respondents had a decline in income status only. Less than one sixth of the respondents had an income status decline and a health status decline.

The comparatively small number of respondents who experienced a one-fold or a two-fold status decline in health status may be related to respondents in the total original sample who were in poor or fair health at the outset of the study period having been excluded. The proportion of the original sample of 4,340 respondents who were in poor or fair health, and were excluded of the sample for that reason, was 16.6% respondents (Table 4-2). There are various other possible explanations for health status decline being less common than income status decline: This study focused on the mid-life age group, a group that experiences relative good health and likewise rates their health at minimum as good (Shields & Chen, 1999). There are some indications that the health status of Canadians is improving; therefore, increasingly fewer respondents would experience health status declines (Health Canada, 2010). Another possible reason for health status decline being less common may be methodological. The criterion for what constitutes a health status decline may have been more stringent than the criterion for what
constitutes an income status decline. Finally, the more frequent income status declines during the study could be related to economic downturns during the same period. These downturns have been attributed successively to the economic crisis in Japan, the technology correction, the World Trade Center attack, the war in Iraq, and rising oil and gas prices.

One third of respondents had neither an income status decline nor health status decline compared with the original sample (Model 1a; Table 4-3). This is large in comparison to the proportion of respondents who experienced both an income status and a health status decline, or a decline in health status only. Within Model 1, the size of this group was second only to the size of the group of respondents whose income status declined and not their health status. Slightly more male respondents (34.3%) had neither an income status decline nor a health status decline than female respondents (31.8%; Table 4-3). Consistent with the literature that states that the majority of men and women in the age range of this study experience good health (Shields & Chen, 1999; Shields & Martel, 2006) are the findings for Model 1a and Model 1b combined. More than two thirds of male respondents (69.3%) and almost three quarters of female respondents (73.1%) did not experience a health status decline.

7.3.4 Model 1: frequency of other variables

In the study’s total sample for Model 1, about four in five respondents in Cycle 1 were married or in a common-law relationship (Table 5-5). At the outset, or at Cycle 1, more male respondents were married than female respondents. By Cycle 7, the proportion of married respondents decreased for both male respondents (1.3%) and female respondents (6.0%). In all cycles, the male-female difference was statistically significant. This study found that female respondents were less likely to take new partners. This observed change was likely due to men re-partnering more often than women in mid- or later-life (Statistics Canada, 2006i, 2012a), rather than a higher rate of attrition for married women as compared with married men.

More than seven out of 10 respondents were high school graduates at the outset (Table 5-6). In Cycle 1, 69.4% of the male respondents were high school graduates. In comparison, by Cycle 7, 71.5% of the male respondents were high school graduates. In Cycle 1, 74.2% of the female respondents were high school graduates. By Cycle 7, 75.9% of the female respondents were high school graduates. In all cycles, a statistically significant higher proportion of female respondents, as compared with male
respondents, were high school graduates, similar to the male-female distribution of high school graduates in Canada as a whole (Zeman, 2007).

The proportion of high school graduates increased by 2.6% between Cycle 1 and 7, with the increase for male respondents (3.0%) being higher than for female respondents (2.3%). It is unlikely that this was related to respondents having completed high school in this timeframe. It is more likely that there was a higher attrition rate of less well-educated respondents versus better-educated respondents (Alderman, Behrman, Watkins, & Kohler, 2001; Fitzgerald, Gottschalk, & Moffitt, 1998; Hill & Willis, 2001; Mirowsky & Reynolds, 2000; Olson & Witt, 2011).

In Cycle 1, less than one in 10 respondents was non-White (with a statistically significant slightly lower proportion of non-White female respondents as compared to male respondents). By comparison, per Statistics Canada (2006e), in 1996, 11.2% of Canadians were non-White. Per Statistics Canada (2001b), in 1996, men comprised slightly less than half of Canada’s non-White population. The corresponding statistic is that 62.2% of non-White respondents were male (data not shown). Non-White male respondents were over-represented in this study.

Approximately 90% of non-White respondents were immigrants (data not shown). In comparison, Statistics Canada 1996 (1998a) and 2006 (2011h) Census data indicated that about two thirds of non-Whites were immigrants (with the percentage being higher for female respondents than male respondents). This proportion seems to be stable over time. In this study, it is possible that more non-White respondents who were not immigrants were in poor or fair health at the outset and, therefore, were excluded from the study sample. As well, Census data included all ages, whereas this study’s respondents were of older ages, that is, those who were younger were excluded.

At the outset, more than eight out of 10 respondents owned their own home (Table 5-7). The rate of homeownership increased slightly by Cycle 7, for both sexes together (1.9%), and for male respondents (3.1%) and female respondents (0.7%). This reflects a broader trend in Canada whereby the homeownership rate increases as the population ages until retirement age, at which point the homeownership rate starts to decline (W. M. Brown & Lafrance, 2013; Hou, 2011; Statistics Canada, 2011c). In the study’s total sample, there were some differences according to the sex of the respondent: Among respondents who were homeowners, the homeownership rate was slightly higher for male
respondents (83.0%) than for female respondents (82.6%). One study indicated that although the rate of homeownership was higher for women living alone than for men living alone (Williams, 2010), the rate of homeownership was higher for male lone parents than for female lone parents (Statistics Canada, 2006j). Locating male versus female homeownership statistics for all types of marital status proved difficult. It may be that many homes are jointly owned and this does not facilitate ready male-female comparisons.

Another noteworthy finding was the proportion of respondents whose employment status between Cycle 1 and Cycle 7 went from employed to not employed. The proportion decreased 23.3%, from 80.2% to 56.9%. This decrease was not entirely the result of attrition. It was estimated that, at minimum, 18.0% of the decrease was the result of factors other than attrition: Many respondents reached age 65, traditionally the age of retirement, and therefore no longer were employed. In Cycle 1, a statistically significant larger number of male respondents as compared to female respondents were employed (87.5% vs. 72.5%; Table 5-8). By Cycle 7, 66.3% of male respondents were employed compared with less than one half of female respondents (47.3%). Between Cycle 1 and Cycle 7, the decrease in the employment rate for male respondents was 21.2% and for female respondents was 25.2%. Similarly, this was not all due to attrition. It estimated that more of the decline in the rate of employment for female respondents as compared to male respondents (a minimum of 19.6% vs. 16.3%) was related to reasons other than attrition. These results are consistent with other findings regarding sociodemographic trends for mid-life and older Canadians: fewer women than men were employed at older ages (Gower, 1997; Pyper & Giles, 2002; Statistics Canada, 2006j).

7.3.5 Model 1a: predictors of no decline in income status and no decline in health status

Again, Model 1a’s research question was, “What factors were predictive of no decline in income status and no decline in health status”? In Model 1a (Table 6-1), lower (vs. higher) total household income at the outset was predictive of no income status decline (as well as no health status decline). A possible explanation for the relationship between no income status decline and lower (vs. higher) total household income at the outset could be the existence in Canada of a social safety net (Smeeding & Sandstrom, 2005), which obviates an income status decline at the age of these respondents. Indeed, those in this study’s age group, although they may have had lower total household incomes, they may have had more stable incomes and therefore
were less prone to income fluctuations. This finding may be reflective of the fact that this group of respondents were in receipt of social assistance or public pensions. LaRochelle-Côté, Myles, and Picot (2008) indicated that the incomes of low-income individuals change little from their mid-50s onward; their incomes are protected by Canada’s social welfare system. Although this group is on a fixed income, they have a steady income (Smeeding & Sandstrom, 2005). Furthermore, per the social causation hypothesis, the absence of an income status decline may be related to the absence of a health status decline.

The other findings for Model 1a were as follows: Those respondents (without the inclusion of health behaviours in the modelling) who were in the younger or middle age group (vs. older), were a high school graduate (vs. were not), and were employed (vs. not employed) were more likely to experience the outcome. Respondents who were in good health (vs. excellent) and were smokers or had smoked were less likely to experience the outcome (with the inclusion of health behaviours).

Male respondents who had lower (vs. higher) total household income at the outset, were in the younger or middle age group, and were high school graduates, were more likely to have had neither an income status decline nor a health status decline (Model 1a with the inclusion of health behaviours). Male respondents who were in good health (vs. excellent), were or had been smokers, and were heavy drinkers were less likely to have had neither an income status decline nor a health status decline (Model 1a with the inclusion of health behaviours). These findings seem to be consistent with other similar research.

Male respondents who were married were more likely to experience the outcome--marriage is known to be protective factor for health for men. In other words, the findings from this study are consistent with what has been long established in the research literature (Robards, Evandrou, Falkingham, & Vlachantoni, 2012; Trovato & Lauris, 1989), that is, for men, in particular, marriage protects against health status decline. In addition, there is some evidence that the protective effect of marriage in terms of health status decline is constant when moving from married status to another marital status and back to married (Lillard & Waite, 1995). The literature also establishes that being part of a couple is a protective factor for men’s income (Gottschalk & Zhang, 2010). In sum, this profile of male
respondents who had no decline in income status and no decline in health status is consistent with the findings in the literature.

Without the inclusion of health behaviours in the modelling, female respondents who had lower total household income at the outset, were in the younger age group, were a high school graduate, were more likely to have had neither an income status decline nor a health status decline (Model 1a). Female respondents who were in good health (vs. excellent) at the outset, or who were or had been smokers were less likely to experience the outcome. The findings for female respondents, similar to the findings for male respondents, seem to be consistent with other research. Those female respondents (without the inclusion of health behaviours in the modelling) who were employed were more likely to experience no decline in income status or in health status. While for men, being married promoted experiencing this outcome, for women being employed promoted experiencing this outcome. Marriage was a protective factor for male respondents and employment was a protective factor for female respondents.

7.3.6 Model 1b: predictors of decline in income status and no decline in health status

The research question for Model 1b asked, “What factors were predictive of a decline in income status and no decline in health status”? In response, without and with the inclusion of health behaviours, the chances of experiencing the outcome were higher for respondents who had higher rather than lower total household income, heavy drinkers rather than nondrinkers or moderate drinkers, and inactive physically rather than active physically (Table 6-2). The chances of experiencing the outcome were lower for respondents (both sexes together) who had good health (vs. excellent) at the outset (and with the inclusion of health behaviours, very good health), were in the younger age group (vs. the older age group), were male respondents (vs. female respondents), and were a high school graduate (vs. not a high school graduate).

An unexpected finding was that higher (vs. lower) total household income at the outset was predictive of income status only decline. Although it was statistically significant, the odds ratio for this independent variable was very close to one. A possible explanation for higher income having been predictive of income status decline is a notion similar to Fuller-Thomson et al. (2011) ceiling effect: Perhaps the incomes of those at the top of the income ladder had nowhere to go except down. However, a ceiling effect is inconsistent with the notion of cumulative advantage as expressed in the reverse causation versus social causation hypotheses, critical gerontology, and the life course perspective. Another
explanation for this finding is that respondents who retired during the course of the study would have experienced a loss of income. Withdrawal from the labour force because of retirement generally reduces household income (LaRochelle-Côté, Picot, & Myles, 2010).

On the other hand, the finding regarding higher (vs. lower) total household income at the outset as a predictor of the absence of a decline in health status was expected. The social causation literature establishes that higher household income does prevent health status decline (Buckley, 2003; Buckley et al., 2004a; J. P. Smith, 2007).

Model 1b observations are consistent with Model 1a observations: In both submodels, the respondents did not have a health status decline and those respondents with good health (vs. excellent) were less likely to experience the outcome. Although none of the submodels of Model 1 addressed causation directly, there could have been an argument for reverse causation if the causal mechanism had been as follows: those respondents with poorer health at the outset were more likely to experience an income status decline. The inverse was the case: With the inclusion of health behaviours in the modelling, both sexes together and female respondents who had good or very good health (vs. excellent) at the outset were less likely to experience the outcome. The finding was that respondents with better health at the outset were more likely to have had an income status decline. These findings do not support reverse causation.

Surprisingly, among male respondents (and both sexes together), those who were physically inactive (vs. physically active) and heavy drinkers (vs. moderate or nondrinkers) were more likely to experience the outcome (of no decline in health status). This finding is seemingly inconsistent with the literature that establishes that physical activity promotes good health (Ramage-Morin et al., 2010; Shields & Shooshtari, 2001). It is also established in the literature that excessive alcohol consumption leads to health status decline (M. S. Kaplan et al., 2008) and moderation in drinking is associated with better health (Poikotainen, Vartiainen, & Korhonen, 1996). A related but unsurprising finding, with respect to the predictors of the absence of a health status decline was that male respondents who were obese (vs. not obese) were less likely to experience the outcome. This is consistent with the literature (Ramage-Morin et al., 2010; Shields & Shooshtari, 2001)—those who were obese were less likely to have had no health status decline. It is unclear why heavy drinkers and physically inactive (male respondents and
both sexes together) were more likely to experience the outcome and male respondents who were obese were less likely to experience the outcome, especially given that these latter two variables would appear to be related. Perhaps physical inactivity and heavy drinking were related to the income-status-decline component and oddly not the health-status-decline component of the outcome. If the study timeframe had been longer, for example, thirty years, perhaps some of these factors also would precipitate a health status decline. Consistent with this suggestion is evidence by McDonough and Berglund (2003) that deterioration of health is a slow process.

In the study, being in the younger age group protected against income status declines (without a health status decline). It is not surprising that respondents in the younger age group would be less likely to experience an income status decline. Among Canadians, instability, at least in earnings income, is lowest among prime-age (age 35–54) workers, but rises for older workers (age 55–64; Beach et al., 2010). Older people are more likely to withdraw from the labour force because of retirement and are less likely to become reemployed if laid off (Cawthorne, 2010).

This study also found that respondents who were male were less likely to experience the Model 1b outcome. This is consistent with evidence in the literature: Flippen and Tienda (2000) concluded that being a woman, combined with being older, was associated with a less stable income. According to Morissette and Ostrovsky’s (2007) study, lone mothers continued to experience market income instability.

