THE HEALTHY OR CHRONICALLY ILL IMMIGRANT

THE HEALTHY OR CHRONICALLY ILL IMMIGRANT:

A LONGITUDINAL COMPARATIVE ANALYSIS OF CANADIAN IMMIGRANT AND NATIVE-BORN STRESS AND MENTAL HEALTH, CHRONIC CONDITION, AND AGE EFFECT CHARACTERISTICS UTILIZING THE NATIONAL POPULATION HEALTH SURVEY (NPHS)

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A Thesis

Submitted to the School of Graduate Studies

in Partial Fulfillment of the Requirements

for the Degree

Master of Arts

McMaster University

MASTER OF ARTS (2004) **McMaster University**
(Geography) Hamilton, Ontario

TITLE: The Healthy or Chronically Ill Immigrant: A Longitudinal Comparative Analysis of Canadian Immigrant and Native-Born Stress and Mental Health, Chronic Condition, and Age Effect Characteristics Utilizing the National Population Health Survey (NPHS)

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NUMBER OF PAGES: (xviii), (215)

Abstract

Utilizing the longitudinal component of the National Population Health Survey (NPHS) (1994/1995 – 2000/2001), designed to collect comprehensive information on the health status of the Canadian population and related socio-demographic information, differences in health status between immigrants and non-immigrants (i.e., native-born individuals) were explored. Specifically, the analysis investigated how chronic conditions influence the health of immigrants, the role of stress and mental health upon immigrant health status, and the influence and role of previously underrepresented variables such as age and arrival cohorts on foreign-born health status. The conceptual approach of this project draws upon a 'population health' perspective, which suggests that the most influential determinants of human health status are non-medical in nature, but rather can be identified as the social and economic characteristics of individuals. Analysis was completed through the use of ordinary least squares stepwise regression and logistic stepwise regression in association with descriptive stochastic methodologies. Analysis of the mental health and stress variables suggests that, contrary to what has been expressed in literature in the past, both immigrants and the native-born do not perceive stress, distress, or depression to be major problems or health concerns in their lives. Furthermore, the analysis indicated, as was expected, that older immigrants are at greater risk of developing more chronic conditions relative to younger groups, and that arrival cohorts, the period in which an immigrant entered the nation, do exert a considerable influence on the health status of the foreign-born. Surprisingly, this analysis indicates that the Healthy Immigrant Effect (HIE), which proposes that recent immigrants,

regardless of country of birth, tend to be in better health than the Canadian-born population upon entering the nation, may be more apparent than real, especially when investigating mental health and stress conditions amongst the foreign-born.

Acknowledgments

First and foremost I would like to thank Dr. Bruce Newbold. If it were not for his generous assistance and supervision this project would not have been conceptualized or completed. His ideas, contributions, and guidance were greatly appreciated. I would also like to thank all those other members of the School of Geography (past and present) who assisted me on this journey.

A special thanks is extended to the Canadian Institutes of Health Research, which provided project funding and financial support making this project possible. In addition I am grateful for the assistance provided by James Chowan and Cindy Cook from the McMaster Research Data Centre. Together they answered many questions and provided helpful encouragement.

To my friends, on campus and off I wish to thank-you as well. Your encouragement was deeply appreciated, your offers of assistance did not go unnoticed, and the distractions you provided throughout this period were gratefully welcomed. I wish you the very best of luck in all your endeavours and extend a very sincere thank you to you all!

Finally, I must thank the other very special people in my life, my loving family, especially my parents, who instilled in me the importance of striving for my dreams, the courage to pursue the desires in my heart, and the drive to learn all that I can learn. Thank you for your unwavering support and for feigning interest as I drone incessantly on and on and on…

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Introduction:

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1.0 Study Context

Canada's prosperity, diversity, and relatively open-immigration policy, have long made it a natural attraction to individuals immigrating from other nations. It is a diverse and inimitable nation that accepts and promotes the notion of a multicultural population; presenting immigrants with possibilities most often previously unattainable in their nation of origin. Beginning in the 1960s, reforms and reassessments to Canadian Immigration Policy subsequently increased the number of immigrants entering the country and introduced immigrants to the nation with greater variations with respect to their education, origin, and income (Kobayashi *et al.*, 1998). These changes to the composition and demographics of the immigrant population present new challenges to social service provision including health care provision.

The majority of the research related to the immigrant population has focused upon issues relating to the social adjustment of newcomers to the nation, the influences of immigrant settlement to the social and economic structures of the nation, the effect of immigration upon the changing demographic profile of the Canadian population, and the motivations behind the choice to immigrate. Relatively less attention has been directed towards understanding the multidimensional determinants of immigrant health, variances

between immigrant health status and the health status of native-born populations, the influence of age and period of arrival on immigrant health, the mental health and stress characteristics of the immigrant population, and upon the persistence of chronic disease and illness amongst immigrants.

Those few studies that have addressed immigrant health have typically been completed in a cross-sectional format, failing to demonstrate variances in health status over a specified duration. Although providing an indication of immigrant health status relative to the native-born population by examining the persistence and prevalence of specific illnesses and participation in high-risk behaviour and lifestyle practices, they fail to paint a comprehensive portrait of the different forces at play in determining immigrant health status, and do not adequately describe how the interconnection of these forces relate to changes in health status changes over time. The influence of health determinants, like many of the other forces and factors that influence human survival and development, may intensify and diminish over periods; different factors being more influential at one point in time and failing to exert any significant influence at another. It is only by identifying and defining those determinants believed to be most responsible for influencing human health status, by conceptualizing some method by which to trace the influence of these health covariates and determinants over time, and through analysis of how these forces modify health status, that an understanding of immigrant health can be accomplished.

1.1 Defining the Study Objectives

In order to further improve the knowledge and understanding of concerns regarding immigrant health status variances between the immigrant and native-born groups and to provide insight into the determinants of health for the immigrant population, this analysis was conducted. The goal of this thesis is to measure and compare health status and need for care within immigrant populations; to understand the role of age, arrival period, race and ethnicity, country of origin, and other covariates associated with health status and utilization, and to determine if stress and mental health disorders are important factors in deciding the health of immigrant groups, with comparisons made to the native-born population. Native-born refer to any individual who was born within Canada, while immigrants refer to a group of individuals who are foreign-born, that being, any individual who entered into the nation as a refugee, legal immigrant, or illegal immigrant. Although the reasoning behind immigration may vary from individual to individual, and each immigrant possess' their own defining and unique characteristics, each of them has one common trait, that they were not born within Canada.

Three key objectives subsequently follow from these research goals:

1. *To explore the role of stress and mental health upon immigrant health status;*
2. *To investigate the influence and role of age (and arrival cohort) on immigrant health status*;
3. *To gain insights into how chronic conditions influence the health of immigrants.*

With each analysis an investigation into the influence of lifestyle choices and other covariates associated with the determinants of health framework was conducted. Each of these objectives was selected for analysis because current literature and research has concluded that differences exist between native-born and immigrant health status. These seemingly unexplainable divergences in health justify further analysis in order to conclusively determine if variances in health do exist between these two very different population groups.

Analysis is also required in order to investigate and determine whether or not stress and mental health conditions, which represent serious conditions resulting in numerous adverse and debilitating health outcomes, readily afflict the immigrant population and negatively influence their health status following the often stressful experience of immigration. Understanding the various ways that mental health and stress conditions influence immigrant health is necessary because immigrants by nature represent a group of individuals that are exposed to potentially adverse stressors; the process of immigration in itself is a considerable source of stress and anxiety. The displacement and isolation that immigrants may experience following immigration; being potentially isolated from loved ones; possibly being the victims of racism and prejudice; experiencing considerable reduction in socio-economic status and the feelings of self-worthlessness and triviality that are associated with such experiences may result in considerable, unhealthy, and debilitating stress. Immigrants represent a group of individuals seeking potential opportunity and shelter in a 'better-place', it is necessary therefore to understand if immigrants perceive and understand stress, and to ensure that if

they do recognize the impacts of stress upon their health, that they have sufficient services available to them in order to effectively minimize and hopefully eliminate any stress they may endure.

The observed variances in health status between immigrants and native-born groups, and the lack of current research addressing the topic, further rationalizes the necessity of research focusing upon the positive health association between age and illness, which proposes that as age increases an individual's susceptibility or risk of illness manifestation increases. Despite a great deal of research having established that age is positively correlated with health status, the bulk of these studies have based observations on the general population and very few have addressed or examined the immigrant population separately. However, immigrants represent a very special group of individuals with a mean age typically lower than the national mean age and with lifestyle conditions and experiences varying significantly from those of native-born persons. Furthermore, the age at which immigrants enter the nation may vary between groups, subsequently resulting in individuals entering the nation with completely unique and defining characteristics relative to immigrant groups that arrived earlier in time or that entered the nation at a later date. With such unique characteristics it is unfortunate that the majority of analysis has failed to focus more upon immigrants. Further research is therefore necessary to determine if age exudes an influence on the health status of newcomers and to determine if the health trends observed amongst the native-born population, similarly apply to the immigrant population.

Finally, because previous research has investigated the prevalence of disease and illness amongst immigrants and determined that the foreign-born population typically suffer fewer chronic ailments and report lower levels of disability relative to the native-born, it is important to compare the trends of chronic conditions amongst the immigrant population within a longitudinal context. By observing if differences in chronic condition rates between the two population groups persist with time, rather than observing differences exclusively in a cross-sectional format, a true understanding of the health status difference between these two groups may be achieved. It is important to understand how chronic conditions manifest among immigrants and differ from the native-born because it may provide insight into those conditions immigrants are most at risk of developing, and may allow appropriate screening techniques to be implemented and suitable policy to be developed that addresses such conditions.

1.2 Study Organization

This investigation fills gaps within the literature identified by a Health Canada report (Statistics Canada, 1999) and builds upon existing literature through two key contributions. Firstly, the analysis utilizes longitudinal data, enabling immigrant health to be traced over a period of time (1994/1995 - 2000/2001), while controlling for health covariates. In this way, the research emphasizes the *dynamic* nature of health by placing health status and health characteristic trends within a *longitudinal* context. Secondly, the analysis focuses upon specific health issues that have been overlooked within the general literature, including the effects of immigrant arrival cohort, and mental health conditions

upon immigrant well-being. Results from the analysis are presented in both descriptive and multivariate outputs, created from data presented in the Canadian National Population Health Survey (NPHS) commissioned by Statistics Canada. All results are congruent with the guidelines and regulations established and enforced by Statistics Canada.

The work completed for this thesis is presented in several different chapters; each with its own focus and additional or supplemental information is presented with the assistance of tables, figures, and appendices. Chapter two reviews the current literature regarding immigrant health, and points to deficiencies within the current analyses. Chapter three summarizes the methods and approaches utilized to complete accurate data analysis and discusses the National Population Health Survey; presenting readers with information about the study's objectives, design, and data collection procedures. Chapter four and chapter five present findings from the NPHS analysis dealing with stress and mental health issues, and age and arrival cohort issues, respectively. Chapter six, dealing with discussions and conclusions, presents readers with a synthesis of information about major findings observed through the analysis process, discusses linkages between the current study and existing immigrant health and health determinants literature, and wraps up with some general commentary.

Chapter Two

Literature Review:
Exploring the Immigrant Health Literature and Disseminating the Determinants of Health

2.0 An Exploration of Immigration Health Literature

Health is a complex multidimensional concept that plays an inherent role in every human's life and that is continuously influenced by both natural and non-natural forces. Despite substantial increases in medical research, pharmacological developments, and evolving proficiency in the fields of clinical health sciences, biomedical, and social science research, a clearly defined understanding of the determinants of health seemingly eludes researchers. A plethora of research exists related to the causative nature of disease and illness and with conceptualizing a definition of health. However, understanding what makes a person healthy, and conversely, the interconnected processes that result in ill health are not yet fully understood. These processes may act singularly or synergistically, may involve extended latency periods, and may influence individuals in a combination of various symptoms and outcomes. Despite this apparent challenge, the identification of the determinants of health is a necessity to addressing and understanding current health concerns.

Understanding the determinants of health is important not only for the native-born members of a society but also for those individuals who have immigrated to a nation.

Immigrants potentially represent a minority group within the population that are exposed to various conditions and alternative stressors that may greatly and adversely influence their quality of life or health status; subsequently resulting in a necessity for immigrant health research. Therefore, in an attempt to review contemporary ideas regarding the measuring and understanding of health status, the determinants of health, and exploring how these afore mentioned theories and ideas relate to the immigrant population, a systematic review of the literature was completed and findings, limitations, and considerations from the literature are presented in the following section.

2.1 The Healthy Immigrant Effect: Phenomena or Reality?

The Healthy Immigrant Effect (HIE) is based on observations that recent immigrants, regardless of country of birth, tend to be in better health than the Canadian-born population upon entering the nation, but with increasing time spent in the destination origin, the health status of these individuals begins to decline to, or below, the national health status standard (Chen, Wilkins, and Ng, 1996). This perplexing and alarming health trend is particularly true among immigrants arriving from non-European countries. Chen, Wilkins, and Ng (1996) concluded that individuals who had lived within the country for more than ten years experienced an increase in the number of chronic conditions and long-term disabilities they suffered, so that rates of occurrence among immigrants approached levels in the Canadian-born population. Based on these observations it is reasonable to conclude that as time-spent in the nation increases,

immigrant's lifestyles and health-related behaviour begins to resemble that of the Canadian-born, subsequently causing a deterioration in health status (Figure 2.0).

Results of analyses completed by Chen, Ng, and Wilkins (1996) and Chen, Wilkins, and Ng (1996) support the existence of such a phenomenon. Based on data from the NPHS (1994/1995), Canada Census (1986-1991), and the Health and Activity Limitation Surveys (1986-87 and 1991), the researchers concluded chronic conditions were less common among immigrants than among the Canadian-born population (50 percent versus 57 percent respectively) and that immigrants were less likely than the Canadian-born population to have any long-term disability. As well, the age-adjusted proportion of non-European immigrants who had been hospitalized overnight in the 12 months before the interview was significantly lower than that of the Canadian-born population (7 percent versus 10 percent respectively). In addition, the 1991 age-standardized percentage of males from non-European nations who had a disability was 7.6 percent compared with 16.5 percent of Canadian-born males. The results for immigrant and native-born females were 8.6 percent and 16.2 percent respectively. The prevalence of severe disability was low but the overall ranking persisted: 1.4 percent for non-European males versus 2.7 percent for the Canadian-born, and for females the analysis revealed results of 2.2 percent versus 3.3 percent. For both sexes, changes between 1986 and 1991 in the prevalence of disability by place of birth were small (especially for severe or moderate disability) (Chen, Wilkins, and Ng, 1996).

The HIE may reflect multiple non-exclusive factors. First, people in good health are generally more inclined than those in poor health to emigrate, with potential

immigrants required to undergo screening to ensure they do not suffer from serious or debilitating medical conditions (Chen, Ng, and Wilkins, 1996; Abraído-Lanza *et al.*, 1999). In particular, employability, which is one factor in granting permission to immigrate into Canada, requires a certain level of health in order to be productive, although individuals entering the nation under the clause of family reunification, which may include the elderly or disabled individuals, are not necessarily refused entrance.

While explaining the high level of health amongst immigrants at the time of arrival, this does not explain the subsequent decline in health. The question remains, therefore, as to why, despite the HIE, immigrant health status deteriorates with duration of residence and within such a short period of time following arrival at the destination. The existing literature recognizes that immigrants, by definition, move from one set of health risks, behaviours, and constraints, to an environment that potentially includes a very different mix of these same characteristics, with probable adverse impacts upon health (Gordon, 1957; Marmot and Syme, 1976). While it does not provide substantial insight into why health status declines after arrival, declines in health status have often been attributed to the uptake of unhealthy lifestyles including poor dietary habits, and smoking and/or drinking, following settlement in the destination country (Frisbie *et al.*, 2001). Contributions to poor health stemming from unhealthy lifestyle choices are, however, unlikely to manifest themselves within a few short years as is observed within the literature, but rather several decades may pass before adverse health outcomes or characteristics develop. Moreover, such outcomes also imply that immigrants would

need to reduce their health promotion behaviours far below those of native-born Canadians.

Structural explanations provide an alternative line of reasoning for exploring such health variations. Birch and Gafni (1999), for example, argue that the restructuring of the Canadian health care system throughout the 1990s resulted in an increasing proportion of care being deemed as non-insured. In an era of cost-containment, the impacts within the Canadian health system are not consistently equal across the population (Eyles *et al.,* 1995), with low-income groups and the poorly educated less able to deal with system restructuring, even within the publicly financed system (Birch and Gafni, 1999). By extension, the immigrant population may also be particularly disadvantaged. Unease or distrust of the medical system, or a medical system that does not provide culturally sensitive and appropriate care, may create additional barriers and apprehension towards accessing available services (Anderson *et al.*, 1993; Bentham *et al.,* 1995; Deinard and Dunnigan, 1987).

Furthermore, declines in health status may reflect a broader set of health determinants that are magnified within the immigrant population. Articulated by the determinants of health (DOH) framework, health is influenced by a broad range of factors and interrelationships between factors, with demonstrated associations between health status and social, demographic, economic, psychological, physiological, and environmental variables (Dunn, 1996; Evans and Stoddart, 1990; Evans, 1994; Jones and Moon, 1992). Consequently, declining relative health within the immigrant population may represent a combination of issues including their social, political, economic, and

cultural position within the host society. Conversely, loss of socio-economic status and social networks, poor working conditions, and language barriers may contribute to declines in health (Anderson, 1987; Chen, Wilkins, and Ng, 1996; Elliott and Gillie, 1998; Grossi *et al.*, 1999; Hanna, 1997; Lock, 1991; Saldov, 1991; Wozniak, 2001). Access to health services, and ultimately overall health, may be especially limited among immigrant women whose family, job, or cultural expectations and roles may make it difficult to access and use resources (Anderson *et al.,* 1993; Dyck, 1995; MacKinnon and Howard, 2000; Oxman-Martinez *et al.*, 2000; Weerasinghe *et al.,* 2000). Poor access and service use may lead to a worsening of health status over time owing to the relative under-use of preventative health screening and under-diagnosis and treatment of health problems. However, for health status to continue to decline over time, barriers to care must also persist over time, while existing evidence suggests that utilization of health care services actually increases with increasing duration of residence (Newbold, 2003). Improved access and use of health services therefore likely leads to increased recognition and reporting of conditions, and consequently poorer self-assessed health.

Immigrants may also embody different perceptions of health relative to the broader population in general, and health professionals in particular, hindering understanding of health and illness. Indo-Canadian women, for example, perceive loneliness and depression as matters that do not warrant medical attention, but instead view them as personal problems (Anderson, 1987). If, on the other hand, health status is correlated with these effects, it is logical to assume that as acculturation progresses, language skills improve, and knowledge of and opportunities to access health services

increase, health status should, at a minimum, stabilize. However, it is ultimately unclear from the literature what role acculturation has upon health outcomes, although acculturation, measured through (for example) community participation, social contacts, income adequacy, and housing, may be associated with better health.

2.2 Understanding Immigrant Health Status:

Accessing Services and Maintaining Health

Despite the health variations associated with the HIE, immigrants typically do not report any significant barriers to health care services (Chen, Ng, and Wilkins, 1996). These researchers reported that most newcomers (77 percent) reported having no difficulties accessing needed care or services for their health problems. However, those who did not seek services gave the following reasons:

- Language difficulties (7%)
- Health problems were not serious enough to warrant visitation (3%)
- Did not know the doctor or where to go (3%)
- Poor relationships with doctor (2%)
- Transportation issues / lack of available time / lack of available appointments / feelings of embarrassment (9%)

Furthermore, Chen, Ng, and Wilkins observed that approximately 80 percent of the newcomers (76.2 percent males and 83.6 percent females) reported having a range of professional contacts over a one-year duration. Contacts included visitations to:

- General Practitioner (80%)
- Dentist (39%)
- Nurse (7%)
- Psychologist / Social worker (7%)
- Optometrist / Optician (24%)
- Pharmacist (23%)
- Specialist (20%)
- Chiropractor (3%)

Utilization rates such as these reflect self-reported statements made by immigrants claiming to have few problems accessing health care services, largely attributed to Canada's universal health care system. These findings indicate that immigrants are accessing services when required and are making active attempts to maintain their health. Newbold (2004) for instance, noted that concurrent with declining self-assessed health, the proportion of the foreign-born reporting contact with a general practitioner increased suggesting that need for care was being met. The same analysis similarly concluded that the utilization of hospital services by immigrants was largely consistent with hospital use in the general population. That is, hospital use was related to need for care, consistent with expectations. Moreover, the foreign-born were neither at greater nor lesser risk of experiencing a hospitalization relative to the native-born. Reinforcing the conclusions presented by Newbold (2004), Chen, Ng, and Wilkins (1996) observed that few individuals (5 percent) reported having had unmet needs for health care services; findings did not vary by immigrant status or years in Canada, but was identified as being negatively associated with low income.

The lack of reported difficulty accessing services, introduces another important health determinant that may significantly influence health status: the supply of health care services. Various regions may have varying quantities and qualities of services. Although, as has been previously stated, the majority of immigrants deny having any problems accessing services, the number of services at an immigrant's disposal may significantly influence their health status. Therefore, the inclusion of such a variable in immigrant health research is necessary. Although determining exactly how it impacts or

influences immigrant health status may be difficult, steps should be taken in order to determine the variables 'fit' in the health determinants framework.

2.3 Dissecting the Determinants of Immigrant Health:

A Population Health Perspective

Within their work, "Producing Health, Consuming Health Care", Evans and Stoddart (1990) construct a progressively complex framework of the determinants of population health (Figure 2.1). The concluding framework produced by the authors consists of several interconnected natural (i.e., genetic endowment and individual response, etc.) and non-natural (i.e., health care and prosperity, etc.) determinants of health status. The framework produced by Evans and Stoddart illustrates the complexity of pathways through which variables influence health. However, the framework only presents a general overview of the numerous variables and factors that interact to determine health status, and there is little in-depth exploration and description of these determinants and their interactions with health status in the context of immigrant health. An alternative representation of the framework is presented within this work, and presents some of the sub-determinants of health, or rather, the specific determinants of immigrant health, which collectively compose the larger determinant categories presented by Evans and Stoddart (Figure 2.2). Although these researchers conceptualized the framework based on the general population the revised framework has been modified to focus more exclusively on the immigrant portion of the population. This approach is a basic representation of the numerous determinants and correlates that influence

immigrant health. Further research may be required to determine if any outstanding determinants of health remain unidentified, and to conclusively determine the mean intensity of influence each variable possesses.

Determinants can be understood as causes, mediating factors, and contextual influences, in this context, relating to the health status of individuals and particularly to immigrant groups (Dunn and Dyck, 2000). Recently, a transition has occurred in the focus of health research from a paradigm concerned with the biomedical causation of health outcomes, to an increasing focus upon the social determinants of health; a transition to the new population health perspective. John Frank (1995) alluded to the importance of this new perspective, in which researchers are finally beginning to contemplate the full realm of health determinants, and recognizing that health outcomes are not the result of a single factor but rather that:

> *"[T]he major determinants of health status, particularly in countries at an advanced stage of economic development, are not medical care inputs and utilization, but cultural, social and economic factors – both at the population and individual levels. The influence of these factors is ubiquitously manifested in profound social gradients in health status, which are surprisingly independent of diagnostic categories of illness, tending to persist across shifts in disease pattern and in hazardous exposures over time, and across societies"*

Typically, health orientated literature focuses on attempts to discover the aetiology of disease (Dunn and Dyck, 2000). However, unravelling these causes requires a clear understanding of the mechanisms through which a single agent, a set of factors, or

a sequence of circumstances can lead to a disease or illness. An enhanced understanding of population health determinants, their interactions, and contextual influences will significantly influence the understanding of health outcomes; subsequently resulting in the potential success of public health programs because specific conditional influences may be addressed. Identifying determinants is difficult due to their complexity and dynamic nature, but it is a necessary endeavour that may provide unique insight into the health status of immigrants.

2.3.1 Exploring Socio-Demographic Correlates

The multitude of factors that individuals experience throughout their everyday lives and the very characteristics that define them as individuals are categorized by social determinants of human health. Consequently, a great deal of existing literature is directed at understanding these correlates of health, with the literature revealing, that social determinants of health exert a potentially strong influence upon the health status of immigrant populations (Dunn and Dyck, 2000). One of the most influential social factors affecting health status - immigrant health status - in particular is participation in social networks (Dunn and Dyck, 2000; House, Landis, and Umberson, 1999). Scientists have long noted an association between social relationships and health. More socially isolated or less socially integrated individuals are less healthy, psychologically and physically, and have a greater propensity for the development of adverse health outcomes (House, Landis, and Umberson, 1999). Social support seemingly provides a buffer that protects individuals from the negative health effects of stress, largely by reducing the likelihood

that undesirable events and life conditions will be appraised as stressful or traumatic (Cohen, 1988; Sorensen, 2000).[1]

Researchers such as House, Landis, and Umberson (1999) hypothesize that the extent and quality of social relationships experienced by individuals is a function of broader social forces. Whether people are employed, married, attend church, belong to community organizations, or have frequent contact with friends and relatives, the nature and quality of those relationships are all determined in part by their position in a larger social structure that is stratified by age, race, sex, and socio-economic status, and is organized in terms of residential communities, work organizations, and larger political and economic structures. These researchers further posit that social networks influence health, based on the quantity of social relationships, their formal structure (such as their density or reciprocity), and the actual content of these relationships (House, Landis, and Umberson, 1999). Dunn and Dyck (2000) propose that immigrant networks can have two outcomes: the network can be of *lower quality* due to arrival in a new country resulting in language and cultural barriers, or conversely, that the constructed networks may be of a *better quality* due to "enclaving" effects experienced following settlement.

Studies have indicated that marriage is beneficial to mental and physical health, largely because it provides economic resources and social support (Umberson and Williams, 1999). However, the benefits of marriage depended on the quality of the marital relationship (Grove, Hughes, and Style, 1983; Sorensen, 2000). Lilliard and

[1] Social support was not specifically analyzed because the variable utilized to measure social support was not constant across all cycles in the NPHS and because the only variable that could have potentially acted as a replacement measure for social support referred exclusively to labour force/support in the work-place. However, marital status was included within the analysis in order to act as a proxy for social support, as research has indicated that marriage provides a strong sense of personal social support.

Panis (1996) propose that marriage results in greater material well-being stemming from the economies of scale achieved by combining resources and from specialization of tasks common in marriage. These researchers further propose that marriage operates by reducing stress and stress-related illness, increasing care giving in times of illness, encouraging healthy behaviours, and discouraging risky or unhealthy acts, therefore, resulting in increased health status among those married individuals and significantly lowering morbidity and mortality rates compared to unmarried persons. Marriage seemingly reinforces a social network between couples, allowing them to more adequately deal with the stresses endured in the destination location.

In a 1996 study completed by Lilliard and Panis, comparing health utility between single, married, divorced, and widowed males it was observed that the decision to marry for the first time, by itself does not generate any benefits as measured by self-reported health, however, divorced men by contrast may expect a health benefit from remarriage. For divorced men over age 50 the net benefits are even larger than the gross benefits. It was observed that divorced men's health deteriorates 28 percent faster than that of married men, and that never married, divorced, and widowed men are at higher risk of mortality than married men. It is reasonable to assume that although the participants in this study were not exclusively restricted to immigrants, the results are similarly applicable to minority groups.

Education also has a significant impact on immigrant health status. Strauss *et al.*, (1993) concluded that increased education is generally associated with better health. Furthermore, findings from Chen, Ng, and Wilkins (1996) report that over three-quarters

of recent (76 percent) and long-term (79 percent) non-European immigrants aged 18 and over completed secondary education, relative to fewer numbers (74 percent) of the Canadian-born. The researchers also discovered that recent European immigrants (85 percent) have secondary graduation or greater, but fewer (71 percent) long-term European immigrants have attained this level. Such statistical outcomes indicate that typically immigrants, regardless of county of birth, are achieving higher degrees of schooling relative to the native-born population. The results also point to the importance of distinguishing immigrants by arrival cohort.

Arrival cohort is a variable, that despite its under utilization and representation in previous publications and immigrant health investigations, may exert a significant influence on immigrant health status, that is, the period in which an immigrant entered the nation may exert a significant influence on their health status. Pérez (2002) suggests that more recent new comers may possess better health status relative to immigrants who have entered that nation in the past, and therefore have resided within the country for a greater length of time. In addition, the variable is important because it may provide information about the motivations for immigration, and help to explain the characteristics of the individuals entering the nation. The addition of the arrival cohort variable into the present investigation further sets it apart form earlier publications and previous immigrant health research.

Research has illustrated that a gradient exists (direct positive correlation) between age and health status. This relationship shows that as age increases, the number of chronic illness and disabilities an individual experiences also increases; so that as a

person ages, they become increasingly susceptible to illness and declining health (Novak, 1997). Chen, Ng, and Wilkins' (1996) analysis further concluded that recent immigrants tended to be younger than the Canadian-born population, therefore, contributing to their healthier state. However, this occurrence may be a remnant of the screening practices employed by the Canadian Federal government.

Perhaps one of the most profound and problematic social determinants of health is gender itself. Gender includes both a basic biological distinction labelled *sex* and a fundamentally social one labelled *gender* (Sorensen, 2000). Gender has been reported as being strongly correlated with emotional well-being and common mental health disorders of recent immigrants (Ritsner *et al.*, 2001). Gender has both cultural and genetic attributes that may result in varying degrees of health status amongst males and females. Furthermore, females may be forced into a subordinate role, drastically reducing their participation outside of the household; considerably reducing their exposure to social amenities and health care services (Belsky, 1999). Moreover, females are typically much more likely to admit illness and to be sensitive to their physical state. Males on the other hand have increased job participation, which may potentially lead to greater degrees of stress exposure, over-work, and physical exhaustion (Holmes, 1988; Belsky, 1999).

The majority of the literature prepared on the concept of race and ethnicity as a determinant of health originates from the United States and is limited in two key aspects. First, the literature tends to conflate 'race' and immigrant status and is based on the premise that human health variations and the differential distribution of health status can be abbreviated exclusively to genetic and biological factors (Dunn and Dyck, 2000).

Second, the literature typically relates to race as a static population category, which subsequently fails to acknowledge issues such as racialization; resulting in the marginalization of specific social and population groups (Dunn and Dyck, 2000). Such a limitation is problematic because research has revealed that racial variations in health status may result from differences in personal individual socio-economic circumstances (Dunn and Dyck, 2000). Despite the problematic nature of these variables and the methodological difficulties encountered when incorporating them into an analysis, the inclusion of race and ethnicity is important as both variables can impose a significant influence on health status. The benefits of utilizing such variables aids, not only with categorically defining the population being examined, but also by providing insight into the general health status of each of the groups being observed.

Work completed by Parakluam, Krishnan, and Odynak (1992) concluded that regional location or region of settlement has a significant impact on health status. Health status measurements and differentials compared between provinces revealed that for immigrant males Quebec scored the highest and the Atlantic Provinces scored lowest; for immigrant females British Columbia scored greatest and the Atlantic provinces the lowest. Controlling for age, sex, and region, in the country as a whole, for males, the health status of the foreign-born is better than that of the native-born among all age groups except for those aged 60 years or over. The study further concluded that health status of the foreign-born is a function of the region of residence in this country; the less developed the region the more likely that the health status of the immigrant is unfavourable compared to the native-born.

Many of the studies investigating health status among immigrants fail to identify the impacts that pre-migration health and experiences may have on the health outcomes of the individuals in the new region of settlement. The lack of pre-immigration health measures reflects a data issue, due primarily to the fact that following immigrant relocation to the destination region, historical health records and evidence of health care service utilization are often untraceable or may be non-existent. It is difficult to comprehensively gauge an individual's current health status without having some idea of an individuals' past health state and previous health practices. While it is true that upon entering the nation the immigrant population is subject to a screening process, utilized to detect the presence of infectious and potentially life-threatening or population threatening illness; researchers may find it impossible to gather any sort of historic data that would aid with the process of formulating a retrospective picture of the individual's health status within their own home nation, prior to migration. Despite this difficulty, some literature does attempt to document pre/post immigration health status variances (Dunn and Dyck, 2000). Past health experiences will have a significant influence on the health status of the immigrant in the new community. Attempting to determine such pre-immigration influences is typically avoided however, as recall-bias on the part of the respondent and no discernible way to verify the accounts as true, makes such research problematic. Therefore, the majority of research focusing on the health effects attributed to immigration focus on health outcomes following re-settlement in the destination community.

With such a broad range of individuals immigrating to the nation from such a broad range of countries, it is increasingly important to understand how the health status of individuals differs from one origin nation to the next. Therefore, it is important to investigate the influence that country of birth variables have upon immigrant health status. Not only does country of birth information provide insight into the different characteristics of incoming immigrants, but such information may also provide insight into which determinants of health have the greatest impact, or rather are most significant, for the different groups of immigrants that call Canada home. Despite potentially encountering difficulties when utilizing such variables, including problems with appropriately aggregating countries of birth or working with low sample sizes (i.e., from isolated nations or non-typical origin nations), investigating the influence of country of birth is important and necessary in order to produce a comprehensive report.

2.3.2 Exploring Mental Health Correlates

Many positive outcomes can be attributed to the process of immigration such as increased financial opportunities, freedom, and opportunities for self-growth and development. However, immigrants often characterize the actual process of immigration as an extremely stressful experience in which the period of resettlement presents substantial demands for adaptation and monumental conditions that need to be negotiated before any of the opportunities afforded by migration can be experienced (Sorensen, 2000). There is some literature addressing the relationship between migration and health, and the explanations for potential causes of immigrants' high rates of emotional distress

upon entering into a nation, such as the works completed by Aroian (1988) who investigated the psychological adaptation of Polish immigrants to Seattle, and by Lin *et al.,* (1979) who observed stresses experienced by Vietnamese immigrants. However, there has been little empirical research completed on understanding the mechanisms through which the stressors experienced throughout the immigration and resettlement process affect emotional and physical health.

The shortcomings of past research, as identified by Sorensen (2000) have left several important issues unanswered such as (1) identifying which aspects of the resettlement and immigration process are particularly most distressing, (2) explicating how generic stressors have specific components unique to immigration and resettlement, and (3) understanding how cumulative interactions among multiple stressors experienced in the immigration processes act synergistically to adversely impact health status. Sorensen further concludes the primary reason for the shortcomings of the existing literature, are that researchers who have attempted to resolve these issues base their work primarily on standardized measures of psychological functioning. Such indicators are excellent measures for documenting the relationship between life experiences and changes, and health status, but cannot elucidate mechanisms of how such life-processes affect health status.

Despite seemingly high utilization of medical services, Matuk (1996) reported that immigrants admit to experiencing sudden and significant stress during their resettlement process. Immigrants often experience personal, social, and financial hardships from occupational adjustments, social isolation or racial discrimination, and as

a result they pay very little attention to their health unless they require illness treatments. Several researchers (Dunn and Dyck, 2000; Matuk, 1996; Chen, Ng, and Wilkins, 1996) also observed that newcomers must learn how to communicate within an alien culture, and therefore language barriers proved challenging when attempting to gain access to medical health care services. Despite these reported difficulties the majority of literature clearly states that immigrants do not have trouble accessing services available to them.

The process through which stress acts upon human health is not fully understood. As well, limited work has been completed associated with investigating the influence and interaction of mental health conditions such as stress, depression, and distress with determinants of health. As a result, there has been little empirical research completed on understanding the mechanisms through which stressors experienced during the immigration and resettlement process effect emotional and physiological health. Physicians increasingly acknowledge that stress is a contributing factor in a wide variety of health problems. These problems include cardiovascular disorders such as hypertension (high blood pressure); coronary heart disease (coronary atherosclerosis, or narrowing of the heart's arteries); and gastrointestinal disorders, such as ulcers. Stress also appears to be a risk factor in cancer, chronic pain problems, and many other health disorders (Bouten et al., 2003; Otis, Keane, and Kerns, 2003; Lillberg *et al.*, 2003; Fackelmann and Raloff, 1993). Researchers have identified stress, specifically an individual's characteristic way of responding to, or coping with stress, as a risk factor for cardiovascular diseases. Stress is also highly correlated with reduced or decreased human immune response. Therefore, stress itself may act as a causative agent for illness,

but the effects of stress upon the body may also subsequently leave an individual predisposed to developing further illness. Also problematic is the dichotomy between mental health and stress. Prolonged stress may have a causative influence towards the development of mental health problems, but mental health issues may themselves result in increased duress, distress, and stress. Persons who experience a high level of stress for a long time, and who cope poorly with such stress, may become irritable, socially withdrawn, and emotionally unstable. Some people under intense and prolonged stress may start to suffer from extreme anxiety, depression, or other severe emotional problems. Individuals with a well-developed ability to confront, deal, and cope with stress may be able to effectively reduce their anxiety levels and reduce stress to a state of minimal health or psychological impact. Individuals with coping strategies, in essence, deal with stress in a constructive manner and reduce the impact it has upon their life quality.

Research by Ritsner *et al.,* (2001) explored the adverse effects of stress upon health status, and further concluded stress may be gender related. Utilizing the TBDI (Talbieh Brief Distress Inventory) scale, a self-administered questionnaire that related stress to gender, Ritsner *et al.,* found that women consistently report greater levels of stress relative to males. Research indicates that female immigrants may be subject to elevated rates of stress potentially attributed to hierarchical traditions and socio-cultural regulations (i.e., masculine dominated societies) experienced in their origin nations (Stoller and Gibson, 1997; Luxton, 1980; Kendall, Linden, and Murray, 2001). Therefore, the cumulative stress of challenges endured throughout the migration process,

further compounded by difficulties encountered at the destination-location may have significant impacts of the health status and well-being of immigrant females.

Investigation of the life-experiences of 25 Polish immigrants, determined that six central stressors summarize the challenges faced by recent immigrants immediately following migration: *loss and disruption, novelty, occupation, language, subordination, and feeling at home* (Sorensen, 2000). Migration is characterized by multiple and simultaneous losses that completely disrupt the lives of immigrants resulting in extreme distress (Sorensen, 2000). Such losses include valued possessions, careers, places of emotional significance, and especially the loss of social networks and isolation from family and religion (Sorensen, 2000). Novelty describes the process of challenges to adaptation in the host society; problems experienced while attempting to understand social processes and overcome social barriers due to a lack of knowledge (Sorensen, 2000). The resulting lack of familiarity with the host population's social processes may result in jeopardizing the immigrant's ability to live satisfactorily (i.e., both materially and psychologically) (Sorensen, 2000). Challenges due to language barriers manifest themselves in numerous ways such as inability to gain meaningful employment and relate to members of the foreign-born population (Sorensen, 2000). Subordination is experienced by immigrants due to a feeling of lack of control over basic properties of their life (Sorensen, 2000). Essentially, the barriers and challenges experienced by recent immigrants culminate in a feeling of inferiority and being a "second-class" citizen (Sorensen, 2000). The final stressor identified, feeling at home, is the end-point of the adaptation process (Sorensen, 2000). One would assume that achieving a sense of

familiarity with the host population would result in a state of psychological comfort derived from feelings of acceptance, however, it was discovered that such feelings create tension due to perceptions of displacement between the origin and destination "worlds" (i.e., immigrants are accepted by the host-society at the sacrifice of their traditional heritage, customs, and traditions, resulting in pangs of guilt and potential remorse) (Sorensen, 2000). Sorensen concedes however, that such feelings and stresses are relative to the experiences of the immigrants involved in the analysis; some immigrant groups may have less traumatic departures and less demanding resettlements. Unfortunately, a limitation of current immigrant stress related research is that there is no indication of how the magnitude and intensity of stress varies relative to length of time within the host nation or amongst different ethnic communities.

2.3.3 Exploring Lifestyle and Behavioural Health Correlates

The habits and dependencies individuals develop, such as smoking, excessive drinking, poor dietary habits, and participation in high-risk activities can have serious influences on health status. Therefore, such dependencies and risky behaviours are significant health determinants. Chen, Ng, and Wilkins (1996) observed that the number of immigrants never having smoked was much more common than among the Canadian-born population. Also, immigrants were significantly under-represented amongst regular drinkers and over-represented amongst those that never drank. Similar results were discovered for rates of smoking through research and analysis completed by Dunn and Dyck (2000) utilizing first cycle (1994/1995) data from the National Population Health

Survey. Physical activity and exercise are also examples of lifestyle choices that can impact health status. Chen, Ng, and Wilkins (1996) further observed that the nature of immigrant's leisure time pursuits varied with respect to birthplace. Inactive leisure activities were less common amongst long-term European immigrants when compared to activity among the Canadian-born.

Recent research has focused on the adverse health effects associated with exposure to environmental tobacco smoke (ETS), commonly referred to as second-hand smoke, observing the effect of tobacco smoke on non-smokers who share the same environment with a smoker such as within a household, living environment, or occupational setting. The United States Environmental Protection Agency (EPA) estimates that exposure to ETS, which contains all the toxic agents inhaled by a smoker, causes approximately 3,000 cancer deaths and an estimated 40,000 deaths from heart disease per year in non-smokers (Encarta, 2000). Second-hand smoke can aggravate asthma, pneumonia, bronchitis, and impair blood circulation, severely altering an individual's life-quality, subsequently leading to a substantial decrease in health status.

While some studies have found that moderate consumption of alcohol has beneficial health effects, including protection from coronary heart disease, such research is relatively recent and requires further consideration and exploration. Although there is growing recognition and acceptance of the beneficial health outcomes associated with moderate and responsible alcohol consumption, and evidence that teetotallers may have an increased probability of developing future heart-health problems, the majority of empirical research examining such behaviour concludes that excessive and prolonged

intake of alcohol can seriously disturb body chemistry resulting in unfavourable health outcomes and considerable declines in long-term health status (Risk Indicators Worksheet, 1998).

2.3.4 Exploring Socio-economic Health Correlates

Socio-economic status influences health habits, the prevalence of depression, the burden of care-taking and number of working hours, access to health insurance and medical care, and security in old age (Sorensen, 2000). As well, socio-economic position has further been shown to affect nutrition, growth, and development; determining life chances including later education and income; and contribute at a population level to striking differences between rich and poor geographic areas and between developed and developing countries (Sorensen, 2000).

Research completed by Sorensen (2000), Lilliard and Panis (1996), and Dunn and Dyck (2000) indicate that socio-economic indicators have a broad impact on health, and socio-economic status is related to health status, respectively. The findings presented from several other studies also indicate that substantial increases in mortality and morbidity are associated with persistent low-income insecurity (McDonough *et al.*, 1997; Abraído-Lanza *et al., 1999*). Van Doorslaer *et al.,* (1997) proposed that what makes the difference to health is more a matter of people's relative income and status in society rather than their absolute material living standards. Relative income suggests that the psychosocial causes of the health gradients within countries are more powerful than the direct physical effects of exposure to poorer material circumstances. In addition, research

completed by Chen, Ng, and Wilkins (1996), concluded that immigrants' household income tended to be better with longer duration of residence in Canada. It was observed that 52 percent of recent European immigrants had household incomes of $30, 000 or greater compared with 59 percent of those who had been in Canada more than 10 years. Similarly, only 47 percent of recent non-European immigrants had household incomes in this range but for non-European immigrants who had been in Canada more than 10 years, the proportion was 63 percent, somewhat above the figure for the Canadian born. The findings presented by Dunn and Dyck (2000) reveal that immigrants living in Canada less than 10 years were significantly over-represented in the lowest and lower middle income quintiles, and were significantly under-represented in the highest quintile. Dunn and Dyck (2000) also propose that socio-economic factors are more important for immigrants than non-immigrants, although in ways that defy simple explanation.

2.4 Limitations of the Literature

Typically, any analytic study or investigation has potential limitations and flaws inherent in design, the sources of data utilized, interpretations and conclusions, and through biases and errors incorporated in the methodological approaches utilized. Reviewing the literature identified numerous interesting results and unexpected conclusions. However, several limitations were also identified consistently throughout the literature regarding immigrant health and determinants of population health. Several of the researchers including Dunn and Dyck (2000), Matuk (1996), and Chen, Ng, and Wilkins (1996) state that an unfortunate limitation in the current research is that it

aggregates variables, provides little information about pre-migration characteristics and influences, and is typically based on cross-sectional data. Aggregation of variables refers to the problems of data detail. For example, the majority of studies group sources of immigrants into large categories (i.e., Asian = Chinese, Taiwanese, Korean, Mongolian, and Japanese), which consequently reduces the precision of the analysis. However, in some instances such aggregation may be unavoidable due to low sample sizes or information disclosure regulations. The majority of data utilized within analyses is based on recently collected information and therefore there is little indication of the respondent's health status prior to immigration. Such information is required if an accurate estimation of the immigration-process' impact is to be fully understood on the individual's mental health and health status state. Finally, studies based on cross-sectional data do not provide any indication of health status change with time. Health processes are typically sensitive to time, as health is non-static, and therefore conditions may intensify or diminish over the duration of "*n*" units of time. Longitudinal analyses are the only means by which a comprehensive and clear understanding of how the health status of immigrants change as time spent within the destination location increases.