When disaggregated by sex, male (vs. female) respondents who were married were less likely to have had an income status decline and not a health status decline. For these male respondents, their marital status may prevent an income status decline, that is, for male respondents, in particular, marriage protects against an income status decline. This is confirmed by the research literature (Robards et al., 2012; Trovato & Lauris, 1989). Respondents, and male respondents in particular, who were married and whose spouses work have had the benefit of sharing the financial responsibilities associated with raising children and running a household. In effect, their marital status acts as a buffer, warding off income status decline. Women’s contribution to household incomes tended to diminish instability in family income (Gottschalk & Zhang, 2010). In fact, Morissette and Ostrovsky (2005) found that in the period between 1996 and 2001, Canada’s tax and transfer system ensured the stability of market incomes of
younger families with husbands. Single parents would not have had this buffer. Male single parents, because of their higher incomes relative to female single parents, are, for the most part, responsible for child support payments (Steeves, 2012). It is plausible, that this in turn resulted in income status decline for these male respondents. It is clear that, in the context of the life course, one of the most important changes that affects later-life financial security for both men and women is a change in marital status (Crystal, 2006).

Another important finding in the current study, with respect to female respondents, was that non-Whites (vs. Whites) were less likely to experience an income status decline and no health status decline. Being non-White and female may protect against an income status decline in that it is possible that non-White women with low income were protected from an income status decline by Canada’s social safety net. Despite their incomes being low, they were stable. This also may be a result of non-White female respondents (particularly those over age 65) living with family (Maheux & Chui, 2011; Milan & Vézina, 2011); this thereby ensured their incomes were protected.

Finally, it is understandable that some factors prevented a health status decline, for example, higher total household income and being White (for female respondents), but it is puzzling that these factors were associated with an income status decline. The explanation may be a trend that started during the period of this study; it involved the disappearance in Canada of many low-skill but relatively well-paid jobs in unionized work settings (Betcherman & Lowe, 1997; Lowe, 1998; Maxwell, 2002, October 8; Townson, 2009; Yalnizyan, 2009; Yalnizyan, Ide, & Cordell, 1994). The profile of those in the population who were most adversely affected by this trend and Model 1b respondents’ profile are similar. Those with higher household incomes, and who were not well educated, were older, were female, were not married, and were not in good health would have been affected by the changing structure of the Canadian labour force.

7.3.7 Model 1c: predictors of decline in health status and no decline in income status

For Model 1c, the research question was, “What factors were predictive of a decline in health status and no decline in income status”? In response to this question, respondents (both sexes together) who had lower (vs. higher) total household income at the outset, had good health (vs. excellent) at the outset, were male respondents (vs. female respondents), were non-White (vs. White), and were smokers or had smoked (vs. never smoked) were more likely to experience the outcome (Table 6-3). Male respondents
who were in the younger or middle (vs. older) age group, and were heavy drinkers (vs. nondrinkers or moderate drinkers) were less likely to experience the outcome.

As expected, lower (vs. higher) total household income at the outset drove health status decline. It is to be noted that the odds ratio for this independent variable was very close to one but statistically significant. The literature confirms the finding that lower total household income at the outset is important as a predictor of poor health (Benzeval & Judge, 2001; Blane et al., 1993; Fuller-Thomson et al., 2011; McLeod et al., 2003; J. P. Smith, 2007). Model 1c supports social causation. Respondents with lower total household incomes at the outset were more likely to experience a health status decline.

Sex was a predictor of Model 1c’s outcome: This finding raises the question of why male respondents versus female respondents were more likely to have had a decline in health status only. Because of male respondents’ higher mortality rates (Crimmins et al., 2011; Verbrugge, 1989b), male respondents, more than female respondents, may have experienced health status declines and may not have experienced a concomitant income status decline. Their shorter life expectancy may have meant they had fewer years within which to experience an income status decline.

Other findings are consistent with the literature: Respondents (both sexes together and male respondents) who were more likely to experience the outcome were those who had good health (vs. excellent) at the outset and had smoked, or were smokers (vs. never smoked). Male respondents who were less likely to experience the outcome were those who were in the younger or middle (vs. older) age group, both without and with the inclusion of health behaviours. Aging and deterioration of health go hand in hand (M. Denton & Walters, 1999; Fuller-Thomson et al., 2011; Shields & Shooshtari, 2001).

It is unclear why male respondents who were heavy drinkers had a decreased likelihood of experiencing a health status decline. However, these findings are consistent with those of Shields and Shooshtari (2001); they found that weekly drinkers, which included heavy drinkers, were less likely to report fair or poor health. Model 1c’s findings, in this regard, are consistent with the findings for Model 1b; they are the inverse of one another. In both, perhaps heavy drinking was related to income status decline (its presence in Model 1b and its absence in Model 1c) and not health status decline. Perhaps health status declines due to heavy drinking might take longer than the period of this study to manifest themselves. If the study timeframe had been longer, perhaps a health status decline would have occurred.
With the model that included health behaviours, respondents (both sexes together and female respondents) who had lower (vs. higher) total household income at the outset, had good health (vs. excellent) at the outset, and were non-White were more likely to experience a health status decline. Canadians who are non-White tend to have better health than Whites and Aboriginals (Kobayashi, Prus, & Lin, 2008). Kobayashi et al.’s (2008) research appears to refute this study’s findings. However, it may be that this discrepancy in findings is related to the fact that this study examined what factors hastened a health status decline (while protecting against income status decline) and not, as theirs did, visible minority status as a predictor of health.

Germane to this discussion of Model 1c are some comparisons with Model 1b. One could expect that some of the variables that promote a decline in one of the submodels may protect against a decline in the same dependent variable in the other submodel. For example, because lower total household income was associated with health status decline in Model 1c, it was reasonable to expect a finding that higher total household income was a statistically significant variable in Model 1b, that is, a variable that protected against a health status decline. The findings from the two models are also consistent with respect to good health at the outset, and sex (as a predictor, not a stratifying variable). These Model 1c variables were the inverse of the respective Model 1b variables.

Model 1c had the second fewest number of statistically significant independent variables compared to the other submodels in Model 1 (Table 6-3). Notwithstanding, the Nagelkerke $R^2$ were .25 (for both sexes together), .33 (for male respondents) and .20 (for female respondents).

7.3.8 Model 1d: predictors of decline in income status and decline in health status

For Model 1d, the research question was, “What factors were predictive of a decline in both income status and health status”? In response to this question, with the inclusion of health behaviours and for both sexes together, respondents who had higher (vs. lower) total household income at the outset, had good or very good health (vs. excellent) at the outset, and had smoked, or had been a smoker (vs. never smoked) were more likely to experience the outcome. Those who were in a younger (vs. older) age group, and were a high school graduate (vs. were not) were less likely to experience the outcome.

With respect to the finding regarding good or very good health (vs. excellent) at the outset, Figure 5-3 speaks to whether respondents at various levels of self-rated health were more or less liable to
experience a health status decline. The figure depicts a tipping point for health status decline: Respondents with good health were approximately twice as likely to experience a health status decline as compared with those with either very good health or excellent health.

In contrast to this study’s finding that relatively worse health was a predictor of health status decline, Fuller-Thomson et al. (2011), in their study of new immigrants to Canada, found that relatively better health was a predictor of health status decline. Specifically, Fuller-Thomson et al. (2011) found that those in very good or excellent health (vs. good health) upon arrival in Canada had greatly increased chances of a decline in health. As stated above, Fuller-Thomson et al. (2011) suggest a ceiling effect, whereby respondents in their study had better health at the outset and who may have had nowhere to go except down in health status. Fuller-Thomson et al.’s (2011) study builds upon Newbold’s (2005) examination of the healthy immigrant effect which suggests that immigrants were healthier than Canadian-born upon arrival in Canada but experienced health status declines such that their health status matched that of Canadian-born.

An explanation for the difference between Fuller-Thomson et al.’s (2011) and the findings from this study may be due to another effect. This study’s respondents were middle-aged and older; therefore, this age demographic could be experiencing the effects of aging. At older ages, individuals experience more deterioration in their health. It is possible that with this study’s sample, the effect of aging on health overtook any ceiling effect, resulting in those in (merely) good health being more likely to experience a health status decline. It is instructive to examine other differences between the two studies: First, Fuller-Thomson et al. (2011) study’s focus was immigrants to Canada. Second, their study examined only one of the two outcomes of Model 1, that is, health status decline. The other outcome, income status decline was not featured in their study. Third, in their study, a two-step reduction in a respondent’s health rating constituted a health decline, whereas in this study, a decline from any level to fair or poor (or deceased) constituted a health status decline. Finally, for the self-rated health variable, the reference and target groups were the inverse of the ones used in this study. In this study, excellent health status was the reference group. Although very good health at the outset was more likely to be associated with health status decline in both studies, in the Fuller-Thomson et al. (2011) study, very good health was in reference to good health. In their study, both those with very good health and excellent health were more likely to have had a health status decline.
To understand Model 1d findings it is useful to compare them to the submodel findings that have been discussed thus far. Indeed, the discussion of the research related to the previous submodels sheds light on this submodel’s findings. As might be expected, the findings for Model 1a (neither an income nor a health status decline) were close to the inverse of the findings for Model 1d. Respondents in Model 1a were more likely to be younger, high school graduates, and employed whereas respondents in Model 1d were less likely to have these attributes. In Model 1a, lower total household income at the outset was related to no decline of income status and health status versus Model 1d, in which higher total household income at the outset was related to both income status decline and health status decline. Similarly, those who had good health (vs. excellent) at the outset were less likely to experience the outcome of Model 1a. These results were the inverse Model 1d; those who had good health (vs. excellent) at the outset were more likely to experience the outcome. These findings affirm the robustness of the interpretations of the statistically significant variables in Model 1a and Model 1d.

With respect to the interpretation of the variables that were statistically significant in Model 1a and Model 1d, the following is an exploration of the possible role of total household income at the outset. Interpretation is complex because, in Model 1b, the variable appears to be both a protector of health status decline and a promoter of income status decline; however, in Model 1d, it was a promoter of a two-fold status decline. Furthermore, the finding in Model 1b was consistent with the Model 1c finding, in that one was the inverse of the other.

The explanation of why higher total household income was associated with two-fold status declines may involve the self-rated health variable. Possibly, poorer health at the outset (that is, merely good and not excellent health), was a stronger promoter of health status decline than higher total household income was a protector against health status decline. In this regard, Model 1d would be consistent with the other submodels. Thus, it appears that poorer health was a promoter of health status decline, and higher total household income served mainly as a promoter of income status decline (and not, in the presence of other variables, as a protector against health status decline).

It is instructive to consider how other significant variables operate, in concert with higher total household income, to promote income status decline. Respondents with a high school education were more likely to experience the Model 1a outcome and less likely to experience either the Model 1b or
Model 1d outcomes. Since educational status was not statistically significant in Model 1c, high school education may protect primarily against income status decline in Model 1a. Higher total household income and relatively low educational attainment, in combination, may be related to income status decline.

Further comparisons of Model 1d with the results of Model 1b (income status only decline) and Model 1c (health status only decline) are useful. Some statistically significant variables in Model 1b and Model 1c may point to risk factors associated with one-fold versus two-fold status declines (Model 1d). Some of the statistically significant findings in one submodel were the inverse of the findings in the other, for example, sex in Models 1b and Model 1c. Male respondents were less likely to have the Model 1b outcome and were more likely to have the Model 1c outcome. Sex was not a statistically significant variable in either Model 1a or Model 1d. In other words, sex, by itself, did not appear to affect the risk of a two-fold status decline occurring. Male respondents, however, were more likely to have a health status only decline and were less likely to have an income status only decline.

In the comparison of the Model 1a and Model 1d findings, when the models were stratified by sex, male respondents who were married were more likely to have the Model 1a outcome. In Model 1b, male respondents who were married were less likely to have the Model 1b outcome. The interpretation is that being male and married protected against an income status decline.

Similarly, another comparison of Model 1a and Model 1d findings relates to female respondents. Female respondents who were employed were more likely to have the Model 1a outcome and less likely to have the Model 1d outcome. Being female and employed protected against two-fold status declines.

On the other hand, in Model 1b and Model 1c, the statistically significant visible minority status variables were the inverse of each other. Female respondents who were non-White were less likely to have the Model 1b outcome but they were also more likely to have had the Model 1c outcome. Being non-White protected against income status decline but promoted health status decline. Being non-White was not statistically significant in either Model 1a or Model 1d. Non-White status does not appear to either protect against a two-fold status decline or promote the likelihood of this outcome.
With respect to the age variable, respondents who were in the younger (vs. older) age group were less likely to experience Model 1b outcomes. There were some sex differences, with female respondents who were in the younger (vs. older) age group having been less likely to experience the Model 1b outcome. Male respondents who were in the younger and middle (vs. older) age group were less likely to experience the Model 1c outcome. In Model 1d (with the inclusion of health behaviours in the modelling), respondents in the younger (vs. older) age group were less likely to experience the outcome. In Model 1a (with the inclusion of health behaviours in the modelling), respondents in the younger (vs. older) age groups were more likely to experience the outcome. This internal consistency suggests that the passage of time was the mechanism that drove status declines: Respondents may have health status declines and income status declines (independently due to age) without the first health status decline or income status decline affecting the second status decline. The second status decline may occur regardless, an effect of aging. Simply put, social causation may not necessarily be the mechanism that was related to the statistically significant age group variables in Model 1d.

It is interesting to note which variables were not statistically significant in either Model 1a or Model 1d. The variables were sex, homeownership status, visible minority status, immigrant status, physical activity, and obesity. In other words, these variables did not appear to either protect against two-fold status declines or promote two-fold status declines.

It is understandable, that for Model 1d, the Nagelkerke $R^2$ was .11 (for both sexes together), the lowest for all submodels in Model 1. The occurrence of both an income status decline and health status decline was a relatively uncommon outcome (Figure 5-1); therefore, it follows that the size of the Nagelkerke $R^2$ would be less.

7.3.9 Model 1: goals met and research questions answered

Model 1 responded indirectly to the primary goal (Table 7-1) of determining whether income status decline was a stronger determinant of health status decline than health status decline was of income status decline. In response to this question, first, in Model 1a, the absence of a decline in income status may have been linked to the absence of a decline in health status. Second, in Model 1b, the income status decline may have been precipitated, not by a health status decline, but by health at the outset. However, health at the outset provided little evidence that reverse causation was operating. Third, in Model 1c, because lower total household income was associated with health status decline there is some
support for social causation. Fourth, in Model 1d, there is little support for either social causation or reverse causation—the findings were probably related to the effects of aging.
Table 7-1
Fulfillment of Study’s Research Goals

<table>
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<th>Goals</th>
<th>During the 14-year period (1994-1995 to 2006-2007) for mid-and later-life Canadians (ages 40 to 59 at the outset)</th>
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Goal 1 was to determine whether income status decline a stronger determinant of health status decline than health status decline was of income status decline. Goal 2 was to determine whether sociodemographic factors and health behaviour predictive of changes in income status and health status. Goal 3 was to delineate frequency distribution of independent variables and dependent variables.

1 Model 2b responses regarding decline in health status that occurred before, or in concert with a decline in income status, were combined.

2 Frequency distribution of independent variables was delineated for select independent variables only in Model 2, Model 3 and Model 4’s submodels.
Model 1 responded to the secondary research goal, which was to determine what sociodemographic factors and health behaviour were predictive of changes in income status and health status. It also responded to a tertiary goal, which was to delineate the frequency distribution, for both sexes together and by sex, of dependent variables.

With respect to these goals, the following specific research questions were answered: What factors were predictive of no decline in health status and no decline in income status? What factors were predictive of a decline in income status, and no decline in health status? What factors were predictive of a decline in health status, and no decline in income status? What factors were predictive of a decline in both income status and health status?

7.4 Model 2

The research question for Model 2 was as follows, “With respect to decline in both income status and health status, which more frequently came first, a decline in income status, or a decline in health status, or a decline in health status that occurred in concert with a decline in income status?” The frequency of decline in income status that preceded decline in health status is discussed first. Next, discussed is the frequency of declines in health status that preceded declines in income status. Then, discussed is the frequency of declines in health status that occurred at the same time as declines in income status. Finally, discussed is the frequency of declines in health status that preceded declines in income status, grouped with declines in income status that occurred in concert with declines in health status.

Two submodels are discussed. Respectively, Model 2a examined, among respondents with an income status decline and a health status decline, factors that predicted an income status decline that occurred before a health status decline. Model 2b examined, among respondents with an income status decline and a health status decline, factors that predicted a health status decline that occurred before an income status decline or a decline in both income status and health status during the same cycle.

7.4.1 Model 2: frequency of sequence of income status decline and health status decline

Model 2 involved a further analysis of the 16.1% of respondents who had both an income status and a health status decline over the study period (Model 1d; Table 4-3).
Model 1’s findings (Figure 5-1) indicate that income status declines were more frequent than health status declines. Model 2’s findings indicate that among those with a decline in both income status and health status, the income status declines more frequently occurred first. Health status declines were relatively more frequently in concert with an income status decline than as a health status only decline.

About 60% ($n = 230$) of those with a decline in both income status and health status had an income status decline before a health status decline (Model 2a). The next largest group or 25.1% had income status and health status decline in the same cycle. The smallest group or 14.4% had a health status decline before an income status decline. The occurrence of a health status decline before an income status decline was a relatively rare event among the respondents. The latter two groups were combined for analysis in the study to constitute 39.6% of the respondents who had a health status decline before or during the same cycle as an income status decline (Model 2b).

The finding that income status decline commonly preceded health status decline is consistent with what was found in the literature, that is, the social causation hypothesis is the most feasible hypothesis. In other words, income status declined first, followed by health status declines.

Model 2 examined status outcomes disaggregated by sex. There were about the same number of male respondents and female respondents who had both an income status decline and a health status decline. More male respondents, or 62.7%, than female respondents, 57.9%, had an income status decline before a health status decline (Model 2a). For both male respondents and female respondents, the least common event was that health status declined first. For female respondents, it was less common than it was for male respondents. Because, more often, in the event of both statuses declining, income status declines first, it can be concluded that social causation rather than reverse causation is the main direction of influence for both male respondents and female respondents. The absence of literature that confirms the similarity between men and women, in terms of the direction of causation, suggests corroboration of this finding, although further research is warranted (Benzeval & Judge, 2001).
7.4.2 Model 2a: predictors of income status declined first and then health status declined

In this model, male immigrant respondents were less likely to experience an income status decline that occurred before a health status decline (without including health behaviours in the modelling; Table 6-7). The odds of having an income status decline before a health status decline (without including health behaviours in the modelling) was almost twice as low for male respondents who were immigrants versus those who were not immigrants. It is known that immigrants are likely to have low incomes (Pendakur & Pendakur, 2011; Statistics Canada, 2001b). The findings of Model 1 indicated that lower total household income at the outset protected against income status declines (Model 1a and Model 1c) and promoted health status declines only (Model 1c). In the context of Model 2a, the incomes of immigrant male respondents may have been low; however, their incomes also may have been relatively stable at least compared to their health status--income stability fended off income status declines first.

Ostrovsky (2008) found that “earnings instability is particularly high among those immigrants just entering the labour market, but it falls sharply during the subsequent two or three years” (p. 6). Ostrovsky suggested that immigrants gain some income stability over time even though they continue to experience income inequality (Ostrovsky did not imply that immigrants have more stable incomes than nonimmigrants nor did Ostrovsky examine two-fold status declines or male-female differences). This study’s findings and the literature suggest that immigrants have low incomes and that this group is less likely to have an income status decline occur first given that a two-fold decline occurs. However, it was not immediately clear why, for male respondents, immigrant status was statistically significant in predicting the outcome of Model 2a and it was not statistically significant when health behaviours were included. A possibility is that immigrants’ health behaviours are different from non-immigrants health behaviours, and, therefore, the immigrant effect disappears when health behaviours are taken into account.

Other findings for Model 2a indicate that, without the inclusion of health behaviours in the modelling, female respondents who were younger and who had good or very good health (vs. excellent) at the outset were less likely to experience an income status decline that occurred before a health status decline. Odds ratios of 0.08, 0.13, and 0.38 (Table 6-7) suggest that these female respondents were very much less likely to experience this outcome. This finding may be related to sex differences: Women tend to develop non-life-threatening disabling conditions,
such as arthritis, whereas men tend to develop life-threatening conditions (Crimmins et al., 2011), such as cardiovascular diseases (Morabia & Abel, 2006a; Shields & Chen, 1999). This submodel may be identifying those female respondents who experienced either good or very good health (vs. excellent) at the outset and then, in their mid-life, were diagnosed with a chronic illness that resulted in activity limitations and hence a health status decline. Indeed, Crimmins et al. (2011) concluded, “Women in late middle and older age have worse functioning . . . than men” (p. 88). This literature establishes health status declines in this cohort. Furthermore, what explains the lower likelihood of female respondents experiencing an income status decline having preceded a health status decline? It is possible that these female respondents did not experience income status declines first because their income and/or their employment situation provided income security by means of a pension or disability insurance thereby delaying income status decline. In addition, because income was measured at the household level, female respondents may have experienced a health status decline but their partners (who typically were higher earning) did not experience an income status decline, and so their household income remained stable. In this submodel, younger female respondents, although they had relatively good health at the outset, also had relatively stable incomes and therefore the declines were less likely to be in the order of income first and then health. It is conceivable that these female respondents’ health status was more tenuous than their income status was.

Because, in Model 2a, the variables specify which respondents were less likely to have had an income decline before a health decline, the support for reverse causation was indirect at best.

7.4.3 Model 2b: predictors of health status declined first and then income status, or income status and health status declined during same cycle

As expected, the findings from Model 2b were almost the inverse of Model 2a. The findings for Model 2b indicated that female respondents who had good or very good health (vs. excellent health), at the outset (without and with the inclusion of health behaviours) were more likely to experience a health status decline first and then an income status decline or an income status decline during the same cycle as a health status decline. Other findings for Model 2b indicate that, without the inclusion of health behaviours in the modelling, female respondents who were in the younger (vs. older) age group were more likely to experience the event. Odds ratios of 12.44, 7.98, and 2.63 (Table 6-8) suggest that female respondents with, respectively, good
health, very good health, or who were younger were much more likely to experience the outcome.

Two values for health at the outset, that is, good health and very good health were both statistically significant predictors in Model 2b for female respondents. The mechanisms that precipitated the declines observed may have been different when the value of the health status variable was different. For example, good health, as the relatively lowest value for health at the outset, may have promoted an income status decline in the same cycle or in a later cycle, after a health status decline. Health that was rated as merely good may represent a health status that increased the susceptibility of a health status decline (Model 1c). The change from good to either fair or poor health status might have resulted in, per Model 2b, a health status decline and then a subsequent income status decline or a decline in the same cycle.

On the other hand, in Model 1c in which there was only a health status decline and not an income status decline, very good health (vs. excellent) at the outset was not a statistically significant variable but good health was. This suggests that those with very good health were more prone to experiencing the outcome due to a factor or factors not specified in the model but associated with very good health. In other words, in Model 2b, very good health was acting as a proxy for another unspecified factor.

In Model 2b, good and very good health predicted an income status decline after or during the same cycle as a health status decline. Accordingly, it may be a health status decline was associated with subsequent income status declines (or income status declines in the same cycle). The consequent health problems may have resulted in considerable loss of income (or health care costs; J. P. Smith, 1999). As such, a decline in health status (from good or very good) provides some evidence of reverse causation.

A feature of Model 2b that complicates the interpretation of its findings is related to the fact that the responses for those who experienced a health status decline first or a health status decline during the same cycle as an income status decline were combined. When this combined status outcome occurred (Model 2b), it occurred more often among female respondents (42.1%) than among male respondents (37.3%). Among female respondent respondents who experienced this
combined outcome, only about one third experienced a health status decline first (Table 5-12). Therefore, the interpretation of this outcome is complicated by the fact that the decline-during-the-same-cycle subgroup is the larger subgroup. Despite these female respondents’ relative youth and relative good health, their income and health were so closely associated for two thirds of these respondents that declines in one led to declines in another in rapid succession, that is, all within the same cycle. In short, these female respondents were particularly vulnerable--when a decline in one status occurred, soon thereafter there was a decline in the other status. Given the observed frequencies for the combined outcomes in Model 2b, it is not possible, unequivocally, to associate the statistically significant predictor variables with health status declines that occurred before income status declines. There might be, at best, weak evidence for causality with respect to this specific temporal sequence of status decline.

It is interesting to note that immigrant status was not statistically significant in Model 2b. One could expect that, if immigrant males were less likely to have an income status decline before a health status decline, immigrant status would be a statistically significant variable in Model 2b. It is unclear why immigrant status would seemingly protect against the outcome of income status decline before health status decline but not be statistically significantly related to health status decline before (or at the same time as) income status decline. The reason may be due to the relatively small sample size of male respondents with this outcome (Table 4-3).

In sum, in Model 2b, for female respondents, the statistically significant variables are consistent with Model 2a. The interpretation of the Model 2b regression results however is complicated by the fact that the health-at-the-outset variable and age variable may be associated with the declines-in-the-same-cycle outcome. It is unclear whether the causal mechanisms were related to reverse causation, or, as is more likely, status declines that occurred close together in time of either temporal sequence. As a result, for Model 2a and Model 2b, there was only some support for any mechanism of causation. A method other than the one used in this study might provide more evidence of causality. As well, other variables, not included the study in the models might explain more. These might be measures of access to services, geographical location, degree of social support, existence of chronic conditions, or history of employment.
7.4.4 Model 2: goals met and research questions answered

Model 2 responded to the primary goal (Table 7-1) of determining whether income status decline was a stronger determinant of health status decline than health status decline was of income status decline. The response was equivocal: First, the finding that income status decline commonly preceded health status decline suggests that the social causation hypothesis is the most feasible. Because, more often, in the event of both statuses declining, income status declined first, it can be concluded that social causation rather than reverse causation was the main direction of influence for both male respondents and female respondents. However, frequency counts, by themselves, are limited in that the observation that an event occurred after another event does not mean that the second event was caused by the first.

Second, as stated above, in Model 2a, the logistic regression findings support reverse causation but only indirectly. This is by virtue of the fact that the statistically significant variables (health, age group, and immigrant status) meant lower and not higher odds that the outcome occurred.

Third, as stated above, because of the construction of the dependent variable in Model 2b, it is not possible to state definitively whether social causation or reverse causation was at play.

Model 2 also responded to a secondary goal, which was to determine what sociodemographic factors and health behaviour were predictive of changes in income status and health status.

With respect to these three goals, the following specific research questions were answered: If there was a decline in income status and health status, which came first, a decline in health status or a decline in income status? What factors were predictive of a decline in income status that preceded a decline in health status? It did not respond directly to the following two questions: What factors were predictive of a decline in health status that preceded a decline in income status? What factors were predictive of a decline in income status that occurred in concert with a decline in health status? These latter two questions were not answered because responses regarding decline in health status that occurred before, or in concert with a decline in income status, were combined. Instead, another similar question was answered: What factors were predictive of a decline in income status that occurred preceding or during the same cycle as a decline in health status? Model 2b address this scenario.
In Model 2a and Model 2b, overall, there were few (three out of 13) statistically significant variables. By comparison, in Model 1d, a larger number (six out of 14) of independent variables were statistically significantly related to the outcome of both income status decline and health status decline. These variables also included health at the outset and age. The Nagelkerke $R^2$s for Model 2a and 2b were substantially higher than for Model 1d. This suggests that in Model 2 was more effective than Model 1d, even though it included fewer predictors.