Other limitations were reported and observed within the literature, including issues related to the generalizability of outcomes, problems with how and why respondents were responding to questionnaires, and low response rates or sample sizes. Issues with outcome generalizability were encountered often; analysis conducted on specific immigrant groups may not be comparable with the larger immigrant population, due to variations in socio-cultural habits and characteristics, the findings of studies

limited to examining one or few cultural, ethnic, or racial immigrant groups may not have applied very well to other ethnic groups. Several studies reported that members of the household with "supposed" best knowledge of the health characteristics of individuals responded to the surveys. Although results collected through this process are typically considered robust, misrepresentation of opinions or erroneous responses may subsequently result from such methodological approaches. In some instances, such methods cannot be avoided, as when analyzing individuals in a foreign-language or dealing with minors, but self-reported or self-perceived results are preferable. Finally, low sample numbers were often utilized for analysis because immigrants were weary of participation, and/or language or social barriers made it difficult for interaction or accurate responses to questions.

Furthermore, low-response rates may exist as a consequence of the screening process experienced by all immigrants entering the country. Such practices subsequently reduce the number of recent immigrants entering the nation with pre-existing health ailments or poor health statuses, however such policies do not effectively prevent health status deterioration often experienced following relocation into the destination community. While it is fortunate that such practices ensure the arrival of healthy and productive individuals, the approach from a research perspective, is problematic as it effectively reduces the overall occurrence or frequency of illness and disability within the incoming immigrant population. For example, immigrants with cancer or congenital illnesses may not be admitted entrance to the nation and therefore research investigating

such ailments among recently immigrated individuals is difficult, if not literally impossible.

The literature also fails to include discussion concerning arrival cohorts or period of arrival. As Pérez (2002) correctly points out, differences in health status across the immigrant population may result from cohort effects. That is, for example, more recent new comers or arrivals may have possessed a better health status when they entered the nation relative to the their long-term immigrant counterparts, who have resided within the country for a greater length of time, and who immigrated to the nation at an earlier period. Earlier arrivals, for the most part, are also much older then recent immigrants, and more likely to reflect predominantly European sources. With changes to Canadian immigration policy in 1962, major source countries shifted, such that by 2002, the Asia and Pacific regions represented the largest origin (52 percent). Africa and the Middle East represented the second largest origin region (20 percent), and Europe and the United Kingdom became the third-largest origin region (17 percent). Immigration policy has also shifted over recent years, with the Federal government placing increased emphasis on 'economic' immigrants, selected on the basis of Canada's 'point program', which scores immigrants based upon criteria such as language abilities, skills, education, and age, or their ability to financially contribute or invest within the nation. In addition, arrival cohort proxies exposure to environmental conditions or hazards within the host country, exposure to economic, social, or fiscal conditions, which may entail greater awareness of health care opportunities, and may elucidate an increasing need for care with increasing age. The variable is further important because differences in self-

assessed health status are likely to be revealed when arrival cohort is controlled for, with the variable reflecting differences within the immigrant population including mean age, reason for entry, and health status and behaviour in the host country.

While there is a great deal of literature identifying the adverse implications of stress on mental health and health status within the general population, very little discussion focuses upon the influence of stress on immigrant health. The variable, however, is an important one to investigate, not only because stress has serious health implications, but also because typically immigrants self-report the process of migration and acculturation as not only an economically and socially trying-time, but in addition, as a psychologically and emotionally draining and stressful experience. It is important to understand how stress influences immigrant mental health, and whether the stress experienced following relocation influences health status and has implications associated with the HIE.

2.5 Extensions

Health is a complex multidimensional concept that influences nearly every aspect of human survival. Despite substantial improvement and development in medical research, a clear conceptualization of the determinants of health has not yet been established, nor does a comprehensive understanding of the HIE exist. Reviewing the current literature provided a better understanding of the determinants of health and the various influences that these determinants exert upon health status. By examining the

limitations of previously completed studies and attempting, where possible, to avoid duplication of such shortcomings, a more effective analysis was completed.

Extensions to the immigrant health literature will be significantly aided by utilizing data from the National Population Health Survey, enabling longitudinal analysis. By conducting a longitudinal analysis, the research is able to 'track' variances in immigrant health status through time. Analyzing the data in this fashion will provide valuable insight into how immigrants adapt to new socio-cultural influences within the country. Analysis will also aid the understanding of the HIE and provide information about the process of health variation with time, and the seemingly perplexing health divergence between immigrant and native-born populations. Tracing the same individual through time provides insight into health status changes, and therefore, potentially, provides an indication of the forces that are acting upon immigrants to result in the proposed Healthy Immigrant Effect. Also, analyses focusing more upon the under-represented variables of arrival cohort and stress disorders will greatly increase the comprehensiveness of immigrant health analysis and research. These are important variables that provide in-depth information about health care utilization patterns and health status trends that without the use of longitudinal datasets are increasingly difficult to effectively analyze. It is important to determine how immigrants are coping with the stresses experienced following the migration process and the health status outcomes associated with acculturation processes. As well, it is important to investigate how immigrants of different arrival cohorts compare to the native-born national health standard.

Figure 2.0
A Visual Conceptualization of the Healthy Immigrant Effect

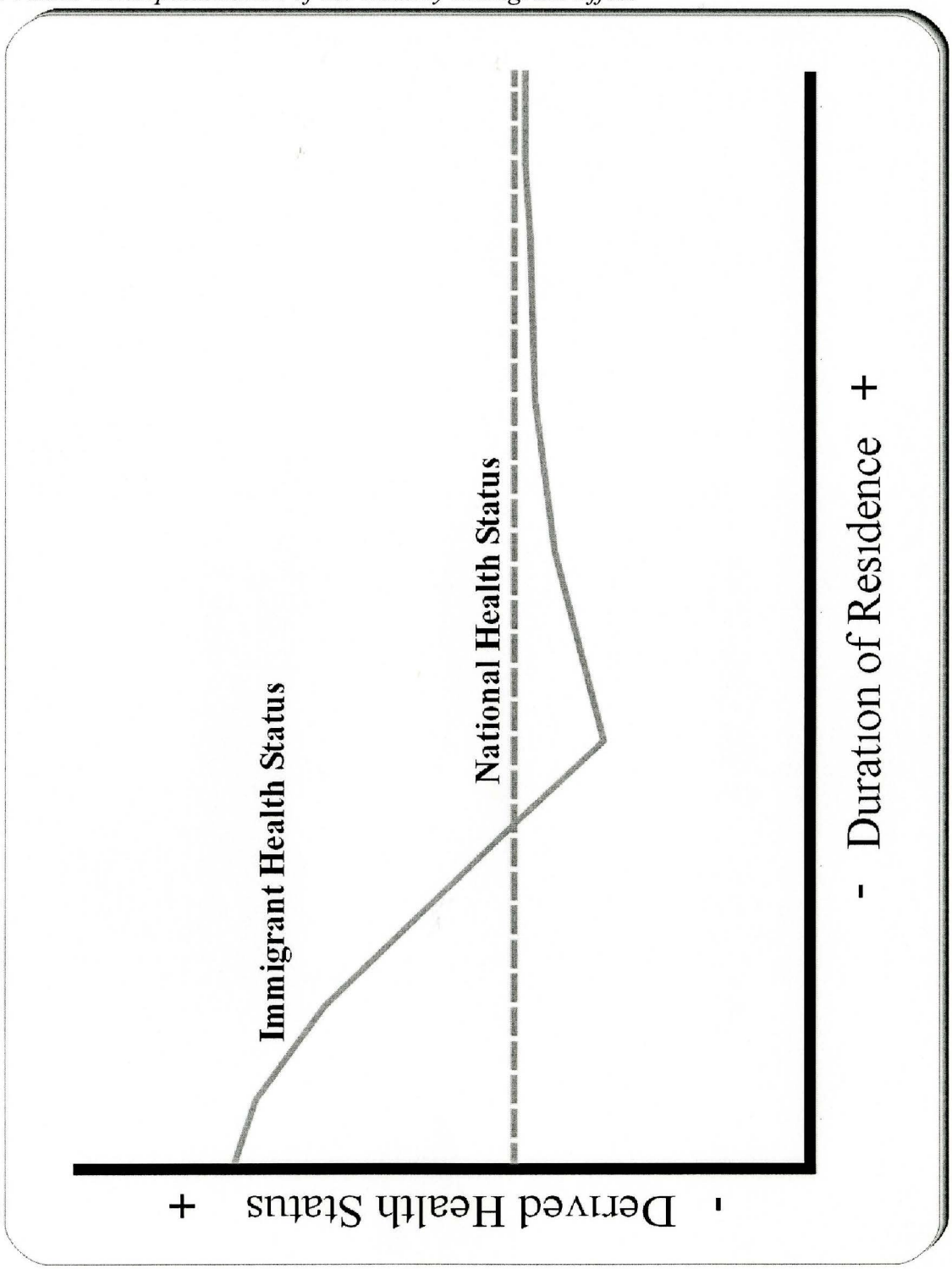


Figure 2.1
Determinants of Health Framework – Evans and Stoddart Version

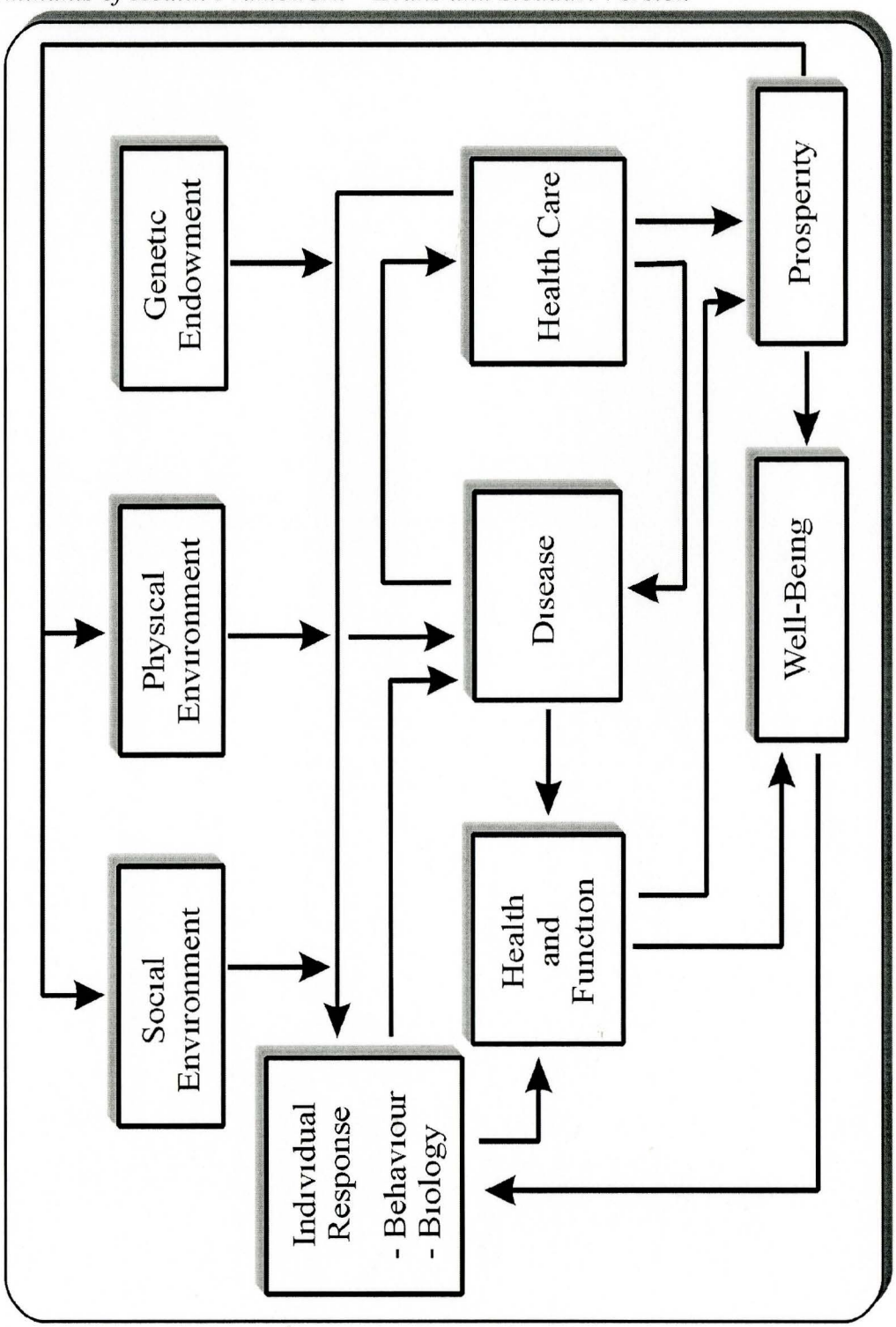
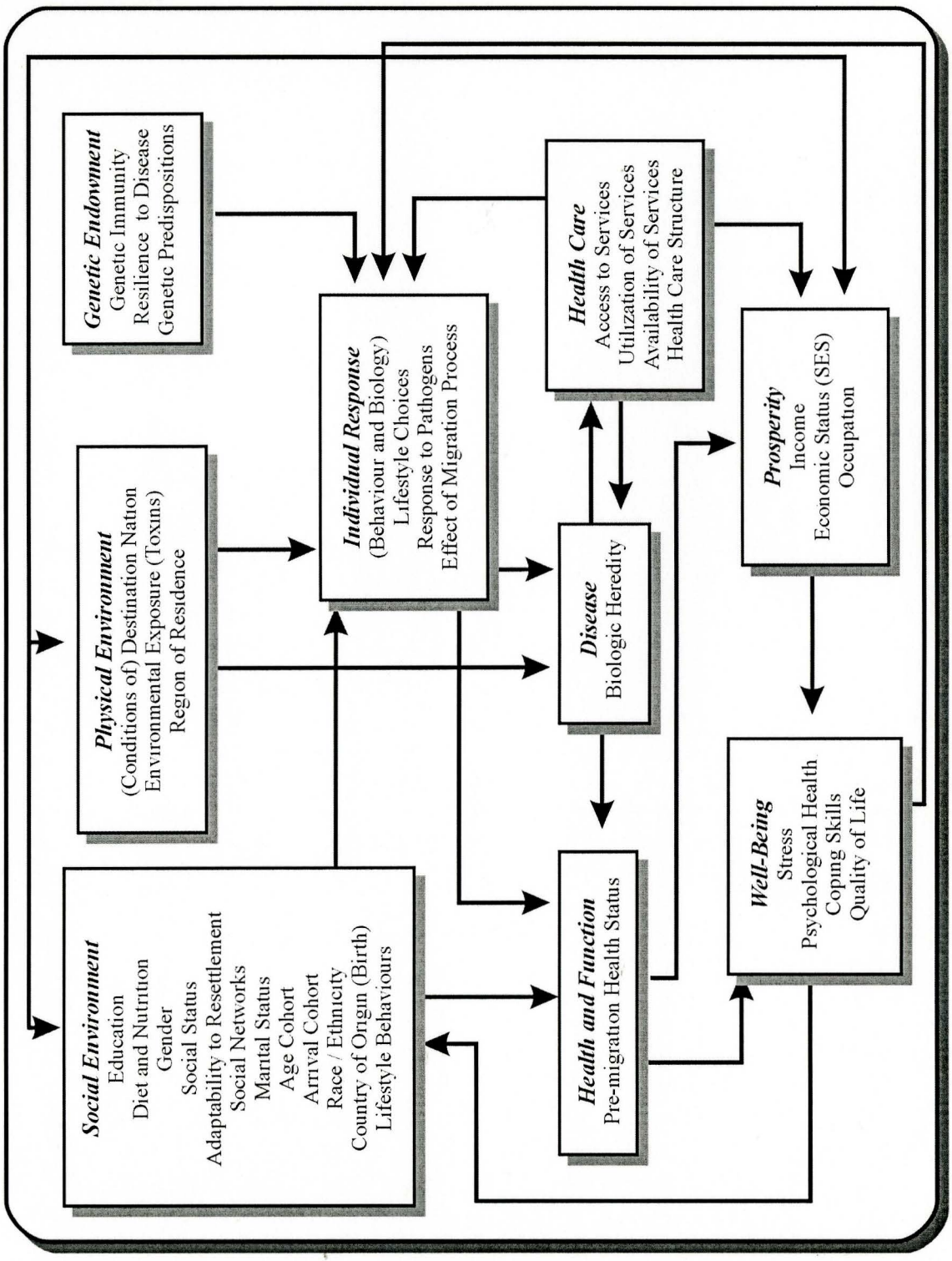


Figure 2.2
Determinants of Health Framework – Revised Edition



Chapter Three

Data and Methods:

Analyzing the National Population Health Survey

3.0 What is the NPHS?

The National Population Health Survey was designed to collect comprehensive information on the health status of the Canadian population and related socio-demographic information (Swain, Catlin, and Beaudet, 1999). Data collection for the survey was commissioned by Statistics Canada commencing in 1994/1995 and will continue every second year thereafter for 20 years in order to create a comprehensive longitudinal health dataset. To date, four cycles of information have been prepared and released for the purpose of research and analytic review so that cycle one corresponds to the period 1994/1995, cycle two refers to the period 1996/1997, cycle three relates to 1998/1999, and cycle four captures the duration of 2000/2001.

Initially, throughout its first three cycles, the NPHS was composed of both cross-sectional and longitudinal files, but with cycle four the NPHS converted to a strictly longitudinal survey. As a result of this change the NPHS is now composed of two components: the survey of households and the survey of health care institutions. The NPHS household component includes household residents in all provinces, with the exclusion of populations on Indian Reserves and Crown Lands, residents of health care institutions, full-time members of the Canadian Armed Forces, and some remote areas in Ontario and Quebec. The Health Care Institutions component includes long-term

residents (expected to stay within the institution longer than six months) in health care facilities with four or more beds in all provinces, with the exclusion of the territories (Longitudinal Documentation, 2002).

The Household component of the NPHS has completed four cycles to date, with each of these cycles providing in-depth information on the health of a respondent within the household. The respondent, who was randomly selected in the first cycle and followed through subsequent cycles, provides demographic information about all members of the household. The health questionnaire includes questions related to health status, use of health services, health determinants, chronic conditions, and activity restrictions (Swain, Catlin, and Beaudet, 1999; Longitudinal Documentation, 2002). Socio-demographic data is also collected including age, sex, education, ethnicity, household income and labour force participation information. In addition to the two official languages of Canada, English and French, interviews were also completed in Spanish, Portuguese, Italian, Chinese and Punjabi (Dunn and Dyck, 2000).

As was mentioned previously, one of the unique and advantageous qualities of the NPHS, from a research perspective, is that it includes a longitudinal component. This inclusion of longitudinal data is important because it demonstrates the dynamic nature of human health. With cross-sectional data, which only observes participants at a specific time (Babbie, 1999), essentially taking a "snap-shot" of the population, the analysis is unable to determine how health outcomes change with time and the influence of various variables. Longitudinal data however, which observes the same population at different

points in time, over an extended duration or period of time (Babbie, 1999), utilizing essentially the same variables, reveals how outcomes and health states vary over a period.

Cross-sectional data allows researchers to examine the health outcomes of individuals but the advantage of longitudinal data is that it allows the researcher to gain better insight into the causative factors behind these health outcomes and changes to health status and behaviour. For example, NPHS data illustrated that in 1994/1995 an estimated 2.4 percent of the population aged 18 years and over had received some type of government supported home care. Similar results were presented in 1996/1997 at 2.5 percent. However, upon closer examination of this data it is revealed that only 36 percent of the people who had received home care in 1994/1995 were still receiving services in 1996/1997. Approximately half of the respondents (46 percent) were indeed living at home but no longer receiving care. Approximately 14 percent of the sample was deceased in 1996/1997, and 4 percent had recently been entered into institutional healthcare facilities (Swain, Catlin, and Beaudet, 1999). This example provides insight into the ambiguity of cross-sectional data and illustrates the advantages gained through longitudinal analysis. Although longitudinal datasets are ideal from a research and analysis point of view, they do require a number of unique operational and methodological approaches in order to maximize statistical representativeness of the sample over time and to minimize response error. However, the benefits such datasets provide for statistical analysis far outweigh the procedural difficulties involved with their conceptualization and manipulation.

The NPHS was selected and utilized for the purposes of this analysis for two primary reasons. First, the NPHS is a comprehensive dataset focusing on social, demographic, and health characteristics for the Canadian population. Secondly, utilizing the NPHS not only allows longitudinal analysis, but also allows comparative analysis of native-born individuals (i.e., those respondents born in Canada) and foreign-born immigrants. Comparing these two groups not only illustrates how they vary from one another on a social and demographic basis, but also provides insight into how the health status of these two groups converge and diverge from one another.

3.1 Outlining the objectives of the NPHS and collecting data:

The official objectives of the NPHS, as defined by Statistics Canada are as follows:

- *Aid in the development of public policy by providing measures of the level, trend and distribution of the health status of the population;*
- *Provide data for analytic studies that will assist in understanding the determinants of health;*
- *Collect data on the economic, social, demographic, occupational and environmental correlates of health;*
- *Increase the understanding of the relationship between health status and health care utilization, including alternative as well as traditional services;*
- *Provide information on a panel of people who will be followed over time to reflect the dynamic process of health and illness;*
- *Provide the provinces and territories and other clients with a health survey capacity that will permit supplementation of content;*
- *Allow the possibility of linking survey data to routinely collected administrative data such as vital statistics, environmental measures, community variables, and health services utilization* (Longitudinal Documentation, 2002)

In order to reduce inaccurate data collection results, interviewers were instructed to make all reasonable attempts to obtain NPHS interviews with the longitudinal respondents. For individuals who refused to participate in the NPHS, a letter was sent to the respondent stressing the importance of the survey and the household's co-operation in completing the survey. Failure to respond to this letter was followed by a telephone call (or visit) from the interviewer in an attempt to persuade participation. Several strategies were put in place to reduce the number of non-response cases. Refusals were followed up by senior interviewers, project supervisors or by other interviewers to try to convince respondents to participate in the survey. In order to effectively maximize the response rate, a large number of non-response cases were also followed up in subsequent collection periods. Interviewers used several methods to trace longitudinal respondents. The last known address and telephone number were provided as part of the information on the case, as well as the name and address of one or two previous contacts, if collected in a previous cycle. In addition, interviewers were trained to follow up available leads such as local telephone directories and utilize directory assistance. If these leads were unsuccessful, the case was transmitted to an experienced interviewer specially trained in tracing respondents. The survey was not conducted if respondents were found to have relocated to a location living outside Canada (Longitudinal Documentation, 2002).

Following the completion of the first, 1994/1995, cycle a total of 17, 276 individuals, in the longitudinal component, were eligible for re-interview. Full information was available for 15, 670 individuals in the 1996-1997 cycle. The corresponding number for 1998/1999 was 14, 619 respondents. The most recent cycle,

for 2000/2001 was composed of 13, 582 individuals. In total, 1, 305 foreign-born individuals, aged 20 years and greater, were identified and followed through cycle one to cycle four, excluding those individuals who died or emigrated from the country. Sample atrophy was related to deaths, incomplete or problematic questionnaires (i.e., partially completed), or non-response. The rates of atrophy reported at the end of each cycle were: 9.3 percent (1996/1997), 6.7 percent (1998/1999), and 7.1 percent (2000/2001) (Longitudinal Documentation, 2002).

3.2 NPHS Variable Selection

Since it is increasingly recognized within health related research and literature that health service and resource access and utilization are not the only factors contributing to individual health status, a 'determinants of health' perspective was adopted for this analysis. Representing a synthesis of public health and social science literature, issues such as lifestyle options, housing location, employment, education, income, as well as mechanisms related to social power, identity, status and control over life circumstances were included in the analysis, as such factors were deemed as influential determinants of health status. Drawing from this literature, the response variables included within this analysis may be divided into six broad categories, each of which are composed of numerous sub-variables representing health covariates or health determinants. These variables include socio-demographic variables (i.e., gender, age, marital status, self-perceived general health, race, country of birth, consultation with a general practitioner, current working status, and speaks a language other than English or

French). It also includes socio-economic variables (i.e., income adequacy and education level)[2]. Lifestyle variables were also included within the analysis (i.e., smoker and drinker-type variables and levels of physical activity). Arrival cohort is a variable that represents the period in which an individual entered the nation (i.e., year of immigration). The arrival cohort variable was hypothesized to exert a strong influence on immigrant health status, as it not only indicates the year of immigration, but also may capture differences in the origin and age of immigrants and allude to changing Federal immigration policy. Stress and mental health variables were also added to the analysis (i.e., personal stress and self-perceived happiness). Place of residence variables have been described within the literature as having an influence on health status and were therefore included to test for correlations (i.e., Canadian provinces). Finally, immigrant status (or nativity-status) was included in order to determine if being an immigrant left individuals at greater or less risk for certain health outcomes (i.e., immigrant vs. native-born status) (Appendix 1.1). Variables were selected for inclusion within the analysis based upon *a priori* expectations.

Predictor variables can be grouped under three main headings including general health indicators (i.e., self-perceived general health status and happiness), chronic conditions (i.e., respiratory illness, heart disease, and the presence of any chronic condition), and mental health and stress conditions (i.e., depression, distress, general chronic stress, specific chronic stress, and personal stress) (Appendix 1.1). These variables were selected based upon their ability to best measure overall general health

[2] Income adequacy is a variable that is based upon income and household size and is defined by Statistics Canada.

status, mental health status, and chronic condition characteristics amongst the immigrant and native-born populations. Some of these variables were interpreted as being closely associated or correlated with one another and therefore reported very similar health outcomes. For example, some respondents answered positively to possessing both high blood pressure and heart disease. Individual variables such as these were aggregated into one singular variable (i.e., heart disease); facilitating analysis by not producing duplicate outcomes or repetitive outputs, and beneficially increasing low response rates in order to meet Statistics Canada disclosure regulations. Other variables such as gender, immigrant status, year of immigration, etc., were identified as constant within the NPHS across all cycles.

One of the limitations discovered in the NPHS longitudinal component, however, was a lack of continuity between each cycle with regards to some variables. For example, a variable introduced in cycle one (1994/1995) may not have appeared in any other subsequent cycle as a result of being 'dropped' from the analysis; two or more variables may have been grouped into one derived variable; or variables were present in more than one cycle but were not present in all cycles (i.e., variables may be present in cycle one and cycle four but absent from all other cycles). In order to address this issue a comprehensive review of the dataset was completed and the longitudinal nature of each variable to be included or measured within the analysis was verified (Appendix 2.1). Variables that were associated with completing the previously mentioned project objectives (refer to introduction) were identified in the primary cycle and verified to exist in each subsequent cycle of data. For example, several chronic conditions were measured

in order to determine chronic illness prevalence amongst immigrants, therefore each of these variables was identified and located in the NPHS cycle one (1994/1995) and traced across each of the three remaining cycles. If a variable was interrupted across all cycles it was dropped from the analysis. However, an exception to this rule does exist, particularly for some of the mental health and stress variables which were included in the first cycle (1994/1995) absent from subsequent cycles but re-emerged in cycle four (2000/2001). Such variables were still included within the analysis because although they do not represent true longitudinal variables, they do provide 'longitudinal insight' as results from analysis can be measured across a six-year divide. Although the outputs are not measured in every subsequent cycle, they do illustrate measurement over a period at two different points in time. It is important to emphasize that despite this 'break' from traditional longitudinal analyses, which continuously trace the sample through time without interruption, the analysis is a *longitudinal investigation*. By examining the same sample, albeit with a two-cycle omission (i.e., 1996/1997 and 1998/1999), the analysis still provides insight into the dynamic nature of health status, and in particular into the changing health status of immigrants. It should also be stressed that this two-cycle omission was not a voluntary decision, but rather was an unavoidable limitation of the NPHS design. While it is true that the two-cycle omission was applied to all variables when completing the multivariate regression, even though only the general chronic stress, specific chronic stress, and personal stress variables were not included in the 1996/1997 and 1998/1999 cycles, the omissions were completed in order to maintain consistency across all models.

3.3 Conducting the NPHS Analysis

Since it is unclear how social status differences manifest in the health of teenagers (Dunn and Dyck, 2000), analysis of respondents was limited to those aged 20 or greater in 1994/1995. When controlling for age within the analysis, individuals were 'aged' forward by two years from each cycle to the next. For example, individuals aged 20-54 in cycle one (1994/1995) were subsequently aged 22-56 in the following cycle (1996/1997). Employing this method was necessary in keeping with the longitudinal analysis approach incorporated into this project. Through aging individuals within the analysis the results capture the actual aging of the individuals in reality. By capturing the aging process a more comprehensive analysis is conducted because it may provide insight into the health gradient associated with aging individuals as described within the health determinants and aging research literature. Following the identification of variables, verifying variables for continuity, and aggregating any appropriate covariates into singular variables, the analysis was completed utilizing SAS software within the McMaster Research Data Centre. Results from the analysis are presented in two formats, with the first focusing upon descriptive analysis and the second utilizing multivariate analysis modeling.

Descriptive analysis was completed through the creation of two-way cross-tabulations and calculated mean frequencies. A cross-tabulation is a comparative analysis between two or more variables (McGrew and Monroe, 2000). Data values for all variables included in such tables are categorized as either ordinal or nominal, and the frequency counts for each are compared through a contingency analysis. Analysis was

also presented in the form of arithmetic means to describe variables that were continuous as opposed to nominal or ordinal. Calculating the arithmetic mean is the most common method for determining central tendency, the central or typical value of a set of data, and is determined through the summation of the entire data set divided by the number of observations within the set (McGrew and Monroe, 2000). Mean analysis was most commonly employed when calculating variables associated with mental health and stress because such data was typically presented in a ratio or interval format within the NPHS. Mean analysis quickly illustrates trends within the data and allows the researcher to quickly and efficiently compare the results of the analysis. Furthermore, utilization of such methods allows covariates to be simultaneously controlled.

Descriptive analysis was supplemented with regression analysis, completed in order to accurately determine the relationships present between health covariates. Two forms of regression were employed within the analysis: ordinary least squares stepwise regression and logistic stepwise regression. These two forms of regression are similar in that each utilizes a set of independent (response) variables to explain a single dependent (predictor) variable, providing information on the absolute and relative ability of each variable to explain the dependent variable. However, the two methods vary in terms of their application and process of analysis. Logistic regression was utilized when analyzing bivariate predictor variables such as self-perceived general health status and self-perceived happiness, and chronic heart disease, chronic respiratory disease, and the presence of any chronic condition. Ordinary least squares regression was alternatively

utilized when modeling predictor variables associated with mental health and stress which measured the health outcome either in an index or scale approach.

Ordinary least squares regression is defined as:

$$Y = b_0 + b_1 x_1 + b_2 x_2 + \ldots + b_p + e$$

Where Y is the dependent variable, b are the regression coefficients for the corresponding x (independent) terms, b_0 is a constant or intercept, and e is the error term reflected in the residuals. The parameters of the regression equation are estimated using the ordinary least squares method (OLS).

Logistic regression is defined as:

$$\theta = \frac{e^{(a+\beta_1 x_1 + \beta_2 x_2 + \ldots + \beta_i x_i)}}{1 + e^{(a+\beta_1 x_1 + \beta_2 x_2 + \ldots + \beta_i x_i)}}$$

Where α is the constant of the equation and, β is the coefficient of the predictor variables. In all cases, variables significant at the $p < 0.10$ level were entered and retained within the models.

Selection of the variables involved in such an analysis is key, particularly the selection of the independent variables, which must relate too, or explain (be associated with) the dependant variable. Typically, the use of regression analysis suggests a functional relationship between variables; therefore independent variables must be evaluated carefully in order to ensure that they all represent a logical relationship to the dependent variable.

The process of multivariate regression analysis is completed through the calculation of one regression coefficient *(b)* for each independent variable (Xi). Each coefficient indicates the absolute influence of an independent variable on the dependent variable. When variables are measured on different scales, the coefficient of variation provides a better measure for comparing the relative variation between variables. In multiple regression, a valid comparison of the *relative* ability of each independent variable to explain the variation in the dependent variable is accomplished by computing standardized regression coefficients, also known as "beta values." These coefficients serve as relative indices of strength, allowing a direct comparison of the influence of each independent variable in accounting for the variation in the dependent variable. Among the set of independent variables, the one with the largest beta value produces the strongest relationship to the dependent variable. The interpretation of regression coefficients depends upon the sign of each beta value (positive or negative), which determines whether the relationship between the dependent and independent variable is direct or inverse.

Two types of models were created; one focusing exclusively on the immigrant population referred to as the 'immigrant-only' model, the other composed of both immigrant and native-born respondents, labelled the 'pooled' model, enabling the testing of whether or not immigrants and the native-born differed significantly with respect to a particular health outcome. Analyses between these two models were completed on NPHS data from the first cycle (1994/1995) and most recent cycle (2000/2001) exclusively. The two models were composed in order to effectively test whether the two

sample groups shared similar health characteristics and to determine if variables had similar health influence and associations, or whether the models were exclusive and unique from one another. Comparison between these two models paints a picture of how immigrants and the native-born differ with respect to health. More specifically, the inclusion of the nativity-status variable within the 'pooled' model clearly indicates whether conditions are significant specifically for the immigrant group.

Significance testing including T-test and Z-test methods were utilized in order to determine if observed variances between 1994/1995 and 2000/2001 were significant or insignificant. Z-tests were utilized in order to test differences between proportions, while T-tests were utilized to determine significance levels associated with differences of means.

The Z-test is defined as:

$$z = \frac{\frac{x_1}{n_1} - \frac{x_2}{n_2}}{\sqrt{\hat{p}(1-\hat{p})\left(\frac{1}{n_1} + \frac{1}{n_2}\right)}} \quad With \ \hat{p} = \frac{x_1 + x_2}{n_1 + n_2}$$

The T-test is defined as:

$$t = \frac{\bar{x}_1 - \bar{x}_2}{\sigma_{\bar{x}_1 - \bar{x}_2}} \quad With \ \sigma_{\bar{x}_1 - \bar{x}_2} = \sqrt{\frac{\sigma_1^2}{n_1} + \frac{\sigma_2^2}{n_2}}$$

3.4 Variable Estimation and Weighting

The purpose or principle of variable estimation in the NPHS is that each person within the sample represents, in addition to himself or herself, other individuals not included within the sample population. Therefore, an individual within the sample is representative of multiple individuals who were not questioned or surveyed. For example, if a random sample of 2% is gathered from the sample universe, each of the individuals within the sample population is representative of 50 other individuals, so that each of the members of the sample population has a weight of n=50 associated with them (assuming N = 100) (Longitudinal Documentation, 2002). Utilizing weighting and estimation allows for a much greater sample size, without having to literally survey such a large number or group of people. Although it is true that some of the responses are 'estimates' it can be said that such results are typical and do mirror the responses that would be obtained though individual surveying methods. While exceptions to the rule are always possible and individuals may provide responses that completely contradict the expected response, such extreme occurrences are often rare, and would most often be discarded from any subsequent analysis as an outlier response.

The longitudinal weighting procedure is based on the weighting done for cycle one of the NPHS cross-sectional sample. However, some weight adjustments that were applied to the cross-sectional weights are not necessary for subsequent longitudinal cycles and such adjustments were removed from the dataset to create 'stripped weights' for each longitudinal panel member. The weighting method used for the purpose of the

current project was the Longitudinal Full Weight (WT60LF) (Longitudinal Documentation, 2002). The longitudinal subset of the NPHS includes only selected members who responded within all cycles (1994-2001) or who have died in subsequent years since the commencement of data collection. The weights of all non-respondents are therefore redistributed in order to compensate for non-response outcomes.

3.5 Bootstrap Methods and Purpose for Variance Estimation

In order to accurately determine the quality of the sample estimate and to calculate the covariance and confidence intervals, the standard deviation must be calculated for all outcomes. Due to the nature of the NPHS, which utilizes a multi-stage survey design, there is no basic or standard formula that can be used to calculate variance estimates. Therefore, an approximate method was required – bootstrapping (Longitudinal Documentation, 2002). The bootstrap method is used because it allows sample design information to be taken into account when calculating variance estimates. The bootstrap re-sampling method used in the NPHS involves the selection of simple random samples called replicates, and the calculation of the variation in the estimates from replicate to replicate. In each stratum, a simple random sample of (n-1) of the n clusters is selected with replacement to form a replicate (a cluster may be chosen more than once). In each replicate, the survey weight for each record in the (n-1) selected clusters is recalculated. The calculated weights are then post-stratified according to demographic information in the same method as the sampling design weights, in order to obtain the final bootstrap weights. The process, selecting simple random samples, recalculating and post-

stratifying weights for each stratum, is repeated N times, where N typically represents 500, in order to produce 500 bootstrap weights. In order to obtain the bootstrap variance estimator, the point estimate for each of the N samples must be calculated. The standard deviation of these estimates is the bootstrap variance estimator. Following the completion of bootstrap estimation, estimates with a coefficient of variation ranging between 0 and 16.6 are reported. Estimates with a coefficient of variation between 16.6 and 33.3 percent are reported as well, but are subject to high sampling variability. Estimates with a coefficient of variation greater than 33.3 percent are suppressed.

Chapter Four

Mental Health and Stress:
Elucidating the Influence of Stress, Distress, and Depression on Immigrant Health status

4.0 Defining and Understanding Stress

Stress is medically, or more appropriately, psychologically defined as an unpleasant state of emotional and physiological stimulation that individuals experience in situations they perceive as threatening to their well-being (Encarta, 2000; Rathus, 2004). The word stress, however, has numerous interpretations; some define stress as events or situations that result in a feeling of overwhelming and burdening pressure, others believe stress is experienced as tension and anxiety, still others describe stress as intense, uncontrollable, inescapable negative emotion, frustration, and anger. Interestingly, some researchers suggest that stress, in some regards, may actually be healthy; stress being an important stimulus that maintains a certain level of 'alertness'. Such stress, defined by Hans Seyle, a prominent stress researcher, is referred to as *eustress* (Rathus, 2004). The result of these various interpretations and perceptions of stress subsequently means that arriving at a universal definition of the condition is a daunting task, further complicated because some individuals proffer that stress is *not* a substantive emotion at all, but rather is the psychological state of response to anxiety-inducing situations. This response includes physiological changes — such as increased heart rate and muscle tension — as

well as emotional and behavioural changes varying from minor mood-changes to extreme depression and contemplation of suicide (Rathus, 2004). However, most psychologists regard stress simply as a process involving a person's interpretation and response to an anxious event or demanding process. What makes stress so dangerous is that it is such a common experience, and is often accepted as an unavoidable or inevitable part of life. While efforts are made to effectively minimize the condition, enduring attempts to completely eliminate the problem often lack; individuals simply begin to accept the day-to-day hassles and causes of stress that afflict them.

The circumstances that cause stress are called *stressors.* Stressors vary in severity and duration and are influenced differently by varying life experiences and health determinants. Stressors may include any number of factors or forces, natural or artificial, experienced by an individual. Unfortunately, if day-to-day stress develops into chronic stress (i.e., enduring stress that afflicts individuals with increased frequency and for extended durations), and, if not managed appropriately it can lead to serious adverse health issues and problems. Exposure to chronic stress can contribute to both physical illnesses, such as heart disease, and mental illnesses, such as anxiety or panic disorders (Rathus, 2004). Although there are effective medical treatments, which can control and reduce stress, often the best course of action an individual can follow is to make an active attempt at reducing the source of stressors within their lives and by developing personal techniques (i.e., stress management techniques), such as meditation, to effectively reduce, prevent, and ultimately eliminate stress disorders (Rathus, 2004).

Problems encountered within professional and personal relationships may be the most common source of stress, but major life events may cause severe stress as well, and as Sorensen (2000) describes, the process of immigration can account for a great deal of stress. Immigrants represent a minority group in the population and because of the process they must undergo to relocate into a host society they are exposed to considerable amounts of tension, anxiety, and frustration. Stress may be compounded amongst refugees, reflecting their experiences prior to arriving in the host country. The cumulative impact of these various emotions can easily lead to the development of chronic stress and have considerable adverse impacts on their health status. It is important therefore to fully understand the impact of stress upon immigrant health status, and to gain insight into how stress, distress, and depression experienced by this group interacts with various health determinants. Understanding these interactions is necessary so that (1) active attempts to reduce exposure to stressors encountered throughout the immigration process can be implemented, and (2) to provide services that can effectively reduce any reported stress encountered by this group following relocation into the nation.

4.1 Analyzing Stress through Descriptive and Multivariate Modelling

Data collected for the mental health and stress predictor variables including general chronic stress, specific chronic stress, and personal stress was gathered for the periods 1994/1995 and 2000/2001 exclusively; data associated with the predictor variables distress and depression, was collected for each of the four NPHS cycles. These

variables were derived or aggregated from a greater number of variables, each specifically analyzing some stressor or group of stressors.

Data associated with *general chronic stress*, ranging from 0.0-10.0, was derived from questions dealing with stressors such as activity overload, financial difficulties, and problems with relationships in day-to-day encounters (Derived Variables Documentation, 2002). *Specific chronic stress* measured the total number of stressors respondents were exposed to and scored respondents according to the individual's personal situation. For example, for partnered persons (i.e., married individuals), questions about the respondent's relationship with their partner were included. For persons not partnered (i.e., single individuals), respondents were asked questions concerning the difficulty of finding someone compatible. Respondents with children were questioned about the household in general, followed by questions regarding the children specifically. The scale ranged according to the minimum and maximum scored for each of the cycles, in 1994/1995 the range was 0.0-14.0 and in 2000/2001 the range was 0.0-13.0 (Derived Variables Documentation, 2002).

The degree of reported *personal stress* was measured by calculating responses to five different questions dealing with trying to take on too many things, others expecting too much, work around the home not being appreciated, people being overly critical, and experiencing pressure to conform (Derived Variables Documentation, 2002). Each respondent was required to answer positively to at least four questions dealing with the identified issues in order to receive an assigned score on the stress index. The index

ranged from 0.0-5.0, with greater numbers translating into a greater intensity of personal stress.

Mean values associated with *distress* were derived from questions dealing with respondents feeling sad, nervous, restless and/or fidgety, hopeless, worthless, and feeling everything was an effort (Derived Variables Documentation, 2002). Responses to each of these questions were scored from 1.0 to 4.0, with greater values indicating greater levels of distress for a total possible score ranging from 0-24. The index was based on a subset of items from the Composite International Diagnostic Interview (CIDI). The CIDI is a structured diagnostic instrument that was designed to produce diagnoses according to the definitions and criteria of both DSM-III-R and the Diagnostic Criteria for Research of the International Classification of Diseases, 10th Version (ICD-10) (Derived Variables Documentation, 2002).

Finally, information associated with *depression*, ranging from 0 to 8, was estimated based on responses to twenty-nine questions addressing feelings of lethargy and lackadaisical attitude, physiological changes such weight loss or gain, restlessness and/or insomnia, self-loathing and contemplation of suicide and death, and questions concerning the duration and frequency of these various feelings (Derived Variables Documentation, 2002).

Mental health and stress predictor variables were analyzed using multivariate regression and cross-tabulation methods. Observing outcomes through two-way cross-tabulations, analyzing the influence of county of birth, race, arrival cohort, and gender provided insight into what variables were potentially associated with immigrant health,

and indicated where further analysis was necessary. These results were supplemented with multivariate regression analysis to determine how variables interact with one another and other determinants or correlates of health. The results from these analyses are reviewed within the following sections.

4.1.1 Descriptive Analysis:

Analyzing Predictor (Dependent) Variables by Health Correlates

Although each of the predictor and response variables used in this analysis are equally important and useful for investigating the health characteristics of immigrants and native-born, self-perceived general health, which indicates how respondents feel about their health status, and self-perceived happiness, which specifies how individuals typically feel, are discussed initially because they are more general indicators of health status. Discussion of these variables establishes some of the general trends that are present in the results for the immigrant and native-born groups. Discussion then proceeds to the mental health and stress predictor variables, which are the focus of this chapter. As well, the discussion proceeds from those response variables that are more, or exclusively, applicable to the immigrant sample (i.e., country of birth and arrival cohort), followed by discussion of the remaining predictor variables that are applicable to the total population (i.e., race and gender). All variances and differences reported between variable groups and time periods were analyzed for significance at the $p < 0.05$ level.

4.1.2 Self-Perceived General Health Status

Analyzing general health by the various response variables, including country of birth, arrival cohort, race, and gender revealed that both immigrants and native-born typically rank their health status as excellent or very good (approximately 65-75%), suggesting that both groups are generally satisfied with their health status. Results further suggest that between 1994/1995 and 2000/2001, the proportion reporting excellent or very good health declined. Conversely, the proportion reporting good health and fair or poor health increases. For example, reported rates of excellent health for non-European immigrants decrease significantly from 60.2 percent to 52.1 percent and rates for European immigrants decrease significantly from 61.5 percent to 50.2 percent (Figure 4.1). Furthermore, results indicate that reported rates of excellent health are reasonably equivalent between the non-European and European groups, suggesting that both groups feel they are relatively healthy, but the variation between the two groups is still significant.

Although this outcome is encouraging, suggesting that both European and non-European immigrants have comparable self-perceived excellent health, the results do somewhat contradict immigrant health literature which has stated that European immigrants typically have better health relative to non-European groups. Analysis of arrival cohorts (Figure 4.2) suggests that overall immigrants are happy with their health status as the majority again report excellent or very good health. Although the results indicate a significant decrease in rates of excellent or very good health with time from cycle one to cycle four, and that the variation between individual arrival cohorts is

significant, the observed decrease and differences in rates are supported by evidence presented in the literature. Immigrants arriving at different periods of time will likely have varying perceptions and attitudes regarding health, possess very different social and biological characteristics, originate from very different parts of the world, and belong to different age groups. The cumulative impact of these different personal characteristics translates into variation in how respondents perceived their health. Recently arrived immigrants will be faced with new challenges and most typically will experience a period of social adjustment in which self-perceived general health status would most likely fluctuate.