Model 2 also responded to a tertiary goal, which was to delineate the frequency distribution, by sex, of dependent variables in this model. The goal of delineating the frequency distribution of select independent variables was met through the production of cross-tabulations, which were employed in the analyses.

7.5 Model 3

Model 3 asked different but related research questions as compared with Model 2. First, with respect to an income status decline first, Model 3a asked the following questions, “What was the frequency of any decline in income status? What was the frequency of declines in income status preceding declines in health status? Among those with declines in income status (in some cases in conjunction with health status declines and in some cases not), what factors were predictive of an income status decline first and a subsequent health status decline?” Second, with respect to a health status decline first, Model 3b asked the following questions, “What was the frequency of any decline in health status? What was the frequency of declines in health status preceding declines in income status? Among those with declines in health status (in some cases in conjunction with an income status decline and in some cases not), what factors were predictive of a health status decline first and a subsequent income status decline?”

Before responding to these questions, it is important to spell out Model 2 and Model 3’s similarities and differences. Both Model 2 and Model 3 examined the sequential pattern of income status declines and health status declines and the factors that were predictive of these declines. However, Model 2 examined factors that predicted a particular order of status decline (among respondents who experienced a two-fold status decline). Model 2 suggested causal factors for a two-fold status decline in a particular direction. If the order of the Model 2 declines
were to have been associated with certain factors, then further analysis could have revealed causal linkages, that is, the causal connection of one decline to the other.

On the other hand, Model 3 examined factors that predicted a two-fold status decline in a particular sequence (among respondents who had a decline in one status). Specifically, Model 3 addressed what factors predicted whether a subsequent status decline occurred after an initial status decline. If respondents who experienced declines in both income status and health status can be differentiated from respondents who had declines only in income status or in health status, the differentiation would be further support for a linkage between one status decline and a subsequent decline in the other status variable. Model 3 ascertains, from among those who had a status decline, what the statistically significant factors were in bringing about a second sequential status decline. It should be noted that the independent variables in Model 3 were selected from the statistically significant variables in Model 1d.

7.5.1 Model 3a: frequency of decline in income status preceding a health status decline

Model 3a findings indicated that 9.7% of respondents in the original sample had an income status decline before a health status decline compared with 54.2% (Table 4-3) of respondents in the original sample who had any income status decline over the study period. This latter group included respondents who had an income status only decline, an income status decline before a health status decline, both an income status decline and a health status decline at the same time, and a health status decline before an income status decline.

7.5.2 Model 3a: predictors of decline in income status preceding a health status decline

In Model 3a, respondents (both sexes together) with good health (vs. excellent) at the outset (without and with health behaviours) had twice the odds (Table 6-9) of experiencing an income status decline before a health status decline (compared with all respondents who had an income status decline). Without the inclusion of the health behaviours, respondents with very good health (vs. excellent) had 50% higher odds of experiencing this outcome. Health at the outset was related to income status declines followed by health status declines.

Good health and very good health (without health behaviours) were both statistically significant in Model 3a. The role of health at the outset appears to be ambiguous. Good health may have promoted an income status decline occurring first. Health that was rated as merely good
represented a health status that increased the susceptibility of income status declines (in conjunction with health status declines per Model 1d). The results of Model 3a could be interpreted as good health (vs. excellent) at the outset was followed by an income status decline, which is then followed by a health status decline. Alternately, very good health may indeed have delayed a health status decline. Scenarios to explain the findings of Model 3a may be as follows: Respondents who experienced good health were more prone to experience an income status decline because of their relatively poorer health. The sequence could be interpreted as reverse causation followed by social causation. Respondents who experienced very good health experienced an income status decline first (related to factors other than health at the outset). After this income status decline, they experienced a health status decline. This sequence could be interpreted as social causation. Thus, the issue is whether health at the outset was associated with the initial decline (possible reverse causation), or the second decline (possible social causation), or both.

One way to address this ambiguity is with reference to the Model 1b findings. In Model 1b, the independent variables were related to an income status decline without a health status decline. Respondents with good or very good health (vs. excellent) at the outset were less likely to have had this outcome. In other words, in Model 1b relatively poorer health at the outset did not promote an income status decline, therefore, Model 1b does not support reverse causation. The Model 1b findings provide an explanation that addresses the interpretational ambiguity for Model 3a results regarding health at the outset. Hence, Model 3a supports social causation.

Respondents who were in the younger (vs. older) age group were less likely to have had an income status decline before a health status decline (without and with the inclusion of health behaviours). This observation supports the interpretation that age is linked to a subsequent health status decline after an income status decline.

Respondents who were smokers or had smoked had almost 50% higher odds of having had an income status decline before a health status decline (among respondents with an income status decline).
The combination of independent variables that were statistically significant in Model 3a appears to be consistent with each other. Respondents who had a subsequent health status decline after an income status decline were more likely to be in good health (vs. excellent) at the outset, and to have had a history of smoking, but less likely to be in the younger age group. Interrelated variables, that is, health at the outset, history of smoking, and age, precipitated a health status decline after an income status decline. These findings point to social causation.

7.5.3 Model 3b: frequency of decline in health status preceding income status decline

It was found that for Model 3b, 2.1% of respondents in the original sample had a health status decline first where declines occurred in both dependent variables, compared with 26.4% (Table 4-3) of all respondents in the original sample who had a health status decline. The latter included respondents who had an income status decline before a health status decline, both an income status decline and a health status decline at the same time, a health status decline before an income status decline. Rephrased, about one in thirteen persons who had a health status decline also had a subsequent income status decline.

It was much less common for respondents to have had an income status decline after they have had a health status decline than vice versa. The prevalence of income status decline preceding health status decline was higher (9.7% vs. 2.1%) than vice versa. Again, this suggests social causation being a more frequent mechanism than reverse causation.

7.5.4 Model 3b: predictors of decline in health status preceding income status decline

There was only one statistically significant factor predicting the Model 3b outcome (without the inclusion of health behaviours in the modelling; Table 6-10). Those respondents who had experienced very good health (vs. excellent) at the outset were less likely to experience an income status decline after a health status decline. Very good health, but not good health, appears to be a factor in reducing the likelihood of an income status decline after a health status decline occurred. This finding was difficult to interpret given findings in other models suggesting that self-rated health was associated with health status decline and not income status decline.

Implied in Model 3b’s findings is an absence of factors that clearly support the hypothesis of a causal linkage for a health status decline to promote a subsequent income status decline. It is
possible, however, that the model was misspecified in that there are other independent variables, other than ones used that predict two-fold status declines, overall, that might have been statistically significant in predicting the relatively rare occurrence of a health decline followed by an income decline. Other unknown independent variables may be related to the self-rated health variable.

It is also possible that the finding in Model 3b is related to the relative infrequency of the outcome as discussed above. Of note, in that regard, is that the age variable was not statistically significant in Model 3b, whereas it was statistically significant, together with the health variable, in Model 2a and Model 2b, (without the inclusion of health behaviours in the modelling) and in Model 3a (without and with the inclusion of health behaviours in the modelling).

In summary, the finding for Model 3b can be interpreted as follows: With respect to the finding that there was only one statistically significant predictor, one possibility is that there were a limited number of independent variables tested. Alternatively, it is possible that there was only one statistically significant predictor due to the submodel’s small sample size.

7.5.5 Model 3: goals met and research questions answered

Model 3 responded to the primary goal (Table 7-1), that is, assessing whether income status decline was a stronger determinant of health status decline than health status decline was of income status decline. The findings that interrelated variables (self-rated health, age group, and smoking history) were positively related to Model 3a’s outcome (income status decline before health status decline) and self-rated health was negatively related to the Model 3b outcome (health status decline before income status decline) are consistent with social causation. Model 3 responded to a secondary goal, which was to determine what sociodemographic factors and health behaviour were predictive of changes in income status and health status. Model 3 responded to a tertiary goal, which was to delineate the frequency distribution, for both sexes together, of dependent variables. The goal of delineating the frequency distribution of select independent variables was met through the production of cross-tabulations, which were employed in the analyses.
With respect to these goals, the following specific research questions were answered: What were the factors that predicted an income status decline and a subsequent health status decline from among those who had an income status decline with or without any health status decline? Also examined were the factors that predicted a health status decline and a subsequent income status decline from among those who had a health status decline with or without any income status decline were examined.

7.6 **Model 4**

The discussion of the fourth of the four models entails an interpretation of findings vis-à-vis income status regain after experiencing income status decline, and health status regain after experiencing health status decline.

The two research questions are as follows: “What factors are predictive of a regain in income status? What factors are predictive of a regain in health status?”

From Model 4, two respective submodels, Model 4a and Model 4b, were analyzed. The findings for Model 4a examined the frequency of and factors related to regains in income status from among those respondents who had a decline in income status. The findings for Model 4b examined the frequency of and factors related to regains in health status from among those respondents who have had a decline in health status.

7.6.1 **Model 4: frequency of status regain**

Among the respondents in Model 4, fewer had a health status decline than an income status decline. From Table 4-3 and Table 5-13, there were 1,175 respondents in Model 4. Of these, 775 had an income status only decline (data not shown), 147 had a health status only decline (data not shown), and 253 had two-fold status declines. Accordingly, 87.5% of respondents in Model 4 had an income status decline and 27.9% had a health status decline (data not shown).

In Model 4a, 70.8% of all respondents had an income status regain, and in Model 4b, 82.0% of all respondents had a health status regain (Table 4-3). Overall, 78.3% of respondents in Model 4 had regains in income status or health status or both (data not shown). It is interesting to compare this rate with the corresponding regain rate for respondents who had two-fold status declines. Its rate was 93.4% (Table 5-13). Surprisingly, the more at-risk respondents had the
highest regain rate: Respondents with two-fold status declines had their financial and/or health circumstances change for the better. Furthermore, the majority of these respondents had regains in both income status and health status (53.6%; Table 5-13). These findings are important given one of the study’s foci, that is, two-fold status declines. Although there is some literature on rates of health status regain, literature on rates of income status regain and rates of regain after two-fold status declines could not be located, preventing corroboration of this study’s findings. The regain rate suggests three conclusions: First, regains in income and health are prevalent. Second, this is an indication that this group is quite resilient. Third, despite their small proportion (6.6%), those who experienced neither an income status regain nor a health status regain are an important group because they are particularly vulnerable.

7.6.2 Model 4a: frequency of income status regain after experiencing income status decline

Model 4a examined the incidence of an income status regain after experiencing an income status decline compared with all respondents who had an income status decline. Seven tenths of respondents (70.8%) in this submodel’s sample had an income status regain (Table 4-3). Among all four models in the study, this submodel’s sample was the third largest. The finding of a high rate of income status regain is consistent with the literature. According to Duncan (1988), incomes not only frequently decline over the life course they also rebound. The following are some possible explanations for the regains in total household income: Some respondents reached retirement age and as they became eligible for their pensions, their income increased. This is consistent with Prus’s (2002) findings that concluded that once in receipt of a pension, the material circumstances of Canadians who were advantaged economically began to converge with those who were disadvantaged (those with irregular income from low-income households). Other reasons for income status regains are that stay-at-home spouses who returned to work would supplement household income, as might adolescent and adult children who were living at home and who entered the workforce. Another possibility is that respondents’ children were no longer living with them and thereby no longer expending respondents’ income and savings. This potentially could increase the respondents’ household income. These additional disposable funds could be invested to accrue more income thereby increasing the respondents’ HIR. Finally, respondents who were no longer involved in the study, due to attrition, may not have been among those who, as they aged, experienced regains in their total household income. This is
speculative because there is no conclusive evidence from this study’s analysis that this occurred. However, there is evidence that there is a relationship between attrition and unstable earnings, particularly a decline in earnings (Fitzgerald et al., 1998).

A statistically significantly higher proportion of male respondents than female respondents experienced an income status regain between Cycle 3 and Cycle 7. In Model 4a (Table 7-2), 74.6% of male respondents had an income status regain compared with 67.4% of female respondents.

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<th>Table 7-2</th>
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<th>Frequencies and Percentages of Respondents’ Income Status Regain versus No Regain (Model 4a; N = 1,028)</th>
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<td><strong>Both sexes</strong></td>
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<td><strong>Freq.</strong></td>
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<td>Income status regain after experiencing income status decline</td>
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*Note.* Data from Statistics Canada, National Population Health Survey, Cycles 1-7. ‡ excludes missing and unusable data. † Male respondents statistically significantly more likely to have experienced an income status regain than female respondents (p < .05).

Two interrelated factors might have influenced sex differences with respect to income status regain among older adults: marital status and pension income. Immediately after marital dissolution, women usually experience income declines (Galarneau & Sturrock, 1997; Luxton, 2011). Women’s income declines are more dramatic than men’s are (Gadalla, 2008b). Moreover, women, more than men, after divorce or separation, have low incomes (Gadalla, 2008a). Both marriage and remarriage are not only protective of incomes; they facilitate income regains (Morissette & Ostrovsky, 2006). Women’s incomes, in particular, improve with remarriage following divorce (S. Davies & Denton, 2002; Day & Bahr, 1986; Low & Fisher, 2009). Moreover, women who did remarry after being widowed are more likely to experience income status regains than those who did not (Moorman, Booth, & Fingerman, 2006). However, men who are divorced or widowed are more likely than are women to remarry (Beaupré, 2008; Eichler & Pedersen, 2012). This partly explains men’s versus women’s higher rate of income regain.
The second interrelated explanatory factor for sex differences in income status regains is pension income. Women’s pattern of workforce participation not only affects their entitlement to pension benefits, it affects the amounts. LaRochelle-Côté, Myles, and Picot (2012), in their study regarding Canadians’ postretirement income, found that income replacement rates (percentage of employee's pre-retirement income paid out by pensions and other income sources) were higher for persons still married than for those who were not. Because women had lower rates of remarriage relative to men, their replacement rates would have been lower. Higher income women who had become divorced or separated had the lowest income replacement rates. The incomes of divorced low-income women may have been protected by public pensions. It is to be noted that income replacement rates also increased over time, thereby yielding regains of income lost, particularly for married persons. Sex differences in workforce participation and remarriage patterns likely are related to sex differences in income-status-regain rates.