When analyzed by race, results for excellent or very good health status show a significant decrease with time for both the immigrant (Figure 4.3) and native-born groups (Figure 4.4). As well, the difference between the white and non-white or 'other' groups is significant regardless of nativity-status. Overall, rates of self-perceived excellent health are typically greater among the immigrant group relative to the native-born sample. The difference in reported rates of excellent or very good health between the immigrant and native-born groups is significant. This outcome represents the anticipated results as described in the literature.

When analyzed by gender (Figure 4.5 and 4.6), the results for self-perceived general health status indicate that males, regardless of nativity-status consistently rank their health significantly higher than rates reported by female respondents. Females may report these lower levels of self-perceived excellent or very good health due to different perceptions of health between the genders. Although it is encouraging that immigrants

typically report excellent health, it is concerning that such health rankings decrease with time and that variation, although sometimes minimal, does exist between immigrants and native-born. In addition, the difference in reported rates between immigrants and native-born regardless of gender is significant. The results for gender analysis also reveal a decrease with time; this decrease is significant for both population groups.

4.1.3 Self-Perceived Happiness

Analysis of self-perceived happiness reveals trends similar to those observed for general health; rates of happiness significantly decrease with increasing time, and significant differences exist between the groups analyzed, as well as between results for both the immigrants and native-born. Generally, results suggest that immigrants and native-born are very happy and report very low rates of unhappiness. However, the native-born seemingly report being happier relative to immigrants. When controlled by country of birth, the results for European immigrants decrease significantly by 1.3 percentage points and the results for non-European immigrants decrease significantly by 1.7 percentage points from 1994/1995 to 2000/2001 (Figure 4.7). Interestingly, rates significantly increase in 1996/1997 and 1998/1999 relative to the other time periods, especially among the non-European group. As for why there is such a considerable difference between groups in 1996/1997 and 1998/1999, the results are ambiguous.

When rates of happiness are analyzed controlling for arrival cohort (Figure 4.8) they generally reveal a significant decrease in happiness with time, so that immigrants who have been in the country the longest typically report lower rates of happiness relative

to more recently arrived individuals. Similar to the general health analysis, in which decreases in health status could be attributed to different perceptions and increases in age, it is possible that decreases in rates of happiness with time could be attributed to a similar cause. By all accounts, immigrants who have been in the country the longest, should have developed strong social networks, found sources of income through employment, and essentially become more acculturated relative to recent newcomers who would still be enduring difficulties related to migration. Therefore, recently arrived immigrants should potentially be less happy relative to individuals who arrived earlier. The data however, does not illustrate such trends. In fact, the results indicate the opposite, with relatively recent arrivals reporting greater levels of happiness. However, these results could be related to a sense of optimism and hope attributed to arriving in a new place with new opportunities.

When controlled by race (Figure 4.9 and Figure 4.10), the results illustrate that the native-born report being much happier relative to the immigrant group[3]. Although the happiness rates associated with immigrants, regardless of race, vary significantly from each other (both the white and non-white report significant decreases of 1.3 percentage points each), the decline is not as great as those reported by native-born non-white who report a decrease of 3.3 percentage points from 1994/1995 to 2000/2001. There is no change reported by the native-born white; levels of happiness remain unchanged at 97.0 percent. Again, the data for 1996/1997 and 1998/1999 reveal a significant increase in

[3] Some of the reported rates of unhappiness for the native-born group were extremely low and therefore based upon disclosure regulations enforced by Statistics Canada, the results for these cycles were suppressed from the analysis. Alternatively, therefore it can be assumed that self reported rates of self-perceived happiness for 1996/1997 and 1998/1999 are very high.

self-reported happiness rates, particularly for non-whites when compared to results for the other cycles. Unfortunately, due to disclosure regulations enforced by Statistic Canada corresponding results for the native-born group could not be released and therefore similar trends cannot be observed for the native-born sample.

Analysis of self-perceived happiness by gender does indicate a significant decrease in rates of happiness with time regardless of gender and nativity-status (Figure 4.11 and Figure 4.12). Immigrant males and females report significant decreases of 1.6 percentage points and 1.3 percentage points respectively; whereas native-born also report a significant decrease of 0.7 percentage points for males and 0.5 percentage points for females. As well, reported rates of self-perceived happiness indicate that a great deal of significant variation exists between males and females regardless of nativity-status. The difference between male and female groups, for both immigrant and native-born is significant. For some cycles, females report greater rates of happiness, and in other cycles males report greater levels of happiness. In 1996/1997 and 1998/1999 for example there are considerable differences between males and females for the native-born and immigrant groups. The difference in reported rates of happiness between the immigrant male and female groups and the native-born male and female groups are significant.

4.1.4 Mental Health and Stress Variables

Analysis of the mental health and stress predictor variables by country of birth (European and non-European) (Figure 4.13-4.17), indicates that mean levels of stress, distress, and depression decrease significantly over the study period. Mean levels of

general chronic stress amongst immigrant non-Europeans decline from 2.3 to 1.8 representing a significant decrease of 0.5 from 1994/1995 to 2000/2001, and immigrant Europeans report a significant decrease in value from 1.9 to 1.6 representing a decrease in mean stress levels of 0.3. When distress is controlled by country of birth, results again indicate that there is a significant decrease over time. Overall, mean values for the non-European group decrease by 0.9, and mean values for European immigrants decrease by 0.8. The observed decrease for specific chronic stress, personal stress, and distress is insignificant, indicating that changes of reported stress and distress do not change enough to warrant any influence on health status.

Furthermore, the results suggest that significant difference does exist for all conditions analyzed, between the European and non-European immigrant and native-born groups; non-Europeans immigrants typically report greater mean levels of stress and distress. These findings are verified by premises presented in immigrant health literature, which state that European immigrants typically report better health status relative to non-European immigrants. If it is assumed that Europeans report greater general health relative to non-Europeans than it may be reasonable to assume that non-European immigrants should report greater mean levels of stress, distress, and depression relative to European immigrants; which the analysis shows generally occurs. That being said, however, results from the analysis concerning depression by country-of-birth contradict the literature. Reported mean levels of depression are consistently greater for the European group relative to the non-European group.

When the mental and stress predictor variables are analyzed by arrival cohort (Figures 4.18-4.22) three general trends emerge from the data. The first trend identified in the data is that from 1994/1995 to 2000/2001, the reported mean rates typically remain unchanged, and despite a very minimal decrease in mean values with increasing time, the decrease is insignificant, suggesting that rates of stress, distress, and depression do not change enough over time to influence a change in the amount reported by individuals. The second trend observed is that among all conditions analyzed the difference present between the arrival cohorts is significant, with the exception of 1980-1989 and 1970-1979 arrival cohorts. However, as was stated, when the results for immigrants arriving between 1970-1979 and 1980-1989 are compared against one another, the results show very little variation and the difference is insignificant. The third and final general trend observed is that recently arrived immigrants, that is immigrants who arrived between 1990-1994, report lower rates of stress relative to the other arrival cohorts (with the exception of rates reported for depression and distress for which mean rates fluctuate without a seemingly identifiable pattern). The literature states that the process of immigration is an incredibly trying and stressful period, and in addition, the period following immigration is equally stressful (Sorensen, 2000; Aroian, 1988; Lin *et al.,* 1979). The process involves literally 'packing-up' one's life and moving to an alien community with potentially very different social systems and perceptions. By all rights then, it is no wonder that the literature proffers that most immigrants report the process as extremely stressful, and that it is not until the individual has resided in the nation for an

extended period that stress levels begin to dissipate. Why then does data from the NPHS suggest the opposite?

Perhaps lower stress rates amongst those that have just entered the nation result from individuals simply not recognizing signs of stress, or perhaps the cumulative impact of the life-change they have recently made has not yet fully impacted them. Moreover, perhaps they are so enthusiastic about this new journey they are embarking upon, that they simply accept the new difficulties they encounter, and do not perceive the challenges that lie before them as stressors. On the other hand, the explanation may be quite simple; perhaps recent immigrants simply do not easily experience stress. It may be that these individuals enter the nation aware that they must face challenges and therefore the coping strategies that they employ when faced with a stressor effectively minimizes the psychological impact that the experience would otherwise have upon the respondent. The increase in mean rates among those that have been in the country longer may therefore result because the coping strategies these individuals once possessed or employed may no longer be as effective against the cumulative stress they have endured since arriving in the county. The differences in reported stress may also be associated with Canada's changing perspectives and perceptions of immigrants. Individuals arriving in the 1970s and 1980s may have encountered greater levels of isolation or social discrimination and therefore suffered greater socio-economic setbacks relative to those groups that are arriving today, subsequently resulting in increased stress. Finally, stress rates may be lowest amongst those that have been in the nation the longest because they have already endured the stress associated with migration, have undergone acculturation,

and simply are no longer exposed to as many stressors as immigrants that have arrived more recently.

Overall the analysis of predictor variables by race (i.e., white and non-white) (Figures 4.23-4.32) reveals three general trends. Firstly, respondents classified as non-whites generally report greater mean rates of stress and distress relative to those respondents classified as white. These differences, observed for both the native-born and immigrant groups are significant. Secondly, mean rates decrease slightly with time from 1994/1995 to 2000/2001, although typically this decrease is insignificant. The only significant decrease observed occurs for the immigrant group, which report a decrease of 1.0 for the white group and a decrease of 0.9 for the other group from 1994/1995 to 2000/2001. Lastly, the results generally indicate that the native-born report greater mean values compared to immigrants, and the difference between the two groups is statistically significant.

The analysis of the mental health and stress predictor variables by gender (i.e., male and female) (Figures 4.33-4.42) reveals that females, regardless of nativity-status, typically report significantly greater levels of stress, distress, and depression relative to the male immigrant and native-born respondents. Furthermore, the immigrant group reports greater mean rates of stress, distress, and depression relative to the native-born group; the difference between immigrant and native-born groups is significant. In addition, the degree of variation between males and females decreases with time so that in 1994/1995 there is a greater degree of difference in reported mean stress rates by males and females relative to reported mean rates in 2000/2001. This outcome suggests that

with increasing time the mean levels of stress between genders are becoming similar. Although there is a slight decrease in reported stress, distress, and depression rates from 1994/1995 to 2000/2001, the decrease is insignificant, suggesting that both sexes do not experience any improvement in the amount of stress they report.

4.2 Analyzing Predictor (Dependent) Variables through Multivariate Modelling

In this section, results from the regression analysis modelling the associations between mental health and stress predictor variables, including *general chronic stress*, *specific chronic stress*, *personal stress*, *distress*, and *depression*, with assorted response variables are presented (Tables 4.1-4.14). The mental health and stress predictor variables analyzed within this chapter are continuous (i.e., variables that were defined as indexes or scales having numerous possible values) and therefore warranted the use of stepwise ordinary least squares regression. Analysis of *self-perceived general health status* and *self-perceived happiness* utilized logistic stepwise regression, with both the immigrant-only and pooled models producing rho-squared values that suggest the models have a good fit (0.2) (Newbold, 2004).

Analysis of the predictor variables was based on individuals aged 20 or greater in 1994/1995. In order to differentiate between immigrants and native-born two models were created; the 'immigrant-only model', which as the name implies is composed only of those respondents classified as immigrants, and a 'pooled model', which aggregates both native-born and immigrant respondents. This aggregation was completed in order determine if an association existed specifically between immigrants (as measured by the

immigrant or nativity-status response variable) and the predictor variables being analyzed. Analysis was completed utilizing data from the 1994/1995 and 2000/2001 NPHS cycles. Discussion of the regression results begins by discussing those response variables that are most closely associated with the theme of this chapter, and those that are most applicable to the immigrant population. The discussion then continues to discuss the remainder of the associations between response variables and the predictor variables. Statistical significance is reported within the regression tables using the following notations: * $p < 0.05$, ** $p < 0.02$, and *** $p < 0.01$.

4.2.1 Model Analysis by Response (Independent) Variables

Stress and Mental Health Response Variables

Associations between the personal stress and self-perceived happiness response variables within both the immigrant-only and pooled models match the expected outcomes, and observed signs mirror the expected signs. It is reasonable and logical that individuals who report personal stress would be associated with depression, distress, and stress predictor variables, and that individuals who report themselves as happy would be less likely to report these same stress and mental health conditions. Associations between the personal stress response variable and the various predictor variables are somewhat sparse compared to the frequency of inclusion of the self-perceived happiness variable. This difference in the frequency of associations may be related to happiness being a better indicator of personal stress levels than the personal stress response variable. While

individuals may not specifically label themselves as having personal stress, individuals may more easily be able to differentiate between feelings of happiness and unhappiness.

4.2.2 Immigrant Status/Nativity-Status ResponseVariable

Analysis of the NPHS pooled model indicates that the immigrant variable is associated with depression and distress outcomes. This association indicates that specifically being an immigrant is positively associated with reporting depression and negatively associated with distress. There is no specific justification as to why immigrant status would be associated with such outcomes; there is no reasonable explanation for why immigrants would be positively correlated with depression and negatively associated with distress, particularly in light of the earlier descriptive analysis which indicated that immigrants typically reported low levels of depression and distress and generally report low levels of all types of stress. However, the results may be related to acculturation factors or stresses experienced throughout the immigration and relocation process. That being said, such processes cannot be evaluated within the current analysis.

4.2.3 Arrival Cohort ResponseVariable

Arrival cohort is a variable that has not been extensively tested within the health determinants literature, meaning there is not a great deal of literature against which to compare the results from the regression analysis. Based, however, on results from the descriptive analysis, the results derived through regression analysis seemingly match the expected outcome. The models indicate that most recent arrivals are negatively

associated with the predictor variables. The results further illustrate that the majority of associations between the mid range arrival cohorts (i.e., 1980-1989 and 1970-1979 periods) and predictor variables are positive. These results seemingly suggest that recent and relatively recent immigrants are less likely to report mental health or stress disorders and are less likely to report excellent or very good health, whereas immigrants who arrived within the country earlier, such as between 1970-1979, have an increased likelihood of reporting a stress or mental health disorder, but that those who arrived before 1970 are less likely to report a disorder and are more likely to report excellent or very good health. These results are mirrored within the descriptive analysis suggesting that the models are accurate. Again, it is difficult to interpret the results, but it is plausible to assume that recent arrivals have not yet felt the full cumulative impact effect of the stress experienced after immigrating and therefore do not show an association with the stress and mental health disorders. With time, however, stress may accumulate and the association with mental health and stress disorders may increase. An alternative line of reasoning postulates that immigrants who have been within the country for the longest duration have effectively improved their socio-economic status. Having acculturated, these individuals may have developed strong social support networks and therefore may have effectively reduced their potential for developing disorders.

4.2.4 Personal Characteristics and Socio-Demographic Response Variables

The general health variable is a self-assessed and reported measure of an individual's health status, which provides insight into how individuals perceive their

quality of health. Associations between the predictor and response variables within both the pooled and immigrant-only models typically match the anticipated outcome. The results reveal that individuals ranking their self-perceived health status as excellent or very good are less likely to report stress, and are negatively associated with the mental health and stress predictor variables. An interesting point is subsequently raised as a result of this analysis; is it because the individuals report good health that they are less likely to report the stress and mental health outcomes, or is it because they do not experience stress, depression, or distress that they perceive their health to be excellent?

The analysis indicates that race is an active determinant of health within both the immigrant-only and pooled models. Therefore, for the most part, immigrants and native-born individuals reporting their race as white are less likely to report personal stress, specific chronic stress, and are less likely to report excellent or very good health and being happy, but are more likely to experience depression. This outcome is somewhat perplexing as it is assumed that a visible minority may experience a greater degree of racial discrimination and therefore may be more prone to depression relative to whites. Regardless of the reasoning behind the associations between the response and predictor variables, the models do indicate that race is a determinant of mental health and stress. Although country of birth is closely related to race, it does not influence mental health and stress within the immigrant-only model. In fact, the variable is only significant for depression (1994/1995) and does not act as a determinant of health for any of the other conditions. Although, the model does indicate that individuals originating from

European countries are associated with depression, the variable is not associated with any of the other response variables.

Consultation with a general practitioner has a greater number of associations (i.e., the number of associations between the response variable and predictor variable) within the pooled model relative to the immigrant-only model. Within the pooled model, consultation with a general practitioner is positively associated with self-perceived general health status and happiness, depression, distress, personal stress, specific chronic stress, and general chronic stress. This result does not imply that visitation too or consultation with a general practitioner causes mental health and stress disorders. Instead, it may simply indicate that individuals who consult a doctor are having stress disorders diagnosed. In effect, the diagnosis of such disorders may effectively be improving individual health status, because although these individuals are now being diagnosed as having one of the indicated predictor variables, the patient is being effectively treated and their health status monitored. The lack of association between the general practitioner consultation variable and predictor variables within the immigrant-only model may be offset by the potential utilization of alternative health care therapies and treatments, or may be just as the results indicate, immigrants are seemingly less likely to report stress and mental health disorders. Furthermore, the results may indicate that perhaps immigrants do not recognize stress or mental health disorders as ill health conditions. Immigrants may simply not regard stress as an important health issue.

Gender has many more associations within the pooled model compared to the immigrant-only model in which the variable is negatively associated with depression

(1994/1995), and positively associated with general chronic stress (1994/1995) and self-perceived general health status (2000/2001). This outcome suggests that female immigrants are less probable to report depression but more likely to report general chronic stress, although due to the lack of inclusion of the variable within the model it can be concluded that gender is not a strong determinant of mental health and stress for immigrants. Within the pooled model, however, the variable exerts considerable influence. Being female is negatively associated with many of the dependent variables, excluding depression (2000/2001) for which it is not significant and general chronic stress for which it is positively associated. The majority of correlations are, however, negative within the pooled model suggesting that females are less likely to report the indicated mental health and stress disorders. It is unclear why gender is negatively associated with the majority of stress variables but is positively associated with general stress within the pooled model. These associations are perplexing when compared to the results from the descriptive analysis, which typically indicated that females were increasingly likely to have a lower health status and report greater levels of stress, distress, and depression relative to males.

Marital status is often described within the health determinants literature as a prominent determinant of health status because the variable may act as a proxy for social support, which has been determined through empirical observation to have a considerable impact on quality of life and health status ranking, providing a source of emotional support and reducing the probability of stress development. Subsequently, being married should effectively reduce the amount of stress an individual reports. For the most part,

the results from the models verify this assumption: being married is negatively associated with the predictor variables. The models illustrate that married individuals are less likely to report stress and mental health disorders. However, within both the immigrant-only and pooled models, being married is positively associated with personal stress and specific chronic stress, suggesting that it is a source or cause of stress. Interestingly, the pooled model indicates that the married variable is positively associated with personal stress and specific chronic stress in 1994/1995. However in 2000/2001 the variables are negatively associated possibly suggesting that initially marriage may have been a cause of stress, but that by 2000 it is no longer an active stressor for the respondents.

There are a greater number of associations between the currently working variable and predictor variables in the pooled model relative to the immigrant-only model. Literature proffers that working imparts a feeling of self-importance and personal worth, and therefore may increase an individual's self-perceived life quality, as well as providing financial security. Because of this, it was assumed that the currently working variable would be an important determinant of health. However, as the results indicate, the variable was only associated with self-perceived general health status and personal stress. Furthermore, it was expected that the currently working variable would be negatively associated with the stress predictor variables, as employment would not only benefit socio-economic status, but also impart a feeling of worth. However, as observed within the immigrant-only model, the variable is negatively associated with personal stress, indicating that employment is a source of stress. Perhaps this correlation between the predictor and response variable is present because job-stress overburdens the

individuals, or the current type or level of employment is lower or more strenuous then past employment experiences. Employment is positively associated within the pooled model with respect to personal stress and specific chronic stress, but negatively associated with the majority of the other predictor variables. Although employment is positively associated with specific chronic stress in 1994/1995 the variable has no association in 2000/2001. Employed individuals may be better able to cope with the stress introduced into their lives because employment provides them with income therefore allowing for participation in leisure activities and providing the respondents with a sense of fulfillment and self-worth.

Not being able to speak English or French, the official languages of Canada, may greatly reduce the probability of accessing and utilizing appropriate and necessary health care services. However, the literature indicates that immigrants report few language barriers when accessing medical services (Dunn and Dyck, 2000; Matuk, 1996; and Chen, Ng, and Wilkins, 1996). In this case, the variable is negatively associated within the pooled and immigrant-only models, suggesting that speaking another language does indeed reduce the probability of reporting the indicated stress and mental health disorders. However, it also reduces the probability of reporting excellent or very good health. Speaking another language may force immigrants to strengthen their social support networks by seeking out means by which to learn either English or French and adapt their language skills subsequently reducing stress but potential difficulties with communication may reduce general health. On the other hand, immigrants may have strongly developed and rich social networks with 'like-speakers' (i.e., those individuals

that speak the same language). The ability to communicate with these individuals may potentially reinforce a sense of community, belonging, or support amongst immigrants, beneficially influencing health status.

Age is described within health determinants literature as having a positive correlation with health status. Results for the immigrant-only and pooled models suggest the opposite of the expected sign. It is reasonable to assume that younger individuals would be less prone to report mental health or stress disorders. However, the analysis reveals that the young (aged 20-54 in 1994/1995) have a greater association with the predictor variables compared to the old (individuals aged 55 or greater in 1994/1995). Each of the associations between age and the predictor variables is positive; suggesting that younger individuals are more likely to report stress, depression, and distress disorders, but is surprisingly negatively associated with self-perceived general health status. In addition, age appears to be considerably more important within the pooled model as the variable is positively associated with each of the predictor variables. As a determinant of health, age is less often associated with the predictor variables. It is somewhat surprising that younger individuals would be more associated with the predictor variables. However, younger individuals would more likely be working and potentially raising young families. Although employment and families may provide increased socio-economic status, social support, and increase life quality, they could potentially be sources of stress. Particularly for immigrants, stress may affect younger individuals because they are more likely newcomers to the nation and therefore would still be working to establish themselves socially and/or economically within their new

communities. Older immigrants would already be financially established and have experienced a greater deal of acculturation. Although the results from the regression analysis may be surprising, they do match the outcomes generated through descriptive analysis.

4.2.5 Lifestyle Response Variables

The act of smoking can have seriously detrimental and adverse impacts on one's health status. Furthermore, research has indicated that living within a household in which someone smokes can also have serious health implications. Second-hand smoke, otherwise known as secondary environmental smoke, can be even more damaging to health status and respiratory health then directly inhaling smoke (Encarta, 2000). Compared to the pooled model, the smoking variables included in the analysis are much more infrequently correlated with predictor variables in the immigrant-only model. In fact, within the immigrant-only model, the non-smoker smoker variable is insignificant, potentially reflecting the literature which describes immigrants as being less likely to participate in ill-health activities such as drinking and smoking. Consequently, the lack of association between the smoking variables and the predictor variables within the model may be reasonable. When significant, the models illustrate that individuals who do smoke are more likely to report stress and mental health disorders, while individuals who do not smoke are less likely to report the predictor variables. Surprisingly, however, the daily smoker response variable is positively associated with self-perceived happiness, suggesting that individuals who report smoking on a daily basis are more likely to report

being happy. Despite the agreement between the response and predictor variables in the other models, the observed association between happiness and smoking contradict the expected outcome.

While unclear, there is some speculation that smoking may actually reduce stress. Therefore, it may be reasonable to assume that individuals who smoke would be less likely to report stress and therefore may be less likely to be positively associated with the stress disorders. On the other hand, smoking offers only a temporary relief from stress, and the negative health implications resulting from smoking may greatly increase ill health and health complications indirectly reducing health status, which in turn may increase experienced stress. Unfortunately, this analysis does not elucidate the driving forces behind the smoking habit. That is, is smoking causing the stress or the stress causing the smoking?

Alcohol consumption is also described within the literature as having adverse influences on human health status, at least when consumption is described as 'heavy'. Conversely, 'moderate' consumption (less than 14 drinks per week for males) has been linked to beneficial health outcomes. The ingestion of alcohol modifies body chemistry and can impede necessary bodily reactions and functions. Not only does excessive ingestion of alcohol immediately distort individual perception and judgment, it can have long-term adverse health implications. Much like the smoking variables the presence of the alcohol consumption variables in the immigrant-only model is sparse, suggesting that the variables are not overly influential determinants of immigrant health. There is not a great deal of association between the response variables and the predictor variables in the

immigrant-only model, but the associations that are present are for the most part logical and the observed signs match the expected signs. Within the pooled model as well, the observed outcomes and associations are reasonable. The lack of association between alcohol consumption variables and predictor variables within the immigrant-only model may once again be related to findings within health research suggesting immigrants consume alcohol less regularly and at lower quantities relative to native-born. However, again, the association between self-perceived happiness and the heavy drinker response variable is not congruent with findings in the literature.

Physical activity maintains a fit and healthy body and has often been described as a method for reducing stress and improving health. Results from the immigrant-only and pooled models suggest that for the most part, respondents who are physically active are less likely to report stress, distress, and depression, but are also surprisingly less likely to report excellent or very good health. Perhaps the repetitive strain of movements and overexertion, or exercising without proper rest and recovery periods is actually resulting in increased strain and soreness, which could potentially reduce overall self-perceived health status. Contrarily, respondents who report themselves as non-active are increasingly likely to report mental health and stress disorders, and are more likely to report excellent or very good health and being happy. Results for the pooled model indicate that physical activity is positively correlated with depression and general chronic stress, these results are ambiguous and the justification for why an individual who is active, and therefore seemingly healthy, would report stress is questionable. Results may be linked to personal injury experienced as a result of exercise, or may result because the

respondent is stressed and therefore using physical activity as an outlet or therapy in an attempt to reduce this stress. These same reasons may explain the seemingly perplexing association between the physically activity response variables and the self-perceived general health status predictor variable; the association with self-perceived happiness still remains unreasonable.

4.2.6 Income and Socio-economic Response Variables

Although there is relatively little research and literature investigating the correlation between income and mental health and stress, there is a plethora of health determinants literature that elucidate the association between socio-economic status and general health status. The association between socio-economic status and health status is often described as positively correlated so that as income increases so too does health status, life quality, and as the results from the NPHS analysis indicate happiness. It is therefore reasonable to deduce that if income and socio-economic status were ranked as high, the association with mental health and stress would be negative or insignificant. Results from the immigrant-only and pooled model vary however, and a consistent or uniform pattern cannot easily be identified from the results. Within the pooled model, lower income (i.e., low income and lower middle income), is for the most part positively associated with the predictor variables, with the exception of depression (1994/1995) and low income, which has a negative association. These results verify what the literature expresses; low income is associated with reduced health status and subsequently is correlated with mental health and stress disorders. This stress may result from financial

insecurity and the hardships experienced as a result of low annual income. The results for the lower income variables within the immigrant-only model are similar to results observed in the pooled model. That is, income is positively associated with the predictor variables. However, within the immigrant-only model, much like in the pooled model, there is an exception to the ordinary; low income is negatively associated with general chronic stress. The reasoning behind this association is unclear.

Interestingly, within the immigrant-only model the middle-income variable is typically positively associated with the predictor variables, yet within the pooled model the majority of associations are negative, with the exception of personal stress. The health determinants literature proposes that higher income groups should be negatively associated with ill health; individuals who earn more income would typically be healthier. Results for the pooled model do, for the most part, match these findings. Upper middle income and high income are both generally negativity associated with the mental health and stress predictor variables, suggesting the models support the findings discussed within literature. Unfortunately, these variables are also typically negatively associated with general health status, which contradicts the anticipated outcome. Depression (2000/2001) is positively associated within the model, but it is the only variable with a positive correlation. Results for the immigrant-only model vary between cycles and associations. Unlike the pooled model where associations are typically uniformly negative, the immigrant-only model associations vary between negative and positive without any discernible patterning or reasoning. While the majority of associations are indeed negative, the depression variable and personal stress variables are

positively associated. Although there is some divergence between the model outcomes and what is expressed within the literature, typically the models do support the ideas discussed within health economic research; increased income is negatively associated with poor health.

4.2.7 Education Response Variables

Education is also a measure of socio-economic status and has been associated with health in much the same way that income is correlated with health. However, not all the associations with the predictor variables are reasonable. Several of the observed signs do not match the expected or anticipated outcomes. Surprisingly, the models indicate that generally higher levels of education are positively associated with mental health and stress disorders, and are negatively associated with self-perceived general health status and self-perceived happiness. The only association that seems to support the ideas presented within the health determinants literature, is observed within the immigrant-only model between general chronic stress (1994/1995) and post secondary education, and within the pooled model between the variables less than high school and depression (2000/2001). It is unclear why the majority of variables indicate that with increasing education levels the likelihood or propensity of reporting a mental health or distress disorder increases and general health status would deteriorate. One explanation, exclusively related to the immigrant group, may result from the potential lack of recognition of training and education certifications following arrival.

4.2.8 Place of Residence ResponseVariable

Place of residence has been defined as a determinant of health status. Such a correlation is reasonable, as where one resides will certainly influence available health care services, and potentially affect the quality of social networks, and quality of life. The analysis does indicate that place of residence, or more appropriately, province of residence, does indeed influence immigrant and native-born health status. The majority of the associations between provinces and the stress disorders are negative suggesting that residing in certain regions may decrease the probability of reporting stress and distress. In addition, the majority of associations between self-perceived general health status and happiness and the place of residence variables are negative. Any number of factors and conditions within the provinces may be influencing the model outcomes; there is no way to be certain why some associations are positive and other correlations are negative. Work completed by Parakluam, Krishnan, and Odynak (1992) concluded the health status of the foreign-born is a function of the region of residence; the less developed the region the more likely that the health status of the immigrant is unfavourable compared to the native-born. Results from the NPHS do support the idea that different provinces have different associations with health outcomes. Within the immigrant-only models, the Atlantic Provinces are positively associated with the predictor variables. However, within the pooled models the Atlantic Provinces are negatively associated. Quebec is also positively associated with the predictor variables in the immigrant-only model, excluding the association with self-perceived general health status, which is negative; associations vary between positive and negative within the pooled model. There are a

greater number of associations between Quebec and the predictor variables within the pooled model relative to the immigrant-only model. For the most part, Quebec is negatively associated within the pooled model, but it is positively correlated with distress. Ontario is significant within both the immigrant-only and pooled-models, varying between positive and negative associations. Within the immigrant-only model the Prairie Provinces are not significant, however within the pooled model the Provinces are positively associated with stress. Within the immigrant-only and pooled models Alberta has several associations. Within the pooled model British Columbia has several associations with predictor variables, which vary between positive and negative associations.

4.3 Exploring the Difference Between Mental Health and Stress Models

In order to determine if significant differences existed between 1994/1995 and 2000/2001 for the immigrant-only and pooled models, significance testing was completed at $p<0.01$. Although the majority of models did indicate that differences existed between the two time periods, the number of statistically significant differences was relatively low. Within the immigrant-only models, two significant differences existed within the self-perceived general health status model; the first was for the married response variable and the second was present for the high income response variable. In 1994/1995 the married response variable had a positive association with self-perceived general health status, but in 2000/2001 this association was negative; suggesting that initially married immigrants were less likely to report excellent or very good health but that in the most

recent cycle respondents were increasingly likely to report excellent or very good health. A similar change in association was observed for the high income response variable, which transformed from an initially positive association to a negative association. These outcomes indicated that in 1994/1995 individuals with a high income were less likely to report excellent or very good health but in 2000/2001 respondents were more likely to report such a health status. Within the general chronic stress model, there was again a statistically significant difference between the two time periods. In 1994/1995 the association between low income and general chronic stress was positive, but in 2000/2001 this association was negative indicating that with increasing time, respondents were less likely to report stress. Finally, within the distress model, the association between British Columbia and the predictor variable transformed from a positive association initially, to a negative association in the most recent cycle. This statistically significant difference suggests that in 2000/2001 immigrants residing in this province are less likely to report distress.

The number of statistically significant differences between the response variables and predictor variables within the pooled models was greater than those observed amongst the immigrant-only models. Within the self-perceived general health status and depression models the differences between 1994/1995 and 2000/2001 for the currently working response variable was significant. Although the signs remain unchanged for both periods, the strength of the association increases so that in each model the association between response and predictor variables in 2000/2001 was greater. Within the general chronic stress model, the difference between the time periods for gender (i.e.,

female) is significant. Initially the association was insignificant in 2000/2001, however, the association was significant at $p<0.01$. In addition, within the general chronic stress model, the upper middle income response variable showed a statistically significant difference. As well, within the same model, and additionally within the specific chronic stress and distress models, the difference between the two time periods was significant for the Quebec response variable. The strength of the association between response and predictor variables decreased in the general chronic stress model and distress model, but increased within the specific chronic stress model from 1994/1995 to 2000/2001.

The difference between the two time periods for the married response variable within the personal stress and distress models was significant. Within the personal stress model the association transformed from positive in 1994/1995 to negative in 2000/2001. In the distress model, the statistical difference is not related to a change in the sign, but rather is associated with a decrease from 1994/1995 to 2000/2001 in the strength of association between the response and predictor variables. Within the depression model the daily smoker response variable displays a statistically significant difference. Initially, the association between the response and predictor variable was stronger, but in 2000/2001 this association decreased in intensity. Lastly, the personal stress response variable shows a significant difference in the depression model.

4.4 Closing Thoughts

Analysis of the mental health and stress variables suggests that both immigrants and native-born do not perceive stress, distress, or depression to be a major problem in

their lives. The reported rates of stress disorders are much lower than the anticipated rates. While the results are encouraging, suggesting that both immigrants and native-born do report low levels of stress, which has been observed to have an adverse impact on health status, it does not mean that what little stress is experienced is not having a detrimental influence on health status. With the majority of literature proffering that immigrants typically report the immigration process as one involving a great deal of stress, it was anticipated that more recent immigrants would report greater levels of stress relative to immigrants that had arrived earlier. However, the results from the analysis contradict the expected outcomes. The results may suggest that immigrants simply do not perceive stress as a significant health problem or that contrary to what has been observed in the past, recent immigrants are finding the act of immigration to be a less stressful event. These outcomes may suggest that the Healthy Immigrant Effect does not greatly apply to mental health and stress variables. There is so little difference between levels of reported stress, depression, and distress between the immigrants and native-born groups that it would suggest while a large difference may be observed between the two groups when exploring chronic conditions, as suggested in the literature, there is very little difference between groups when restricting the influence of variables on health status to the mental health and stress variables exclusively. The results from the regression analysis and descriptive analysis both compliment one another, with the majority of finding present in the cross-tabulation being mirrored in the regression outputs.

Figure 4.1:
Self-Perceived General Health Status for Weighted Immigrant Sample by Country of Birth

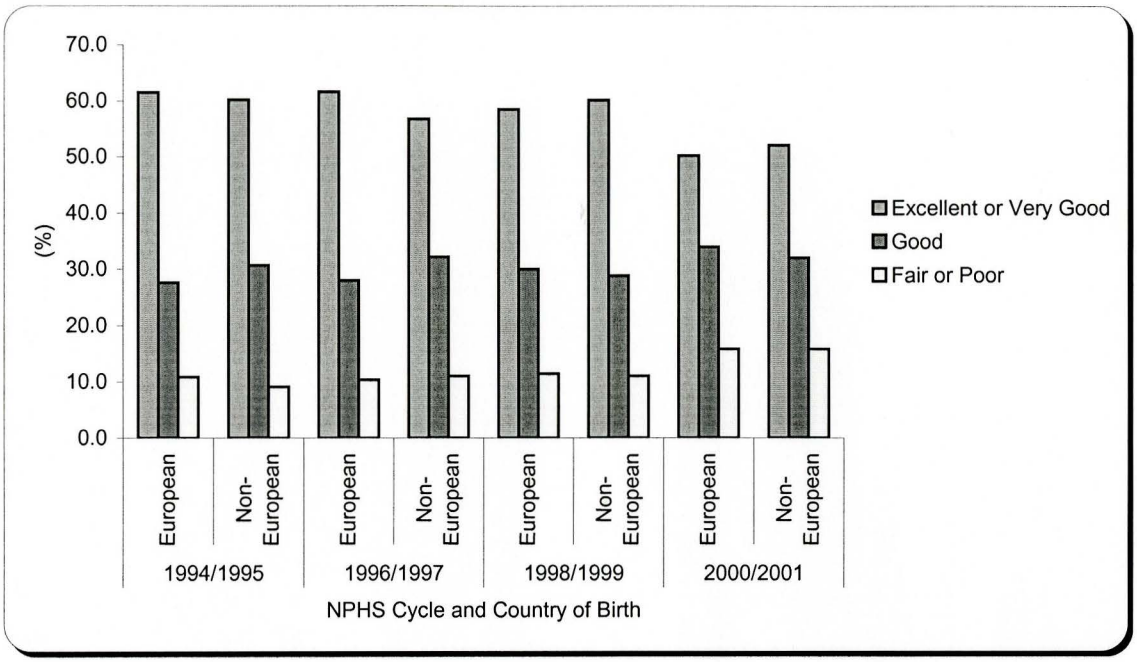


Figure 4.2:
Self-Perceived General Health Status for Weighted Immigrant Sample by Arrival Cohort

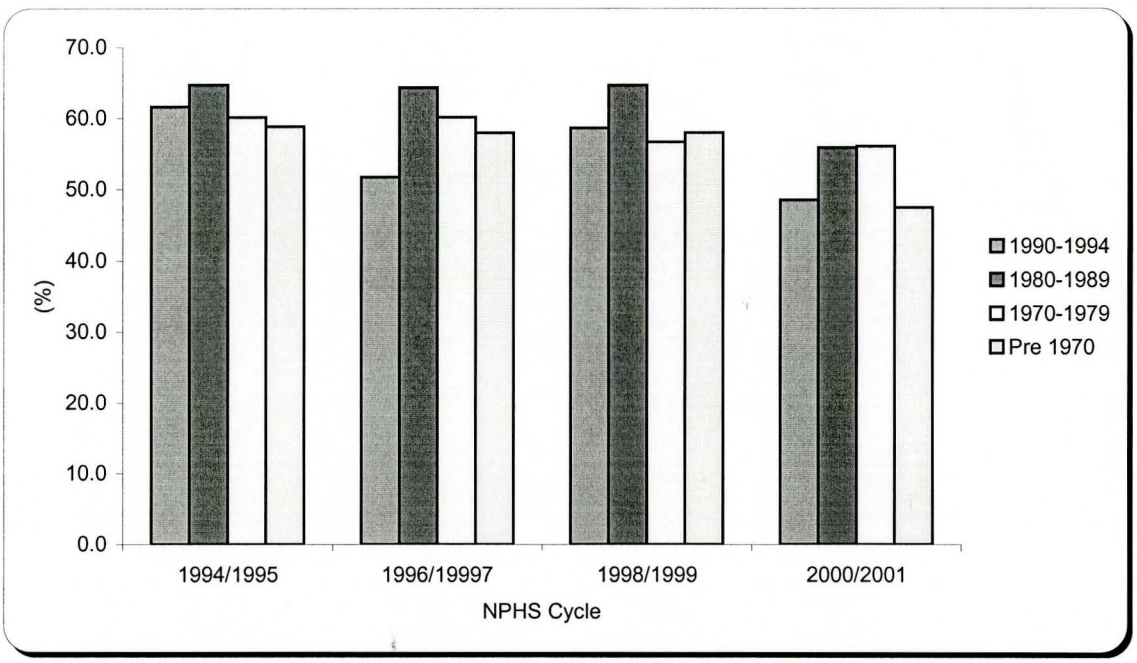


Figure 4.3:
Self-Perceived General Health Status for Weighted Immigrant Sample by Race

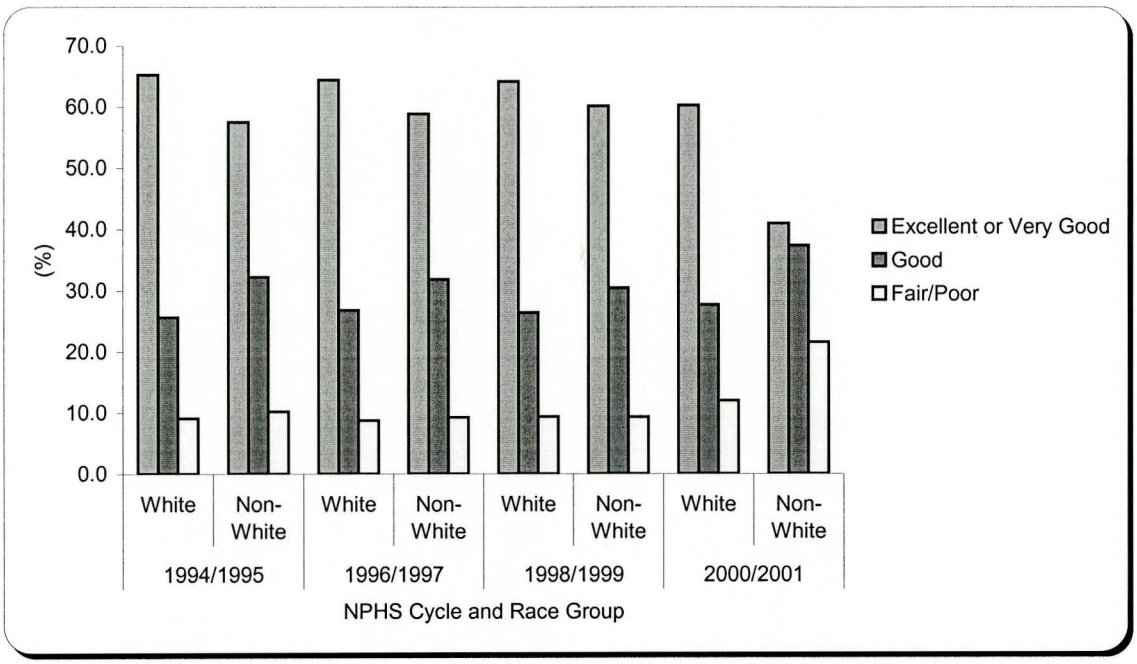


Figure 4.4:
Self-Perceived General Health Status for Weighted Native-Born Sample by Race

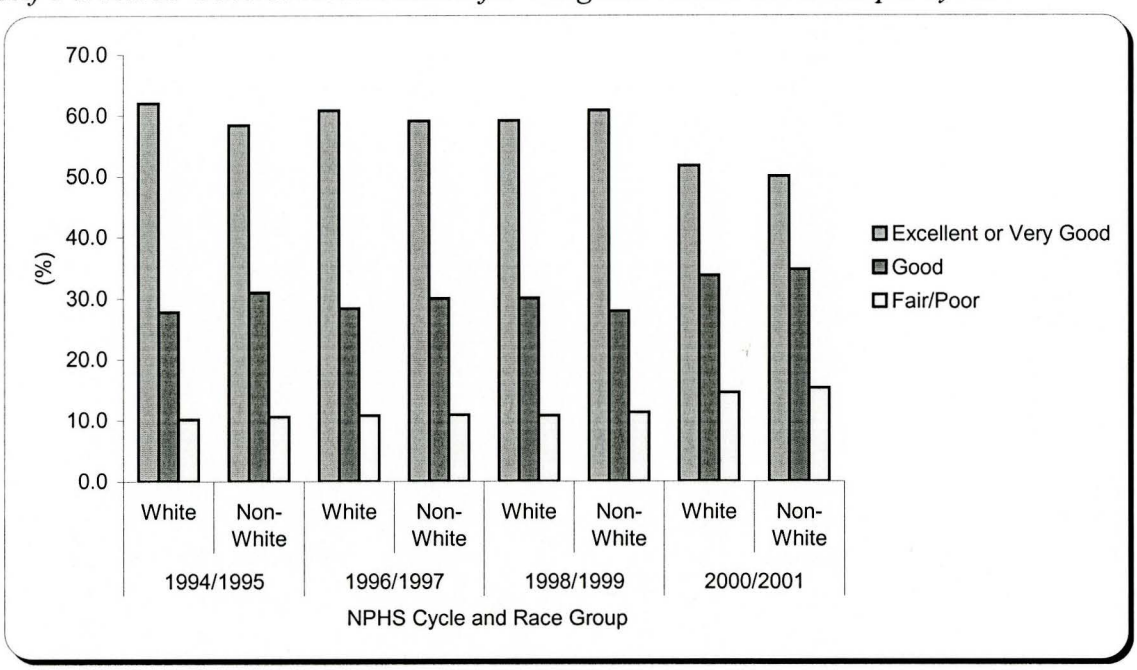


Figure 4.5:
Self-Perceived General Health Status for Weighted Immigrant Sample by Gender

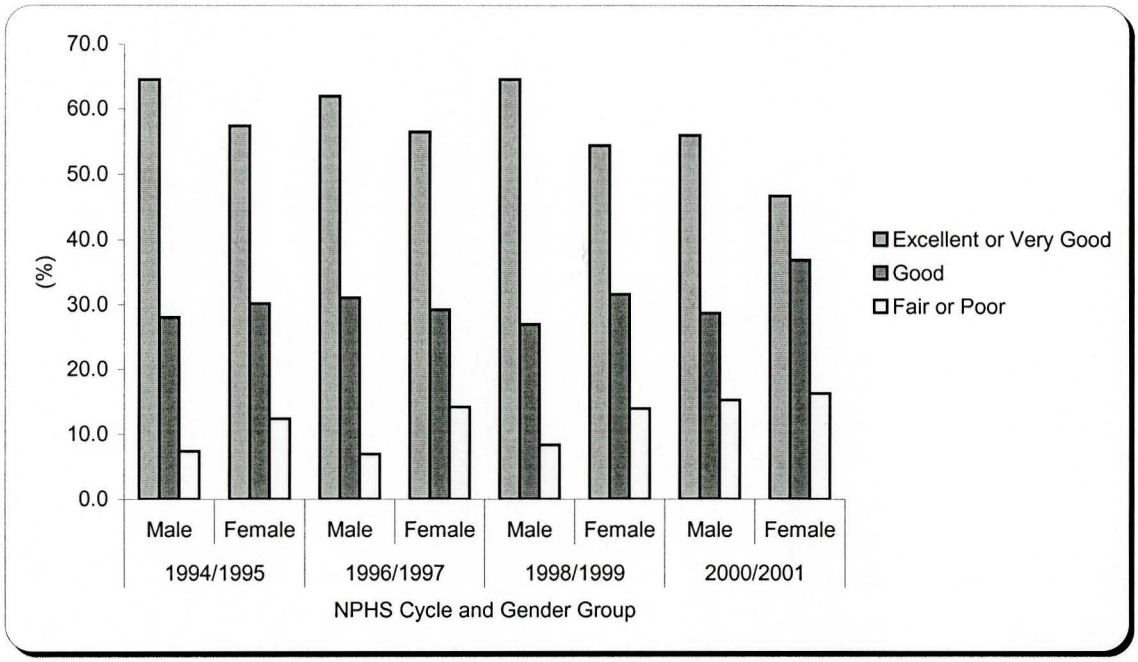


Figure 4.6:
Self-Perceived General Health Status for Weighted Native-Born Sample by Gender

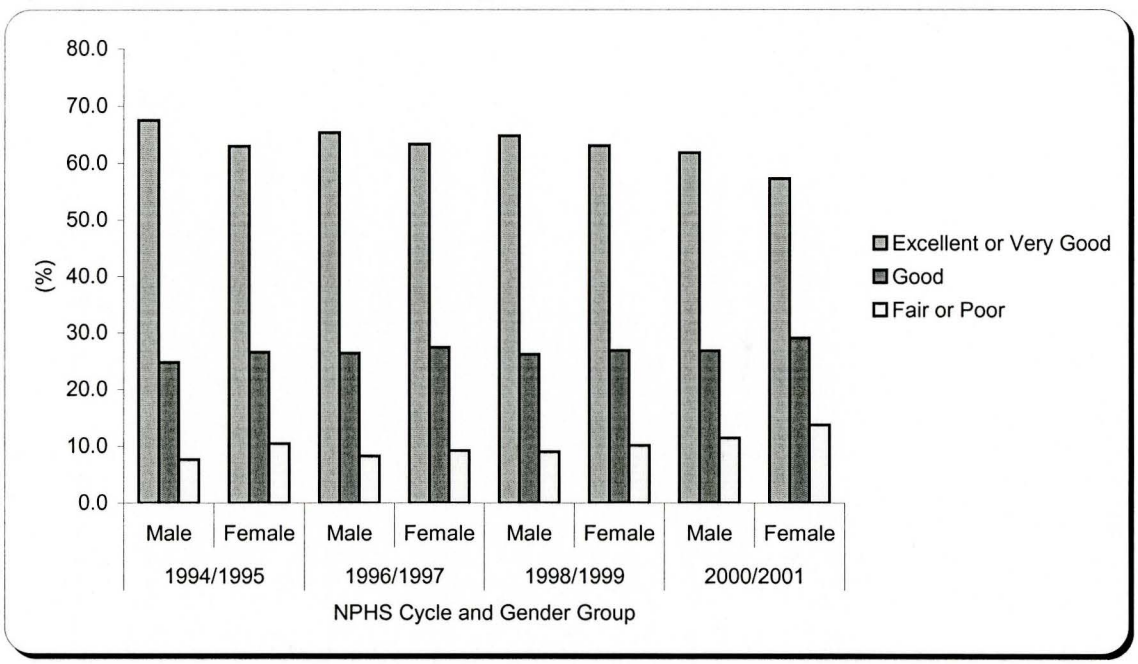


Figure 4.7:
Self-Perceived Happiness for Weighted Immigrant-Sample by Country of Birth

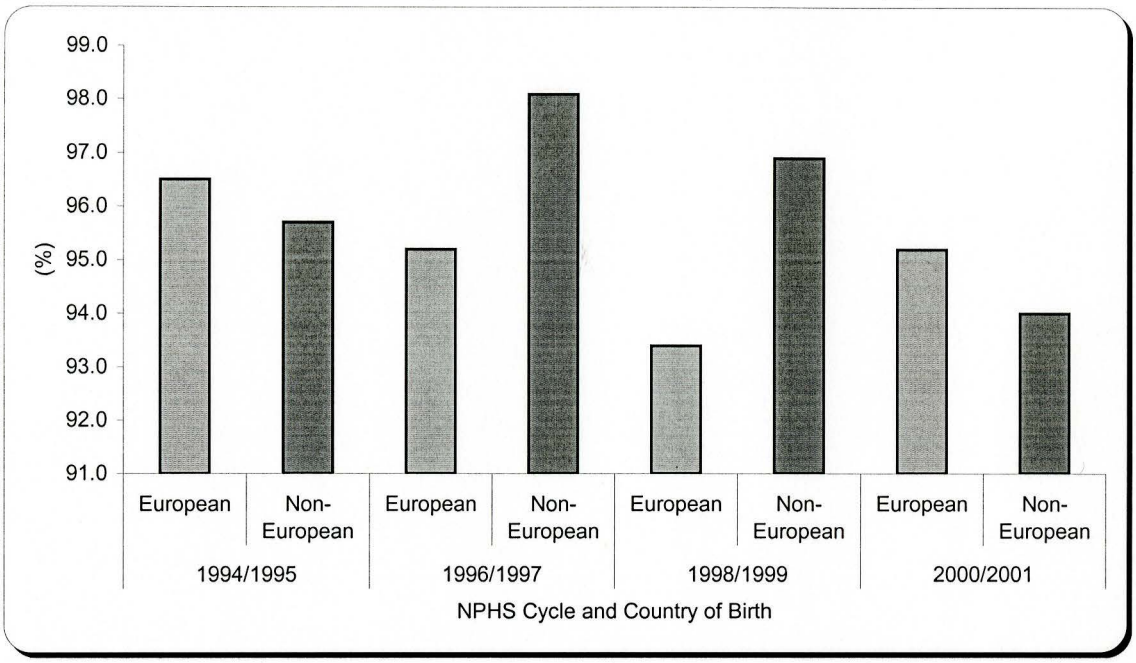


Figure 4.8:
Self-Perceived General Happiness for Weighted Immigrant Sample by Arrival Cohort

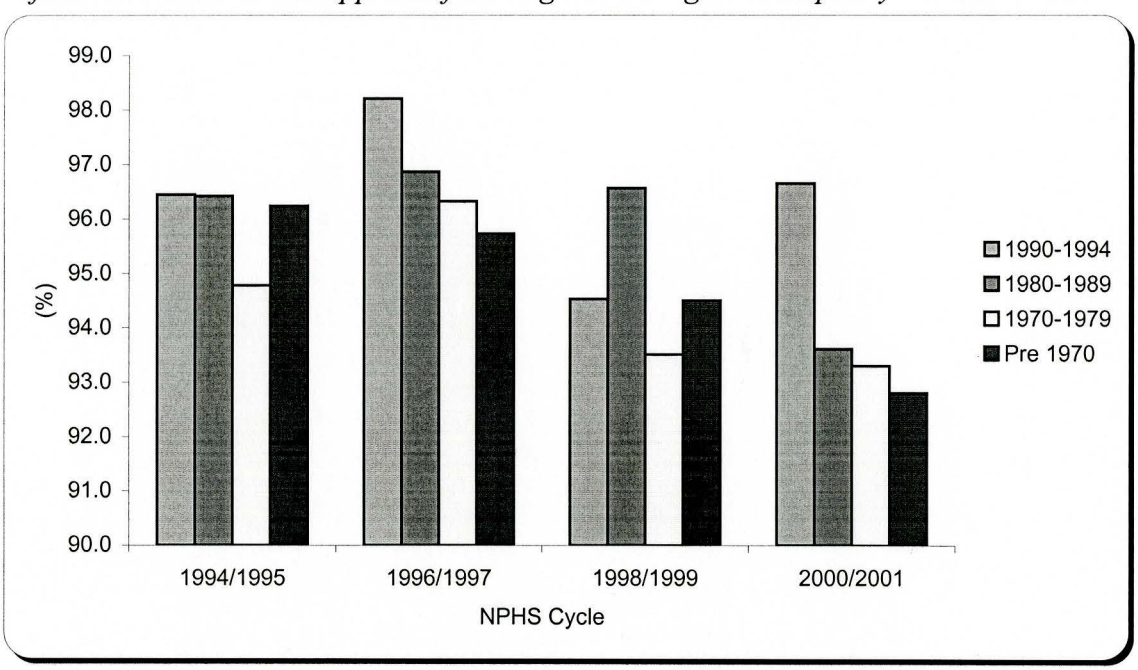


Figure 4.9:
Self-Perceived Happiness for Weighted Immigrant Sample by Race

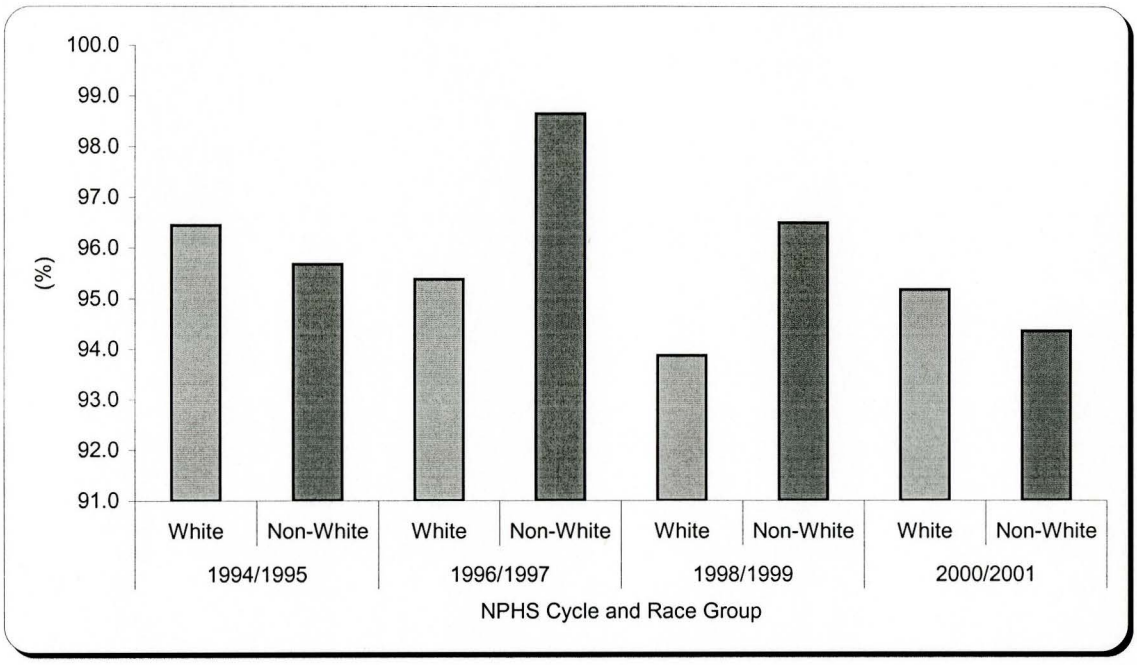


Figure 4.10:
Self-Perceived Happiness for Weighted Native-Born Sample by Race

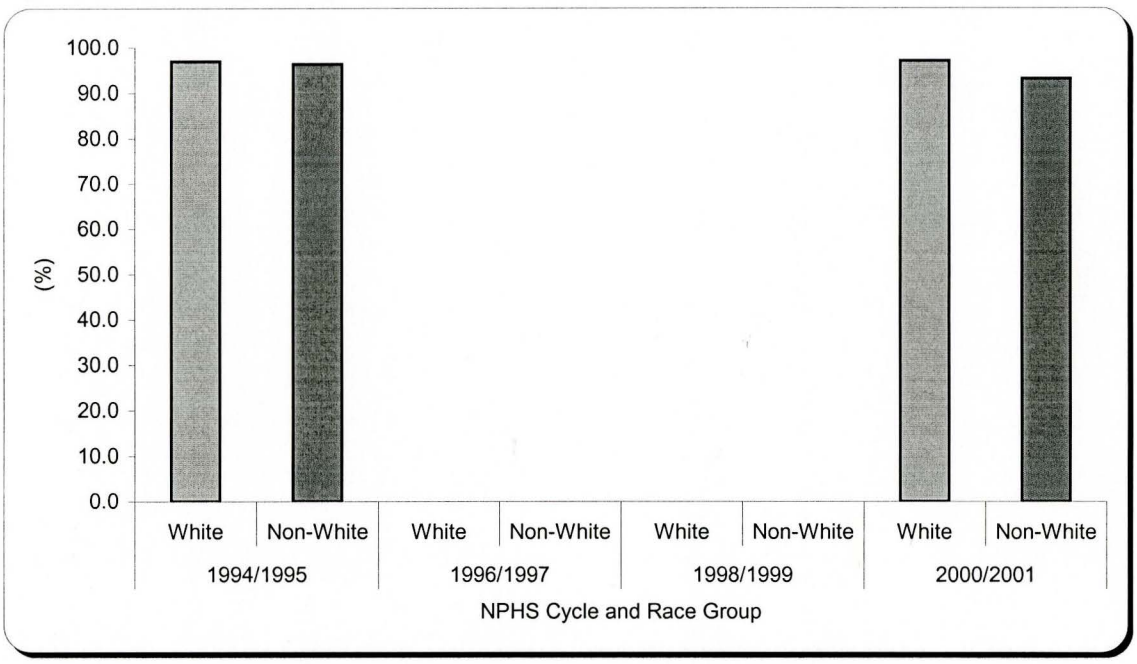


Figure 4.11:
Self-Perceived Happiness for Weighted Immigrant Sample by Gender

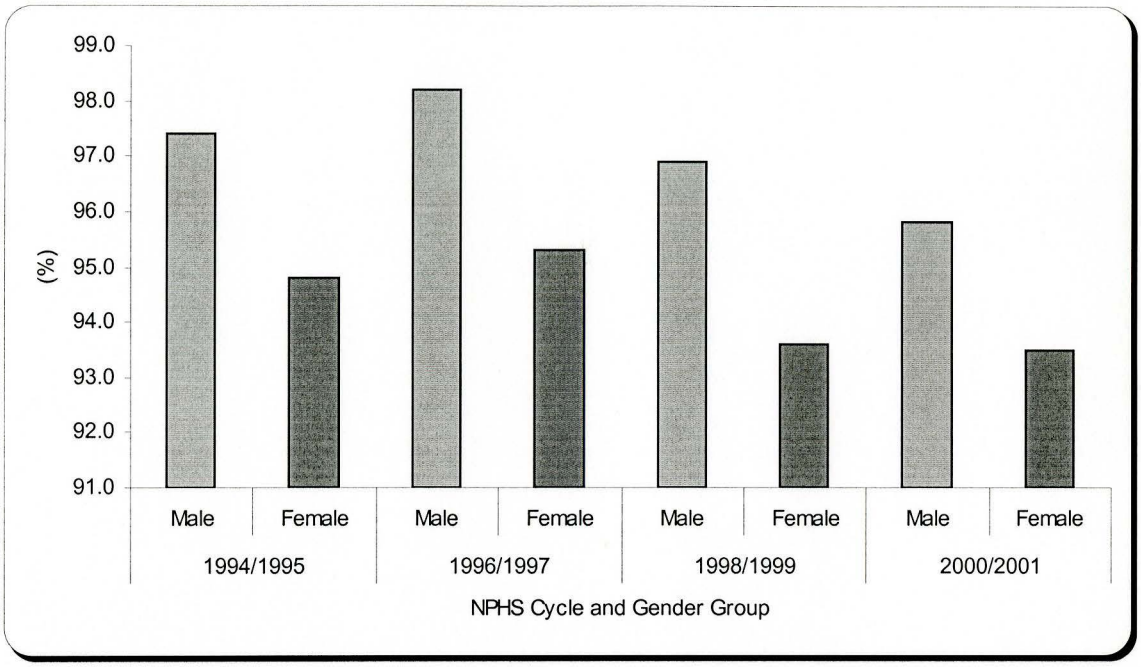


Figure 4.12:
Self-Perceived Happiness for Weighted Native-Born Sample by Gender

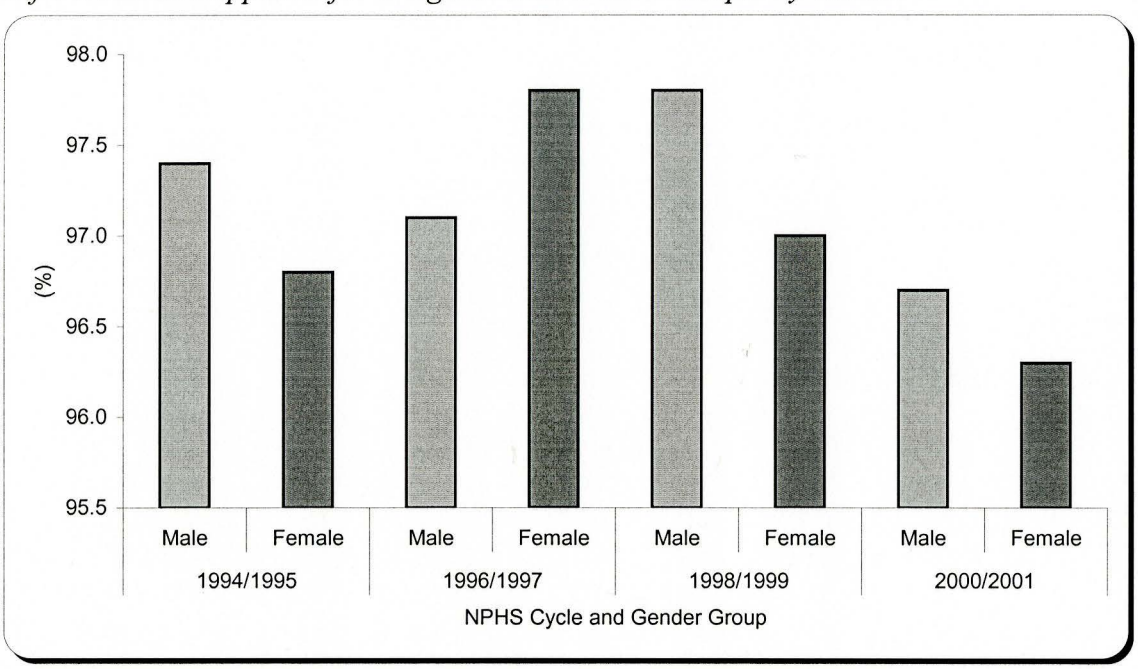


Figure 4.13:
General Chronic Stress for Weighted Immigrant Sample by Country of Birth

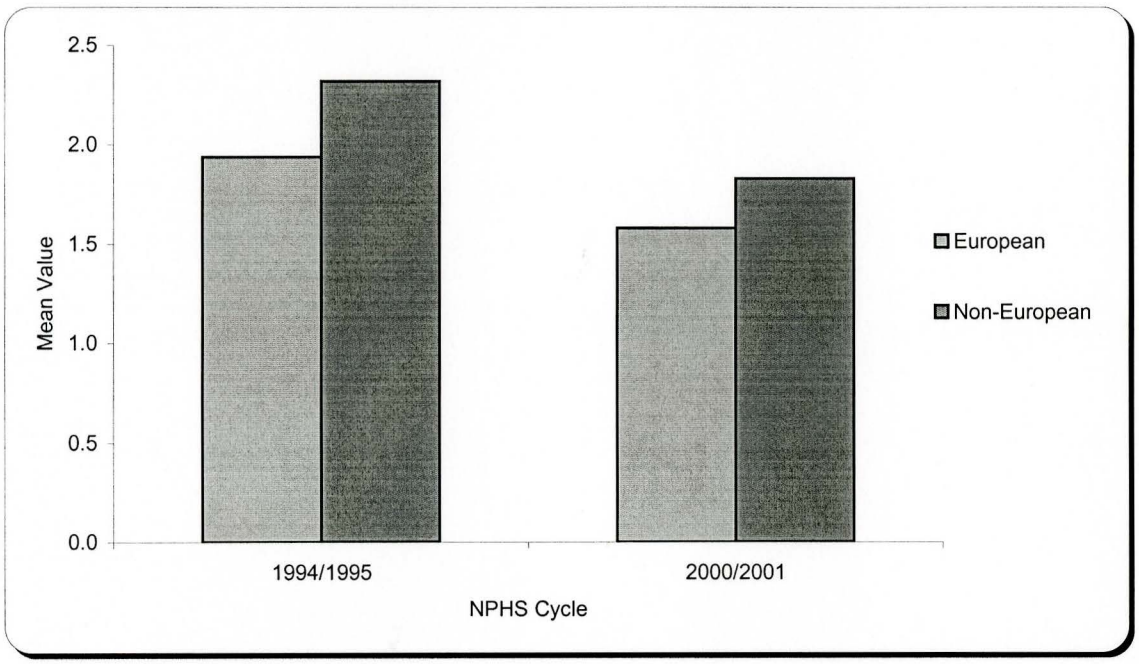


Figure 4.14:
Specific Chronic Stress for Weighted Immigrant Sample by Country of Birth

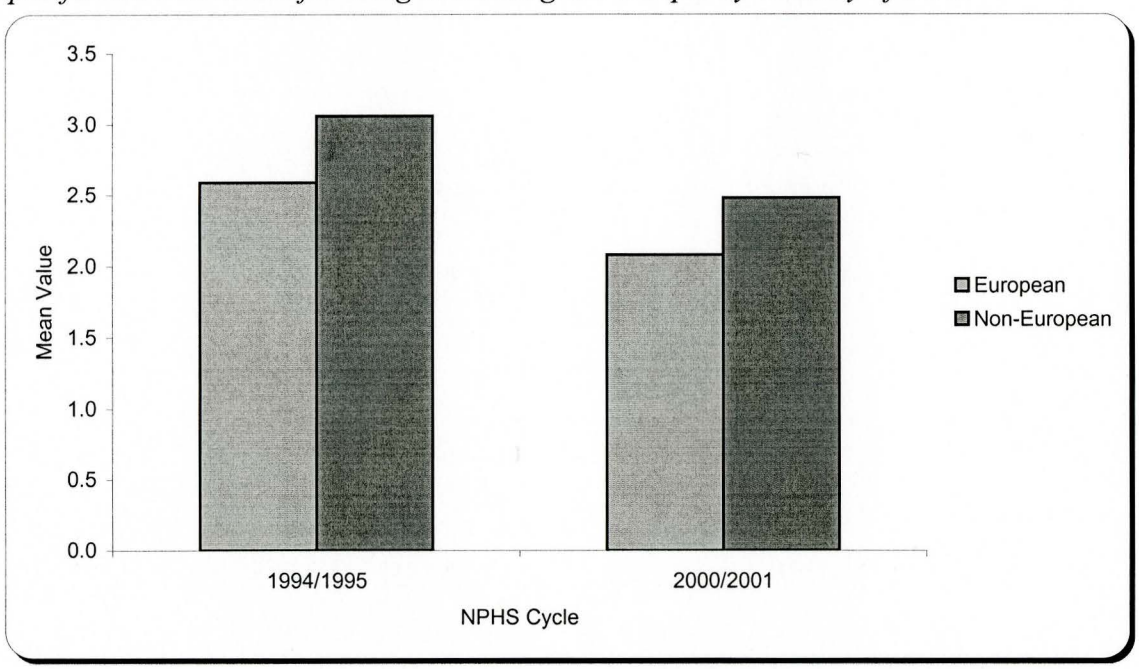


Figure 4.15:
Personal Stress for Weighted Immigrant Sample by Country of Birth

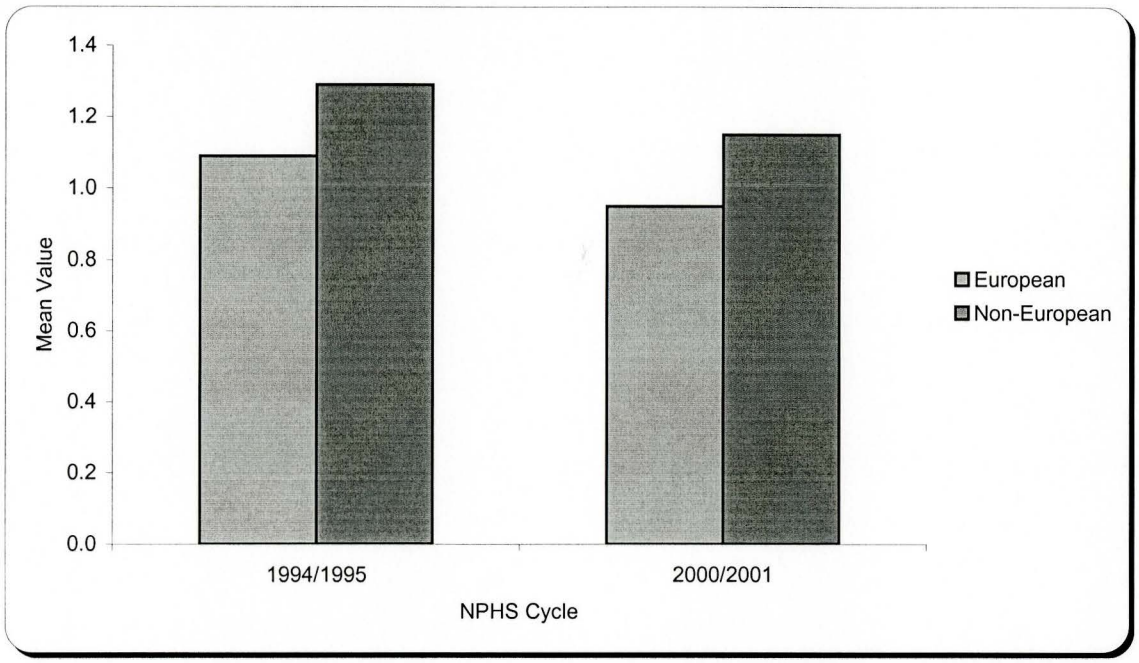


Figure 4.16:
Distress for Weighted Immigrant Sample by Country of Birth

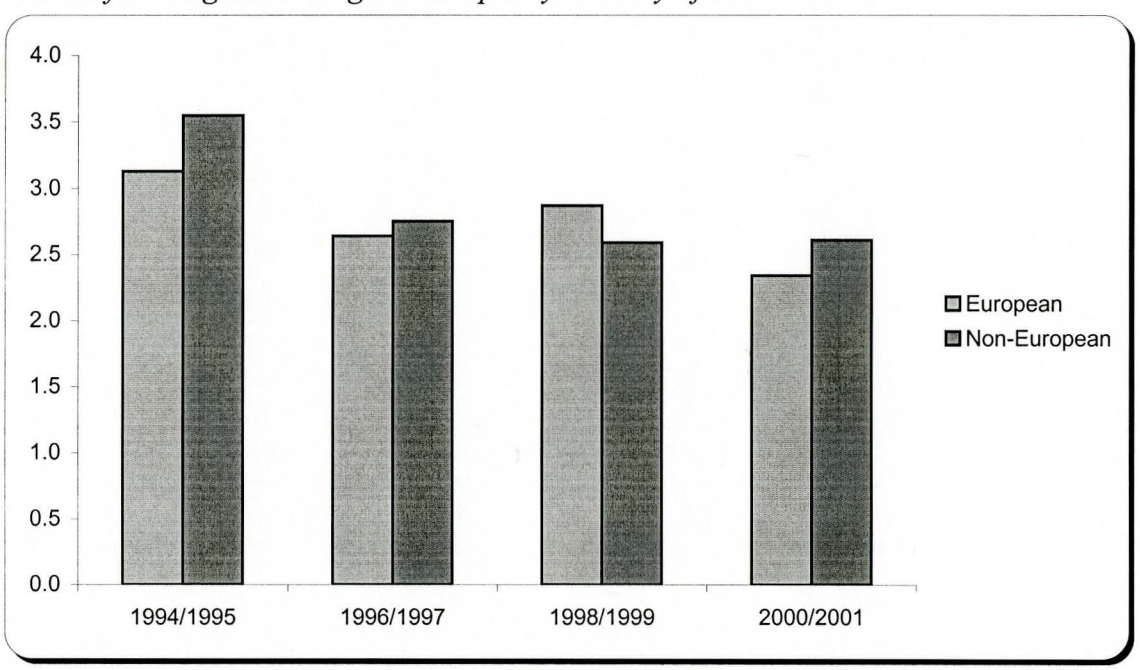


Figure 4.17:
Depression for Weighted Immigrant Sample by Country of Birth

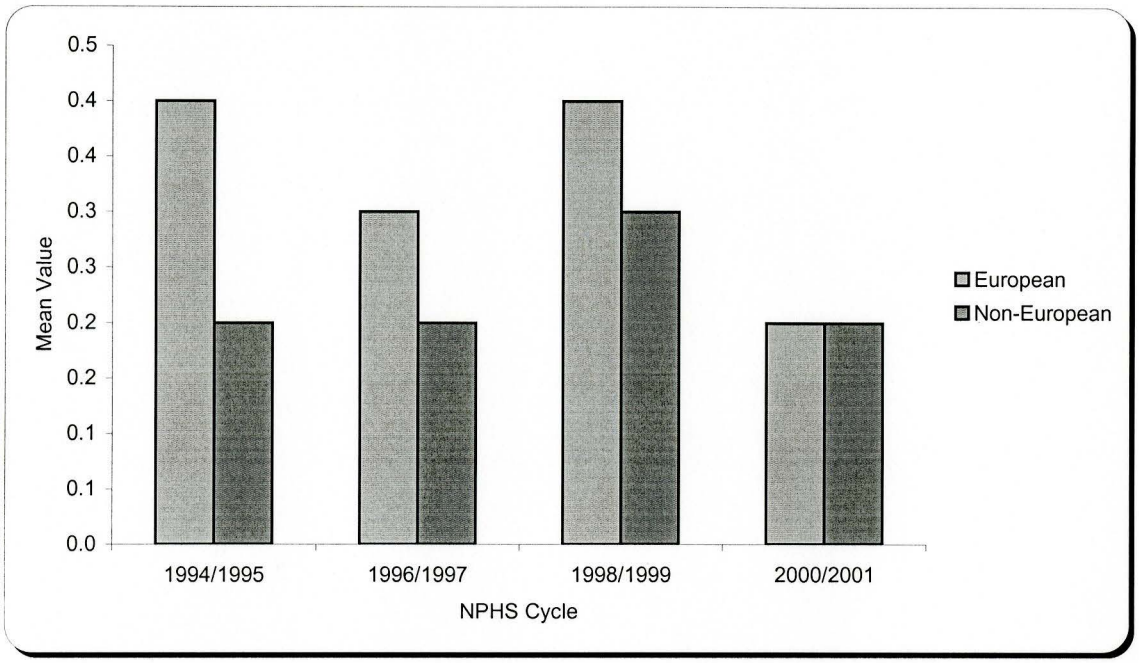


Figure 4.18:
General Chronic Stress for Weighted Immigrant Sample by Arrival Cohort

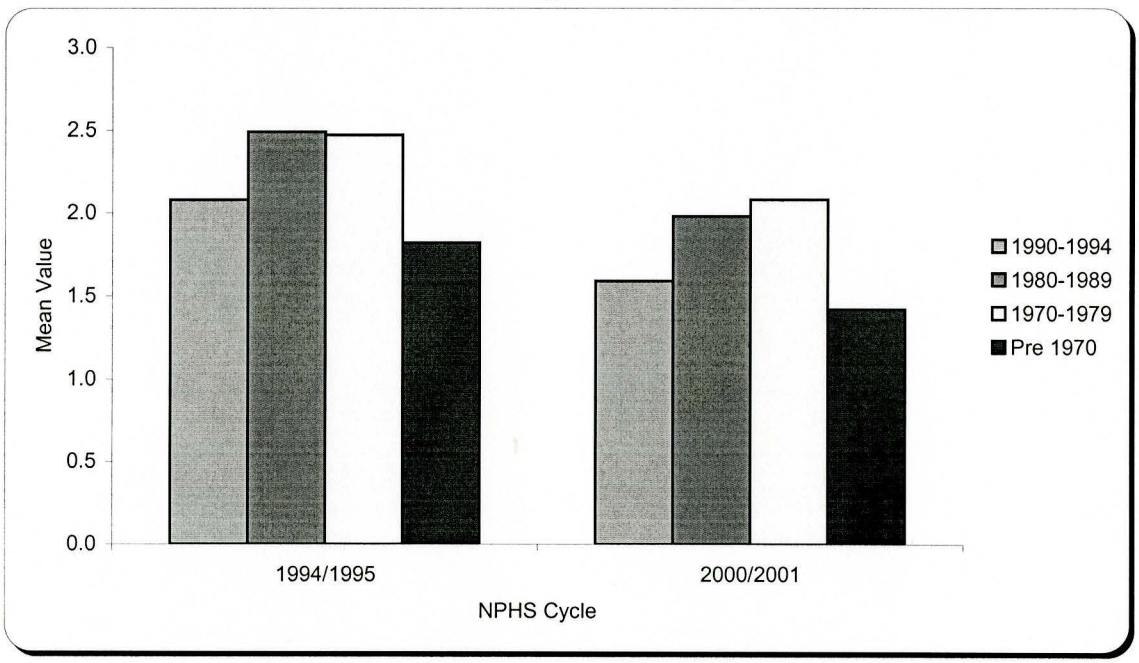


Figure 4.19:
Specific Chronic Stress for Weighted Immigrant Sample by Arrival Cohort