7.6.3 Model 4a: predictors of income status regain after experiencing income status decline

Model 4a’s findings are supported by other submodels’ findings. Because there are obvious similarities in the nature of the dependent variable, that is, absence of a decline, and decline and regain, it was posited that there might be the same or similar factors operating in the submodels. Indeed, there were and the following discusses the similarities between statistically significant predictors of income status regain and income status decline: In Model 4a, without and with the inclusion of health behaviours, respondents who were male (vs. female) were more likely to experience an income status regain. Being male also protected against income status decline (Model 1c) and conversely, being female promoted an income status decline (Model 1b). Per above, the literature confirms that being male protects against income status declines (Gadalla, 2008a, 2008b; LaRochelle-Côté et al., 2012; Morissette & Ostrovsky, 2005).

Respondents in the younger (vs. older) age group were more likely to experience Model 4a (without and with the inclusion of health behaviours) outcomes. Similar to other submodels (Model 1a, Model 1b, and Model1d), being younger protected against an income status decline.

In addition, the findings for Model 4a, without and with the inclusion of health behaviours, were that being a high school graduate (vs. not) and being married (vs. not) were both linked
positively to income status regains (Model 4a). Being a high school graduate and being married (for male respondents only) provided protection against an income status decline (Models 1a and Model 1b).

Overall, these findings are consistent with research that demonstrates the advantage associated with being male, being younger, being educated, and being married with respect to income protection.

Respondents who had lower total household income at the outset were more likely to experience Model 4a’s outcome (without and with the inclusion of health behaviours) outcomes (Table 6-11). Lower total household income was a predictor in Model 1a (neither income status nor health status declined) and Model 1c (health status declined but not income status). This study also found that respondents with higher total household income were more likely to have had an income status decline (Model 1b and Model 1d). It is possible that the association between lower total household income at the outset and income status regain relates to Canada’s social safety net; their incomes rebounded because they became pension recipients over the course of this study. Indeed, LaRochelle-Côté et al. (2008) found that family incomes of average earners declined between age 60 and 68, and then stabilized; they earned four-fifths of what they earned at age 55.

The role of the income status variable is now discussed with respect to another variable that was statistically significant for income status regain, that is, homeownership status. Model 4a is the only submodel in which the homeownership variable was statistically significant. In Model 4a, respondents who were homeowners were less likely to experience an income status regain after an income status decline. From the literature, homeownership and income are related; non-homeowners tend to have low incomes. Seniors who did not own their own homes had higher below-LIM rates than those who did not (Veall, 2007). It was difficult to explain that, in this study, homeowners were less likely to experience an income status regain and those with lower total household income were more likely to experience an income status regain. Homeownership should provide a financial reserve by which to mitigate an income status decline, bounce back financially, and experience an income status regain. Using the Survey of Household Spending, Luffman’s (2006) analysis indicated that almost one third of renters spent almost one third of
their household budget on housing, whereas homeowners spent 6% of their household budget on
shelter. In general, the cost of owning is lower than the cost of renting (W. M. Brown &
Lafrance, 2013). Furthermore, homeownership provides the potential to accrue savings and
create a financial reserve. Among homeowners aged 70 and older, over the last four decades, the
contribution of homeownership to household finances has increased. Retired Canadians have
decreased mortgage liabilities, which contribute to their low levels of debt (Chawla & Uppal,
2012; Lafrance & LaRochelle-Côté, 2012). This cohort benefits financially from
homeownership; in 2006, their incomes increased by 16% related to not having to pay rent (W.
M. Brown & Lafrance, 2010). What is more, Baldwin (2011) contends that seniors underutilize
the potential for income generation related to being a homeowner.

There is other research, however, that supports these study findings regarding the
homeownership variable. Research indicates that homeownership is a financial burden. It may
be that some senior homeowners are *house rich and cash poor*; they have challenges affording
the cost of homeownership after an income decline (Kutty, 1998). In their desire to continue
living in their family home, some seniors may have been persuaded to undertake a reverse
mortgage (Sichelman, 2010) resulting in a loss of potential income and housing security. In any
12-month period between 2002 and 2004, one fifth of Canadians were living beyond their means
in terms of their housing expenditures (either rented or owned), that is, 30% or more of their pre-
tax income is spent on housing (L. McDonald, 2011). According to this research, it is possible
that homeownership presents a financial burden on respondents who experience an income status
decline and thereby prevent an income status regain afterward.

Health status decline might affect whether homeowners experienced an income status regain. It
is possible that ill health plays a role, not only in housing security as L. McDonald (2011) states,
but ill health may be related to income status regains among homeowners. With respect to
whether two-fold status declines, in a particular order, were predictors of status regains, it is to
be recalled that two variables were created, one for each submodel. The reason they were
created was that there was an assumption that regains could be predicted by a particular order of
two-fold status declines. In Model 4a, the variable, *health status decline before or in the same
cycle as an income status decline* was tested, but was not statistically significant. However, the
opposite sequence of two-fold status declines, *an income status decline before or in the same
cycle as health status decline, was not tested. It is possible that respondents who experienced an income status decline followed by a health status decline, and who, furthermore, had the burden of being homeowners, were less likely to have an income status regain. Further research would be needed to understand the mechanisms of income status regain given the study finding—in particular, with respect to the roles of homeownership, income status at the outset and health regains.

In summary, the Model 4a findings suggest the factors identified are mostly consistent both with the literature and with the hypothesis that factors that prevent an income status decline also serve to facilitate an income status regain. The exception was homeownership status for which the meaning of the findings was inconclusive. The findings of Model 4a do not provide support for one direction of causality or another.

7.6.4 Model 4b: frequency of health status regain after experiencing health status decline

Among all respondents whose health status declined, eight out of ten (82.0%) had a subsequent health status regain (Model 4b; Table 4-3). The proportion with regains of health status was even higher than the proportion of regains of income status (Model 4a; 70.8%). This is consistent with the findings of a study by Shields and Chen (1999) in which almost one half of the senior Canadians who called their health fair or poor in 1994-1995 reported an improvement in their health in 1998-1999.

It is interesting to note that not only was health status less likely to decline than was income status, but also health status was more likely to regain once a decline did occur. It appears that the respondents in the study were relatively more at risk with respect to income status than health status in terms of long-term outcomes.

Among the 147 of 400 respondents in Model 4b who had a health status only decline, 85.7% had a health status regain. Among the 253 of 400 respondents who had both an income status decline and a health status decline, 79.9% had a health status regain. The overall pattern of regains in Model 4b for a single decline in health status relative to a two-fold status decline is the same as in Model 4a. Respondents more frequently had a regain if they had only one status decline.
A number of questions arise from these findings: Why was the proportion of those who had health status regains greater than the proportion of those who had income status regains regardless of whether there was a single or two-fold status decline? What is the significance of the findings that the proportion of those whose health status regained was much greater than the proportion of those whose health status declined? Why did those who were doubly disadvantaged by having had two-fold status declines experience regains in such large proportions (Table 5-13)?

These questions all speak to the overall robustness of health status among the respondents in Model 4. Statistics Canada researchers Shields and Chen (1999) provides additional context to these questions. As stated above, according to Shields and Chen (1999), the health of older Canadians not only frequently declines over the life course, but it also returns. They found that among those older Canadians who reported their health as fair or poor in 1994/95, four years later almost one half stated that their health had improved. Similarly, Goldstein, Siegel, and Boyer (1984) found that 16% of their sample from the Los Angeles Health Survey regained their health over a one-year period. Note that this was a much shorter period than either the Shields and Chen (1999) study or this study, and so presumably the proportion of respondents who experienced regains would have been greater had the study periods been longer. The literature suggests that health status does improve among older adults.

The high proportion of health status regains in this study may have been affected, also, by the filtering out of certain respondents from the subsample of Model 4b. The respondents in Model 4 excluded the deceased, those who were in fair or poor health at the outset of the survey, and those with health status or income status data missing in two or more cycles (perhaps respondents unable to participate due to poor health).

The next section, which discusses predictors of health status regain after experiencing health status decline, provides some further responses to the questions regarding the relative frequency of health status regains in the Model 4b findings.

In terms of Model 4b findings by sex, more male respondents than female respondents had regains in health status (Table 7-3). In Model 4b, 84.6% of male respondents had a health status
regain compared with 79.4% of female respondents. Why did more male respondents than female respondents have a health status regain after experiencing a health status decline? Could this be related to sex differences in health status regains that are similar to sex differences in health status declines?

Table 7-3
Frequencies, and Percentages of Respondents’ Health Status Regain (Model 4b; N = 400)

<table>
<thead>
<tr>
<th>Health status regain after experiencing health status decline</th>
<th>Both sexes</th>
<th>Male respondents</th>
<th>Female respondents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Health status declined but did not regain</td>
<td>72</td>
<td>30</td>
<td>42</td>
</tr>
<tr>
<td>Health status declined and did regain</td>
<td>328</td>
<td>167</td>
<td>161</td>
</tr>
<tr>
<td>Missing</td>
<td>85</td>
<td>54</td>
<td>32</td>
</tr>
<tr>
<td>Total</td>
<td>486</td>
<td>251</td>
<td>235</td>
</tr>
</tbody>
</table>

Note. Data from Statistics Canada, National Population Health Survey, Cycles 2-7.

As stated above, men, compared to women, tend to have life-threatening diseases and higher mortality rates (Crimmins et al., 2011; Morabia & Abel, 2006b). Although women were often in poor health due to chronic disease, they live longer than men do (Morabia & Abel, 2006b; Oksuzyan et al., 2010). This points to different mechanisms operating in male versus female health status declines; however, it does not explain the higher rate of health status regains among male respondents as compared to female respondents.

In this study, sex was not a statistically significant predictor of regains in health status. This is inconsistent with research by Shields and Chen (1999) “it is noteworthy that men had less than half the odds of reporting an improvement in self perceived health compared with women.” (p.58). Given the Model 1c (health status only decline) finding that male respondents were more likely to have a health status decline, it would have been reasonable to expect that male respondents would have been less likely to have a health status regain or that female respondents would be more likely to have a health status regain. One possible explanation may be related to the exclusion in Model 4 of the deceased. Because the deceased were excluded from the subsample, the surviving male respondents were a healthier cohort and, therefore, possibly more likely to experience health status regains as compared with female respondents.
7.6.5 Model 4b: predictors of health status regain after experiencing health status decline

Respondents who had higher (vs. lower) total household income at the outset were more likely to experience a health status regain after a health status decline (with the inclusion of health behaviours, Table 6-12). Those respondents who were high school graduates (vs. were not), were immigrants (vs. were not), were smokers or had smoked (vs. had never smoked) and were heavy drinkers (vs. were non-drinkers or moderate drinkers) were all less likely to experience a health status regain after a health status decline.

The total household income variable was statistically significant in the submodel with and without the inclusion of health behaviours in the modelling. Higher total household income at the outset appears to be another example of a predictor variable that was both a protector against a status decline and a facilitator of its regain. The underlying mechanism may be as follows: Higher total household income makes resources available that not only help prevent health status decline, but also, when a health status decline does occur due to other risk factors, higher income helps ensure a health status recovery or regain. On the other hand, lower total household income at the outset may mean either fewer resources to maintain health in the presence of other health risk factors, or, in more extreme situations, resources may be insufficient to maintain health status even in the absence of other health behaviour risk factors, for example, insufficient resources for adequate nutrition or housing. In Model 1c, lower total household income at the outset, together with other statistically significant factors, increased the risk of health status decline. Similarly, it would be reasonable to expect that lower total household income would not facilitate a health status regain. Health status regain, in this situation would be dependent on access to Canada’s socialized health care system. This linkage of lower total household income at the outset with subsequent health status decline, and higher total household income at the outset with health status regain, is consistent with social causation.

In Model 4b, the possible effect of total household income on health status regain was tested in another way. An independent variable, income status decline before or during the same cycle as health status decline, was formulated to determine whether a health status decline, which occurred in a pattern consistent with social causation, affected the likelihood of a subsequent health status regain. Without the inclusion of health behaviours in the modelling, those
respondents whose income status declined before or at the same time as their health status were less likely to experience a health status regain after a health status decline.

Respondents in Model 4b who had two-fold status declines (which represented two-thirds of the respondents) had a lower frequency of health status regains (79.9% compared to 85.7% of respondents who had a health status only decline). The finding that respondents with this two-fold sequence of declines were statistically significantly less likely to experience health status regains may be explained as follows: Some respondents may require a certain level of income to maintain their health at the outset. This level of income required was sufficient to minimize the risk of health status decline. A loss of income, however, may increase their risk of health status decline substantially. Furthermore, if the total household income at the outset was not regained, then the possibility of health status regain would also be diminished. This finding is, again, consistent with social causation. The respondents who had two-fold status declines are an important group to study further because they were less likely to recover their health than those who had a health status only decline.

It is interesting to note that the Model 4b findings vary with the inclusion of health behaviours. Although total household income at the outset remained statistically significant in the Model 4b findings, the other income-related explanatory variable, income status decline before or during the same cycle as health status decline, was no longer statistically significant. In addition, with the inclusion of health behaviours in the modelling, educational status became a statistically significant explanatory variable. This latter finding is perplexing and apparently inconsistent with Model 1 findings. In Model 1a, having been a high school graduate was predictive of the outcome of neither an income status decline nor a health status decline. In Model 1d, high school graduates were less likely to have both an income status decline and a health status decline. In addition, in Model 1b, high school graduates were less likely to have an income status decline without a health status decline. The educational status variable was not statistically significant in Model 1c, that is, health status only decline. The Model 1b and Model 1c findings do not add support to the interpretation that educational status is related to health status decline. According to this study’s hypothesis that variables which protect against a status decline also serve to facilitate status regains, one would have expected from the Model 1a and Model 1d findings that respondents who were high school graduates would be more likely, not
less likely, to experience a health status regain in Model 4b. The reason that the educational status variable was negatively linked to the outcome for Model 4b is unclear.

Several other findings for Model 4b are of interest when compared to findings of other submodels in the study. First, having been or currently being a smoker (vs. never having smoked), was predictive in Model 4b as well as in Model 1a. Those respondents who had been or were a smoker were less likely than those who never smoked to experience the outcome. As well, for Model 4b, those respondents who were heavy drinkers (vs. non-drinkers or moderate drinkers) were less likely to experience the outcome. Similarly, for Model 1a, for male respondents only, respondents who were heavy drinkers (vs. non-drinkers or moderate drinkers) were less likely to experience the outcome.

Second, in Model 4b, health at the outset was not predictive of health status having regained. Importantly, this finding is in contrast to the finding of Model 1a. This finding is also in contrast with other Model 4b findings; specifically that respondents who drank heavily and smoked habitually were less likely to experience the event. One might reasonably conclude that given smoking history and drinking habits were statistically significant, health at the outset would also be.

Third, in Model 4b, both with and without the inclusion of health behaviours in the modelling, those respondents who were immigrants (vs. were not) were less likely to experience a health status regain after a health status decline. Both with and without the inclusion of health behaviours in the modelling, the odds of experiencing this outcome were twice as low for immigrants as they were for nonimmigrants. Fuller-Thomson et al. (2011) found that older immigrants were less likely to experience an improvement in health status. Fuller-Thomson et al. (2011) also found that immigrants, in the first four years after arriving in Canada, were more likely than nonimmigrants to experience a decline in health status. The findings from this study appear to be consistent with their findings; that is, immigrants were less likely than were nonimmigrants to experience the health status regain outcome due to the ceiling effect as described above.
Furthermore, it is interesting to note that the immigrant status variable was statistically significant (for males) only in one other submodel, that is, Model 2a, and that Model 2a involved two-fold status declines. In Model 2a, male immigrants were less likely to have an income status decline before a health status decline. Model 4b’s discussion considered whether health status regains might be related to whether a two-fold status decline occurred. In Model 4b, respondents of both sexes combined who were immigrants were less likely to experience health status regains. There appears to be a link between immigrant status, two-fold declines and health status regains. Immigrants who experienced two-fold declines were also less likely to have a subsequent regain in their health status.

In summary, the following key points emerge from the discussion of the Model 4b findings. From Model 4b, health status regain could be linked to factors that tend to prevent health status declines, for example, not smoking. In other words, respondents who have health status regains have fewer other health risk factors—which could prevent health status regains after there has already been a health status decline.

Health status regains were affected by higher total household income. Increased financial resources facilitated health status regains. On the other hand, income status declines (before or at the same time as health status declines) decreased the likelihood of a health status regain. This implies fewer financial resources to facilitate a health status regain. The availability of income and the absence of income status declines are factors that promote health status regains.

7.6.6 Model 4: goals met and research questions answered

Model 4 responded to the primary goal (Table 7-1) of determining whether income status decline was a stronger determinant of health status decline than health status decline was of income status decline. In response to this question about causation, it is clear there is some evidence of social causation: First, the finding that total household income at the outset was positively linked to health status regain is consistent with social causation. Second, the finding that an independent variable, income status decline before or during same cycle as health status decline, was statistically significantly related to a diminished likelihood of subsequent health status regain is also consistent with social causation.
Model 4 responded to the secondary goal (Table 7-1), which was to determine what sociodemographic factors and health behaviour were predictive of changes in income status and health status. Model 4 also responded to a tertiary goal, which was to delineate the frequency distribution, by both sexes together, of dependent variables in this model. The goal of delineating the frequency distribution of select independent variables was met through the production of cross-tabulations, which were employed in the analysis.

With respect to these goals, the following specific research questions were answered: What factors were predictive of a regain in income status? What factors were predictive of a regain in health status? Overall, in Model 4, there were many (ten out of 15) statistically significant variables.

7.7 Chapter Summary

This section summarizes the discussion of the financial, health, social and behavioural determinants of income status decline and health status decline (and regains). Its purpose is to draw attention to key interpretations of what promoted and prevented those declines (and regains) in the context of the four models. Estimates, in four separate models, using logistic regression, form the crux of the thesis results. These four models are analyzed in terms of the social causation and reverse causation hypotheses.

7.7.1 Variable-by-variable discussion

Total household income at the outset, in most of the submodels, was a statistically significant predictor. Although total household income at Cycle 1 was frequently predictive of status declines (and regains), in all cases, the odds ratio for this independent variable was very close to one. Total household income was not statistically significant in either submodels of Model 2 or submodels of Model 3. These two models explored what factors may be associated with two-fold status declines and the sequencing of declines in income status and health status. Total household income was not a statistically significant predictor of the sequence of decline (Model 2), nor of a subsequent decline in a dependent variable (Model 3). In general, it seems that higher total household income was associated with income status decline and health status regain. Lower total household income protected against income status decline and promoted income status regain.
Similarly, health at the outset was a statistically significant predictor in most of the submodels. For those respondents who had good health (vs. excellent) at the outset, the odds of experiencing the event was from twice as high in Model 3a (Table 6-9) to more than three times as high in Model 1c (Table 6-3) and Model 1d (Table 6-4) to almost 13 times as high in Model 2b (Table 6-8). Health at the outset was not statistically significant in either Model 4a (income status regain; Table 6-11) nor Model 4b (health status regain; Table 6-12). In general, good health at the outset (vs. excellent) was associated with a health status decline. Furthermore, good health (vs. excellent), given an income status decline, promoted a subsequent health status decline, evidence of social causation.

The age variable was also statistically significant in almost all models. It was not statistically significant only in Model 3b (Table 6-9) and Model 4b (Table 6-12). Younger (vs. older) respondents were more likely to experience the outcome in the following models: neither an income nor a health status decline (Model 1a; Table 6-1); a health status decline before an income status decline or in the same cycle if they were female respondents (Model 2b; Table 6-8), and a regain in income status (Model 4a; Table 6-11). Younger respondents were less likely to have had an income status only decline (Model 1b; Table 6-2), a health status only decline (Model 1c; Table 6-3) if they were male respondents, declines in both income and health status (Model 1d; Table 6-4), an income status decline before a health status decline if they were female respondents (Model 2a; Table 6-7) or a subsequent health status decline given any income status decline (Model 3a; Table 6-9). The value of the middle (vs. older) age group was infrequently statistically significant, but when it was, the pattern matched that of the younger (vs. older) age group. Overall, the age variable, specifically, being younger, protected against income status declines and against health status declines.

The sex variable was statistically significant in three submodels: Model 1b (Table 6-2), Model 1c (Table 6-3), and Model 4a (Table 6-11). The interpretation is that, in Model 1b, being female was associated with an income status decline and in Model 1c, being male was associated with a health status decline. Male respondents were also more likely to have had an income status regain after having had an income status decline. Accordingly, it is possible that being male protected against an income status decline and being female protected against a health status decline.
Model 1 and Model 2 were stratified by sex in their respective submodels. This stratification provided another way to compare the role of sex in the model findings. With respect to the socioeconomic independent variables, the following variables were statistically significant only for male respondents: marital status (Model 1a, Table 6-1; and Model 1b, Table 6-2), and immigrant status (Model 2a; Table 6-7). With respect to the health behaviours, the obesity status variable was statistically significant only for male respondents (Model 1b, Table 6-2). Although no independent variables were statistically significant only for female respondents, there were differences in the submodels regarding which independent variables were statistically significant for male respondents, and which independent variables were statistically significant for female respondents. As well, there were differences in the number of variables that were statistically significant in the submodels stratified by sex or for both male respondents and female respondents combined. Overall, this was interpreted as the existence of sex-based differences in outcomes.

In addition to total household income, self-rated health, age, and sex, other variables (marital status, educational status, homeownership status, visible minority status, immigrant status, and employment status) were statistically significant predictors in at least one submodel.

Marital status was statistically significant in Model 1a (Table 6-1), Model 1b (Table 6-2), and Model 4a (Table 6-11). Marital status appears to be a protector variable with respect to both income status decline and health status decline for male respondents. Being married may primarily protect against income status decline. The study findings are consistent with the hypothesis that marriage protects male respondents from income status declines, which in turn, protects them against health status declines. Married respondents were also more likely to experience income status regains.

Educational status was statistically significant in Model 1a (Table 6-1), Model 1b (Table 6-2), Model 1d (Table 6-4), and in Model 4a (Table 6-11) and Model 4b (Table 6-12). Being a high school graduate appears to protect against an income status decline and against a health status decline; it may have a stronger influence on the income-status-decline outcome than the health status decline outcome, particularly for female respondents. It is interesting that high school
graduates were more likely to experience income status regains but less likely to experience
health status regains.

Homeownership status was statistically significant only in Model 4a (Table 6-11). The finding
that homeowners were less likely to have an income status regain was surprising. Surprising also
was that homeownership was related neither to income status declines nor to health status
decreases.

Visible minority status was statistically significant in Model 1b (Table 6-2) and Model 1c (Table
6-3). Non-White respondents, and particularly non-White female respondents, were more likely
to experience a health status decline but not an income status decline. It is interesting to note
that, although female respondents were more likely to experience an income status only decline,
non-White female respondents were less likely to experience this outcome.

Immigrant status was not a statistically significant variable in Model 1 or Model 3. Immigrant
status does not appear to be linked with either income status decline or health status decline or
the likelihood of a subsequent decline in health status after a decline in income status has
occurred or vice versa. The immigrant status variable, however, was statistically significant in
Model 2a (for male respondents only; Table 6-7) and Model 4b (for both sexes together; Table
6-12). In both Model 2a and Model 4b, these respondents were less likely to experience the
outcomes.

Employment status was statistically significant in Model 1a (Table 6-1) and Model 1d (Table
6-4). As such, this variable appears to be related to two-fold declines. Being employed appears
to protect against declines in both income status and health status, particularly for female
respondents.

Among the health behaviours, only smoking history and drinking habits were statistically
significant in more than one submodel. Smoking history was a statistically significant predictor
in Model 1a (neither declined), Model 1c (health status only declined), Model 1d (both declined),
Model 3a (a subsequent health status decline given that an income status decline had occurred),
and Model 4b (health status regained). The drinking habits variable was a statistically significant
predictor in Model 1a (neither declined), Model 1b (income status only declined), Model 1c
(health status only declined), and Model 4b (health status regained). In contrast, the other health behaviours, physical activity and obesity, were statistically significant predictors only in Model 1b (income status only declined). Some of findings regarding the health behaviours were unexpected. Nevertheless, a key finding was that all independent variables used in the study were statistically significant in at least one submodel including the health behaviour models.

7.7.2 Model-by-model discussion

The following sections detail key findings as they relate specifically to each of the study’s models.

7.7.2.1 Model 1: status decline

The following factors at the outset are statistically significant in more than one submodel of Model 1: the respondents’ income status, health status, age, education, employment, and smoking history. These findings are consistent with the literature in that being younger, educated, employed, in very good or excellent health, or not smoking all prevent status decline. With respect to the other explanatory variables and Model 1 outcomes, the following is a summary: First, there were some sex-based differences. Male respondents were more likely to experience the outcome where the respondents’ health status declined and not their income status. In addition, male respondents were less likely to have had only an income status decline. Sex-based differences and their implications are discussed further below with respect to the primary research goal addressed in the other models.

With respect to other demographic variables, being non-White was statistically significant for the outcome where only health status declined and not income status. The findings suggest that, overall, racial background was not a major factor in predicting Model 1 outcomes.

With respect to the health behaviours, overall, they were not major factors. As expected, smoking history was a statistically significant predictive factor. Drinking history was statistically significant in one submodel, but again, as with the income variable, the role of this behavioural variable was unexpected. A history of heavy drinking was statistically significant where income status declined and not health status.
Finally, with respect to Model 1, the research questions related to Model 1d concerned the factors associated with two-fold status declines over the study period. It is important to note that these research questions do not address the first research goal directly but they serve to establish the basis for the specification of Models 2 and 3 that look at the interrelationship between income status decline and subsequent health status decline; in other words, evidence to support social causation or reverse causation.

As such, the statistically significant predictive variables for Model 1d are associated with the group of respondents who experienced declines in both status outcome variables: income and health status. Having a higher income as well as being older, not educated, or smoking promoted declines. As well, being in good or very good health (vs. excellent) promotes declines. These findings are close to the antithesis of the Model 1a findings for statistically significant predictors of no status declines. Again, with respect to the research goals, both total household income and health status are statistically significant factors in predicting two-fold status declines. The predictive variables for two-fold status declines in Model 1d, however, do not specify the sequence of the declines or necessarily support a particular hypothesis for the mechanism or causation for two-fold status declines.

With respect to Model 1, one key finding was that more respondents experienced a decline in their income status than a decline in their health status (Table 4-3). Another key finding was that one third of all respondents had neither an income status decline nor health status decline (Model 1a).

Still another key finding was that total household income at the outset and health at the outset were statistically significant predictors, for both sexes together and by sex, for all of Model 1’s submodels, that is, Model 1a, Model 1b, Model 1c, and Model 1d. Higher total household income at the outset was related to income status only decline or to both income status and health status decline. This result was unexpected. Lower total household income at the outset was related to health status only decline.

Respondents with good or very good health (vs. excellent) at the outset were less likely to experience an income status only decline. Respondents with good health (vs. excellent) at the
outset were more likely to experience a health status only decline. Respondents with good or very good health (vs. excellent) at the outset were more likely to experience both an income status and health status decline.

With respect to the sociodemographic variables, only age was statistically significant in all four submodels. Age was positively associated with the absence of an income status or health decline (Model 1a). Age was negatively associated with income status only declines (Model 1b). Age did have a negative statistically significant relationship in the submodel in which there were health status only declines (Model 1c), but for males only. The younger (vs. older) age group respondents were less likely to have had both an income status and a health status decline (Model 1d).