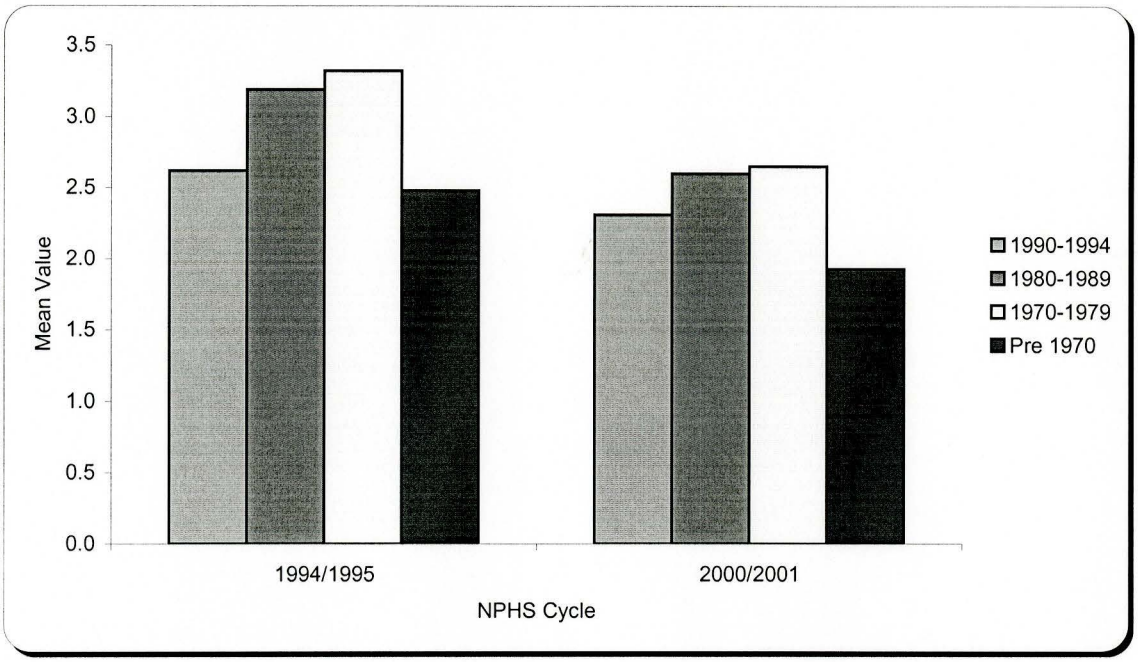


Figure 4.20:
Personal Stress for Weighted Immigrant Sample by Arrival Cohort

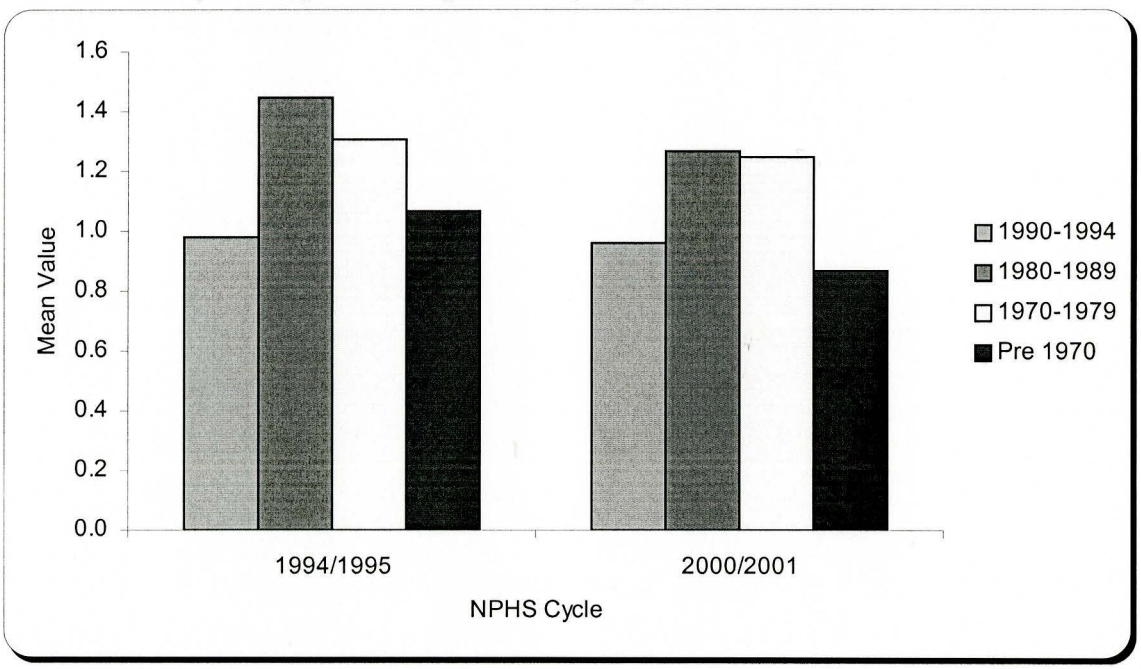


Figure 4.21:
Distress for Weighted Immigrant Sample by Arrival Cohort

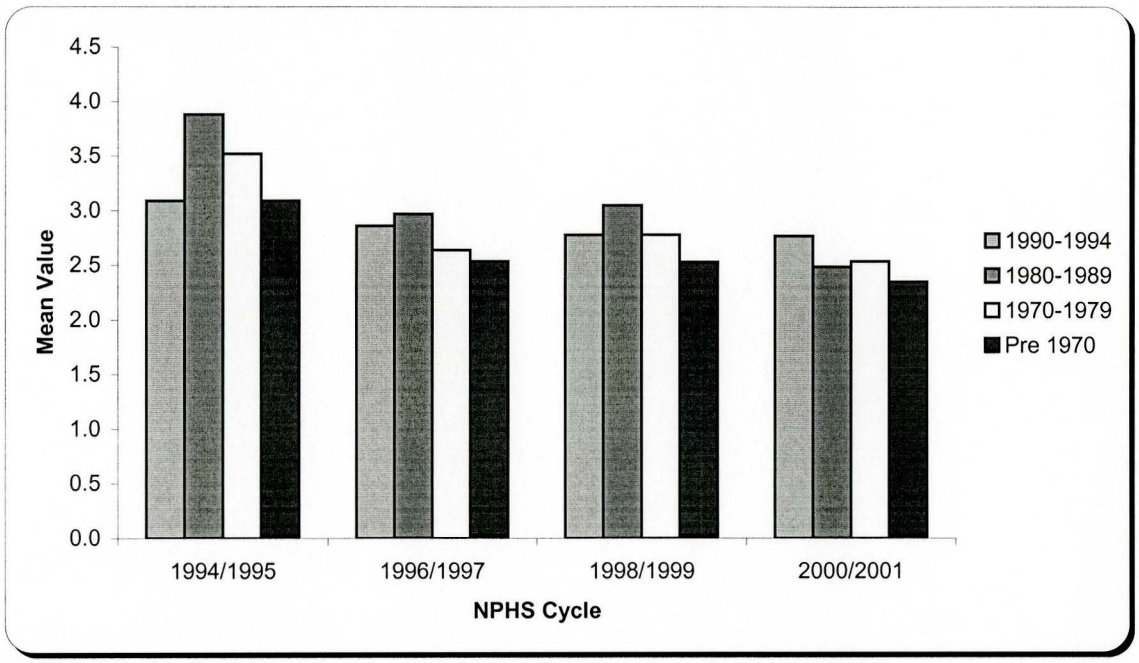


Figure 4.22:
Depression for Weighted Immigrant Sample by Arrival Cohort

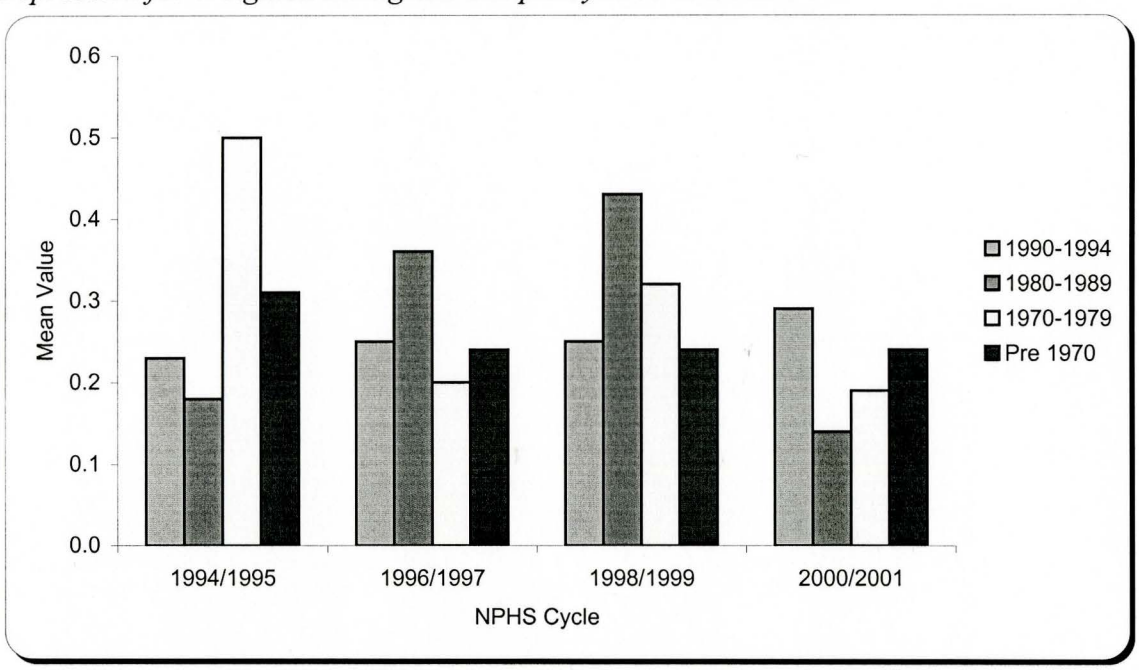


Figure 4.23:
General Chronic Stress for Weighted Immigrant Sample by Race

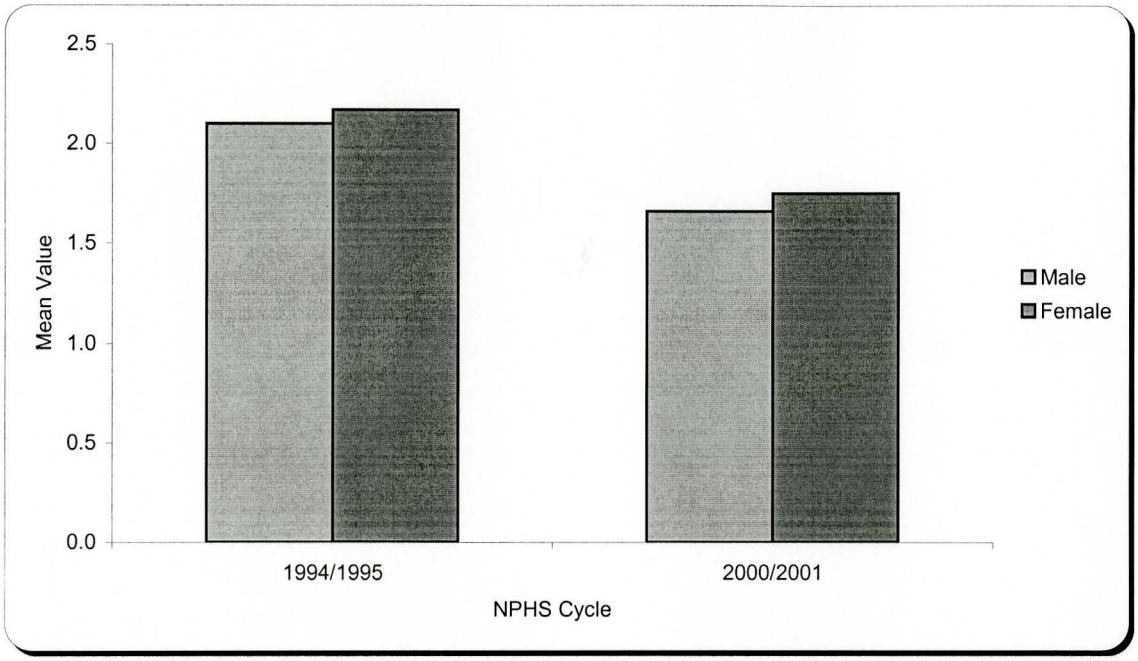


Figure 4.24:
General Chronic Stress for Weighted Native-Born Sample by Race

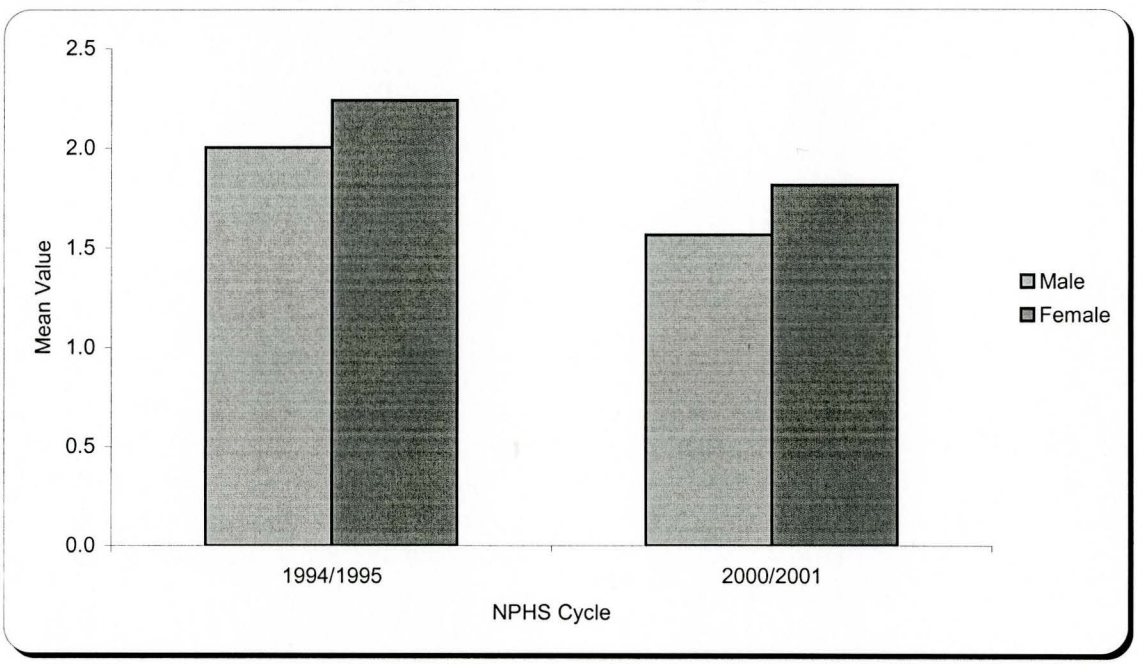


Figure 4.25:
Specific Chronic Stress for Weighted Immigrant Sample by Race

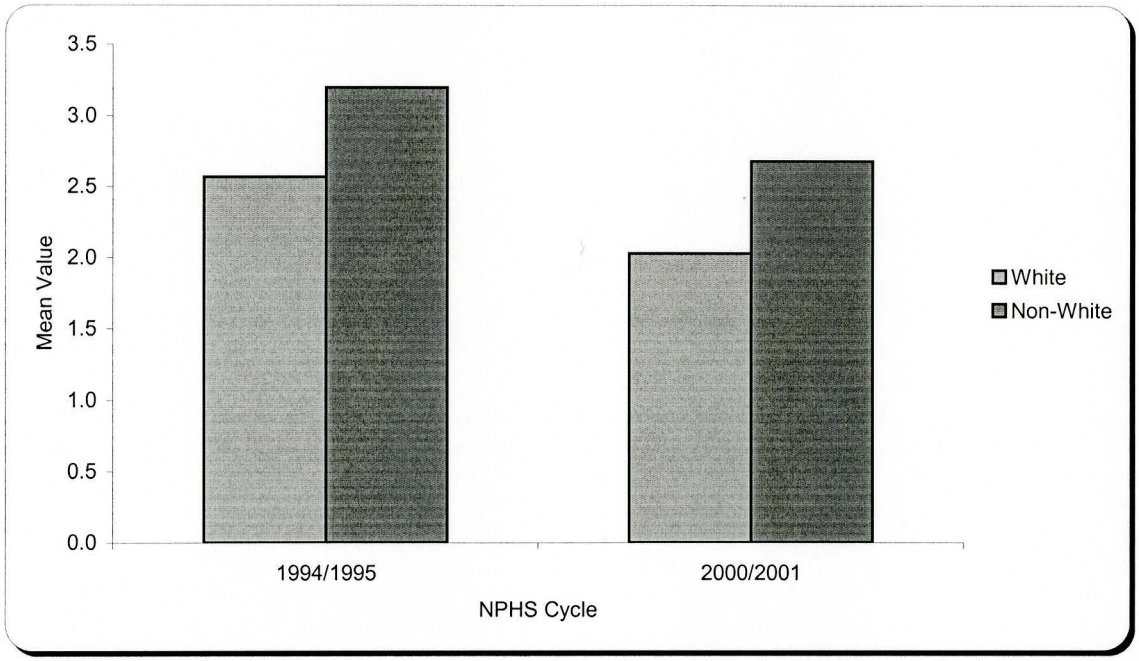


Figure 4.26:
Specific Chronic Stress for Weighted Native-Born Sample by Race

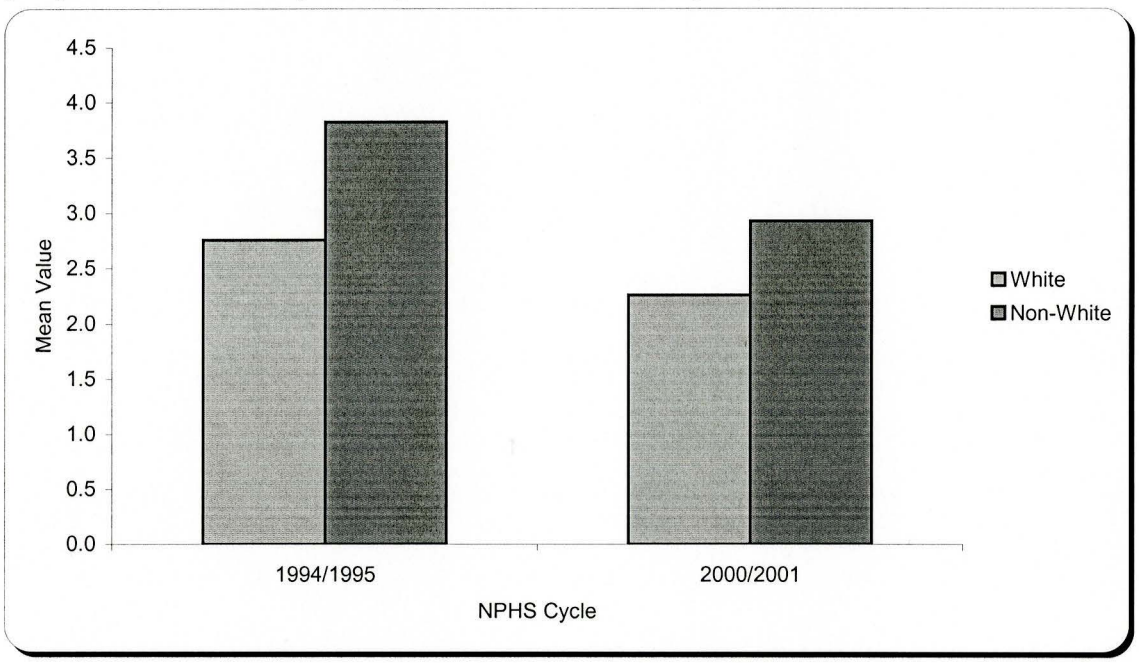


Figure 4.27:
Personal Stress for Weighted Immigrant Sample by Race

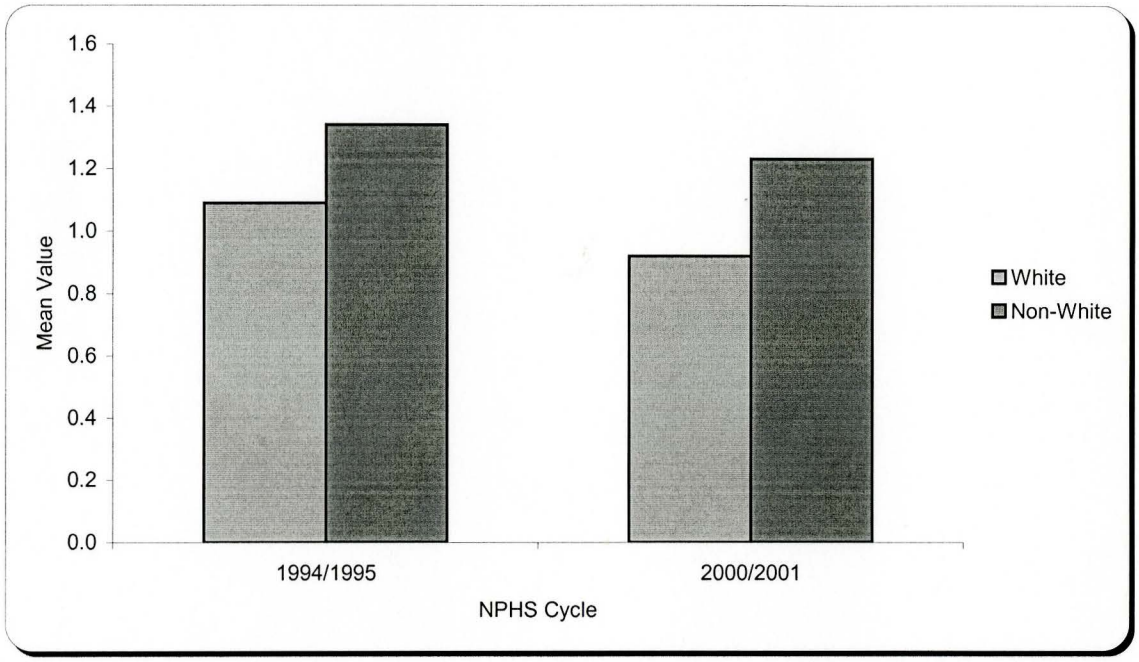


Figure 4.28:
Personal Stress for Weighted Native-Born Sample by Race

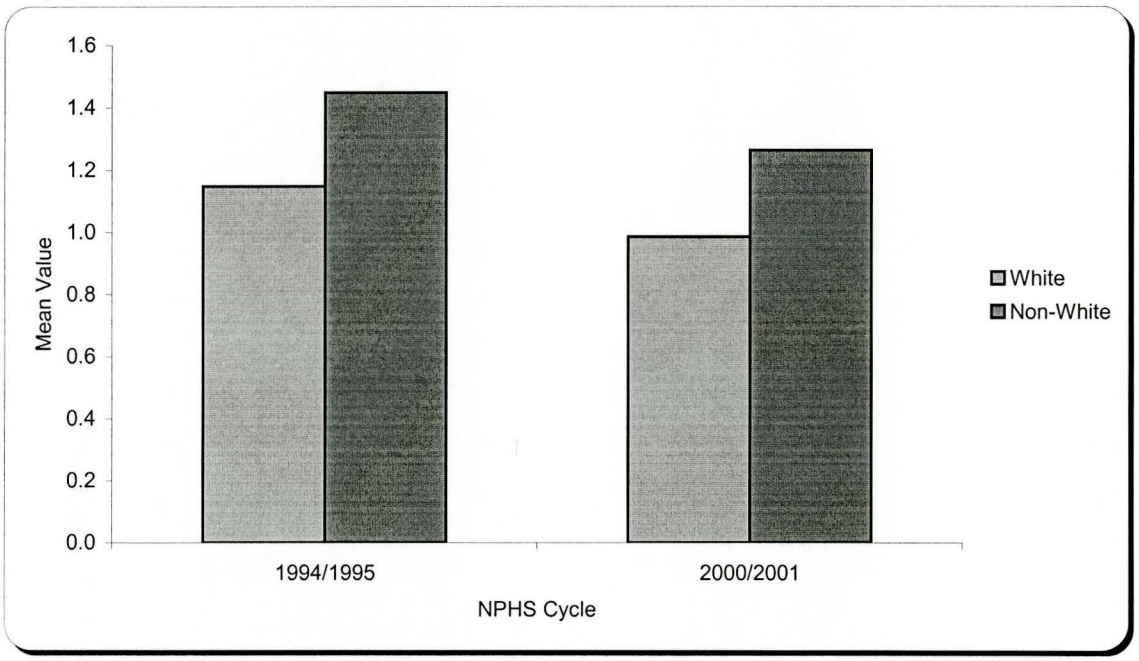


Figure 4.29:
Distress for Weighted Immigrant Sample by Race

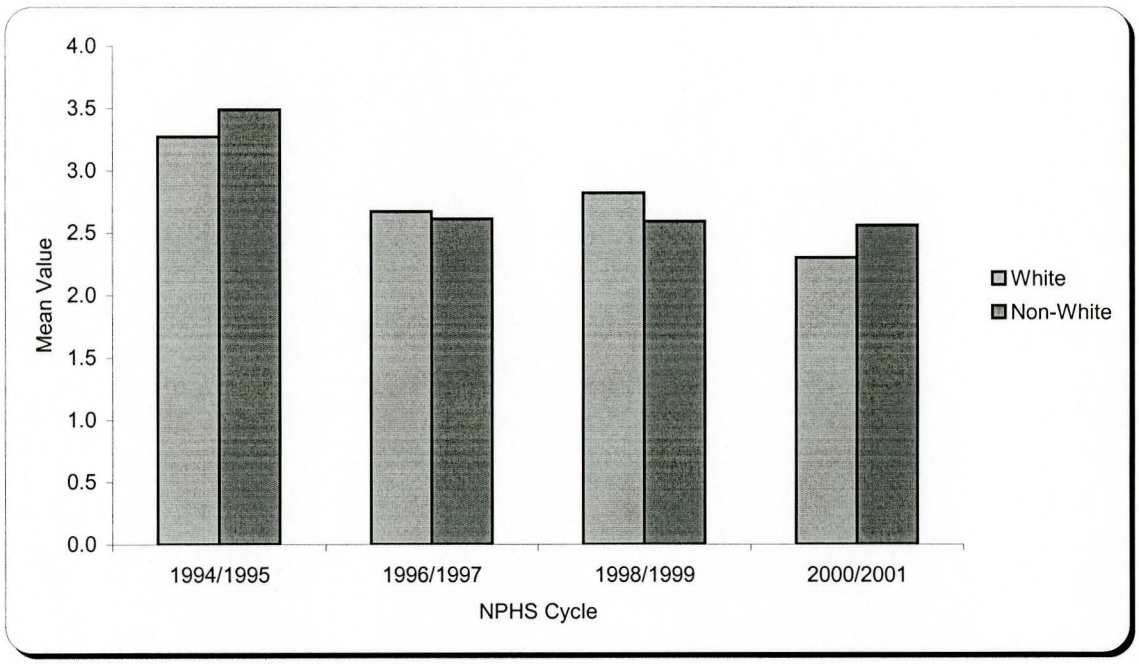


Figure 4.30:
Distress for Weighted Native-Born Sample by Race

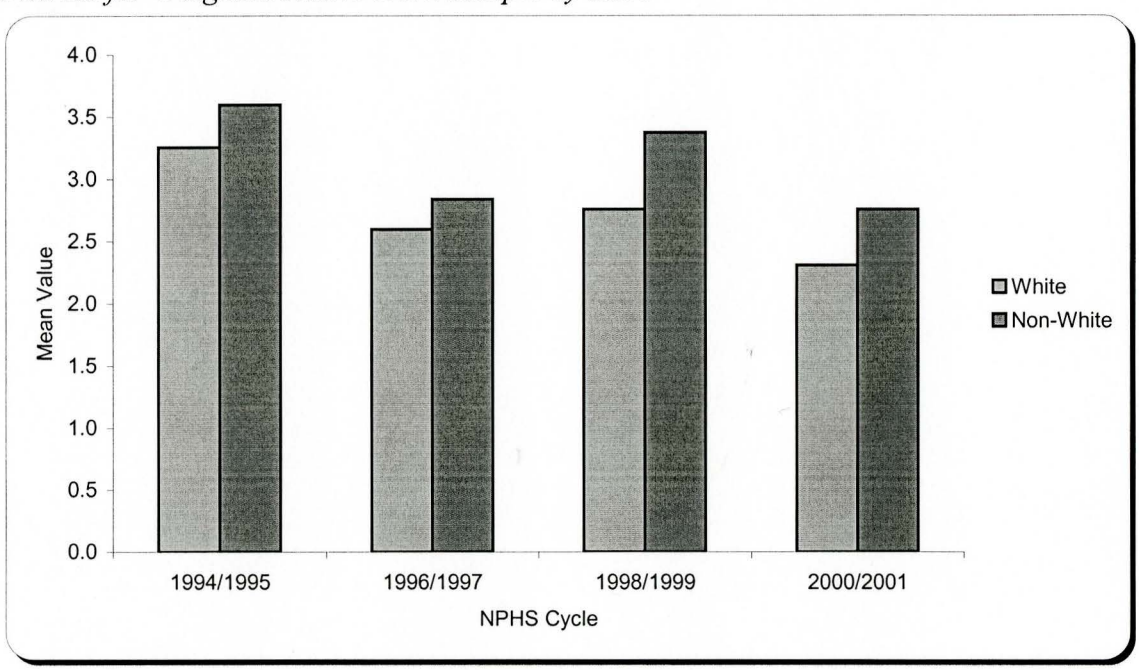


Figure 4.31:
Depression for Weighted Immigrant Sample by Race

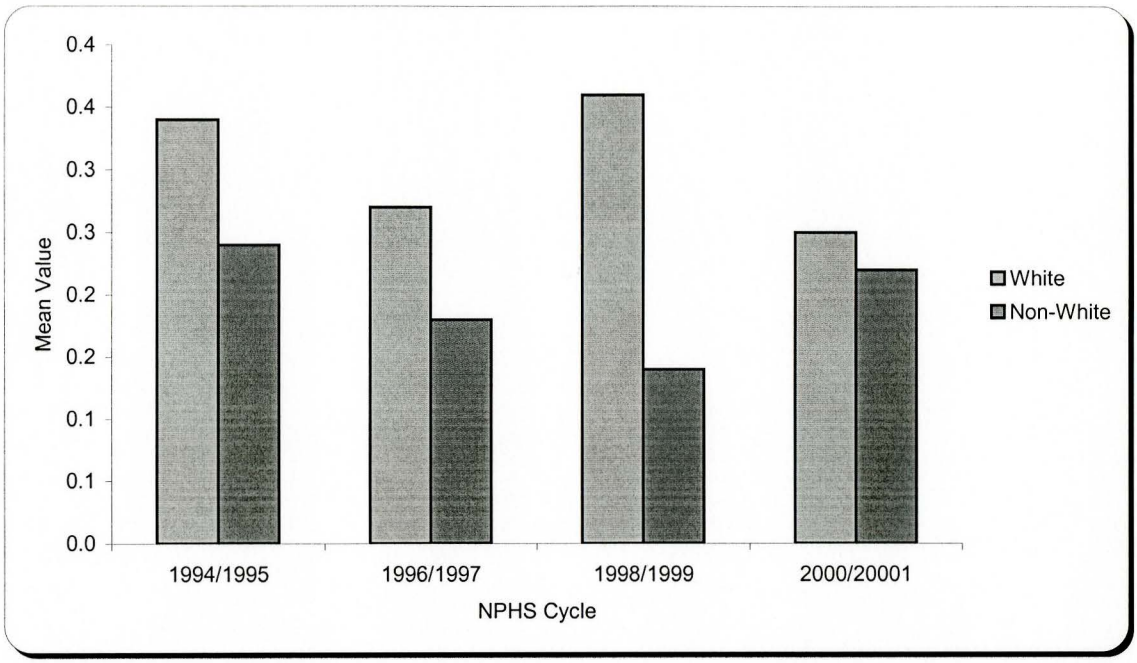


Figure 4.32:
Depression for Weighted Native-Born Sample by Race

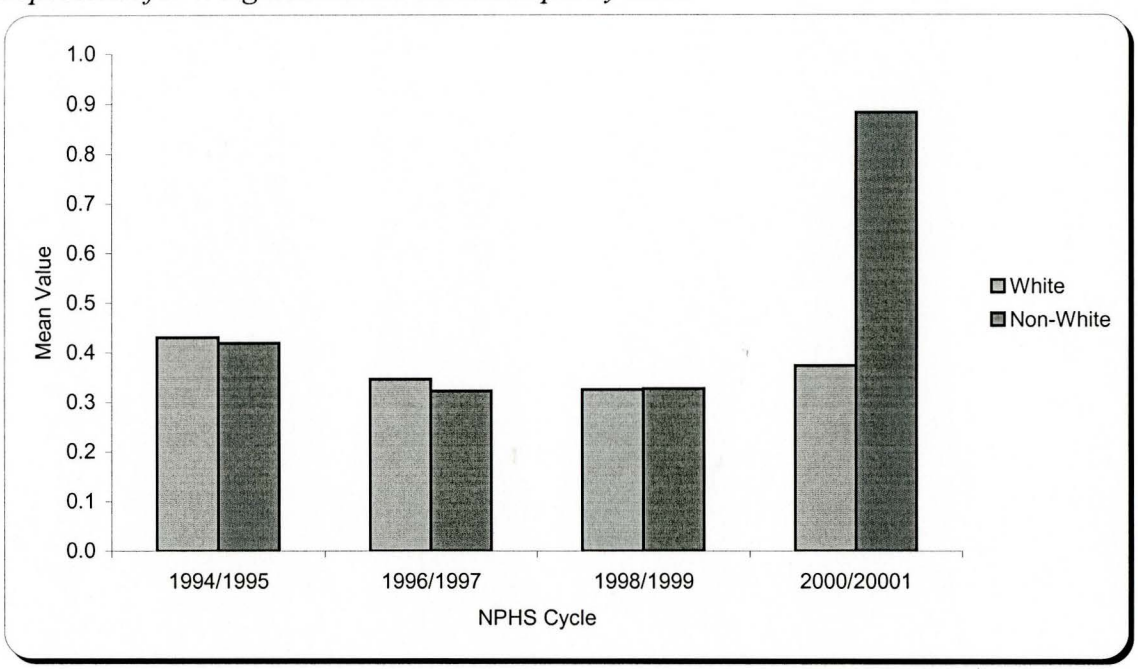


Figure 4.33:
General Chronic Stress for Weighted Immigrant Sample by Gender

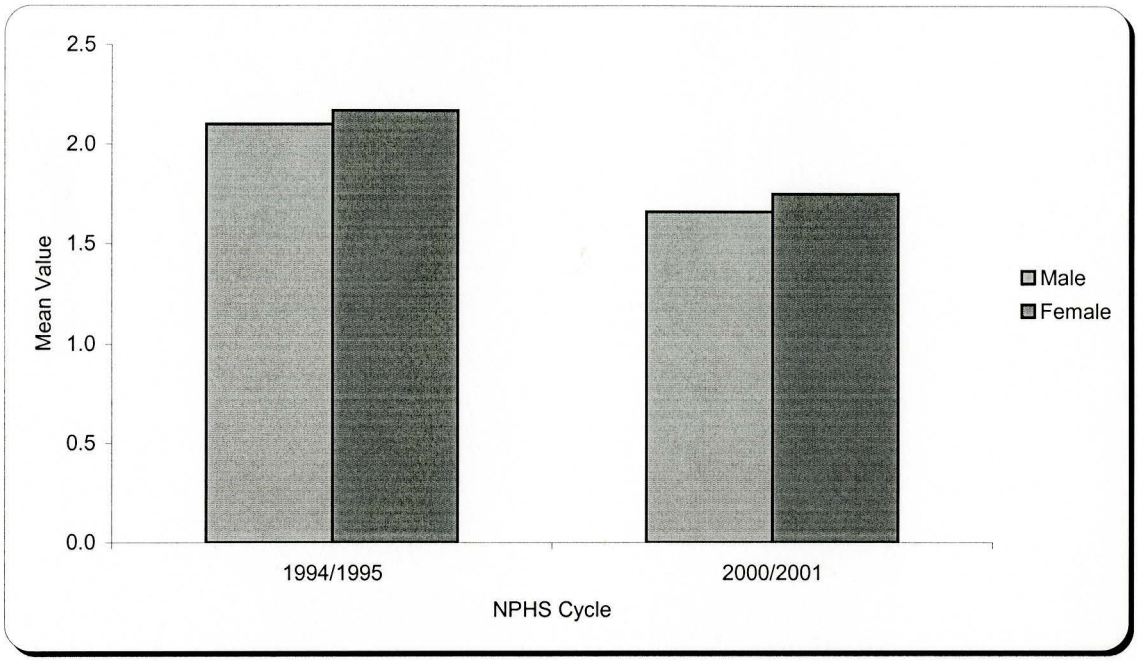


Figure 4.34:
General Chronic Stress for Weighted Native-Born Sample by Gender

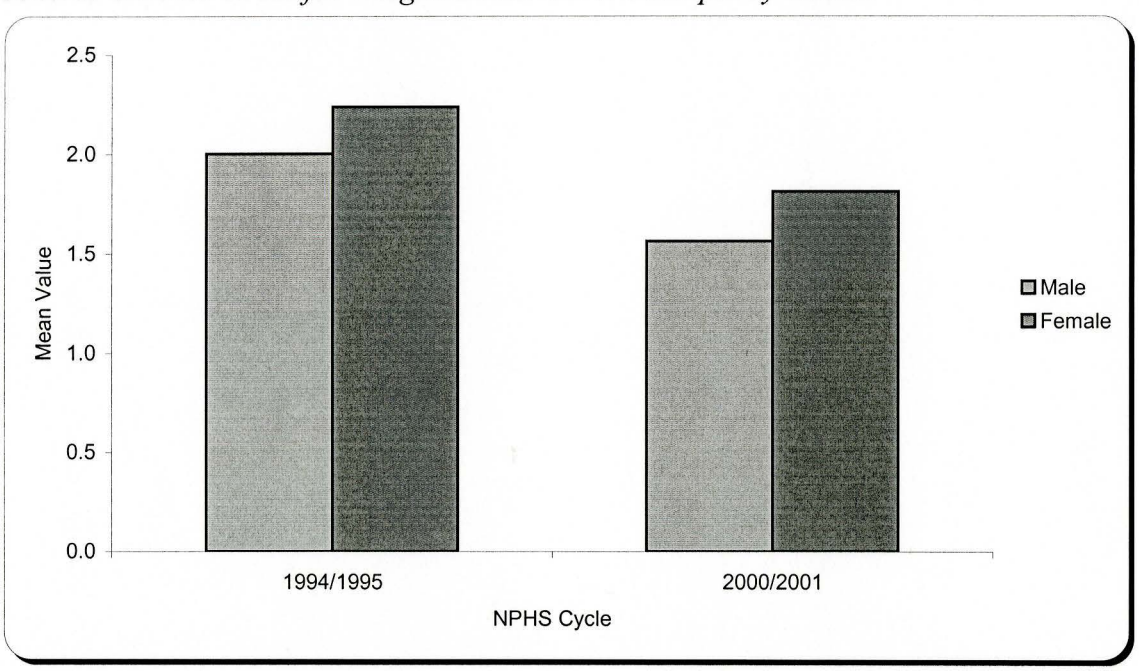


Figure 4.35:
Specific Chronic Stress for Weighted Immigrant Sample by Gender

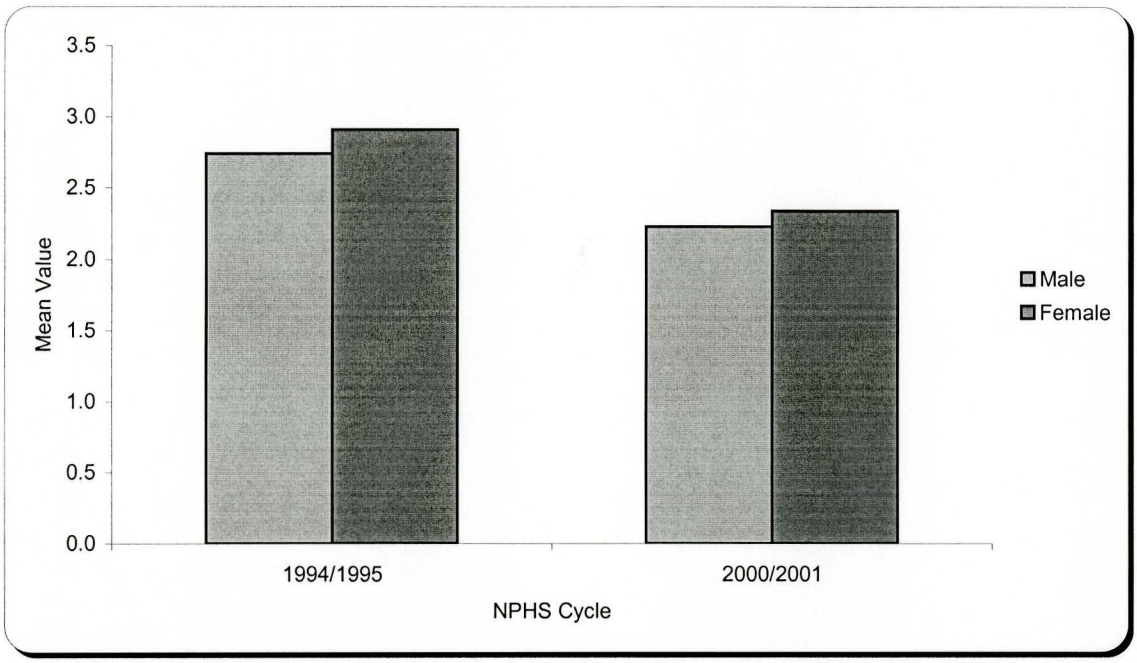


Figure 4.36:
Specific Chronic Stress for Weighted Native-Born Sample by Gender

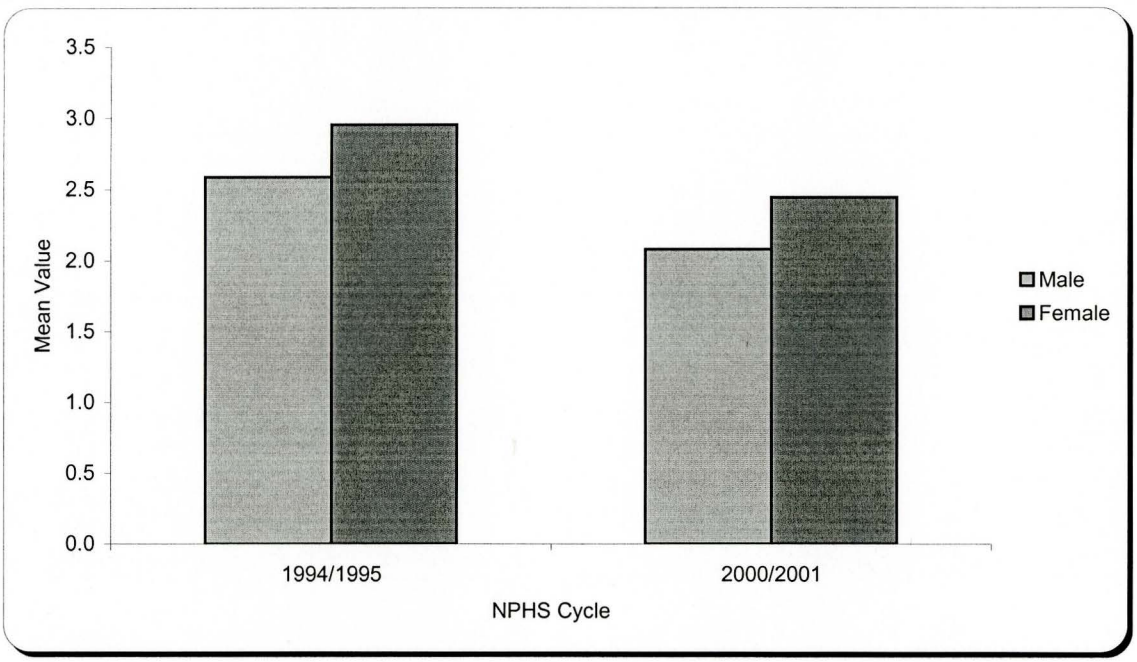


Figure 4.37:
Personal Stress for Weighted Immigrant Sample by Gender

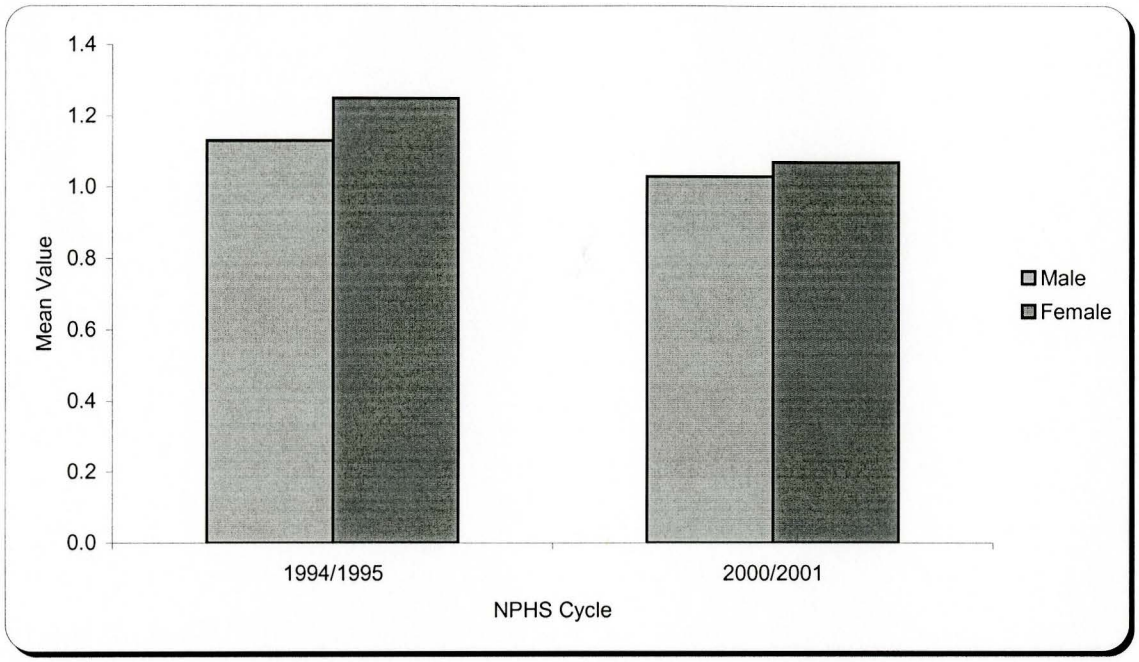


Figure 4.38:
Personal Stress for Weighted Native-Born Sample by Gender

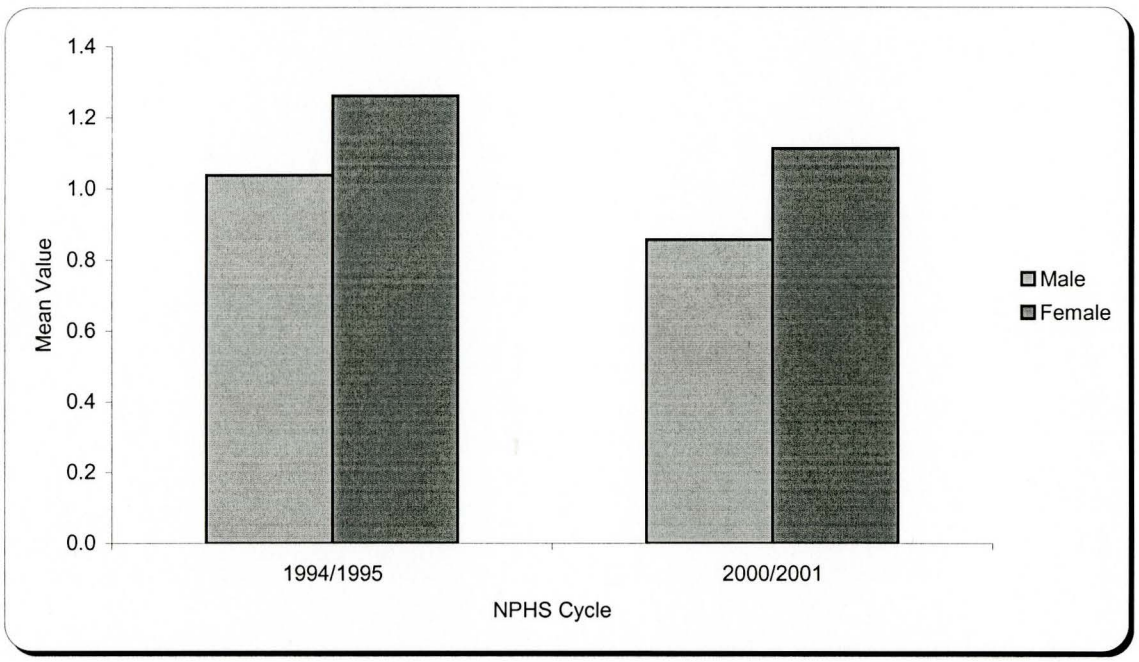


Figure 4.39:
Distress for Weighted Immigrant Sample by Gender

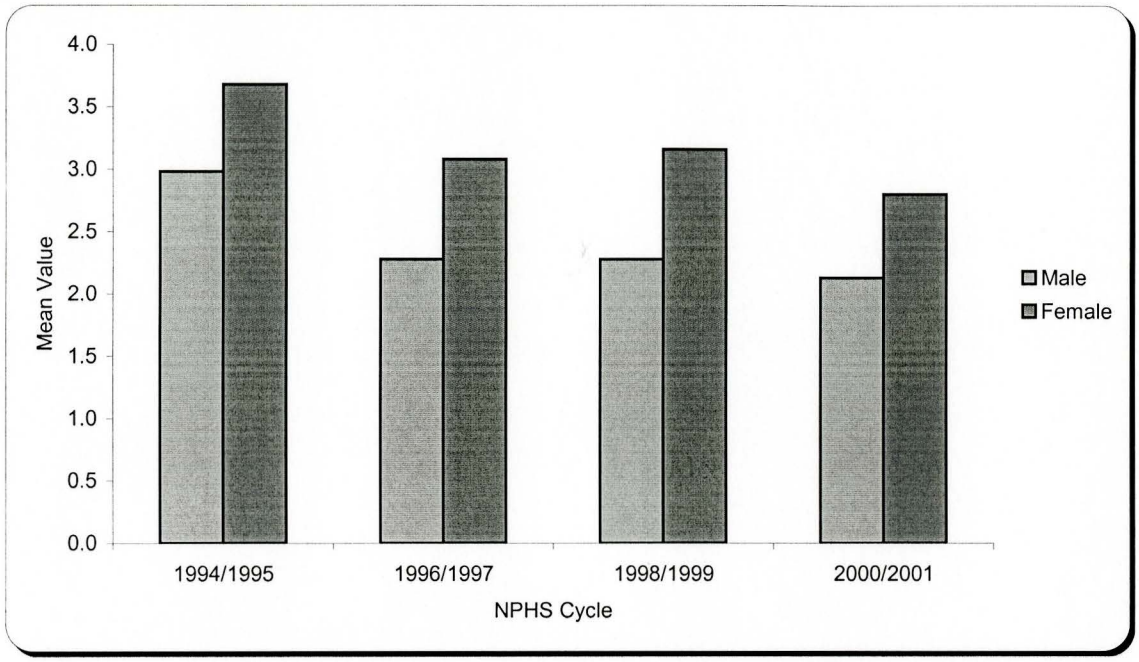


Figure 4.40:
Distress for Weighted Native-Born Sample by Gender

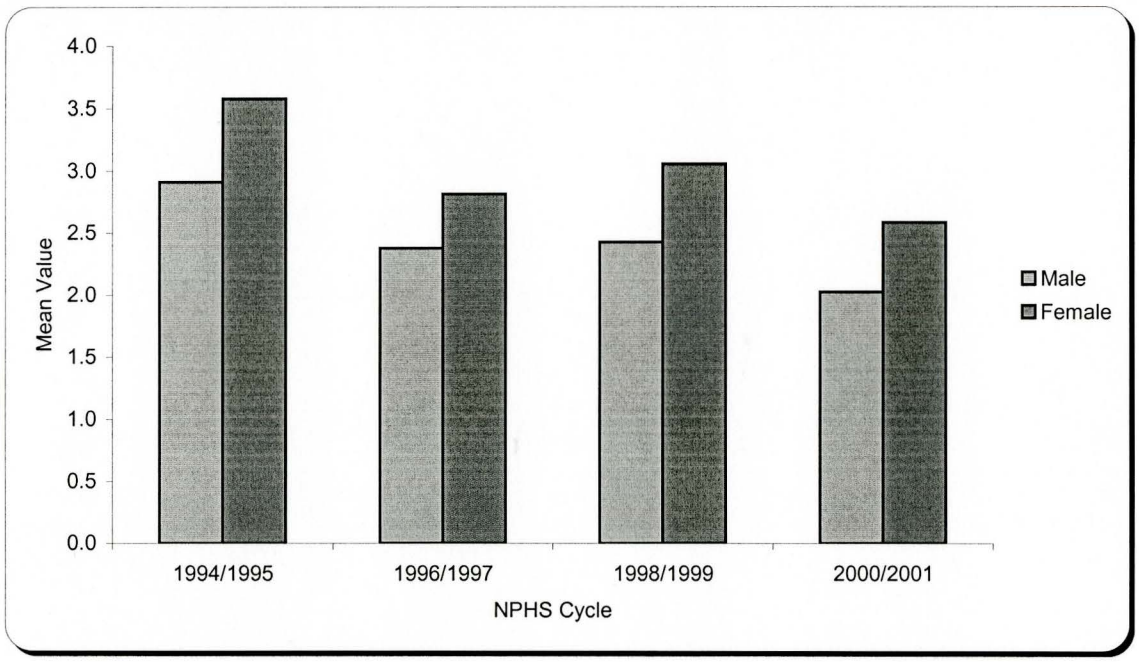


Figure 4.41:
Depression for Weighted Immigrant Sample by Gender

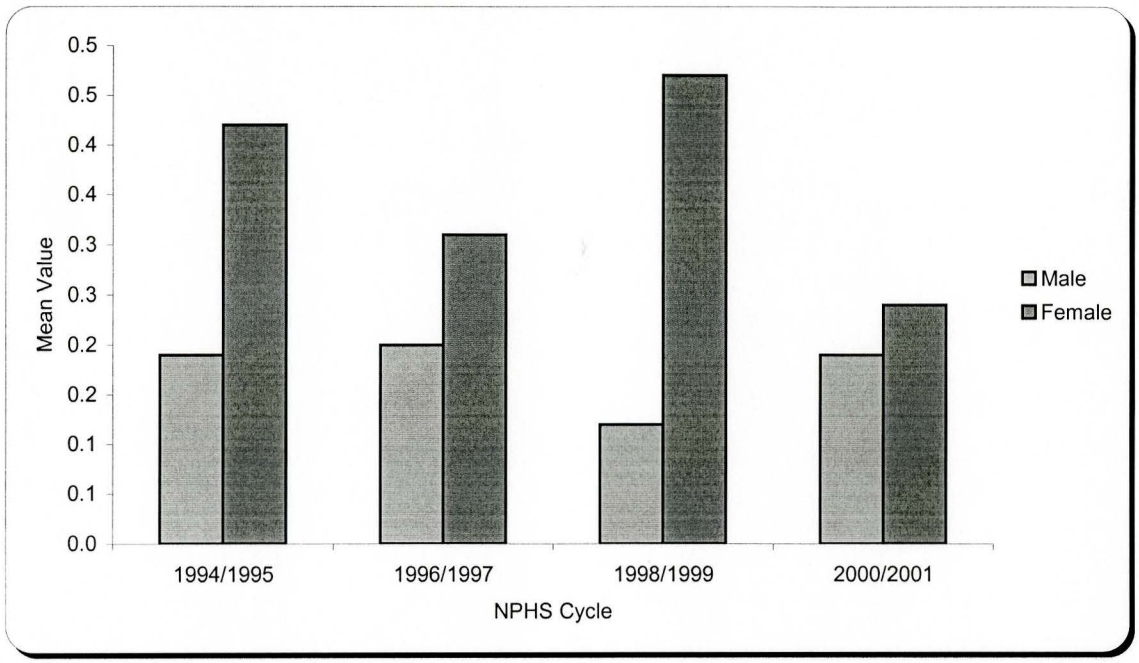


Figure 4.42:
Depression for Weighted Native-Born Sample by Gender

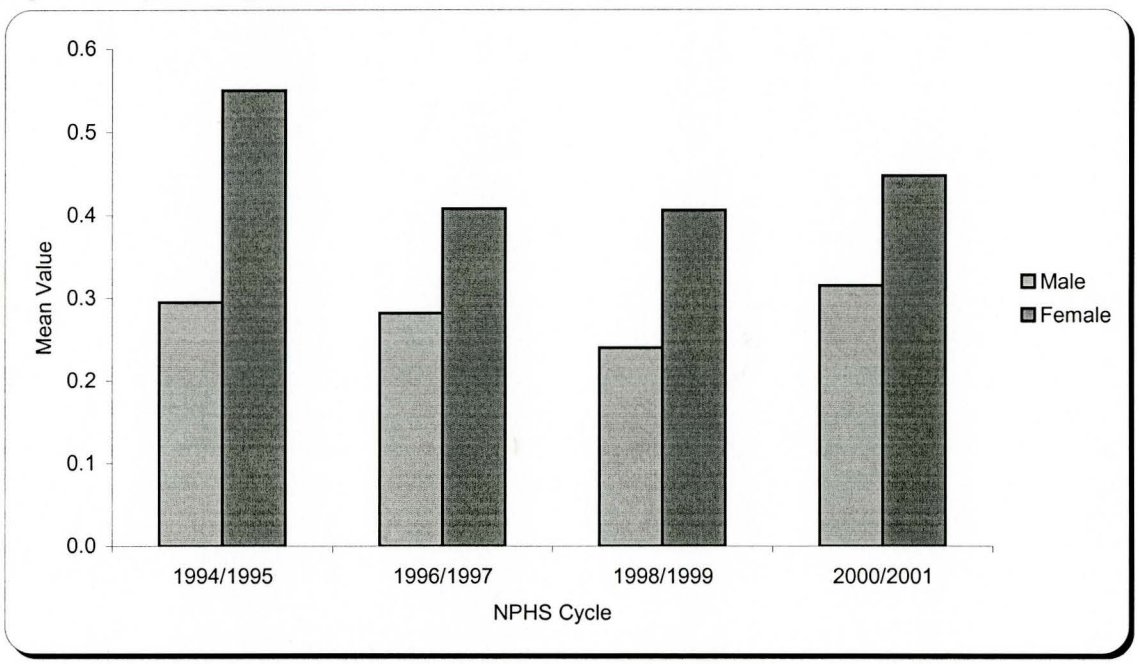


Table 4.1:
Self-Perceived General Health Status *for Immigrant-Only Sample aged 20+ in 1994/1995*