The educational status variable was statistically significant in three of the submodels and the sex variable in two of the submodels. In Model 1a, high school graduates were more likely to experience the outcome. Educational status was statistically significant in Model 1b, when income status only declined and in Model 1d, when both income status and health status declined. High school graduates were less likely to experience the outcomes. Male respondents were less likely to have had an income status only decline (Model 1b) and were more likely to have had a health status only decline (Model 1c).

### 7.7.2.2 Model 2 and Model 3: sequence of status decline

With respect to Model 2 and Model 3, for both sexes together, and separated by sex, one key finding was that health status decline was preceded by an income status decline more frequently than vice versa.

Another key finding of these models was that only four factors were statistically significant in Model 2 and Model 3. In Model 2, three factors were statistically significant: two for female respondents and one for male respondents. Male respondents who were immigrants were less likely to experience an income status decline before a health status decline. The finding for male respondents was surprising because the immigrant status variable was not statistically significant in Model 1d. The findings for female respondents were unsurprising because the same factors were also statistically significant in Model 1d.
In general, female respondents who had both income status and health status declines less frequently reported excellent health at the outset as compared with good or very good health (vs. excellent) at the outset (data not shown). Female respondents who had both an income status decline and a health status decline were more frequently in the older age group as compared with the middle and younger age group (data not shown).

With respect to the sequence of declines, female respondents in good or very good health (vs. excellent) and in the younger (vs. older) age group were less likely to experience the Model 2a outcome and more likely to experience the Model 2b outcome. The findings from Model 2a suggest either that good or very good health (vs. excellent) at the outset were not promoters of a subsequent health status decline after an income status decline, or that good or very good health (vs. excellent) were not promoters of an income status decline preceding a health status decline when both status declines occurred. The second interpretation is more consistent with the expected role of the self-rated health variable. The findings from Model 2b suggest that good or very good health (vs. excellent) was a promoter of a health status decline when there was a subsequent income status decline.

An interesting finding was that being in the younger age group, for female respondents, was related to having a health status decline precede an income status decline or an income status and health status decline during the same cycle (Model 2b) but only without the inclusion of health behaviours in the modelling. It is not clear how this finding should be interpreted: among respondents with two-fold status declines, on one hand, being younger and being a female either promoted an income status decline after a health status decline, or, alternately, promoted a health status decline first or in the same cycle.

The discussion of Model 3a provides further insight into the issue of what precipitates a health status decline after an income status decline (among respondents who had an income status decline). It may be that the mechanism for the outcome in Model 3a was that: health that was less than excellent, aging, and a history of smoking, combined with an income status decline resulted in a subsequent health status decline. The following is a synopsis of this explanation: Respondents with good health (vs. excellent) and very good health (vs. excellent) were more likely to experience the outcome. Respondents who were in the younger (vs. older) age group
were less likely to experience the outcome. Respondents who were, or had been smokers were more likely to experience the outcome. It is to be expected that those in the older age group and those who were in poorer health (relative to excellent health) would experience an income status decline as well as a health status decline. It is also to be expected that those who were or had been smokers would experience a health status decline.

In Model 3b, among respondents who had a health status decline, respondents who (without the inclusion of health behaviours in the modelling) had very good health (vs. excellent) were less likely to experience a subsequent income status after a health status decline. Although it is noteworthy that self-rated health was the only statistically significant variable in Model 3b, the interpretation of this result is challenging. This result may be due to the small sample size in this submodel.

In addition to being the only independent variable that was statistically significant in both Model 3a, and Model 3b, self-rated health was also the only statistically significant variable common to all models involving two-fold status declines (Model 1d, Model 2, and Model 3).

7.7.2.3 Model 4: income status and health status regains

Model 4 interprets findings related to both income status regains (Model 4a) and health status regains (Model 4b).

The majority of respondents who had an income status decline or a health status decline had a regain (Table 4-3). A greater proportion of male respondents compared with female respondents experienced a regain (Table 5-14). Another key finding was that a greater percentage of respondents who had a health status decline had a health status regain than respondents who had an income status decline and had a health status regain.

Some of the variables that were statistically significant in Model 4a were also statistically significant in Model 1a. Total household income at the outset, age group, educational status, and marital status served as protector variables for Model 1a and for Model 4a.
In particular, for those respondents in the younger (vs. older) age group, the odds of experiencing the outcome was three times as great in Model 1a (Table 6-1) to more than four times as great in Model 4a (Table 6-11).

For Model 1a, sex and homeownership status were not statistically significant variables, but they were for Model 4a (in the case of homeownership status, without the inclusion of health behaviours in the modelling). The direction of the homeownership variable finding is not entirely surprising: It is possible that homeownership status was associated with income status in such a way that income status regains were less likely to occur.

In Model 4b, it is noteworthy that there were statistically significant variables that were both expected and unexpected. It was expected that the following independent variables would be statistically significant. Without and with the inclusion of health behaviours, higher total household income at the outset was associated with a health status regain (Table 6-12). In the same model, without the inclusion of health behaviours in the modelling, immigrants were less likely to experience a health status regain. Among the subset of health behaviours, in Model 4b (and Model 1a) smoking history and drinking habits were statistically significant. As expected, respondents who were smokers or had smoked, or were heavy drinkers were less likely to experience the outcomes of Model 4b and Model 1a.

The following statistically significant factor was unexpected in Model 4b: High school graduates were less likely to experience a health status regain than were respondents who did not graduate from high school. It was expected that higher educational attainment would protect against health status declines and promote health status regains.

Two other variables were noteworthy in Model 4b. Without the inclusion of health behaviours in the modelling, respondents whose income status declined before, or in the same cycle as a health status decline were less likely to experience a health status regain. This independent variable investigated the sequence of decline as a factor in regains. It was expected that this sequence of decline would be statistically significant in Model 4b. Also noteworthy in Model 4a and Model 4b is the self-rated health variable, in that it was not statistically significant in either. Self-rated health predicts neither an income status regain nor a health status regain.
7.7.3 Social causation and reverse causation hypotheses

The literature suggests that there are social determinants of health and therefore, the social causation rather than the reverse causation hypothesis is the most feasible. The first research goal of this thesis was to determine whether income status decline was a stronger determinant of health status decline than health status decline was of income status decline. Implicitly this goal asked whether social causation or reverse causation was a more feasible hypothesis. One indicator of whether one status decline was a stronger determinant than the other is whether there were more observations consistent with one or the other hypothesis. However, frequency counts, by themselves, are limited in that the observation that an event occurs later in time does not mean that the second event was caused by the first. Rather, the causation hypotheses, and the models designed to test them, attempt to establish causation.

The study’s four models addressed aspects of social causation and reverse causation. The interpretation of the four models provided considerable support for social causation and less support for reverse causation: First, income status decline commonly preceded health status decline (Model 2), evidence of support for social causation. Second, the logistic regression findings for Model 1a, Model 1c, Model 3a, and Model 4b support social causation. Third, there was no strong support for reverse causation; however, Model 2a findings indirectly provided some evidence to support reverse causation. Fourth, Model 1b, Model 1d, Model 2b, Model 3b, and Model 4a do not provide support for one direction of causality or another. Fifth, variables related to income, health, and age predicted social causation.

The model results are consistent with the expectation that income status decline would be a stronger determinant of health status decline because there is strong support in the literature for social causation (Buckley et al., 2004b; George, 2003; J. C. Johnson et al., 1999; Mullahy et al., 2001; Phipps, 2003; Pugliesi, 1995; C. E. Ross & Mirowsky, 1995).

With respect to the literature regarding the reverse causation hypotheses vis-à-vis this study, C. E. Ross and Mirowsky (1995) confirms, “In the studies to date that have tested both hypotheses, evidence is typically found for both [reverse causation and social causation], although the effects of social causation are generally stronger” p.167-168. In his research, Crystal (2006) explored Mullahy, Robert, and Wolfe’s (2001) recommendations, that is, the how and why this occurs.
According to Crystal, the consequences of disparities in low-income status and health status accumulate over time and they are more pronounced in mid-life because of years of exposure to risks and stresses. The prevalence of most chronic health conditions increases with age (Statistics Canada, 2006f). What is more, those Canadians who have low incomes were likely to have chronic conditions (Statistics Canada, 2006f). However, according to Lynch and Brown (2011), in later life, aging, chronic diseases, deterioration in functioning, and risk of death, override social factors in their impact on health. What is the impact of health on income?

Crystal’s (2006) U.S. 1990 Census data study, although not disaggregated by gender, provides some support for reverse causation; he contended that at mid-life, health begins to have an impact on financial outcomes. Why, in this study, was there little support for reverse causation? The answer may lie in the findings for Model 1, Model 2, and Model 4. First, the rate of health status declines was low overall, and lower than the rate of income status declines (Model 1). Second, when both an income status decline and a health status decline occurred, a health status decline before an income status decline was a less common occurrence (Model 2). Third, the rate of health status regains was higher than the rate of income status regains (Model 4).

These findings regarding social causation and reverse causation can be explained by the life course perspective. Among the life course perspective’s key principles is that change occurs within all of life’s interrelated processes and that life course development is determined by many factors. Both principles are consistent with the causation hypotheses. Consider the finding that was very frequently observed, that is, an income status decline was followed by a health status decline. In this case, it is speculated that social causation was at play. Among the principles of the life course perspective, which this study’s models tested, was the existence of interrelated processes and other explanatory variables, that is, other causal mechanisms and factors.
Chapter 8
Conclusion

8.1 Introduction to Conclusion

In this chapter, conclusions are drawn about the study. Accordingly, this chapter has two main parts. The first part examines the study’s limitations and strengths vis-à-vis the degree to which the research and other goals of the thesis were met. The second part discusses the implications of the findings including suggesting directions for new knowledge about this topic. These implications are discussed in terms of public policy, professional practice, and future research, and their consequent interest to academics, policymakers, politicians, researchers, and social workers.

8.2 Study Limitations

Using the NPHS dataset had some drawbacks. The NPHS excludes a number of groups whose participation in the survey would have ensured a more representative sample. Excluded were members of the Armed Forces, residents of Indian Reserves, remote northern Ontarians and Quebecois and Northerners, and those, who, at the outset, were residents of long-term healthcare institutions (but not those who moved into these institutions). In the case of those who were residents of long-term healthcare institutions, it was possible that regardless they would have been excluded from the study sample at the outset because it was likely that they would have had poor or fair health and hence been screened out. Finally, another drawback of the NPHS dataset was the existence of missing values. As discussed above, steps were taken to minimize the related impact, while maximizing the size of the sample.

Second, the study design did not monitor, for purposes of the predictive models, whether respondents’ status changed between cycles with respect to the independent variables. The design accounted only for changes in the values for the dependent variables. If a respondent’s income status or health status declined (or regained), such a change of status would have been identified as a change. However, the values of the corresponding independent variables were the values at the outset of the study, that is, Cycle 1. Therefore, one of the study’s limitations is that the change of a dependent variable is not necessarily linked to the immediately preceding values of the independent variables in the predictive models. For example, assume that the value of the employment status variable in Cycle 1 was employed for a particular respondent. Assume further that the respondent was not employed in Cycle 2 and had an income status decline in
Cycle 3. According to the study design, the predictive models would link the outcome of income status decline with the value of employed rather than with the value of not employed.

Similarly, it could be argued that the study design should have taken into consideration within-cycle changes in the values of independent variables; however, the NPHS survey questionnaire does not explicitly ask whether the status of the respondent was unchanged. A respondent’s employment status, for example, could change and revert to the original status within a cycle. Regarding the measurements of the values of key independent variables, it should be noted that frequency distributions were measured for all cycles in order to estimate the rate of respondents who had dropped out of the survey.

Another limitation is related to the study design vis-à-vis the independent variables total household income and self-rated health. The study design identifies the first decline in total household income and health in reference to the values of total household income and health at Cycle 1. Per the study design, the income or health values might have increased from Cycle 1 and declined subsequently with that decline not necessarily being captured. It also should be noted that if income status or health status regained within the same cycle or before the end of the next cycle, such status changes also would not have been identified. Regardless, within-cycle changes may have been impractical to operationalize due to the complexity associated with devising such a study design.

A third limitation of the study is that it would have been useful to measure and analyze a respondent’s work history. Work history may be predictive of people’s current and future financial situation as well as predictive of health status. The NPHS does collect information on the work history of its respondents: the historical information was collected for the duration of the survey but not prior to the date the survey was first administered in 1994. Work history from the time of initial employment, which might well have been prior to 1994, would have been more appropriate than what was available in the NPHS.

A fourth possible limitation concerns the validity of measures that involve self-reporting. This is a subject of ongoing debate. For example, although it could be argued that data from other measures would have permitted triangulation of health status, there is a strong argument that survey respondents generally rate their health accurately (Shields & Chen, 1999). Along the
same vein, there are debates about the validity of household income as a measure of SES. Survey respondents consistently refuse to disclose, overrate, or underrate their income (Krieger, Williams, & Moss, 1997; Riphahn & Serfling, 2005). For this reason, some researchers, for example, Singh-Manoux, Adler, and Marmot (2003) suggest that it would be valuable to employ another measure, that is, subjective SES (persons’ sense of their standing in the social hierarchy). Subjective SES is a better predictor of health status and health status decline than is self-reported personal or household income. However, it would have been impossible to devise subjective SES data from the NPHS dataset, and therefore this was not pursued.