Variable	1994/1995			2000/2001			*Diff 94/95-00/01*
	B	SIG	p	B	SIG	p	
Intercept	-1.142	*	0.0237	-0.629		0.3152	0.638
Socio-Demographic Variables							
General Prac. Consultation	1.426	***	0.0001	1.036	**	0.0128	-0.697
Female (Gender)				0.682	***	0.0021	
Married	-0.659		0.0014	0.541	*	0.0458	2.600
Currently Working				-0.852	***	0.0005	
Lifestyle Variables							
Heavy Drinker	-1.061		0.0588	-1.591	**	0.0164	-0.611
Moderate Drinker	-0.623	***	0.0019	-0.900	***	<.0001	-0.909
Physically Active				-1.482	***	0.0006	
Income and SES Variables							
Lower Mid Income				0.750	*	0.0296	
Middle Income	0.568	***	0.0054				
Upper Mid Income				-0.857	***	0.0015	
High Income	0.568		0.0889	-1.198	***	0.0003	-3.557
Education Variables							
High School				0.525		0.0525	
Some Postsecondary Ed.				0.668	***	0.0080	
Post Secondary Ed.	-0.928	***	0.0002				
Arrival Cohort Variables							
Arrival Cohort 1990-1994	-1.445	***	0.0025	-0.746	*	0.0253	1.197
Arrival Cohort 1980-1989				-0.982	***	0.0015	
Arrival Cohort Pre 1970	0.601	***	0.0033				
Place of Residence Variables							
Quebec	-0.847	*	0.0210				
Alberta				-0.881		0.0919	
N (unweighted)	*1097*			*998*			
Rho-squared (P^2)	*0.2*			*0.2*			
Percent Concordant	*78.10*			*80.80*			
Likelihood Ratio	*154.800*			*165.200*			
Significance Level	*** p <0.01		** p <0.02		* p <0.05		

Table 4.2:
Self-Perceived General Health Status *for Pooled Sample aged 20+ in 1994/1995*

Variable	1994/1995			2000/2001			*Diff 94/95-00/01*
	B	SIG	p	B	SIG	p	
Intercept	-0.715	***	0.001	-0.611	*	0.026	0.297
Socio-Demographic Variables							
Race				-0.240		0.057	
General Prac. Consultation	0.840	***	<.0001	0.993	***	<.0001	0.847
Female (Gender)				0.403	***	<.0001	
Currently Working	-0.678	***	<.0001	-1.062	***	<.0001	-2.878
Speaks Other Lang.	-1.048	***	0.008	-0.689	**	0.018	0.735
Age Group	-0.581	***	<.0001	-0.319	***	0.001	1.989
Lifestyle Variables							
Heavy Drinker	-0.693	***	0.000	-0.862	***	<.0001	-0.652
Moderate Drinker	-0.674	***	<.0001	-0.692	***	<.0001	-0.149
Physically Active				-0.376	**	0.011	
Physically Inactive	0.360	***	<.0001	0.582	***	<.0001	1.753
Income and SES Variables							
Middle Income	-0.170		0.089	-0.294	***	0.008	-0.835
Upper Mid Income	-0.449	***	<.0001	-0.628	***	<.0001	-1.140
High Income	-1.003	***	<.0001	-0.966	***	<.0001	0.168
Education Variables							
Less then High School	0.759	***	<.0001	0.528	***	<.0001	-1.722
Some Postsecondary Ed.	0.240	**	0.018	0.313	***	0.001	0.532
Place of Residence Variables							
Quebec	-0.225	**	0.014				
Ontario				0.237	***	0.004	
British Columbia				0.239	*	0.049	
N (unweighted)	*8848*			*8460*			
Rho-squared (P^2)	*0.2*			*0.2*			
Percent Concordant	*79.70*			*79.50*			
Likelihood Ratio	*1016.500*			*1208.800*			

Significance Level *** p <0.01 ** p <0.02 * p <0.05

Table 4.3:
Self-Perceived Happiness for Immigrant-Only Sample aged 20+ in 1994/1995

Variable	1994/1995			2000/2001			Diff 94/95-00/01
	B	SIG	p	B	SIG	p	
Intercept	-2.590	***	<.0001	-3.849	***	0.0004	-0.352
Socio-Demographic Variables							
General Health	-2.081	***	<.0001	-1.864	***	<.0001	-0.242
Race				-1.236	***	0.0012	
General Prac. Consultation				2.422	**	0.0136	
Married				-1.004	***	<.0001	
Lifestyle Variables							
Daily Smoker				0.579	*	0.0426	
Heavy Drinker				1.152	***	0.0074	
Physically Inactive				0.859	***	0.0046	
Income and SES Variables							
Middle Income	-0.770	***	0.0074				
High Income				1.025	***	0.0055	
Education Variables							
Post Secondary Ed.				-0.671		0.0523	
Place of Residence Variables							
Atlantic Provinces				-1.189	*	0.0426	
N (unweighted)	*2348*			*2244*			
Rho-squared (P^2)	*0.2*			*0.2*			
Percent Concordant	*78.90*			*81.70*			
Likelihood Ratio	*113.700*			*165.600*			
Significance Level	*** p <0.01		** p <0.02		* p <0.05		

Table 4.4:
Self-Perceived Happiness for Pooled Sample aged 20+ in 1994/1995

Variable	1994/1995			2000/2001			Diff 94/95-00/01
	B	SIG	p	B	SIG	p	
Intercept	-2.590	***	<.0001	-3.848	***	0.0004	-0.352
Socio-Demographic Variables							
General Health	-2.080	***	<.0001	-1.864	***	<.0001	-0.242
Race				-1.236	***	0.0012	
General Prac. Consultation				2.422	**	0.0136	
Married				-1.004	***	<.0001	
Lifestyle Variables							
Daily Smoker				0.579	*	0.0426	
Heavy Drinker				1.152	***	0.0074	
Physically Inactive				0.859	***	0.0046	
Income and SES Variables							
Middle Income	-0.770	***	0.0074				
High Income				1.025	***	0.0055	
Education Variables							
Post Secondary Ed.				-0.671		0.0525	
Place of Residence Variables							
Atlantic Provinces				-1.189	*	0.0426	
N (unweighted)	*374*			*349*			
Rho-squared (P^2)	*0.2*			*0.2*			
Percent Concordant	*78.90*			*81.70*			
Likelihood Ratio	*113.600*			*165.500*			
Significance Level	*** p <0.01		** p <0.02		* p <0.05		

Table 4.5:
General Chronic Stress for Immigrant-Only Sample aged 20+ in 1994/1995

Variable	1994/1995			2000/2001			*Diff 94/95-00/01*
	B	SIG	*p*	B	SIG	*p*	
Intercept	1.123	***	<0.0001	1.007	***	<0.0001	-0.425
Socio-Demographic Variables							
Female (Gender)	0.119		0.0834				
Speaks Other Lang.				-0.263		0.0788	
Lifestyle Variables							
Smoker in Household	0.205	**	0.0119	0.249	***	0.0025	0.382
Moderate Drinker	0.232	***	0.0015	0.175	**	0.0184	-0.552
Moderately Active	-0.167		0.0524				
Income and SES Variables							
Low Income	0.233		0.081	-0.396		0.0746	-2.431
Upper Mid Income				-0.415	***	<0.0001	
High Income				-0.636	***	<0.0001	
Education Variables							
Less then High School				-0.180		0.0671	
Post Secondary Ed.	-0.149	*	0.0347				
Arrival Cohort Variables							
Arrival Cohort 1970-1979				0.137		0.0679	1.827
Arrival Cohort Pre 1970	-0.248	***	0.0005				
Stress and Mental Health Variables							
Personal Stress Index	1.170	***	<0.0001	1.235	***	<0.0001	1.802
Self Perceived Happiness	-0.530	***	0.0077	-0.404	***	0.0092	0.502
Place of Residence Variables							
Atlantic Provinces				0.531		0.0726	
Quebec				0.227	*	0.0205	
Ontario	0.181	***	0.009				
Alberta				0.289	**	0.0152	
N (unweighted)	*823*			*701*			
F-Statistic	*220.48*			*208.91*			
R^2	*0.731*			*0.798*			

Significance Level *** p <0.01 ** p <0.02 * p <0.05

Table 4.6:
General Chronic Stress for Pooled Sample aged 20+ in 1994/1995

Variable	1994/1995			2000/2001			*Diff 94/95-00/01*
	B	SIG	*p*	B	SIG	*p*	
Intercept	1.656	***	<0.0001	1.158	***	<0.0001	-3.912
Socio-Demographic Variables							
General Health	-0.209	***	<0.0001	-0.244	***	<0.0001	-0.603
General Prac. Consultation	0.083	***	<0.0001	0.113	***	<0.0001	0.877
Female (Gender)	0.041		0.0746	0.107	***	<0.0001	2.074
Married	-0.124	***	<0.0001	-0.132	***	<0.0001	-0.226
Currently Working	-0.067	**	0.0188	-0.103	***	<0.0001	-0.959
Speaks Other Lang.				-0.206	*	0.0287	
Age Group	0.269	***	<0.0001	0.196	***	<0.0001	-1.294
Lifestyle Variables							
Nonsmoker	-0.091	***	0.005				
Smoker in Household	0.139	***	<0.0001	0.199	***	<0.0001	1.530
Heavy Drinker	0.106	**	0.0126	0.116	***	0.0061	0.168
Nondrinker	-0.110	***	0.0005				
Physically Active	0.069	*	0.0237				
Income and SES Variables							
Low Income				0.246	***	0.0004	
Middle Income	-0.208	***	<0.0001				
Upper Mid Income	-0.369	***	<0.0001	-0.168	***	<0.0001	4.348
High Income	-0.524	***	<0.0001	-0.382	***	<0.0001	2.720
Education Variables							
Some Postsecondary Ed.				0.070	***	0.0038	
Post Secondary Ed.	-0.148	***	<0.0001				
Stress and Mental Health Variables							
Personal Stress Index	1.197	***	<0.0001	1.216	***	<0.0001	1.493
Self Perceived Happiness	-0.456	***	<0.0001	-0.491	***	<0.0001	-0.361
Place of Residence Variables							
Atlantic Provinces	-0.097	**	0.0192				
Quebec	-0.178	***	<0.0001	-0.082	***	0.002	2.611
Alberta				0.093	**	0.0123	
British Columbia				0.121	***	0.0004	
N (unweighted)	*7152*			*6531*			
F-Statistic	*1029.15*			*1120.74*			
R^2	*0.733*			*0.756*			

Significance Level *** p <0.01 ** p <0.02 * p <0.05

Table 4.7:
Specific Chronic Stress for Immigrant-Only Sample aged 20+ in 1994/1995

Variable	1994/1995			2000/2001			Diff 94/95-00/01
	B	SIG	p	B	SIG	p	
Intercept	6.140	***	<0.0001	3.462	***	<0.0001	-3.543
Socio-Demographic Variables							
General Health	-0.865	***	0.0027				
Race	-0.728	***	<0.0001	-0.676	***	0.0002	0.211
General Prac. Consultation	0.358	**	0.0112				
Married	0.367		0.0579				
Speaks Other Lang.				-1.238	***	0.0015	
Age Group				0.858	**	0.0108	
Lifestyle Variables							
Occassional Smoker				0.774		0.0617	
Smoker in Household	0.914	***	<0.0001	0.647	***	0.0026	-0.927
Moderate Drinker	0.625	***	0.0003	0.704	***	0.0004	0.301
Physically Inactive				0.424	**	0.0146	
Moderately Active	-0.501	**	0.0135				
Income and SES Variables							
Lower Mid Income				0.890	*	0.028	
Middle Income				0.681	***	0.0039	
High Income				-0.485	**	0.0131	
Education Variables							
Less then High School	-0.394		0.0857				
Post Secondary Ed.				0.433	**	0.133	
Arrival Cohort Variables							
Arrival Cohort 1990-1994				-0.651	**	0.0111	
Stress and Mental Health Variables							
Self Perceived Happiness	-2.873	***	<0.0001	-2.405	***	<0.0001	0.770
Place of Residence Variables							
British Columbia	-0.641	***	0.0034				
N (unweighted)	*822*			*700*			
F-Statistic	*13.16*			*9.94*			
R^2	*0.140*			*0.159*			

Significance Level *** p <0.01 ** p <0.02 * p <0.05

Table 4.8:
Specific Chronic Stress for Pooled Sample aged 20+ in 1994/1995

Variable	1994/1995			2000/2001			Diff 94/95-00/01
	B	SIG	p	B	SIG	p	
Intercept	6.131	***	<0.0001	6.469	***	<0.0001	1.037
Socio-Demographic Variables							
General Health	-1.002	***	<0.0001	-1.038	***	<0.0001	-0.261
Race	-0.564	***	<0.0001	-0.423	***	<0.0001	1.078
General Prac. Consultation	0.262	***	<0.0001	0.168	**	0.0107	-1.144
Female (Gender)	-0.391	***	<0.0001	-0.270	***	<0.0001	1.614
Married	0.236	***	<0.0001	-0.146	**	0.0164	-4.501
Currently Working	0.168	**	0.0114				
Speaks Other Lang.				-0.666	***	0.0039	
Age Group	0.566	***	<0.0001	0.683	***	<0.0001	0.885
Lifestyle Variables							
Nonsmoker				-0.277	***	0.0004	
Daily Smoker	0.327	***	<0.0001				
Smoker in Household	0.528	***	<0.0001	0.393	***	<0.0001	-1.248
Nondrinker	-0.355	***	<0.0001	-0.354	***	<0.0001	0.009
Moderately Active	-0.180	***	0.0041	-0.153	**	0.0109	0.313
Income and SES Variables							
Middle Income	-0.219	**	0.0122	-0.248	*	0.0301	-0.202
Upper Mid Income	-0.525	***	<0.0001	-0.560	***	<0.0001	-0.256
High Income	-0.549	***	<0.0001	-0.886	***	<0.0001	-2.266
Education Variables							
Post Secondary Ed.	-0.339	***	<0.0001				
Stress and Mental Health Variables							
Self Perceived Happiness	-2.370	***	<0.0001	-2.453	***	<0.0001	-0.365
Place of Residence Variables							
Quebec	-0.184	***	0.0094	-0.389	***	<0.0001	-2.175
Ontario	0.278	***	<0.0001				
Prarie	0.276	**	0.0135				
Alberta				0.204	*	0.0217	
N (unweighted)	*7151*			*6531*			
F-Statistic	*56.35*			*59.9*			
R^2	*0.131*			*0.135*			

Significance Level *** p <0.01 ** p <0.02 * p <0.05

Table 4.9:
Personal Stress for Immigrant-Only Sample aged 20+ in 1994/1995

Variable	1994/1995			2000/2001			Diff 94/95-00/01
	B	SIG	p	B	SIG	p	
Intercept	2.439	***	<0.0001	1.333	***	<0.0001	-2.519
Socio-Demographic Variables							
General Health	-0.341	*	0.0309				
Race	-0.356	***	0.0003	-0.220	*	0.0408	0.937
General Prac. Consultation	0.129		0.0933				
Married	0.188		0.0791				
Currently Working				0.217		0.0636	
Speaks Other Lang.				-0.406		0.0903	
Age Group				0.671	***	0.0013	
Lifestyle Variables							
Occassional Smoker				0.616	**	0.0151	
Smoker in Household	0.194		0.0685	0.366	***	0.0051	1.025
Moderate Drinker	0.224	**	0.0189				
Physically Inactive	0.238	**	0.0136				
Income and SES Variables							
Middle Income				0.231		0.08	
High Income	0.298	***	0.0085				
Education Variables							
Less then High School	-0.412	***	0.0011	-0.334	*	0.0431	0.376
Post Secondary Ed.				0.231	*	0.0534	
Arrival Cohort Variables							
Arrival Cohort 1990-1994	-0.224		0.0873	-0.485	***	0.0017	-1.291
Stress and Mental Health Variables							
Self Perceived Happiness	-1.149	*	<0.0001	-0.897	***	0.0003	0.437
Place of Residence Variables							
British Columbia	-0.353	***	0.0034				
N (unweighted)	*823*			*703*			
F-Statistic	*7.39*			*7.08*			
R^2	*0.099*			*0.101*			

Significance Level *** p <0.01 ** p <0.02 * p <0.05

Table 4.10:
Personal Stress for Pooled Sample aged 20+ in 1994/1995

Variable	1994/1995			2000/2001			Diff 94/95-00/01
	B	SIG	p	B	SIG	p	
Intercept	2.325	***	<0.0001	2.585	***	<0.0001	1.513
Socio-Demographic Variables							
General Health	-0.452	***	<0.0001	-0.506	***	<0.0001	-0.720
Race	-0.254	***	<0.0001	-0.221	***	<0.0001	0.467
General Prac. Consultation	0.089	***	0.0008				
Female (Gender)	-0.252	***	<0.0001	-0.275	***	<0.0001	-0.561
Married	0.142	***	<0.0001	-0.061		0.0584	-4.486
Currently Working	0.160	***	<0.0001	0.174	***	<0.0001	0.291
Speaks Other Lang.				-0.264	*	0.0353	
Age Group	0.349	***	<0.0001	0.391	***	<0.0001	0.575
Lifestyle Variables							
Nonsmoker	-0.135	***	0.0011	-0.125	***	0.0032	0.170
Smoker in Household	0.161	***	<0.0001	0.115	***	0.0062	-0.803
Moderate Drinker	0.090	***	0.0075				
Nondrinker				-0.193	***	<0.0001	
Physically Inactive	0.059	*	0.0432				
Moderately Active				-0.074	*	0.0241	
Income and SES Variables							
Lower Mid Income				0.208	***	0.0028	
Middle Income				0.074		0.00554	
Upper Mid Income	-0.055		0.0592				
Education Variables							
Some Postsecondary Ed.	0.081	**	0.012				
Stress and Mental Health Variables							
Self Perceived Happiness	-0.941	***	<0.0001	-1.044	***	<0.0001	-0.837
Place of Residence Variables							
Atlantic Provinces	-0.124	**	0.0178				
Quebec				-0.073	*	0.0266	
Alberta	-0.167	***	0.0009				
British Columbia	-0.204	***	<0.0001				
N (unweighted)	*7152*			*6533*			
F-Statistic	*34.31*			*39.56*			
R^2	*0.076*			*0.084*			

Significance Level *** p <0.01 ** p <0.02 * p <0.05

Table 4.11:
Distress for Immigrant-Only Sample aged 20+ in 1994/1995

Variable	1994/1995			2000/2001			*Diff 94/95-00/01*
	B	SIG	*p*	B	SIG	*p*	
Intercept	9.302	***	<0.0001	7.541	***	<0.0001	-1.942
Socio-Demographic Variables							
General Health	-1.644	***	<0.0001	-1.271	***	0.0002	0.762
Married	-0.998	***	<0.0001	-0.628	**	0.0108	1.085
Age Group	0.545	*	0.0414				
Lifestyle Variables							
Smoker in Household	0.691	***	0.0035				
Physically Inactive				0.408		0.0576	
Moderately Active	-0.513	*	0.0376				
Income and SES Variables							
Upper Mid Income	-0.659	***	0.0018				
High Income				-0.521	**	0.0164	
Stress and Mental Health Variables							
Personal Stress Index	0.948	***	<0.0001	0.859	***	<0.0001	-0.791
Self Perceived Happiness	-5.539	***	<0.0001	-4.725	***	<0.0001	1.063
Place of Residence Variables							
Quebec	1.453	***	<0.0001				
British Columbia	0.530		0.0519	-0.505		0.0765	-2.627
N (unweighted)	*817*			*697*			
F-Statistic	*43.79*			*43.63*			
R^2	*0.352*			*0.307*			

Significance Level *** p <0.01 ** p <0.02 * p <0.05

Table 4.12:
Distress for Pooled Sample aged 20+ in 1994/1995

Variable	1994/1995			2000/2001			Diff 94/95-00/01
	B	SIG	p	B	SIG	p	
Intercept	8.877	***	<0.0001	7.960	***	<0.0001	-2.469
Socio-Demographic Variables							
General Health	-1.810	***	<0.0001	-1.560	***	<0.0001	0.894
General Prac. Consultation	0.320	***	<0.0001	0.265	***	0.001	-0.547
Female (Gender)	-0.254	***	0.0002	-0.148	*	0.0253	1.127
Married	-0.757	***	<0.0001	-0.415	***	<0.0001	3.290
Currently Working	-0.435	***	<0.0001	-0.512	***	<0.0001	-0.689
Age Group	0.616	***	<0.0001	0.628	***	<0.0001	0.073
Lifestyle Variables							
Nonsmoker	-0.417	***	<0.0001	-0.236	***	0.0013	1.777
Heavy Drinker	0.483	***	<0.0001				
Physically Inactive	0.182	***	0.0072	0.185	***	0.0049	0.032
Income and SES Variables							
Low Income				0.550	***	0.0075	
Lower Mid Income	0.448	***	0.0001				
Upper Mid Income	-0.195	***	0.0048	-0.180	*	0.0395	0.135
High Income				-0.342	***	0.0003	
Education Variables							
Some Postsecondary Ed.	0.293	***	<0.0001				
Stress and Mental Health Variables							
Personal Stress Index	0.859	***	<0.0001	0.873	***	<0.0001	0.367
Self Perceived Happiness	-4.978	***	<0.0001	-5.090	***	<0.0001	-0.388
Place of Residence Variables							
Atlantic Provinces				-0.233		0.0665	
Quebec	0.752	***	<0.0001	0.498	***	<0.0001	-2.172
Ontario				-0.258	***	0.0012	
Alberta	0.193		0.0956				
Immigrant / Nativity Status Variable							
Immigrant	0.210	**	0.0132				
N (unweighted)	*7133*			*6518*			
F-Statistic	*188.62*			*199.79*			
R^2	*0.311*			*0.330*			

Significance Level *** p <0.01 ** p <0.02 * p <0.05

Table 4.13:
Depression for Immigrant-Only Sample aged 20+ in 1994/1995

Variable	1994/1995			2000/2001			*Diff 94/95-00/01*
	B	SIG	*p*	B	SIG	*p*	
Intercept	1.446	***	<0.0001	1.686	***	<0.0001	0.624
Socio-Demographic Variables							
General Health	-0.282		0.0751				
Race				0.161		0.0738	
Country of Birth	0.247	***	0.007				
Female (Gender)	-0.182	*	0.0416				
Married	-0.177		0.0951				
Age Group	0.244	*	0.0464				
Income and SES Variables							
Upper Mid Income	0.185		0.0518				
Arrival Cohort Variables							
Arrival Cohort 1980-1989				-0.190		0.0645	
Arrival Cohort 1970-1979	0.237	*	0.026				
Stress and Mental Health Variables							
Personal Stress Index	0.098	***	0.0044	0.110	***	0.0019	0.246
Self Perceived Happiness	-1.130	***	<0.0001	-1.673	***	<0.0001	-1.624
Place of Residence Variables							
Ontario	-0.166		0.064				
N (unweighted)	*818*			*697*			
F-Statistic	*7.24*			*21.64*			
R^2	*0.082*			*0.111*			
Significance Level	*** p <0.01		** p <0.02		* p <0.05		

Table 4.14:
Depression for Pooled Sample aged 20+ in 1994/1995

Variable	1994/1995			2000/2001			Diff 94/95-00/01
	B	SIG	p	B	SIG	p	
Intercept	2.764	***	<0.0001	2.790	***	<0.0001	0.135
Socio-Demographic Variables							
General Health	-0.502	***	<0.0001	-0.386	***	<0.0001	0.760
Race	0.162	***	0.0057				
General Prac. Consultation				0.140	***	0.001	
Female (Gender)	-0.246	***	<0.0001				
Married	-0.198	***	<0.0001	-0.264	***	<0.0001	-1.228
Currently Working	-0.100	**	0.0161	-0.237	***	<0.0001	-2.451
Speaks Other Lang.	-0.285		0.083				
Age Group	0.176	***	0.0005	0.193	***	0.0064	0.196
Lifestyle Variables							
Daily Smoker	0.268	***	<0.0001	0.130	***	0.0016	-2.469
Heavy Drinker	0.122	*	0.0518	0.244	***	0.0002	1.347
Physically Active	0.126	***	0.0057				
Income and SES Variables							
Low Income	-0.218	***	0.0054				
Upper Mid Income				0.102	***	0.0033	
Less then High School				-0.124	**	0.0118	
Education Variables							
Some Postsecondary Ed.	0.147	***	0.0007				
Post Secondary Ed.	0.086	*	0.0324				
Stress and Mental Health Variables							
Personal Stress Index	0.126	***	<0.0001	0.188	***	<0.0001	3.245
Self Perceived Happiness	-2.220	***	<0.0001	-2.260	***	<0.0001	-0.267
Place of Residence Variables							
Quebec				-0.075		0.0574	
British Columbia	0.111	*	0.0285				
Immigrant / Nativity Status Variable							
Immigrant				-0.221	***	<0.0001	
N (unweighted)	*7130*			*6520*			
F-Statistic	*65.73*			*89.61*			
R^2	*0.129*			*0.152*			

Significance Level *** p <0.01 ** p <0.02 * p <0.05

Chapter Five

Age Cohort Analysis:

Elucidating the Influence of Aging on Immigrant Health Status

5.0 Exploring the Influence of Age on Health Status

Aging is not only a physical but emotional and psychological process that influences behaviour, personal perspective and reflection, and of course health. Both observation and research have derived that a strong association exists between aging and individual health status, quality of life, and chronic health problems (Novak, 1997; Belsky, 1999; Kendall, Linden, and Murray, 2001; Rathus, 2004). This association, commonly referred to as a health-gradient, establishes that with increasing age self-reported health status deteriorates and observed levels of morbidity and mortality increase. Subsequently, the younger proportion of a population is typically healthier and the older segment increasingly dependent upon available health care services.

Researchers have long noted the association between increasing age and loss of cognitive capacities, high activity limitation, increases in chronic illness, elevated stress and depression rates, and overall increase in lethargy and tiredness (Belsky, 1999). Researchers typically classify the impact of aging upon health into primary and secondary age impacts (Belsky, 1999). Primary age impacts refer to the biological process of aging itself and the inevitable and universally experienced changes to the human form that occur with the passing of time (e.g., body mass, bone-density, and

height changes). Secondary age impacts, however, refer more to the negative physiological and psychological impacts of age upon the human body. These secondary age impacts correspond to adverse bodily deterioration caused through external forces endured throughout the span of a lifetime (Belsky, 1999). While secondary age impacts can be minimized through healthy lifestyle approaches and health maintenance activities, primary age impacts cannot be manipulated or avoided. The biological phases through which primary age impacts influence health status are an intrinsic part of life and are not yet completely understood; neither is the purpose or biologic necessity for aging understood.

It is understood, however, that aging is an unavoidable process and that with later years comes a greater potential for worsening health. In particular, aging is often associated with specific health outcomes. Although in the broader sense, most of these health outcomes can be defined as chronic conditions, the diversity of adverse health impacts is startling. Aging has been associated with increased probability of developing cardiovascular disease, atherosclerosis, immune deficiency, and nervous system and mental health problems (Belsky, 1999). These associations have been verified numerous times through empirical observation. For example, results from the 1991 General Social Survey, revealed that older individuals self-reported more chronic illness relative to the younger population. Most notably, these aged individuals reported increased rates for chronic conditions including arthritis, rheumatism, hypertension, diabetes, and heart disease (Novak, 1997). The current analysis of the NPHS similarly reveals increases in the rates of illness, stress and mental health conditions, and overall declines in general

health status with increasing age. Analysis of the various impacts age has upon health, and particularly immigrant health, is necessary because the mean age of immigrants typically differs (i.e., mean age of immigrants is typically younger) from the national age mean. Understanding how the health of immigrants is influenced by age may provide insight into how the health status of both the native-born and foreign-born can be improved.

5.1 Analyzing Age Through Descriptive and Multivariate Modelling

In order to effectively analyze the influence of age upon immigrant and native-born health status, the various health conditions (predictor variables), including *self-perceived general health status* and s*elf-perceived happiness*, *general chronic stress*, *specific chronic stress*, *personal stress*, *distress*, *depression*, *heart* and *respiratory disease*, and the *presence of any chronic condition* were analyzed using cross-tabulation analysis. The heart disease variable was aggregated from two variables; one asking whether respondents had a heart disease diagnosed by a health professional and the other asking respondents if they had elevated blood pressure diagnosed by a health professional. Similarly, the respiratory illness variable was aggregated from two questions; the first asking if respondents had asthma diagnosed by a health professional and the second asking respondents if they had chronic bronchitis or emphysema diagnosed by a health professional. Within the NPHS, each variable is self-reported, but within the present analysis they were aggregated due to their high correlation. By contrast, no modification was made to the presence of the any chronic condition variable,

which was derived from responses to twenty-five questions asking respondents if they had any type of chronic condition diagnosed by a health care professional. These questions addressed allergies, respiratory illnesses, arthritis problems, cardiovascular and circulatory illnesses, neurological disorders, dermatological conditions, digestive problems, eyesight problems, diabetes, cancer, and any other assorted type of chronic condition. This preliminary analysis was completed in order to determine if the health status between young and old immigrant groups varied and if differences were present between the immigrant and native-born groups. Literature and research often describe a divergence in health status between young and old groups, but such analysis typically limits observation to the general population and little discussion or documentation for the immigrant groups exist.

Analysis of age cohorts was accomplished by effectively 'aging' the population from one cycle to the next, so that individuals defined as young (aged 20-54) and as old (aged 55 or greater) in 1994/1995, were aged 2 years in the subsequent cycles so that in 1996/1997 young individuals were aged 22-56 and old persons were aged 57 or greater, and so on in the same fashion. Although most people still consider 65 years to be the age at which individuals are considered old, literature suggests that individuals aged 55 or 60 can also be grouped within the older population (Belsky, 1999; Novak, 1997). Individuals aged less than 20 years were excluded from the analysis because it is unclear how social status differences manifest in the health of teenagers (Dunn and Dyck, 2000).

In addition to this preliminary analysis, *self-perceived general health*, *general chronic stress*, *heart disease*, and the *presence of any chronic condition* were further analyzed using an alternative age breakdown specifically applied to the older group. The revised age grouping divides the older group into those respondents aged 55-74 and 75 or greater in 1994/1995, referring to the newly defined groups as young-old and old-old. The new groups were similarly aged by two years in each subsequent cycle. This alternative age breakdown was conceptualized to investigate whether observed health trends amongst the 'young' (aged 20-54 in 1994/1995) and the 'old' (55 or greater in 1994/1995) persist with age, and are present among the 'young-old' (aged 55-75 in 1994/1995) and the 'old-old' (aged 76 or greater in 1994/1995) respondents. By controlling for age cohorts, the analysis emphasizes the dynamic nature of health, which changes through each of the different stages of an individual's life.

Additionally, the predictor variables were not only analyzed by age cohorts, but were further analyzed by arrival cohorts. Whereas the earlier discussion of the influence of arrival cohort, in the mental health and stress chapter, utilized the traditional age breakdown of young and old groups when analyzing the predictor variables, in keeping with the 'age influence' theme of this chapter, the information presented in this section is drawn from analysis that utilized the alternative age grouping of young-old and old-old when examining the predictor variables. Therefore, only the *self-perceived general health*, *general chronic stress*, *heart disease*, and the *presence of any chronic condition* predictor variables were analyzed. The objective of this additional analysis of arrival

cohort was to investigate whether the observed trends between young and old persisted amongst those of an older age.

Reviewing outcomes generated through two-way cross-tabulations, controlling for age cohorts and arrival cohorts, provided insight into how immigrant health was influenced by age (i.e., differences in health status between the young and old), how health status varied between immigrant groups who entered the nation at various times in the near and distant-past, and how the health status of immigrant young and old varied from the health status of similarly aged native-born individuals. By controlling for arrival cohorts, potential differences present in health status amongst immigrant groups who arrived at different points in time can be identified and discussed.

Multivariate regression was applied exclusively to the analysis of *self-perceived general health*, *general chronic stress*, *heart disease*, and the *presence of any chronic condition* to further investigate the trends observed through cross-tabulation. In addition, the regression analysis applies exclusively to the young-old and old-old groups so that insight into which health determinants and covariates influence the health of the older population could effectively be achieved. The results elucidate which health determinants may become increasingly 'determinant' of health status with increasing age. Results from the analysis are reviewed within the following sections.

5.2 Descriptive Analysis:

Analyzing Predictor (Dependent) Variables by Age for the Young and Old Age Groups[4]

Although each of the variables used in this analysis are equally important and useful for exploring the health characteristics of immigrants and native-born, self-perceived general health and happiness are discussed first because they are more general indicators of health status. By discussing these variables initially, some of the general trends observed in the data are established and presented. The discussion then proceeds to the more specific health conditions examined such as the mental health and chronic condition predictor variables; examining the various effects that age and arrival cohort exert on the variables. All differences reported between variable groups and time periods were analyzed for significance at $p < 0.05$.

5.2.1 Self-Perceived General Health Status

Despite most immigrants and native-born ranking their health status as excellent or very good, which suggests that for the most part they are satisfied with their health status, proportions of immigrants and native-born young and old who report excellent health significantly decrease with time (Figures 5.1 and 5.2). In addition, results for these two population groups are statistically significant (with the native-born reporting slightly higher rates), as is the difference between young and old groups regardless of nativity-status (with the young group reporting better health). The observed differences between

[4] Young Age Group (20-54 in 1994/1995) and Old Age Group (55 or greater in 1994/1995)

the native-born and immigrant groups are somewhat surprising. If immigrants typically report better health status, then their reported self-perceived health should be greater than reported rates for the native-born. Of course, the majority of the literature refers to immigrants in general, not distinguishing between young and old. Assuming, however, that findings in the literature hold true for all immigrants, regardless of age, then the foreign-born should report better health. That being said, the observed lower health status amongst immigrants may be attributed to different perceptions of health relative to the native-born; immigrants may be taking better advantage of health services after entering Canada; or simply because the sample includes all immigrants, regardless of arrival cohort.

5.2.2 Self-Perceived Happiness

When analyzing self-perceived happiness the observed differences between the immigrant and native-born groups, and the difference between the young and old, regardless of nativity-status, are significant with little decrease in reported happiness with time (Figures 5.3 and 5.4). The apparent stability (i.e., lack of decrease) for reported happiness rates suggests that both population groups are satisfied with their life-quality.

5.2.3 Mental Health and Stress Variables

The general trend observed when mental health and stress variables are analyzed by age indicates that the mean reported rates of general chronic stress, specific chronic stress, personal stress, distress, and depression (Figures 5.5-5.14) decrease with time and

regardless of nativity-status and that younger groups typically report greater mean rates relative to rates reported by the old. In addition, the results also reveal that reported mean rates of stress, distress, and depression are relatively similar between the immigrants and native-born group. Due to the results observed for self-perceived general health, which indicate that the old report lower rates of excellent or very good health compared to the young, it was anticipated that levels of stress would be greater amongst the old, most likely attributed to failing health, loss of mobility and independence, and the psychological impacts of aging. However, seemingly greater stress experienced by younger individuals, potentially resulting from job stress, more active lifestyles, and family responsibilities may exert a substantial burden on health. The cumulative impact of these various stressors may be responsible for the greater levels of stress reported by the young respondents relative to the old group.

5.2.4 Chronic Condition Variables

For each of the chronic condition variables analyzed, including heart disease, respiratory disease, and the presence of any chronic condition (Figures 5.15-5.20), results increase significantly with time. In addition, the difference between the young and old groups is significant, and the observed difference between immigrant and native-born groups is statistically significant as well. It was expected that as age increases the number of chronic conditions would increase, and therefore the increases from 1994/1995 to 2000/2001 are reasonable, as is the difference present in reported rates of chronic conditions between the young and old groups. While the native-born have greater

numbers of respiratory diseases and overall chronic conditions relative to the immigrant group, the foreign-born report higher levels of heart disease relative to the native-born. These results are perplexing as the literature states that immigrants are healthier than the native-born, therefore the opposite outcome should occur.

5.3 Analyzing Predictor (Dependent) Variables by Age for the Young-Old and Old-Old Age Groups[5]

As was anticipated, and supported from findings in the literature, observations for the previously discussed young and old analysis reveal that differences between the young and old do exist. However, as Rathus (2004) describes, a number of important health-related changes occur to the human body within the very later years of life. Physiological and psychological changes occur constantly within the body and may even become more intensified and influential amongst the very old. As aging occurs, the cumulative impact of physiological changes such as a failing nervous and immune-system, weakening of the circulatory, respiratory, and skeletal system, and deteriorating cognitive abilities, results in the potential development of '*ego integrity versus despair*' rationale amongst the very old (Rathus, 2004). That is, the very old essentially attempt to retain the belief that life is meaningful and worthwhile despite dramatic increases in illness and being faced with the inevitability of death. It is reasonable, therefore, to assume that aging corresponds to increased depression, stress, and distress, concurrent with declines in self-perceived health status and happiness. Additionally, increases in

[5] Young-Old Age Group (55-75 in 1994/1995) and Old-Old Age Group (76 or greater in 1994/1995)

chronic illness should also be observed. In order to effectively test this premise, and determine if the health trends observed amongst the young and old groups persist among the very old, analysis was conducted utilizing the predictor variables *self-perceived general health*, *general chronic stress*, *chronic heart disease*, and the *presence of any chronic condition, focussing upon the* 'young-old' (55-75 in 1994/1995) and 'old-old' (76 or greater in 1994/1995). Only these predictor variables were reanalyzed using the new age breakdown because they represent general health indictors and provide generalizable information about morbidity and illness.

5.3.1 Self-Perceived General Health Status

Overall, the analysis suggests that the previously observed health/age gradient still applies to the very old group, with reported rates of excellent or very good health significantly declining from 1994/1995 to 2000/2001, regardless of nativity status (Figures 5.21 and 5.22). For example, 51.2 percent of young-old immigrants report excellent or very good health in 1994/1995, compared to 43.6 percent of the old-old, representing a significant difference of 7.6 percentage points. In 2000/2001, however, only 33.4 percent of young-old immigrants report excellent or very good health and 17.0 percent of old-old report a similar health status, representing a significant difference of 16.4 percentage points. Similarly, 49.1 percent of young-old and 44.1 of old-old native-born report excellent or very good health general health, corresponding to a significant difference of 5.0 percentage points. Whereas in 2000/2001, these same groups report 40.3 and 24.4 percent, respectively, representing a significant difference of 15.9

percentage points. These results suggest that a considerable difference exists between these two groups and that with increasing age, individuals report decreasing general health status. Although, the majority of respondents, regardless of age, still rank their health status as excellent from 1994/1995 to 1998/1999, by 2000/2001 the majority of old-old report fair or poor general health (41.3 percent).

The analysis also indicates that the native-born report better health relative to immigrants. Initially, results observed for both groups are relatively similar, with 51.2 percent of young-old and 43.6 percent of old-old reporting excellent health. Whereas 49.1 percent of young-old and 44.1 percent of old-old native-born report a similar health status rank of excellent or very good, suggesting that general health between the two population groups is somewhat comparable. In 2000/2001, however, 33.4 percent of young-old and 17.0 of old-old immigrants report excellent health, relative to 40.3 percent and 24.45 percent for native-born young-old and old-old. Research has demonstrated that health deteriorates with age, and the results from the NPHS analysis similarly show a decreasing trend. However, if the HIE holds true then immigrants, regardless of age, should have better health. Therefore, these observed trends contradict the anticipated outcome.

5.3.2 General Chronic Stress

Analysis of general chronic stress (Figures 5.23 and 5.24) indicates that reported mean rates of stress for the immigrant and native-born group are very similar, although the native-born score slightly greater mean rates. Despite the small difference, the

variation between the immigrant and native-born groups, regardless of age, is significant. Overall, mean rates of general chronic stress are low amongst the young-old and old-old immigrant and native-born groups with the younger age group reporting slightly greater levels of stress relative to the older group. Data for 1994/1995 indicates that a significant difference of 0.8 and 0.7 exists between the young-old and old-old immigrant and native-born groups, respectively, and that a significant difference in mean rates of 0.4 and 0.5 exists for the same groups in 2000/2001. In addition, the results still reveal a decrease with time from 1994/1995 to 2000/2001 regardless of nativity-status and age group, but this decrease is insignificant for the immigrant group and significant for the native-born respondents. These results therefore suggest that the difference between age groups is significant, and that the difference between the two population groups is significant as well.

5.3.3 Heart Disease

Analysis of heart disease by age (Figures 5.25 and 5.26) shows that, as was anticipated, rates of heart disease increase with age for both the immigrant and native-born, so that a larger proportion of the old-old group reports heart disease relative to the young-old group. Values of heart disease significantly increase from 1994/1995 to 2000/2001 by 20.3 and 10.0 percentage points for the young-old and old-old immigrants, respectively. As well, heart disease significantly increases for the native-born young-old by 16.5 percentage points and 10.5 percentage points for the old-old. Overall, the immigrant group has greater rates of heart disease relative to the native-born sample.

Lastly, the data reveals that the differences between the young-old and old-old groups, regardless of nativity-status, are significant, and that the differences between the immigrant and native-born groups are significant. The results observed for heart disease remain in check with ideas presented in the literature. Past research has identified age as a strong determinant of cardiovascular illness and demonstrated that as age increases, rates of heart disease similarly increase. The result of this analysis indicates that the proportion of heart disease increases with age and that a significant difference in proportions of heart disease exists between the young-old and old-old.

5.3.4 Presence of Any Chronic Condition

Analysis of the presence of any chronic condition variable by age (Figures 5.27 and 5.28) reveals some very interesting results. Similar to the analysis done on the 20-54 and 55 or greater age groups, results from the current analysis indicate that the number of chronic conditions increase significantly with age and time; consistent with ideas and findings presented in the literature. From 1994/1995 to 2000/2001, native-born young-old and old-old report a significant increase of 8.9 and 3.8 percentage points, respectively; the immigrant young-old and old-old report significant increases of 11.9 percentage points, but the young-old report a much smaller increase of only 0.3 percentage points. This outcome was somewhat surprising, as it was assumed that with increasing age, and worsening health, the number of chronic conditions reported by the older age group would increase considerably. It appears however, that the number of chronic conditions reported by the immigrant old-old stabilizes at a certain age. In

contrast, however, the native-born results do not display such 'stabilization', with the number of reported chronic conditions generally increasing from 1994/1995 to 2000/2001 for the old-old age group.

In addition, much like in the previous analysis, which showed that the older age group reported a greater number of chronic conditions, the old-old still report significantly greater numbers of chronic conditions relative to the young-old, regardless of nativity-status. However, the analysis shows that there is little difference between the number of chronic conditions reported by the immigrant and native-born groups. In fact, the percentage of chronic conditions reported for 1996/1997 and 2000/2001 for the corresponding groups, is nearly equivalent.

5.4 The Influence of Arrival Cohort on Immigrant Health for the Young-Old and Old-Old Age Groups[6]

When the assorted predictor variables were analyzed by arrival cohort, several interesting results appeared. For each of the analyses, the difference from cycle one (1994/1995) to cycle four (2000/2001) is significant, suggesting that important changes to health status are occurring between the various time periods being analyzed. For the most part, the results are congruent with the anticipated results, and match results present in the previous analysis of arrival cohort (i.e., when respondents were aged 20 or greater in 1994/1995). When self-perceived general health status is analyzed (Figure 5.29) the majority of respondents rank their health as excellent or very good, although health status

[6] Young-Old Age Group (55-75 in 1994/1995) and Old-Old Age Group (76 or greater in 1994/1995)

ranking among the most recently arrived immigrant is mixed, sometime greater than and sometimes less than levels reported for those immigrants that have been in Canada longer. The general trend observed suggest that immigrants that arrived between 1980-1989 and 1970-1979 report the best health relative to those that arrived earlier and later. Despite the fluctuations between cycles, the results do suggest that with increasing age and time, the number of respondents reporting excellent or very good health status is decreasing, congruent with the majority of results already observed. When general chronic stress is analyzed (Figure 5.30), the results reveal that reported rates of stress are lower among the very old relative to the rates observed in the earlier analysis. In addition, the results are very different. Whereas the previous analysis revealed that recently arrived immigrants reported low levels of stress, immigrants arriving between 1980-1989 and 1970-1979 reported greater levels, and immigrants that arrived before 1970 reported lower rates again; the current analysis shows very different results. The analysis reveals that in cycle one the recently arrived immigrants report the greatest levels of stress, with subsequent arrival cohorts reporting progressively lower levels of stress, and in cycle four, the pattern more or less returns to the anticipated outcome with recently arrived immigrants reporting low stress, immigrants arriving between 1980-1989 and 1970-1979 reporting relatively increased levels of stress, and the earliest arriving immigrants once again reporting low levels of stress. These results are perplexing and the considerable amount of difference observed between the cycles cannot easily be explained. The change in levels reported may be due to changing perspectives of stress

with increasing age, but it is unsure if such differences could simply be attributed to increasing age.

Considering heart disease (Figure 5.31) by arrival cohort produces results that indicate the proportion of respondents reporting heart disease increases significantly with time. Furthermore, it was expected that greater rates of heart disease would be reported among the older groups. Overall though, the data does reveal the anticipated outcome – rates among those who have been in the country longer, and therefore are older, are higher relative to the more recently arrived groups. Unfortunately, due to regulations imposed by Statistics Canada, the results for analysis of any chronic condition could not be reported. Despite this variable being absent from the analysis, the previous trends observed seemingly suggest that with age the number of chronic conditions reported would most likely increase.

5.5 Analyzing Predictor (Dependent) Variables through Multivariate Modelling

Several predictor variables, including *self-perceived general health status*, *general chronic stress*, *heart condition*, and *any chronic condition* (Tables 5.1-5.8) were analyzed through multivariate regression in an attempt to elucidate the influence of age on immigrant and native-born health status. Although several of these predictor variables are identical to those previously analyzed and discussed in the mental health chapter, this section is unique because only the older proportion of the population was analyzed. This new age categorization was conceptualized so that a true sense of the influence of age upon health status could be investigated. Since it is reported in the literature and has

been observed through the previously presented cross-tabulation analysis that aged individuals typically report worsening health relative to the younger population (Belsky, 1999; Novak, 1997), only the older proportion of the population was investigated to determine if individuals exposed to the same determinants of health were more likely or less likely to report the selected health outcomes with increasing age. The analysis therefore sheds light upon whether aged individuals, particularly immigrants, are increasingly susceptible to the development of adverse health outcomes and if the probability of experiencing or reporting such outcomes actually increases with increasing age.

General chronic stress was analyzed utilizing stepwise ordinary least squares regression, while self-perceived general health status, heart disease, and the presence of any chronic condition, were analyzed using the logistic stepwise regression method. These models produced rho-squared values that typically fell below 0.1, values that would be considered to be a poor fit (0.2) (Newbold, 2004). Results from the regression analysis suggest that many of the health determinants included within the models, as response variables, influence health status, mental health and stress disorders, and chronic illness outcomes. In addition, the majority of observed signs matched the expected outcomes with only a few exceptions. Statistical significance is reported within the regression tables using the following notations: * $p < 0.05$, ** $p < 0.02$, and *** $p < 0.01$.

5.5.1 Model Analysis by Response (Independent) Variables

Age Group Response Variable

The association between age and mental health and chronic conditions is the main focus of this portion. The process of aging has been described within the health determinants literature as a variable that is closely related to morbidity, and is consequentially a very important determinant of health. Age cohorts are utilized within the models so that the same individuals are followed throughout time, taking into account increasing age. The results of the analysis show that the immigrant old-old group has a positive association with general chronic stress in both the 1994/1995 and 2000/2001 models and a negative association with self-perceived general health status in 2000/2001, and with the any chronic condition variable in 1994/1995. The pooled-model shows that the old-old group similarly has a negative association with general chronic stress (2000/2001), and with the any chronic condition variable (2000/2001). These results suggest that being very old generally decreases an individual's probability of reporting excellent or very good health, increases the likelihood of reporting general chronic stress (i.e., for immigrants), and reduces the probability of reporting a chronic condition. While the results for general health status are reasonable, the results associated with general chronic stress, for the immigrant group, and the any chronic condition predictor variable for both population groups, are not congruent with findings present in the cross-tabulation analysis. The cross-tabulation results indicate that with increasing age the number of respondents reporting general chronic stress decreases, and chronic conditions

increase; results from the regression analysis therefore contradict these findings. The reasoning for this disagreement, however, is unknown.

5.5.2 Arrival Cohort Response Variable

The majority of associations between the predictor variables and arrival cohort response variable are negative suggesting that when an immigrant entered the nation does exert an influence on health status. The models typically suggest that immigrants who have been in the nation longer (i.e., arrived between 1970-1979 and prior to 1970), have a positive association with heart disease, and are negatively associated with general chronic stress. These results therefore indicate that respondents are more likely to report elevated blood pressure or having been diagnosed with a heart condition by a medical professional, and report low levels of stress. Furthermore, the results indicate that more recent arrival cohorts (i.e., between 1990-1994 and 1980-1989) have a negative association with the any chronic condition predictor variable, suggesting that immigrants who more recently arrived are less likely to report a chronic condition. Each of these findings is congruent with outcomes observed through descriptive analysis and with premises presented in the literature.

5.5.3 Personal Characteristics and Socio-Demographic Response Variables

Analysis of the models revealed several different patterns and trends, providing a greater degree of insight into the various relationships present between social health determinants and health outcomes. Personal characteristics or socio-demographic

characteristics such as gender, marital status, and age have been described within the health determinants literature as having considerable influence on health outcomes and health status (Ritsner *et al.*, 2001; Belsky, 1999). These findings support the outcome of the NPHS analysis, which indicates that many of the predictor variables are influenced, often repeatedly, by the various response variables tested within the models under the categorization of personal characteristics.

General health is a variable that was commonly associated with the predictor variables. In almost every case, it was negatively associated with the predictor variable indicating that those who ranked their health as excellent or very good were less likely to experience stress or a chronic condition. However, the association observed within the pooled model (1994/1995 and 2000/2001) between general health and any chronic condition was positive, suggesting that if individuals report excellent or very good health they are more likely to report a chronic condition. This outcome is somewhat surprising and contradicts the anticipated outcome, but because the model is only capturing those individuals from the population that are aged, perhaps the fact that they are older is exerting some influence on the outcome. Regardless of the type of association, the results reveal that general health is an important variable, which does influence health status.

Race and the country of birth variables were also associated with the selected outcome variables with the race variable being influential in both the pooled and immigrant-only models, while country of birth, for obvious reasons, was only significant within the immigrant-only model. Interestingly, race was positively associated with the

heart condition (1994/1995) predictor variable, but was negatively associated with the any chronic condition variable (2000/2001) for the immigrant-only model. In contrast, it was negatively associated with general chronic stress (1994/1995 and 2000/2001) within the pooled model. These results suggest that non-white immigrants are more likely to report a heart condition, but are less likely to report a chronic condition; while for the pooled-model, non-whites are less likely to report general chronic stress. Each of these findings contradicted the expected outcome and contrast findings observed for descriptive analysis. Results from the immigrant-only model suggest that immigrants who are non-European are negatively associated with the any chronic condition variable (1994/1995 and 2000/2001). The literature states that typically European immigrants are healthier relative to non-European immigrants (Chen, Wilkins, and Ng, 1996); these results unexpectedly suggest that in fact non-Europeans are less likely to report a chronic condition.

The observed association between the predictor variables and consultation with a general practitioner indicate that within both the immigrant-only and pooled models the variable is constantly positive, suggesting that consultation with a general practitioner increases the diagnoses of stress, chronic conditions, and the likelihood of reporting excellent or very good health status. Since, the analysis is observing older individuals, it is reasonable to assume that they would be accessing health services and consulting general practitioners and medical-specialists more frequently, which may increase their self-perceived health. However, because this group potentially has greater contact with medical professionals, there is a greater likelihood that illness is being identified and

recognized therefore attributing to the positive association between the response variable and predictor variables. This outcome is counter-intuitive because if an individual is being diagnosed with illness, they may be inclined to re-evaluate their health status. If any diagnosed illnesses are being treated however, individuals may feel that their health is stable and therefore would still potentially report a high health status.

Other response variables that were associated with predictor variables within both the pooled and immigrant-only models are gender and martial status, both of which are described within the health determinants literature as having an influence on health status. Descriptive analysis results, which indicate females typically report greater rates of illness and stress, reinforce the multivariate results observed within the pooled model. Native-born females are, however, negatively associated with the heart condition variable (1994/1995); which is not entirely unreasonable since heart disease is more common among males relative to females. With respect to marital status, the positive association with general chronic stress in the immigrant-only model, the positive association with the any chronic condition variable in the pooled model, and the mixed association with general health status in the immigrant-only models contradict the anticipated outcomes. The results suggest that despite findings within previous studies (Lilliard and Panis, 1996), marriage may influence levels of stress for the foreign-born (2000/2001), may reduce general health status, and may increase the likelihood of reporting a chronic condition. Despite these associations, it is speculated that being married does not in reality increase the likelihood of reporting a chronic condition or have an adverse impact on health status, but rather the results may be attributed to married couples being

encouraged to seek medical attention and be more sensitive to health changes by their spouse. As a result, married individuals may be consulting health professionals more often and having any chronic conditions or health ailments identified.

Working status was a variable that had mixed associations with the predictor variables in the models. Depending on the nature of employment, participation in the labour force may leave individuals sore and exhausted. However, if a respondent is working then it most likely suggests that they are younger, so less likely to report poor health, disease, or high levels of stress. In addition the basic ability to work suggests an overall degree of 'healthiness' in order to be productive. Furthermore, because participation in the labour force is associated with increased self-worth and a sense of personal satisfaction, respondents who are currently working may be more inclined to report better overall health. The association of the variables with general chronic stress may again be attributed to the nature of employment and the respondent's satisfaction with their job. Given that the analysis is focussing on the older segment of the population, it may be capturing those individuals that are approaching retirement or that are only working part-time for additional income, therefore low levels of stress associated with work would be expected.

Bilingualism and multilingualism is often noted as beneficial attribute. The variable was included within the analysis to determine if the ability to speak another language exerts any influence on health, or rather to determine if the inability to speak either English of French, the two official languages of Canada, is associated with self-perceived general health status. The literature suggests that language is not a barrier to

seeking health care, and that immigrants typically report no problems accessing available health care services (Dunn and Dyck, 2000; Matuk, 1996; Chen, Ng, and Wilkins, 1996). The results from the immigrant-only model show that immigrants who are unable to speak English or French are less likely to report chronic conditions and heart disease.

Results for the pooled model similarly show a negative association for heart disease, but the response variable is positively associated with the general chronic stress and any chronic condition predictor variables. Surprisingly, the results for the immigrant-only model indicate that immigrants who are unable to speak either of the official languages of Canada are less likely to experience adverse outcomes, but that native-born respondents who cannot speak the languages are more likely to experience poor health and stress. These results may suggest two things, the first being that the inability to speak English of French is not a strong determinant of health for the immigrant population, and secondly, that the model supports ideas presented in the literature which report that immigrants may not experience language barrier problems when accessing available health care services.

5.5.4 Lifestyle Response Variables

Activities such as smoking, drinking, and exercise appear to be much more influential and increasingly associated with predictor variables for the pooled model compared to the immigrant-only model. In most cases the observed sign is appropriate and the response variables are appropriately associated with the predictor variables. For example, within the immigrant-only model there are fewer associations between drinking

variables and predictor variables relative to the pooled model. In fact, there is only one association between the non-drinker response variable and the general chronic stress variable. These results are congruent with the literature, which reports that immigrants are typically under-represented amongst regular drinkers and smokers and over-represented amongst those that never drank or smoke (Dunn and Dyck, 2000). Within the pooled model, each of the associations between the response variables predictor variables appears reasonable. That being, said the positive association between the non-drinker response variable and the any chronic condition predictor variable may at first seem inappropriate, but upon further investigation the association is actually reasonable, with the literature suggesting that moderate consumption of alcohol may actually reduce the probability of some chronic conditions. Therefore, teetotallers, who advocate total abstinence, may potentially be less healthy than individuals who enjoy alcohol in controlled amounts.

Within both the immigrant-only and pooled models, the associations between the predictor variables and the smoking response variables are all appropriate, and the signs match the expected outcomes. Each of the associations are completely congruent with findings present in the literature. The models indicate that being a daily or occasional smoker or residing in a household with a smoker increases the likelihood of reporting general chronic stress and chronic conditions (most likely respiratory illnesses).

The last lifestyle variable that exerts an influence on the predictor variables within the models is related to the level of physical activity an individual practices. For the most part, the observed associations and signs again match the expected outcomes, particularly

within the immigrant-only model; however, within the pooled model the association between the variables often contradicts the anticipated outcomes. The results seem to suggest that being inactive may actually increase the probability of reporting health status as excellent or very good.

5.5.5 Income and Socio-economic Response Variables

Income has been identified in health determinants literature as a significant correlate of health status. Results for both the pooled and immigrant-only models display outcomes that are reasonable and for the most part reflect findings within the literature. The literature typically states that as income increases so does health, and the findings from the NPHS suggest the same. Higher incomes typically correspond to negative signs for general chronic stress, heart disease, and the likelihood of reporting any chronic conditions. Surprisingly though, within both the immigrant-only and pooled models the high income classification is negatively associated with self-perceived general health status. This outcome suggests that respondents reporting a higher income are less likely to report excellent or very good health, which is contrary to what the literature describes. The reasoning behind such associations is unknown. In contrast, lower incomes are generally associated with positive signs between the response variables and predictor variables.

5.5.6 Education Response Variables

Education also has some association with the selected predictor variables. However, the associations are mixed within the pooled and immigrant-only models. The only general trend that can seemingly be derived from the results is that higher education (i.e., post-secondary education) is typically negatively associated with the predictor variables and is present in nearly every model. For the most part, this negative association with predictor variables is expected and congruent with findings in the literature. However, the negative association between post secondary education and self-perceived general health status in the immigrant-only model (2000/2001) contradicts the anticipated outcome. This association is perplexing and no reasonable explanation can be proffered that adequately explains the negative association.

5.5.7 Stress and Mental Health Response Variables

The associations present between personal stress and self-perceived happiness are typically as expected within the immigrant-only model, but contradict the anticipated outcome for self-perceived general health status. Both the pooled and immigrant-only models seemingly suggest that respondents who report personal stress are more likely to also report excellent or very good health, and that individuals who report being happy are typically less likely to report excellent or very good health. In addition the observed results for the association between general chronic stress and self-perceived happiness within the pooled model are surprising. The results indicate that if an individual reports being happy, they are more likely to report general chronic stress. In general, the results

are congruent with the literature, but as the results for several of the models reveal, there is some disagreement in the outcomes. Perhaps these contradictory outcomes are related to some unknown interaction of the variables in the model.

5.5.8 Province of Residence Response Variable

The health determinants literature proffers that place of residence is an influential factor for an individual's health status. Where one resides can influence the stressors and conditions that one is exposed to, and can limit or control the available resources and services. Within the pooled and immigrant-only models it is reasonable therefore that place of residence have at least some association with the predictor variables. However, that being said, there is no dominant pattern visible within any of the models. The only seemingly visible trend observed, is that Alberta and Quebec both have the most associations within the various models. While these results do indicate that place of residence exerts some influence on health status, supporting claims expressed in health determinants research, the reasoning behind the specific associations and relationships present between the response and predictor variables is unclear. Perhaps the correlations are representative of a number of factors, ranging from service availability, demographic characteristics, sample sizes, climatic variations and seasonal temperatures, economic stability, and daily-living conditions.

5.6 Exploring the Difference Between Age Cohort

Although each of the models displays some evidence of change from 1994/1995 to 2000/2001, there are relatively fewer statistically significant differences compared to those differences that are insignificant. Turning first to the immigrant-only models, only the *self-perceived general health status* and *any chronic condition* model revealed a significant change between the two time periods. These significant differences were observed for the association between the married and lower middle income response variables and general health status, and between the arrival cohort 1980-1989 response variable and the any chronic condition predictor variable. Such significant differences within the self-perceived general health status model could be attributed to marriage being negatively associated in 1994/1995 but changing to a positive association in 2000/2001 and the lower middle income variable being insignificant in the first cycle but significant at $p<0.01$ in the fourth cycle. Furthermore, the association, for both the 1994/1995 and 2000/2001 models suggests that immigrants who arrived between 1980-1989 are less likely to report any chronic condition, and both are significant at $p<0.01$. The difference between the two time periods is that the 2000/2001 results suggest that immigrants who arrived during this time period are increasingly less likely to report a chronic condition relative to when they were modelled in 1994/1995.

The pooled models also indicate differences are present between the two time periods. Again, however, the majority of these differences are statistically insignificant. Those differences that are significant are present in the self-perceived general health status model and in the general chronic stress model. Results for the general health

model reveal that significant differences between the 1994/1995 and 2000/2001 cycles are present for the physically inactive, less than high school, and self-perceived happiness response variables. These differences are attributed to changes in positive and negative signs, changes in the levels of significance, and changes in the strength of association between both cycles. Within the general chronic stress pooled model the associations between lower middle income and middle income significantly change between the two time periods. In 1994/1995, the associations between these two response variables and the predictor variable are positive. However, these associations have become negative in 2000/2001. These results suggest that respondents with a lower middle and middle income are initially more likely to experience or report general chronic stress. In 2000/2001, these respondents are less likely to experience stress. Furthermore, the association between the response and predictor variables change with respect to their significance. In 1994/1995 the association between lower middle income and general chronic stress is significant, whereas the association between general chronic stress and middle income is insignificant; the 2000/2001 model indicates that the significance between response and predictor variables have become the opposite of what was observed initially.

5.7 Closing Thoughts

Observation and research has derived that a strong association exists between aging and individual health status, quality of life, and chronic health problems (Novak, 1997; Belsky, 1999; Kendall, Linden, and Murray, 2001; Rathus, 2004). This

association, commonly referred to as a health-gradient, establishes that with increasing age self-reported health status deteriorates and observed levels of morbidity and mortality increase. The results from the NPHS similarly reveal that young respondents are typically healthier than the older group. Overall, the results observed for the young and old were mirrored when analyzing the young-old and old-old groups, suggesting that the reported age/health-gradient applies to all age groups, regardless of whether a respondent is old or very old. These results indicate that with increasing age the number of chronic conditions reported increases, and general heath status declines. When arrival cohort was analyzed, the results again indicated that with increasing age the number of reported chronic conditions increases. The data however, did reveal some interesting results concerning general chronic stress, in which the younger group reported greater levels of stress relative to the old group. Although it was anticipated that the older group would report greater levels of stress relative to the younger group, the observed results are not completely unreasonable when one considers that the younger group would have greater participation in the workforce, and could potentially have more household or familial responsibilities. These outcomes indicate that age does influence self-perceived general health status, reported stress levels, and the number of self-reported chronic conditions, regardless of nativity-status, but further research should focus exclusively upon the older segment of the population to determine if such outcomes apply to other health conditions and indicators. Surprisingly, results from the multivariate regression indicate that the immigrant status or nativity status variable, which was included within the pooled model in order to determine if immigrants were increasingly associated with the predictor

variables relative to native-born individuals, is not significant in any of the models. The absence of any association between the immigrant variable and predictor variables suggest that immigrants do not particularly have an increased probability of reporting a chronic condition, reporting excellent of very good health status, experiencing stress, or reporting heart disease relative to the native-born population. These results may arise because the models are examining the older segment of the population exclusively; potentially suggesting that with increasing age, nativity status is not important as a health determinant but rather that with increasing age all individuals are equally as likely to experience various health conditions or in this instance not experience health conditions. Despite nativity status not being an important or significant determinant of health, the other health determinants such as lifestyle choices, income, and education have a greater impact on deciding individual health status.

Figure 5.1
Self-Perceived General Health Status for Weighted Immigrant Sample by Age (Young versus Old)

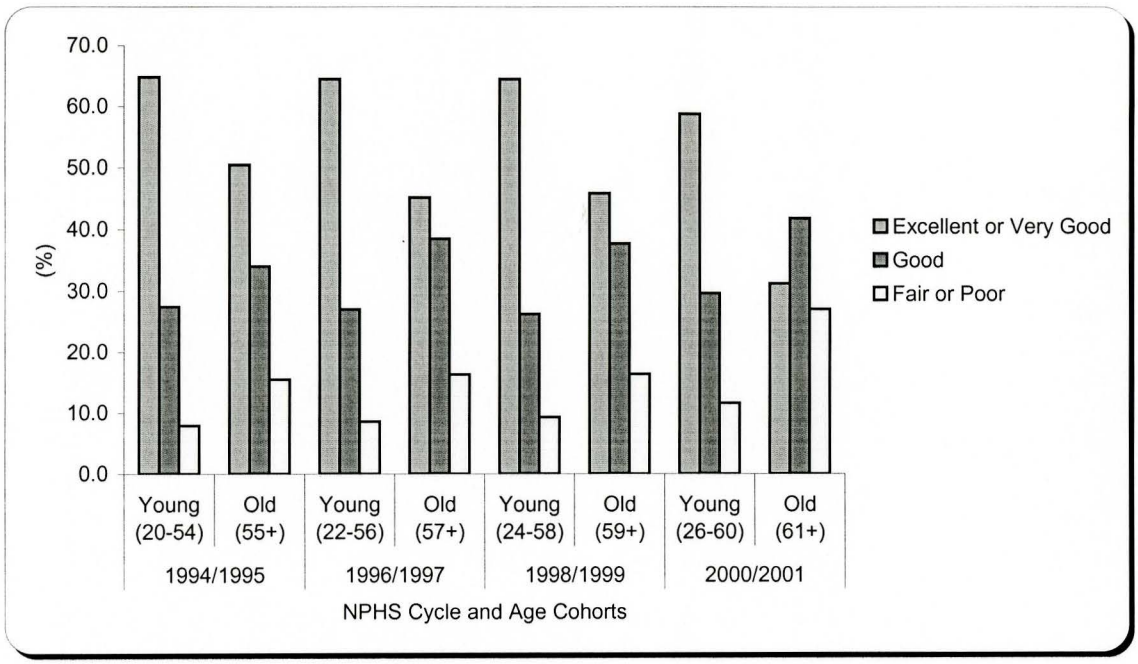


Figure 5.2
Self-Perceived General Health Status for Weighted Native-Born Sample by Age (Young versus Old)

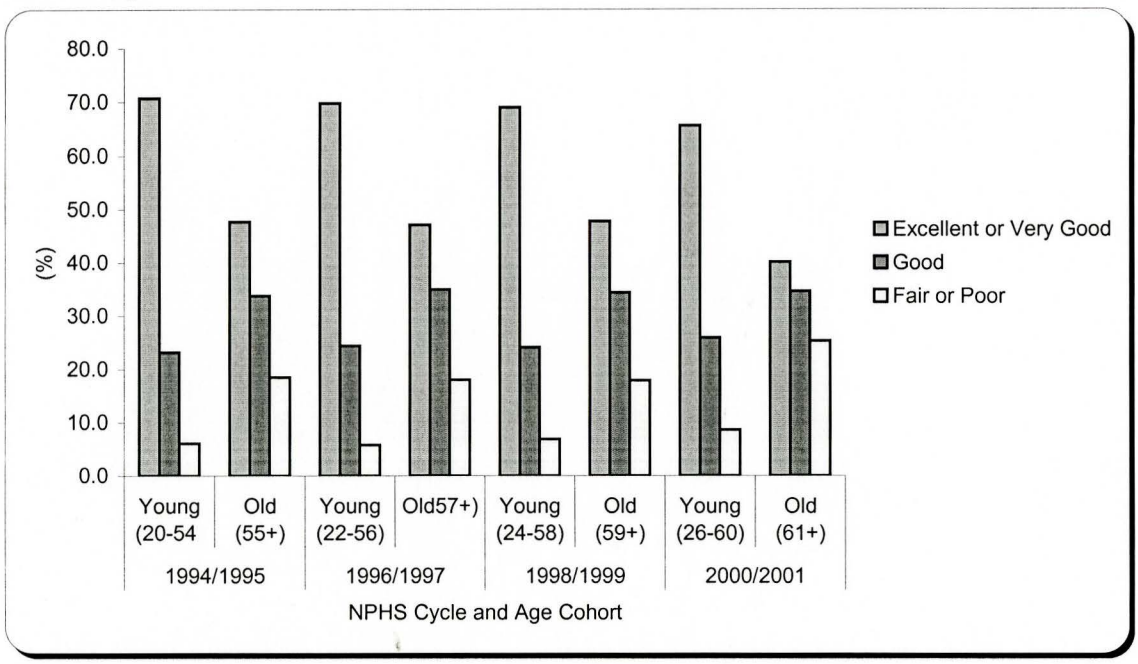


Figure 5.3
Self-Perceived Happiness for Weighted Immigrant Sample by Age (Young versus Old)

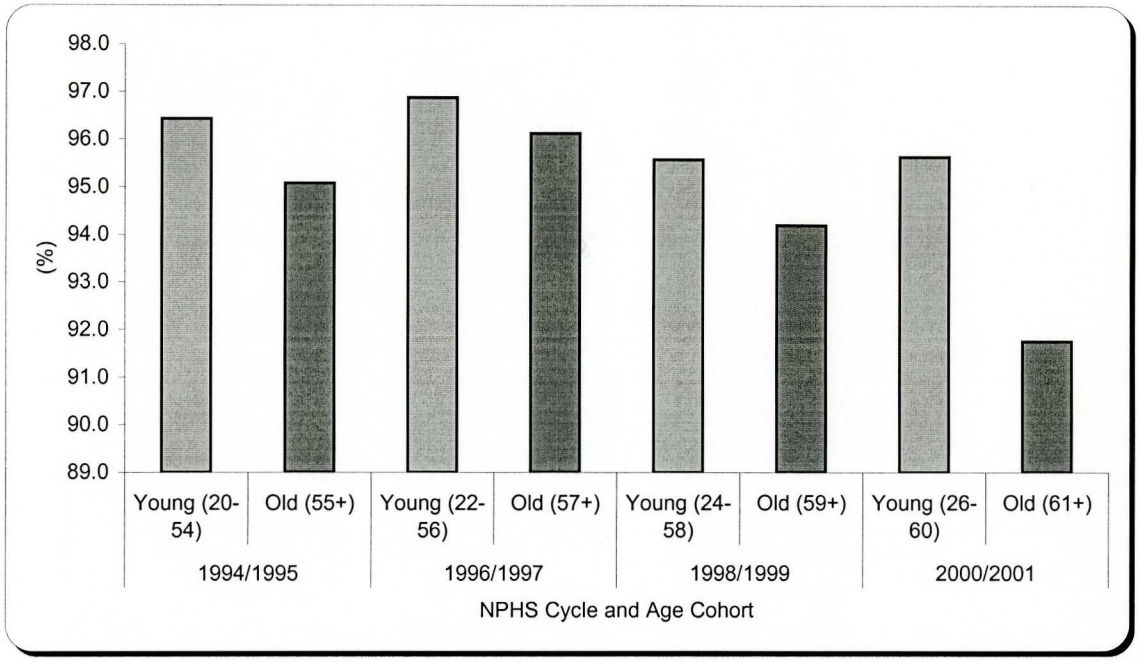


Figure 5.4
Self-Perceived Happiness for Weighted Native-Born Sample by Age (Young versus Old)

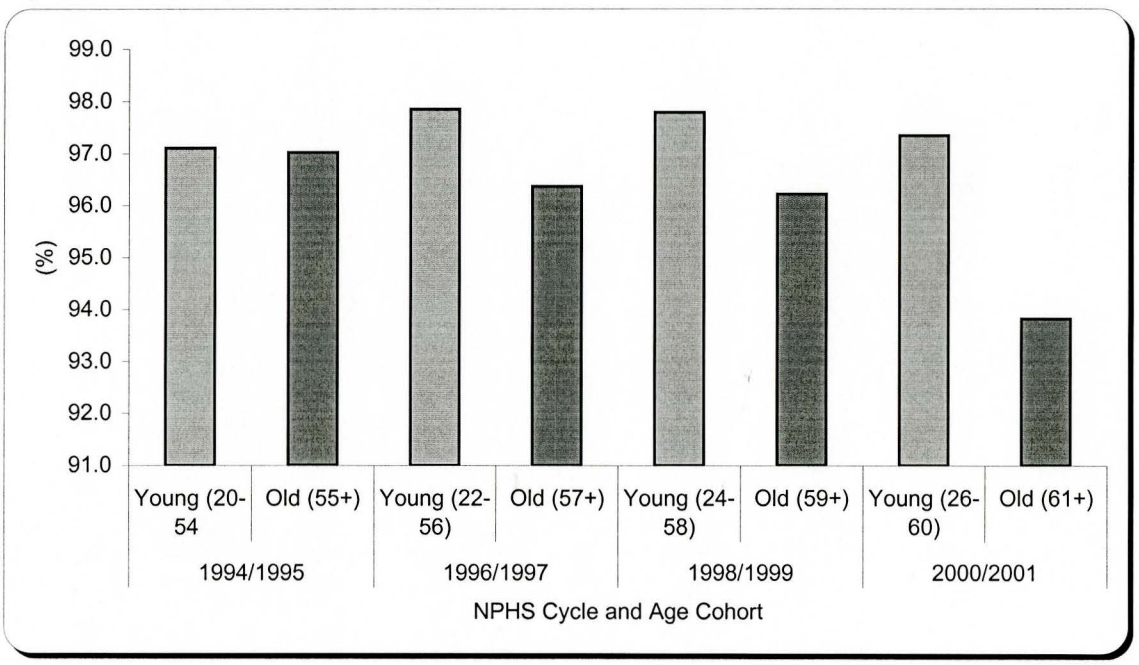


Figure 5.5
General Chronic Stress for Weighted Immigrant Sample by Age (Young versus Old)

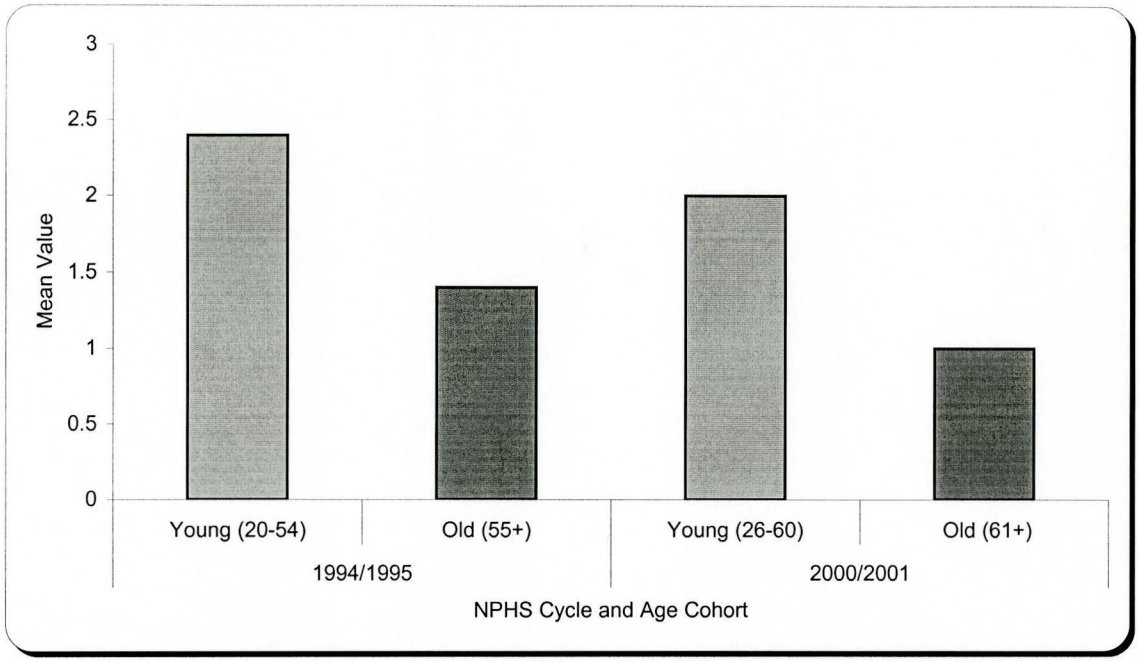


Figure 5.6
General Chronic Stress for Weighted Native-Born Sample by Age (Young versus Old)

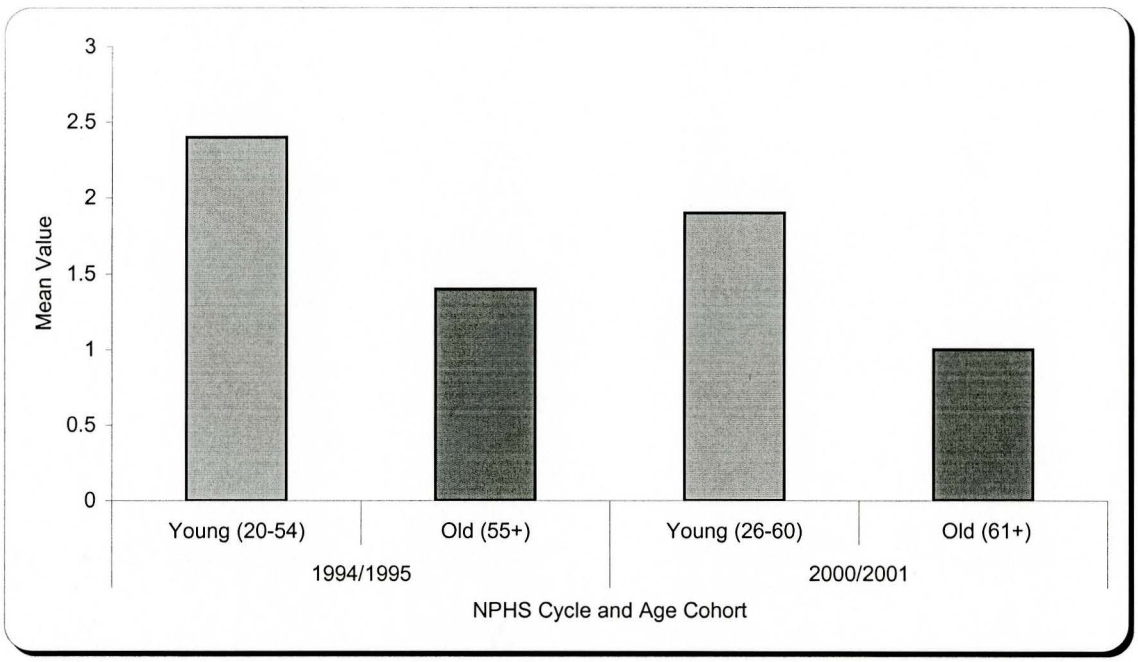


Figure 5.7
Specific Chronic Stress for Weighted Immigrant Sample by Age (Young versus Old)

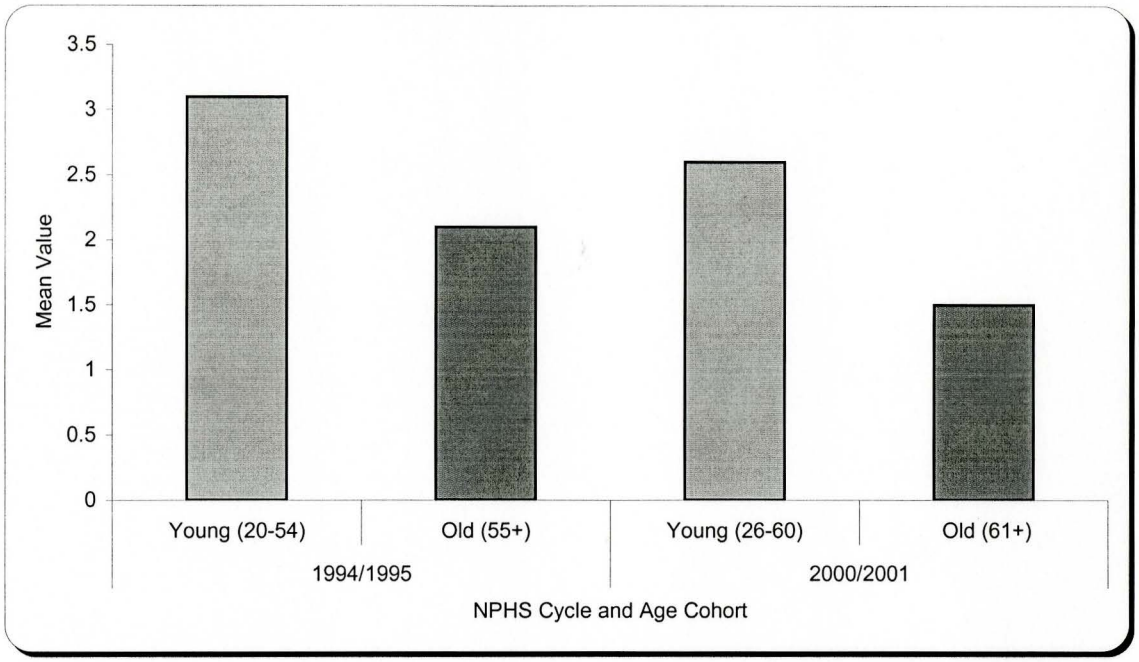


Figure 5.8
Specific Chronic Stress for Weighted Native-Born Sample by Age (Young versus Old)

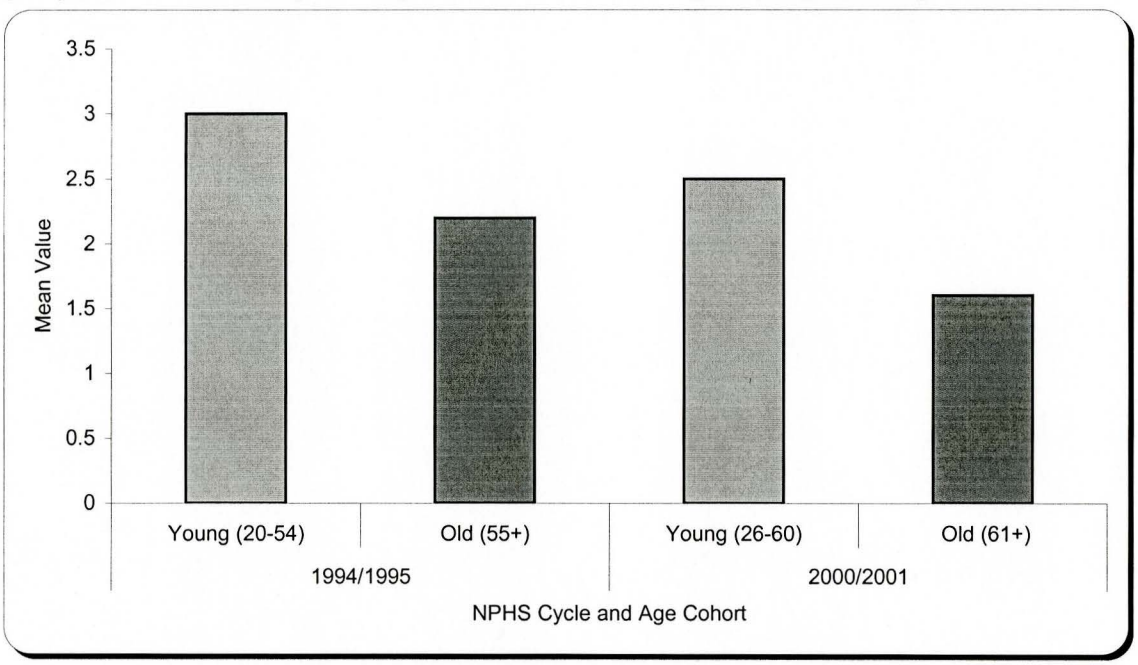


Figure 5.9
Personal Stress for Weighted Immigrant Sample by Age (Young versus Old)

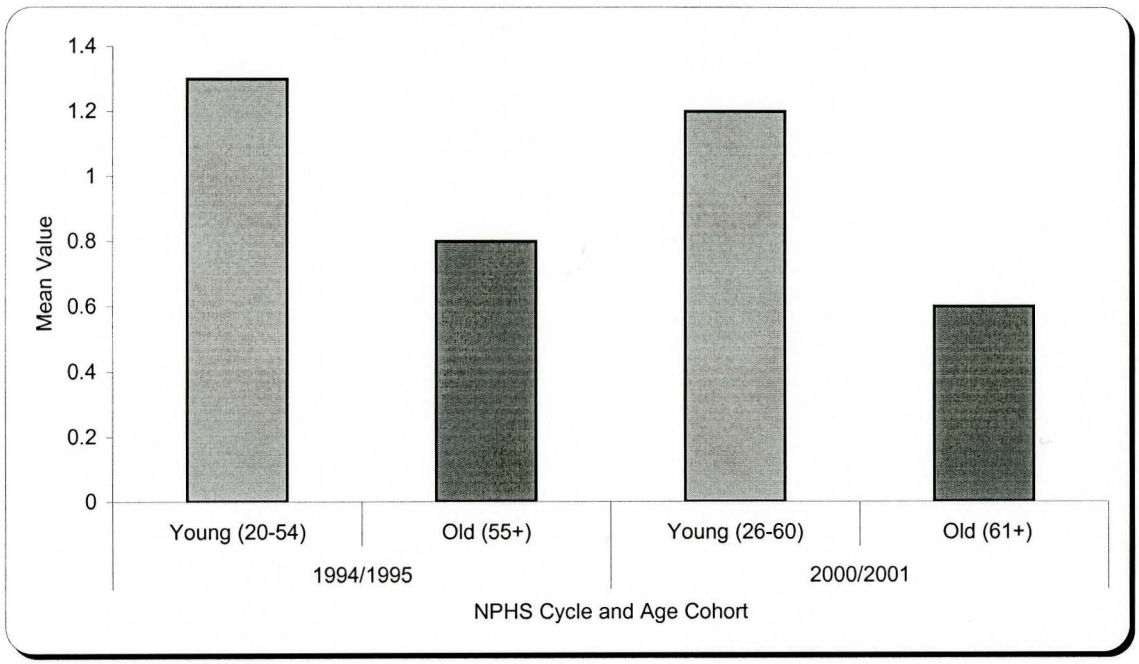


Figure 5.10
Personal Stress for Weighted Native-Born Sample by Age (Young versus Old)

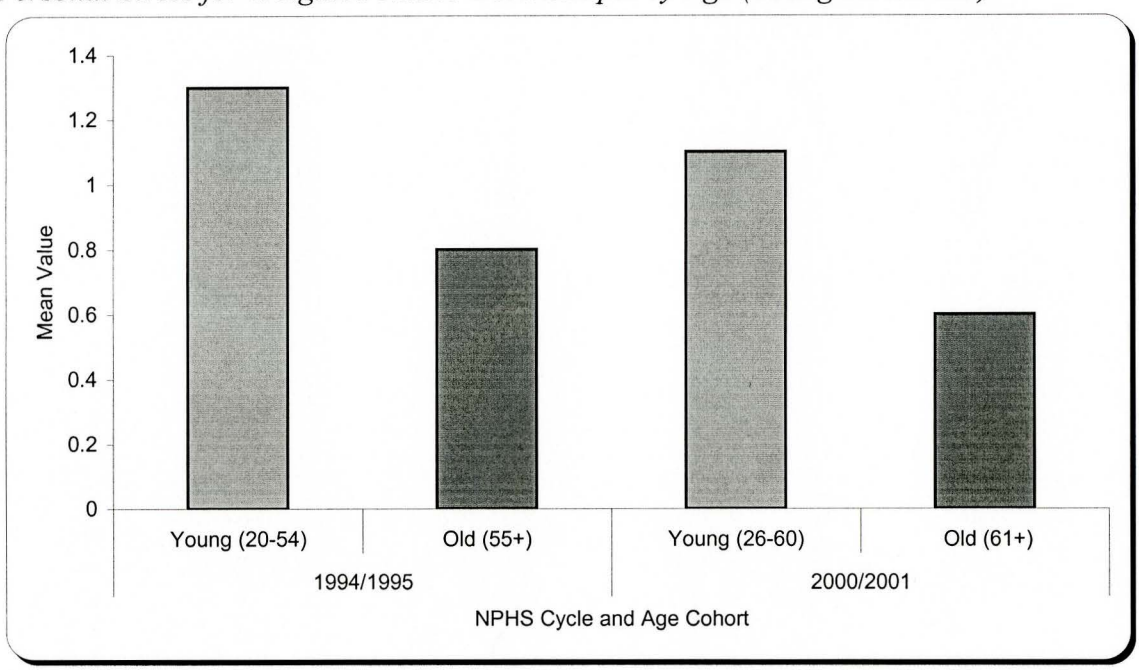


Figure 5.11
Distress for Weighted Immigrant Sample by Age (Young versus Old)