Another related issue is the study’s use of the NPHS’s survey respondent’s data on household income. The value for self-rated health refers to the personal health of the survey respondent. In contrast, the value for total household income does not refer to personal income; rather it refers to household income. To ensure consistency, an alternative was explored for this study. The alternative was to analyze the sub-sample of data on respondents who were primary breadwinners, thereby achieving parallel measures, that is, an individual’s income and an individual’s health. This approach would have identified whether there was a relationship between total personal income and self-rated health. This alternative was discarded for one main reason: an event like retirement was very likely to occur with this sub-sample. Had personal income been used as a measure, retirement would have resulted in a greater income status decline than would result with the use of household income. If a respondent shares household expenses with another household member, the financial impact of retirement is not as great, as it might be otherwise (Chawla, 2006; LaRochelle-Côté et al., 2008; LaRochelle-Côté et al., 2010; MacDonald, Andrews, & Brown, 2010). Therefore, personal income was not as good a measure because it belies the financial implications of living in a household.

Fifth, another possible limitation was the designation of the reference category for the study’s two variables for which there were three levels, that is, health at the outset and age group. Methodologist Garson (2006) suggests that it less than optimal to choose extremes for the reference category. Because it makes for a better comparison, it is better to choose a middle level.

Finally, a major issue, especially when carrying out secondary data analysis, is that models are frequently misspecified. In this study, other predictor variables, in addition to or instead of the
ones used, could have predicted outcomes in the various models. Employing other predictor variables such as access to services, degree of social support, existence of chronic conditions, and employment history would have improved the ability to predict outcome variables.

8.3 Study Strengths

Until approximately a decade ago, few similar Canadian studies had been carried out because datasets that could be used for such studies were not widely available. Indeed, up to that point, there were limited analyses of the influence on health of a range of socioeconomic indicators other than income and marital status (Buckley et al., 2004b). The establishment of the NPHS in the mid-1990s led to the creation of a large, nationally representative dataset. The focus of the NPHS was health status, one of the two foci of this study. The NPHS also captured data related to the other foci of this study, that is, financial status. What is more, the NPHS collected data on several variables related to these foci. They were self-rated health, health behaviour, total household income, and homeownership status. As well, the NPHS collected data on sociodemographic factors such as sex, marital status, and educational status. The creation of the NPHS enabled fine-grained analyses of the effect of socioeconomic indicators on health.

Another important aspect of this study was that its target population was a random sample of Canadians thereby enhancing the generalizability of the study findings. The study’s total sample was representative of this age group of Canadians in this period. NPHS's high response rate meant that the sample size was adequate. What is more, this study can be readily replicated in the future. The study, which involved inferential statistical modelling undertaken in a variety of ways (four models with two to four submodels each) and the method of analysis undertaken, that is, logistic regression, allowed nuanced analyses, thereby revealing distinctive patterns among the predictors and outcomes.

These factors contribute to a number of strengths of this study: First, this study’s scope was noteworthy. The study simultaneously sheds light on the aspects of financial security that influence health outcomes and the inverse, the aspects of health that influence financial security. What is more, the study sheds light on the influence of several sociodemographic factors on income and health. This approach is arguably more comprehensive than the usual approaches to this topic.
Second, this study was empirically driven as well as conceptually driven. Some important features of the NPHS made it ideal in that regard. Employing NPHS’s longitudinal data for analyses was important because implicit in a longitudinal design is an acknowledgement of the life course perspective, one of the two theoretical perspectives used to conceptualize the models. In the words of Settersten (2003b), longitudinal survey data allow a "serious and systematic inquiry about the larger life course" (p. 1). By extension, a longitudinal study has the advantage of “track[ing] how peoples’ social circumstances and health chances are shaped across the course of their life” (Graham, 2007, p. xvi). Arguing for the use of longitudinal data is the fact that health and income intersect with each other and with the lifelong process of aging. Indeed, using longitudinal data was critical in testing the study’s hypotheses--the analyses of status regains, in the context of aging (George, 2003). Aging has many layers of complexity, and is not a simple, uncomplicated phenomenon, and as such, several cycles of longitudinal data were used to explore change over time. Essentially, this study examined factors related to aging, changes in income status and health status over a period of several years. As well, the findings from this study further the understanding, from a life course perspective, of a relatively under-studied phenomenon, that is, declines in income status and health status in mid- and later-life. In addition, causation was studied by examining the sequence of decline in health status and income status. Importantly, this study also examined another topic infrequently analyzed in this same population, that is, regains in income status and health status.

Third, with respect to the assumptions related to logistic regression, almost all were met. Met was the assumption that the variables of interest in all cases must be dichotomous. In addition, the assumption that outcomes were statistically independent was met; that is, “a single case is represented in the dataset only once” (Wright, 2004, p. 220).

The assumption that the levels of the outcome variable were mutually exclusive and collectively exhaustive categories was met.

According to Hosmer and Lemeshow (2000), there has been “surprisingly little work on sample size for logistic regression” (p. 339). A range of minimum sample sizes has been suggested to meet the requirement for the assumption regarding sample size. Wright (2004) suggested that a larger sample be used than would be the case for linear regression analysis. He recommended employing Aldrich and Nelson’s (1984) guideline of 50 cases per predictor. Harrell, Lee, Califf,
Pryor, and Rosati (1984) suggested another guideline, that is, there must be more than 10 cases per predictor for any given model. Using the latter guideline, the assumption of an adequate sample size was met. That said, it is important to note that in one of the submodels, Model 3b, the sample distribution of the dependent variable was not adequate (Table 4-3). As well, in another of the submodels, Model 2b, it was necessary to combine two variables (those whose health status declined before income status declined and whose income status and health status declined during the same cycle) in order to achieve an adequate sample distribution. It would have been ideal to have had submodels for both those whose health status declined before income status declined and those whose income status and health status declined during the same cycle. The optimum, in terms of yielding robust logistic regression analyses findings, would have been to have larger sample distributions in Model 2b and Model 3b.

The specificity (measure of classification accuracy) assumption, which is infrequently met (Wright, 2004), was not met.

It should also be noted that, because logistic regression was the analytical method used, it was not necessary to determine whether any continuous variables had a normal curve, because normality is not an assumption of logistic regression analyses.

In conclusion, all of these attributes support the validity of the findings from this study and their interpretations. It was discussed above, model-by-model, the high degree to which the study’s goals were met and the research questions were answered (Table 7-1).

8.3.1 Public policy implications

Some important public policy implications flow from this thesis’s main findings: First, because the factors associated with health status declines are largely structural or sociodemographic rather than behavioural, the emphasis with respect to public policy should be on programs that promote income stability and thereby prevent health status decline (Hawe, 2009). Indeed, Stronks, van de Mheen, Looman, and Mackenbach (1996) suggested that public policy should address structural issues such as inadequate housing and material deprivation. A similar approach, which was suggested by Muennig (2008) is that public policy should focus on income equality, tax credits, employment insurance, and legislation to ensure minimum wages. By implication, the emphasis in terms of public policy should be on “redistributive programs, such
as early education interventions, earned income tax credits, or social insurance” (Muennig, 2008, p. 574).

Second, for mid- and later-life Canadians, income status decline is a stronger determinant of health status decline than is health status decline of income status decline. Although both occur, this finding confirms that initiatives that promote stable incomes and prevent income losses should be a priority. One approach is to develop human capital by ensuring a populace prepared for employment. This increases the likelihood that they will be self-sufficient and enjoy a decent standard of living. In this regard, this study’s findings suggest that one group that merits public policy attention is the female respondents of Model 2. They were particularly vulnerable—when a decline in one status occurred, soon thereafter there was a decline in the other status. Muennig (2008) holds that had health status decline been a stronger determinant of income status decline, the policy priority would be health prevention programs and disability insurance. Still, this does not preclude the need to thwart income status declines through interventions that counter a lifetime of exposure to risky health behaviours (Herd, Robert, & House, 2011).

Third, the relatively frequent occurrence of income status regains and health status regains may point to the positive impacts of existing policies that mitigate long-term or permanent decline in the income status or health status of mid- and later-life Canadians. From a public policy point of view, income status and health status declines may not be as large an issue as originally thought. In other words, the policy implication of declines is moderated because a large proportion of respondents experienced status regains. That said, it continues to be important to preserve relevant Canadian legislation, improve social transfers (such as those provided by Canada’s retirement income systems), and ensure short-term assistance for those in need. Of particular interest, in terms of policy development, are those study respondents who were less likely to experience an income status or a health status regain. Despite their small proportion (6.6%), particularly vulnerable were the respondents those who had a two-fold status decline and did not experience regains in income status or health status. A profile of their characteristics would provide policymakers with important knowledge to tailor policies that address their needs. Respondents who were less likely to experience regains in income status were homeowners. Respondents who were less likely to experience regains in health status were immigrants, were heavy drinkers and were or had been smokers. A strategic approach would be develop programs
for those who are most at risk of status declines and no regains per the findings of this thesis. Indeed, Veall (2007) suggested that public policies should target the most vulnerable among Canada’s older population. Particular attention should be paid to respondents who were less likely to have a health status regain related to the fact that they had a health status decline following an income status decline (or a two-fold status decline in the same cycle; Table 6-12).

Fourth, a large percentage of respondents in Model 4b had health status regains, with higher total household income being related to those regains. Public policy initiatives that will ensure good health among Canadians include a guarantee that the income levels of Canadians are adequate to ensure that their health is maintained. One model, proposed by The Honorable Marc Lalonde in the 1970s, was based on the concept of a guaranteed annual income (Couchman, 2003; Government of Canada, 1973). According to the proposal, the Government of Canada would guarantee a minimum or basic income for all Canadians. Thus, a guaranteed annual income would ensure a robust social safety net in Canada. It could be concluded that such a policy would facilitate health status regains for Canada’s citizens. Another means of ensuring health status regains would be to protect Canada’s system of publicly funded health care.

Fifth, from a social policy perspective, the finding that homeowners were less likely to experience an income status regain is concerning. The financial burden of homeownership may inhibit income status regain. At the extreme, for seniors, the desire to continue living in the family home may result in losing their homes if they undertake a reverse mortgage. This becomes a public policy issue if lending institutions target vulnerable seniors to entice them to undertake debt, which they can ill afford.

In sum, the study’s findings suggest some possible foci for ongoing and future public policy initiatives. Much still needs to be learned about the way in which particular mid- and later-life events and public policies influence each other. A decline in health status (or in income status) in mid- or later-life may be due to certain public policy choices that have been made by government policymakers (Crystal, 2006). It can be considered a public policy failure when some Canadians experience income and/or health status declines related to a lack of employment or education. As well, other groups that merit attention are those who experienced neither an income status decline nor a health status decline, or only one type of status decline--future
research to inform public policy should focus on understanding what else contributes to these outcomes.

8.3.2 Professional practice implications

There was limited literature to inform the possible professional practice implications of this study. The reasons for this are speculative. It is possible that the topic precluded generalizations that are useful for professional practice. The bodies of knowledge related to income status and health status regains among mid- and later-life Canadians are complex in nature and, therefore, the professional practice implications are multifaceted. More commonly examined, but albeit not at great length, were the social change imperatives that flow from research findings. Whatever the explanation, there are professional practice implications of this study’s findings that should be addressed.

This thesis may be useful for clinicians to identify individuals at risk of income status and health status declines. As well, it may help identify those who are unlikely to experience income status and health status regains. If clinicians understand what promotes income security and good health they will be able to estimate the risk to individuals of adverse events occurring. Knowledge about clients’ strengths and weaknesses in this regard will allow clinicians to anticipate the need for intervention. Clinicians can then proactively investigate pension eligibility as well as tax programs that address financial inequality. Clients identified as at-risk can be encouraged to take preemptive or corrective action against status declines by taking stock of their sources of support and strengthening them.

If those professional practitioners employed in advocacy roles become familiar with the recurring themes that surfaced in this study, they will be better equipped to able to engage in the debates surrounding which public policies require attention.

8.3.3 Future research implications

Research that is an amalgam of all populations fails to differentiate between risks, drivers, patterns, and implications for specific populations. While there are similarities between this thesis’s study population and the general population, there are important and distinct differences. For that reason, this thesis is important--it examines a specific population. Nonetheless, in this regard, this study does have some limitations that future
research could address. Some groups were omitted from the study. Further research could include mid-life Canadians living in the North, on reserve, or other groups excluded from this study. Respondents could also be stratified geographically by region or by urban or rural locations. Sex, visible minority status, and immigrant status were statistically significant variables in some of the models in this study. There could be additional focus on those groups that are of greatest public policy interest.

Another limitation of this study that could be addressed in future research concerns the data used for the explanatory variables. The study could be improved if work life history (or health history) information had been available. In addition, other variables, not included the study in the models might explain more. As well, the independent variables used in the study were also limited in that their values were set at Cycle 1. It would have been useful to compare findings if the regression models were also estimated according to the values of the independent variables in the cycle in which an income or health status occurred.

As noted in the study limitations, a drawback of the NPHS dataset was the existence of some missing values. To address this, it would be useful to undertake future research that validates these findings and ensures its generalizability.

In the study, regains within a cycle were not captured. This was a limitation of the NPHS dataset. Some regains within a two-year period may have been excluded. Both the frequency of declines (in either health or income status) may have been underestimated in the study as well as the frequency of regains. Future research could address this limitation and produce exact estimates on income status and health status regains for mid- and later-life Canadians.

Additional longitudinal research would improve the utility of the study’s conceptual framework and affirm its generalizability. This research would help redefine and evaluate the suggested conceptual framework in the context of social causation and reverse causation. As well, methods, other than the ones used in this study, might provide more evidence of causality.

Ongoing analysis might reveal the following: the policies, programs, and services that are necessary to meet the needs of this study’s population, the effectiveness of policies, programs, and services that address the issues that are raised in this thesis, and the interrelationship between public policy decisions and social causation/reverse causation.
8.4 Chapter Summary

This chapter is comprised of a discussion of the thesis’s implications, and yields insights that will assist both governmental policymakers and program developers in the broader public and nonprofit sectors. In this chapter, the public policy, professional practice, and future research implications are discussed and recommendations for changes are made. Infrequently discussed in the literature were the practical repercussions of this topic for public policy, professional practice, and research. Therefore, most recommendations are based on the drawbacks and strengths of the present study.
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