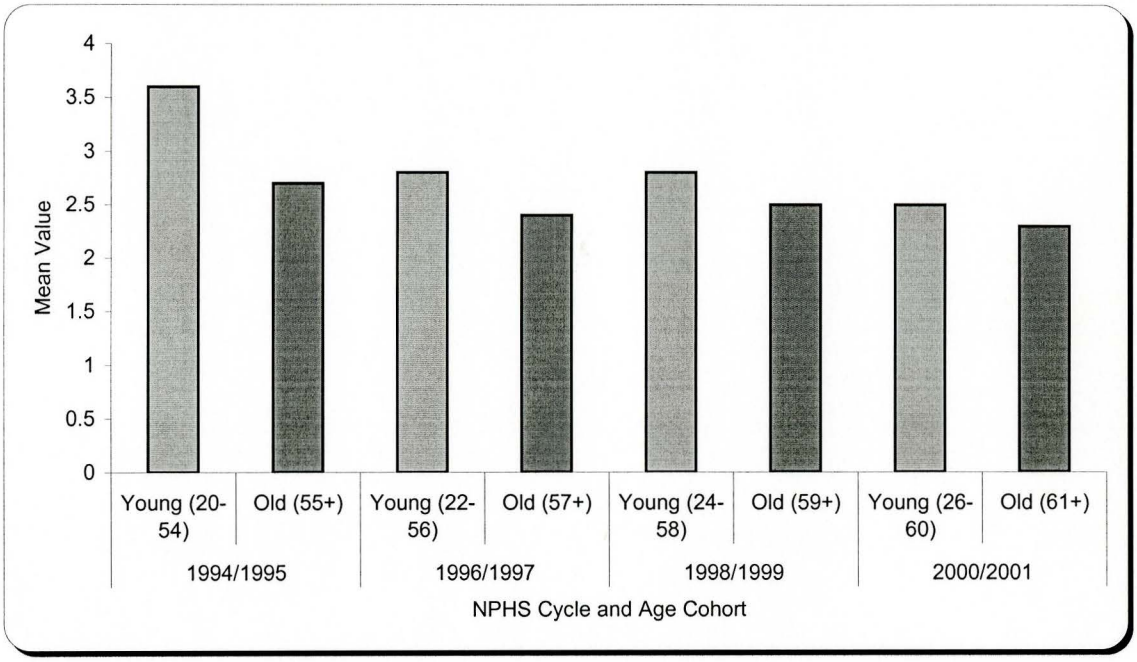


Figure 5.12
Distress for Weighted Native-Born Sample by Age (Young versus Old)

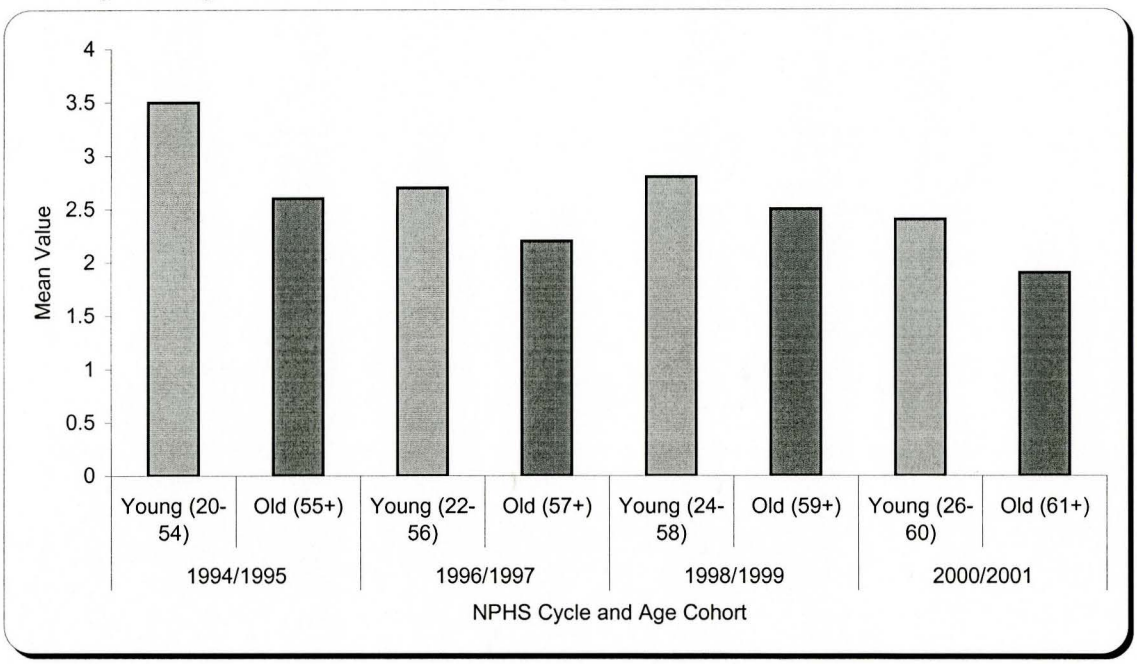


Figure 5.13
Depression for Weighted Immigrant Sample by Age (Young versus Old)

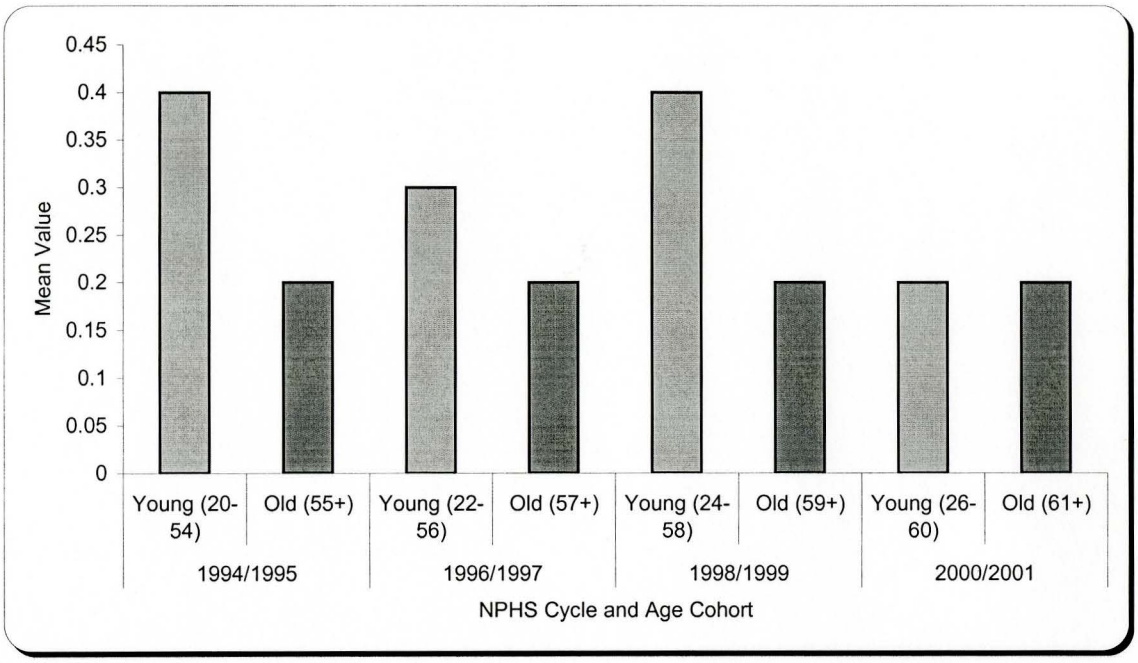


Figure 5.14
Depression for Weighted Native-Born Sample by Age (Young versus Old)

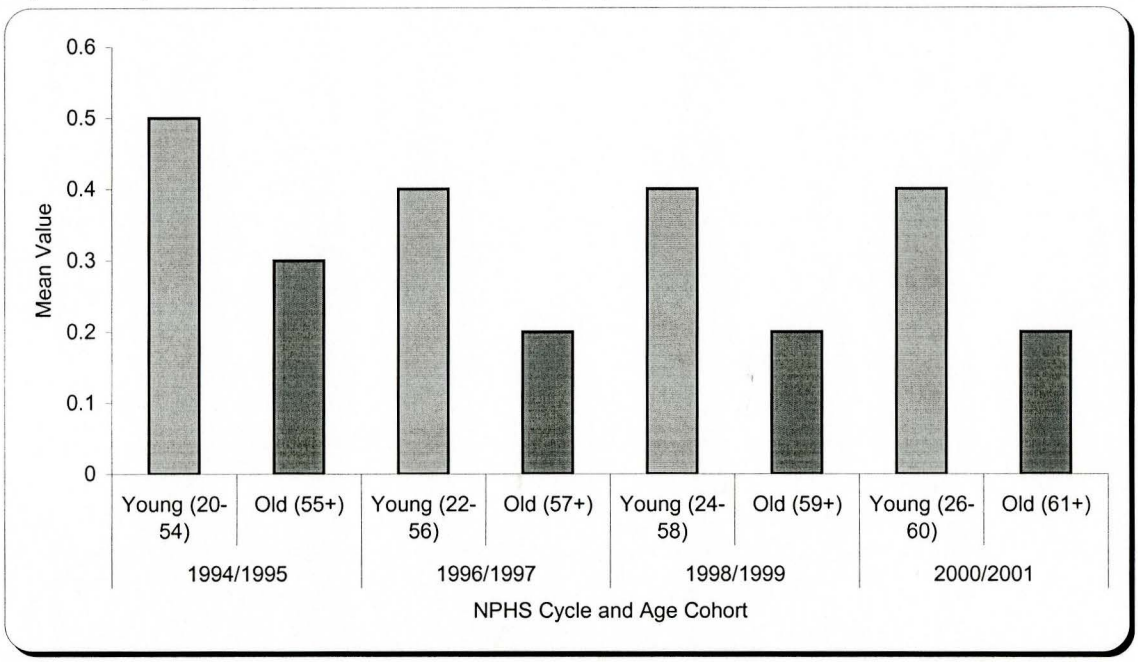


Figure 5.15
Heart Disease for Weighted Immigrant Sample by Age (Young versus Old)

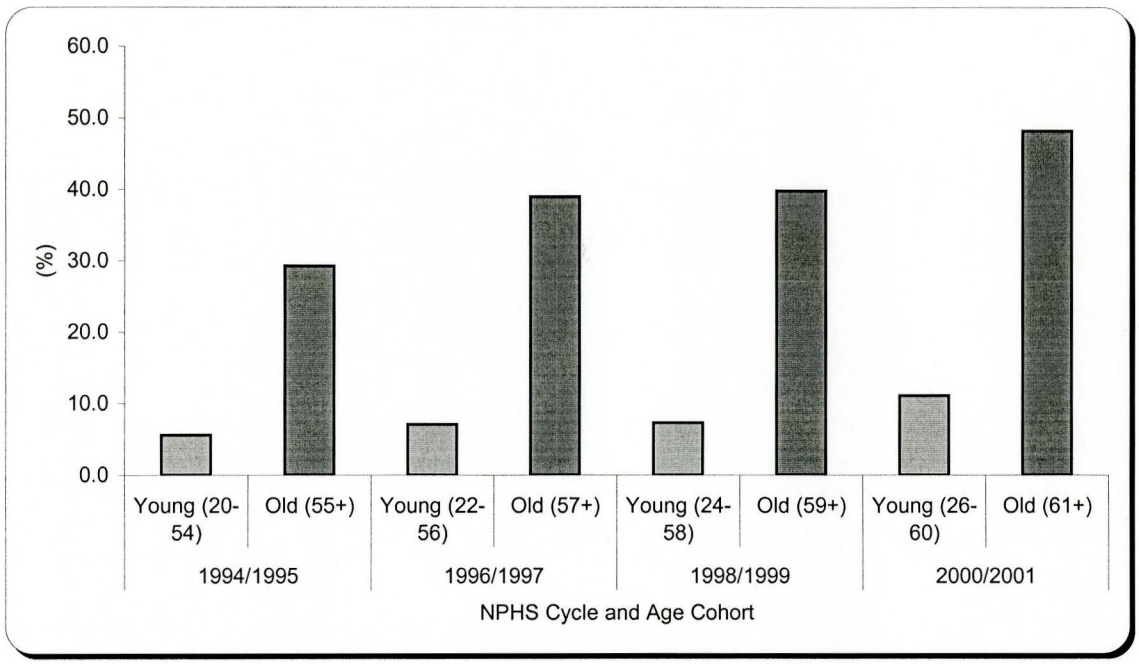


Figure 5.16
Heart Disease for Weighted Native-Born Sample by Age (Young versus Old)

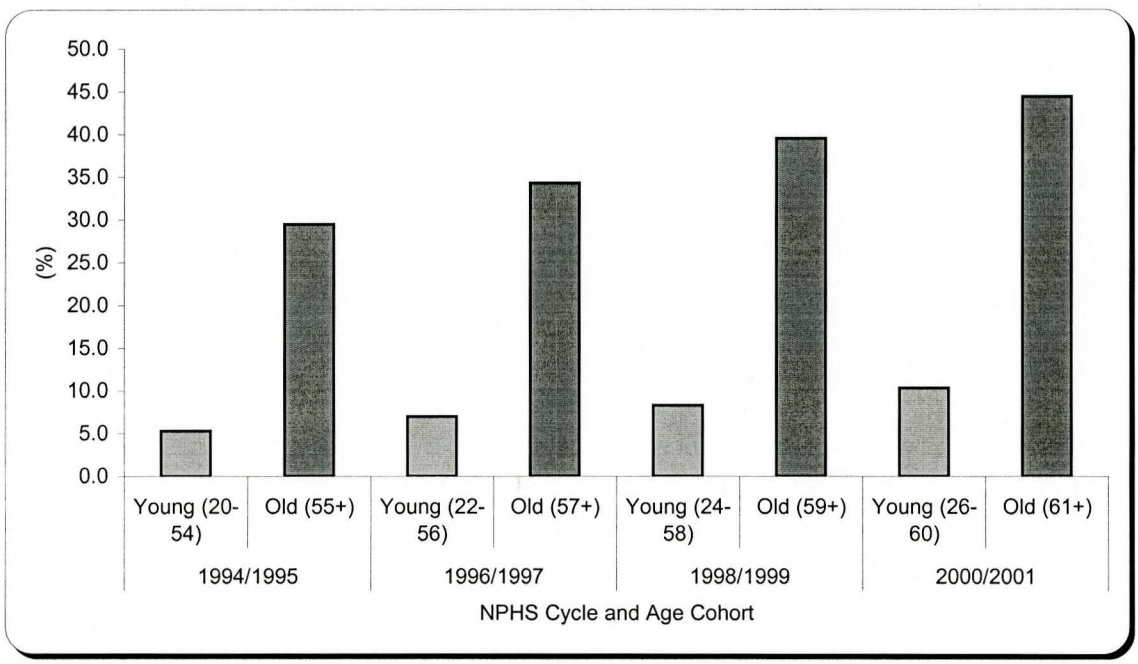


Figure 5.17
Respiratory Disease for Weighted Immigrant Sample by Age (Young versus Old)

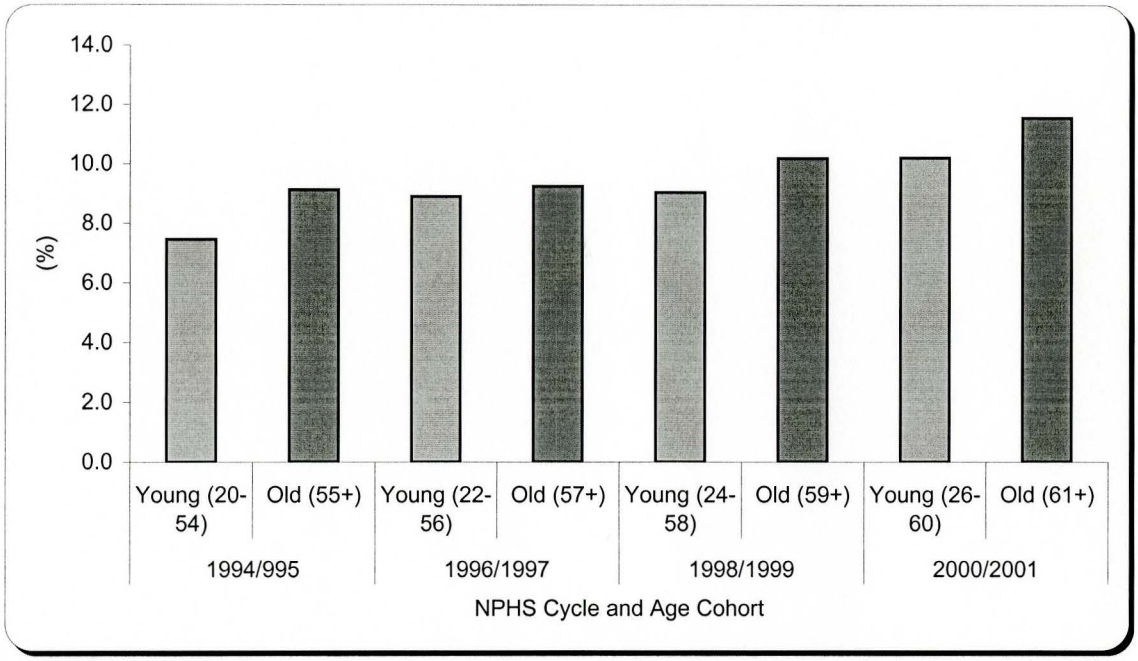


Figure 5.18
Respiratory Disease for Weighted Native-Born Sample by Age (Young versus Old)

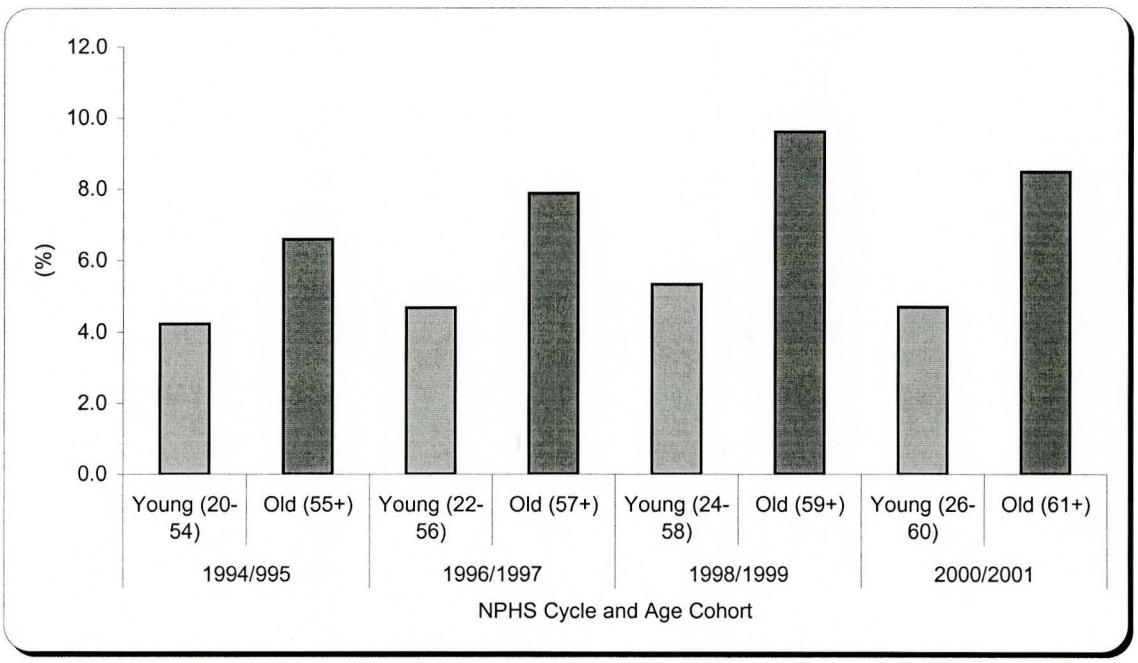


Figure 5.19
Any Chronic Condition for Weighted Immigrant Sample by Age (Young versus Old)

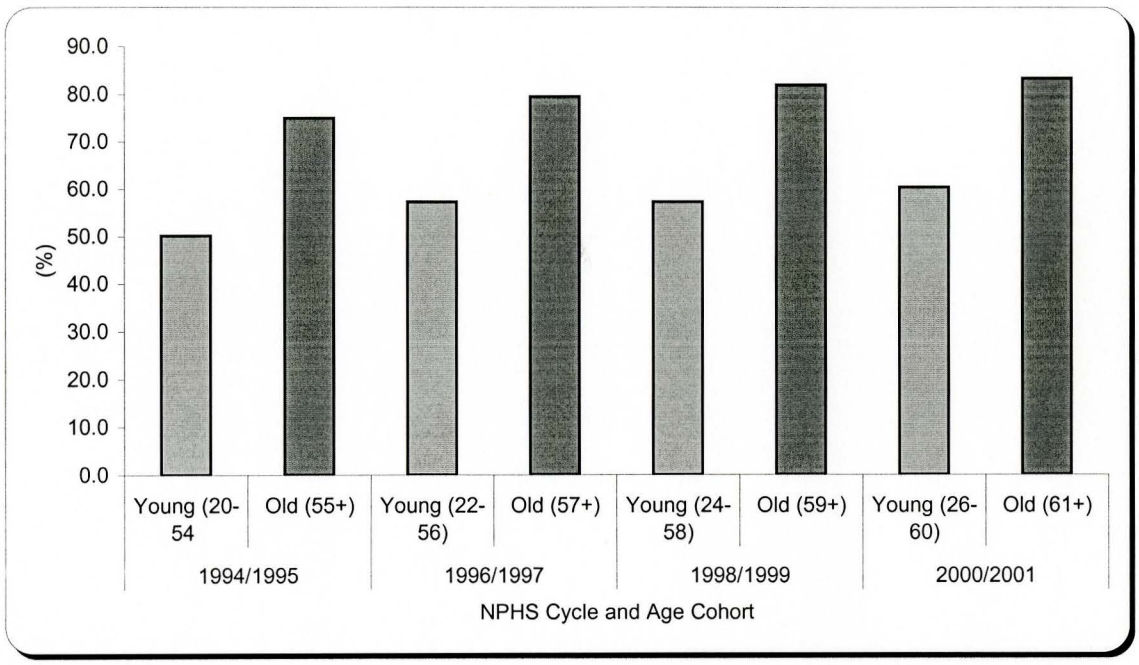


Figure 5.20
Any Chronic Condition for Weighted Native-Born Sample by Age (Young versus Old)

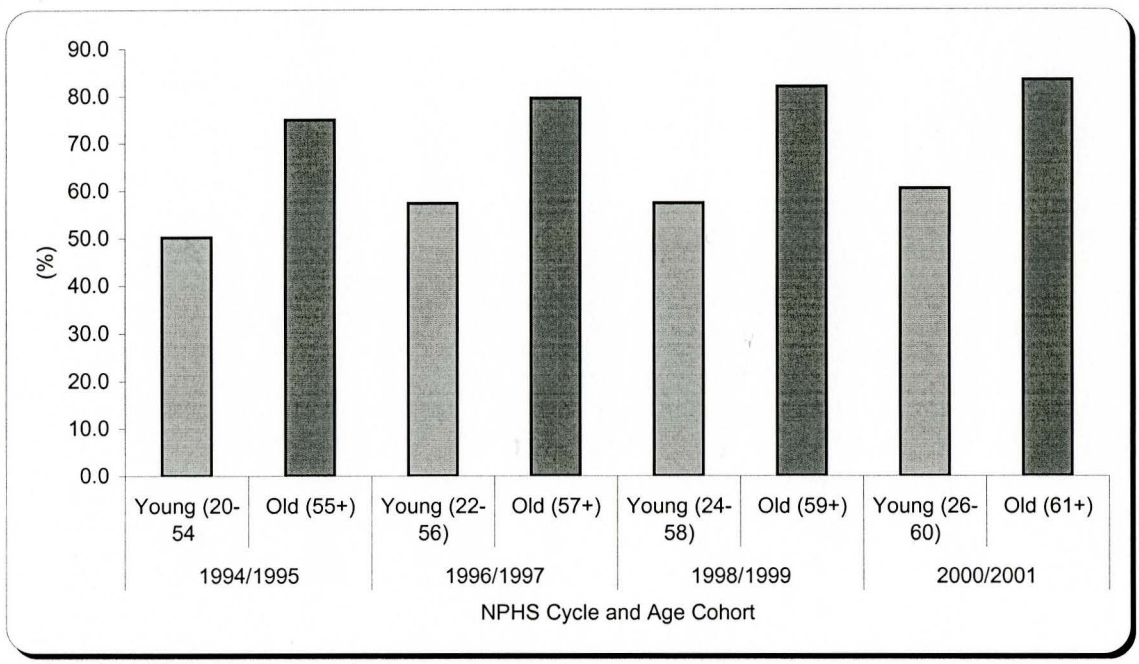


Figure 5.21
Self-Perceived General Health Status for Weighted Immigrant Sample by Age for Older Respondents (Young-Old versus Old-Old)

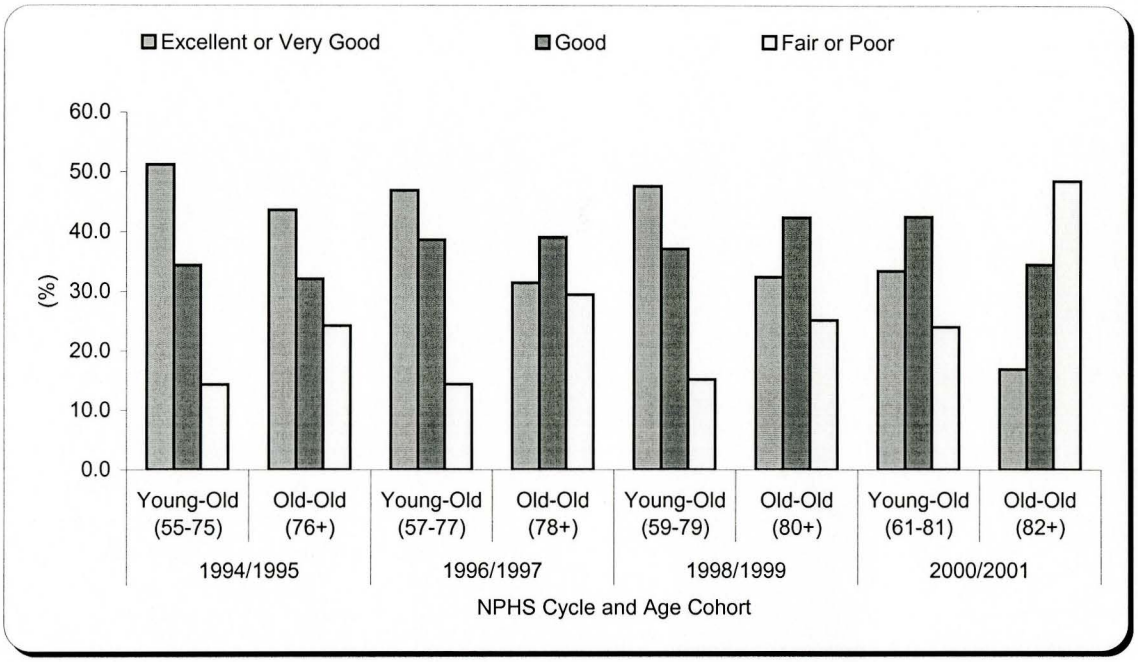


Figure 5.22
Self-Perceived General Health Status for Weighted Native-Born Sample by Age for Older Respondents (Young-Old versus Old-Old)

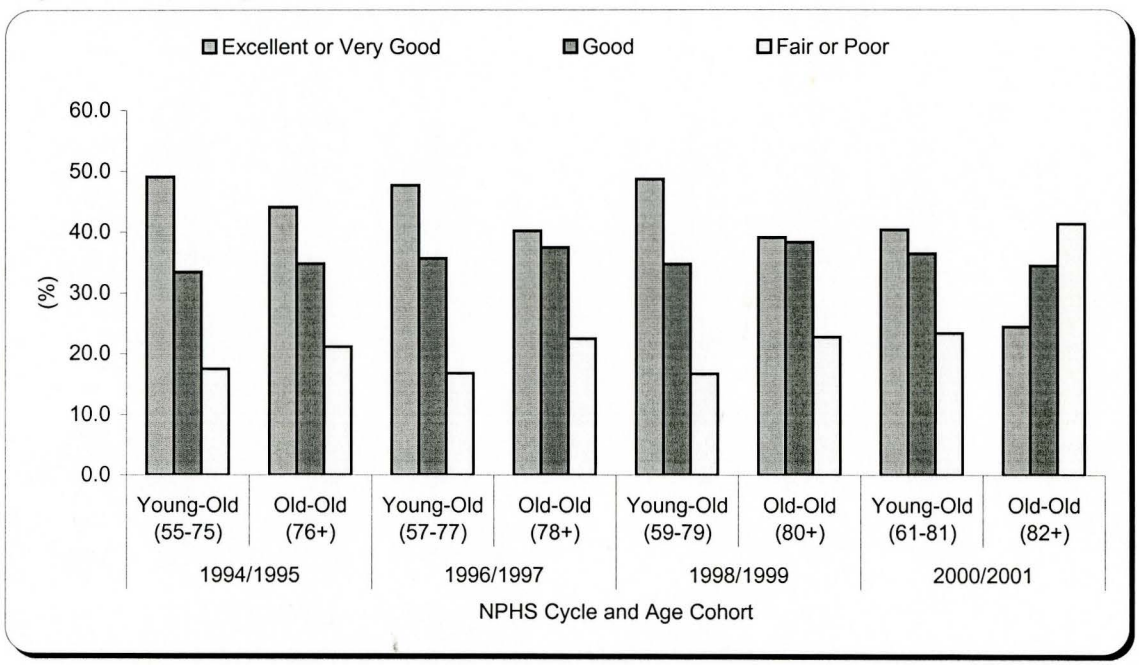


Figure 5.23
General Chronic Stress for Weighted Immigrant Sample by Age for Older Respondents (Young-Old versus Old-Old)

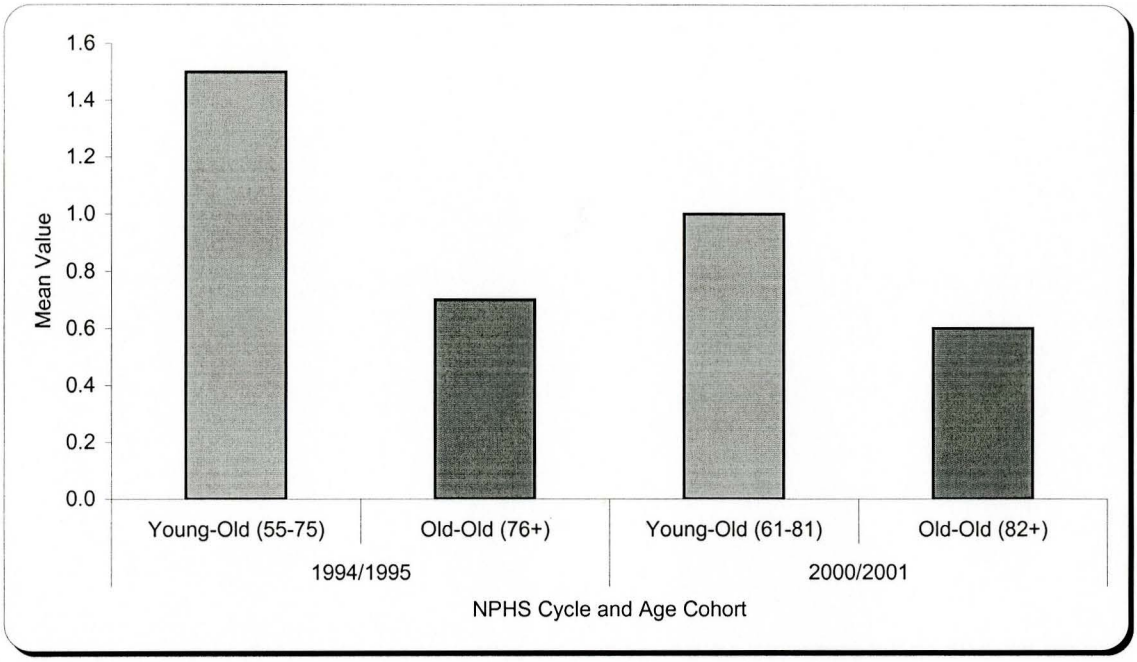


Figure 5.24
General Chronic Stress for Weighted Native-Born Sample by Age for Older Respondents (Young-Old versus Old-Old)

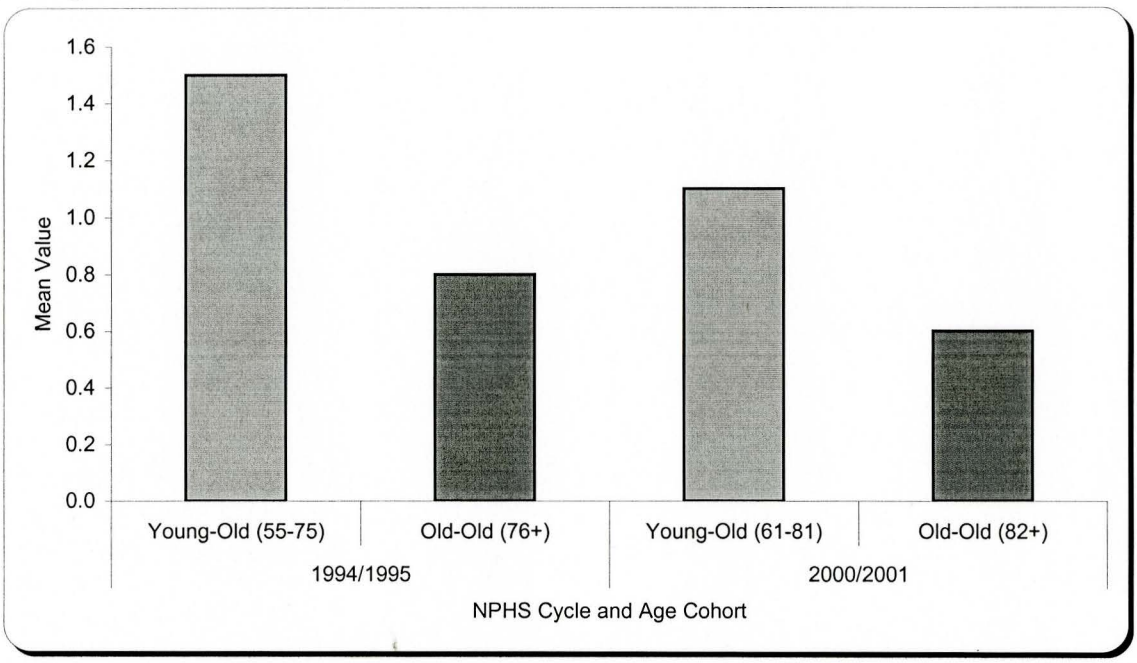


Figure 5.25
Heart Disease for Weighted Immigrant Sample by Age for Older Respondents (Young-Old versus Old-Old)

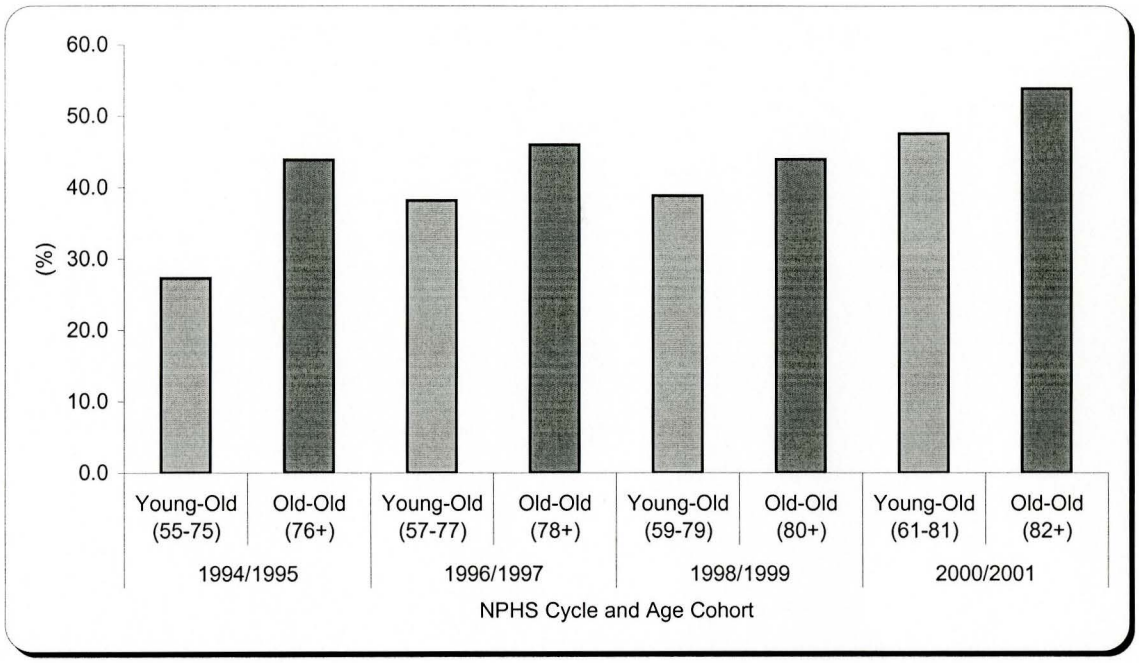


Figure 5.26
Heart Disease for Weighted Native-Born Sample by Age for Older Respondents (Young-Old versus Old-Old)

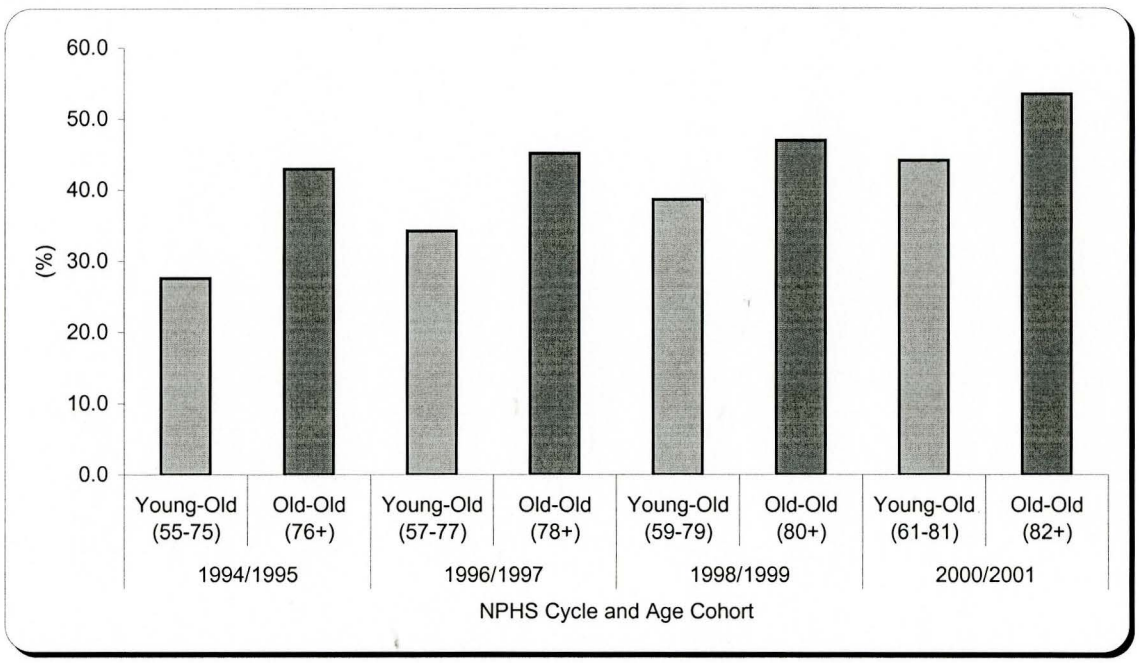


Figure 5.27
Any Chronic Condition for Weighted Immigrant Sample by Age for Older Respondents (Young-Old versus Old-Old)

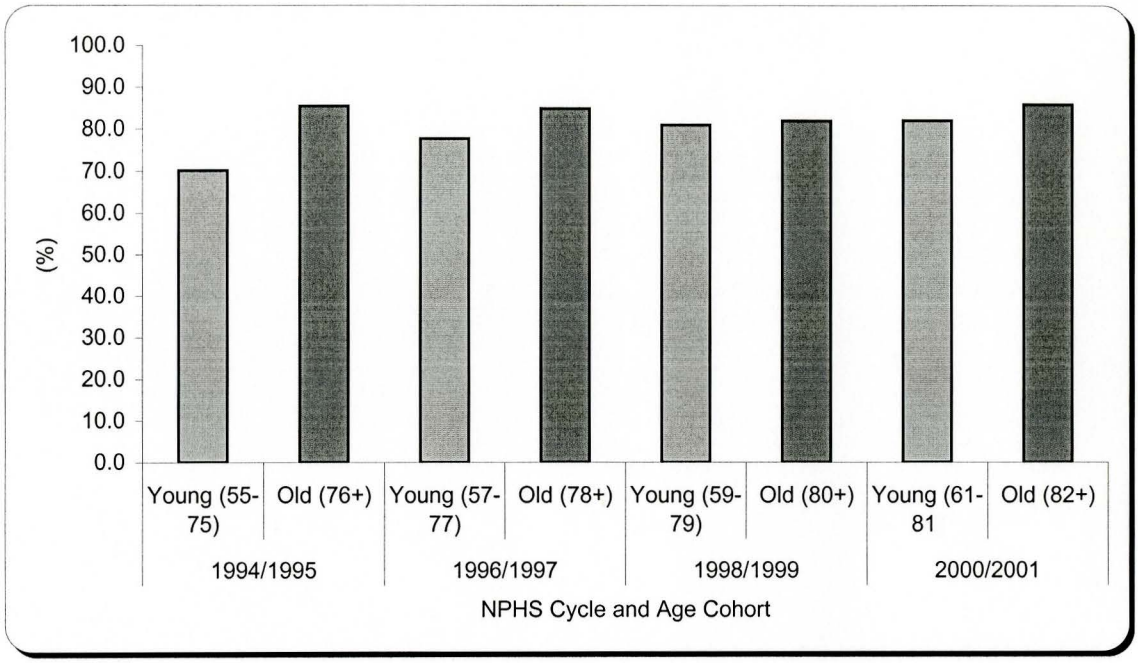


Figure 5.28
Any Chronic Condition for Weighted Native-Born Sample by Age for Older Respondents (Young-Old versus Old-Old)

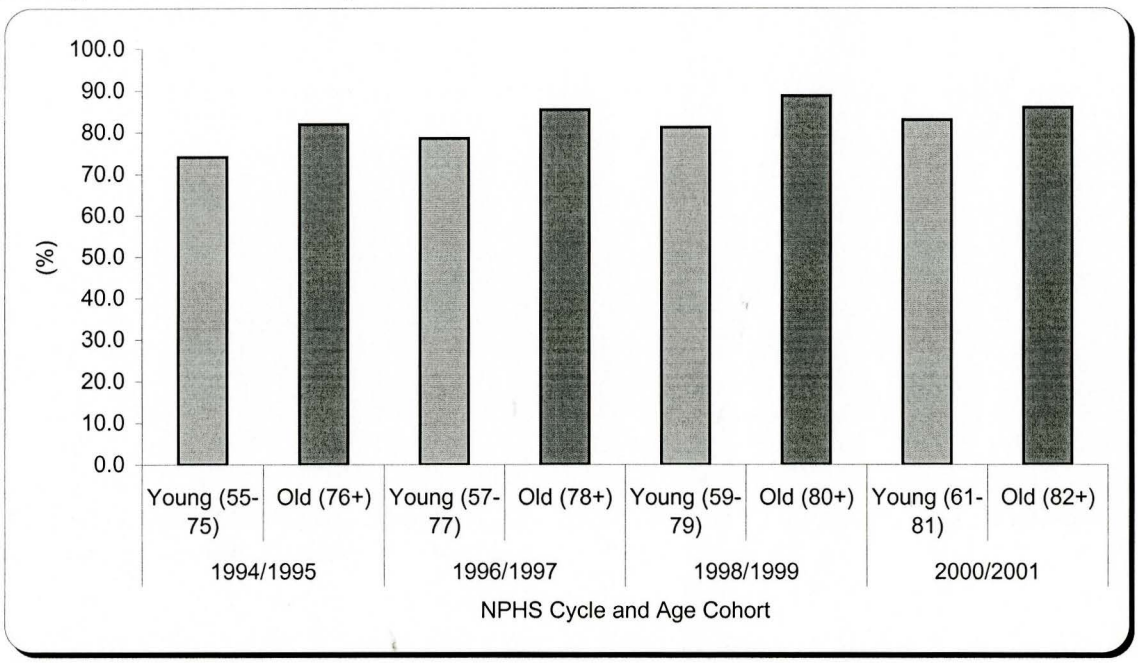


Figure 5.29
Self-Perceived General Health Status for Weighted Immigrant Sample Reporting Excellent or Very Good Health by Arrival Cohort for Older Immigrants

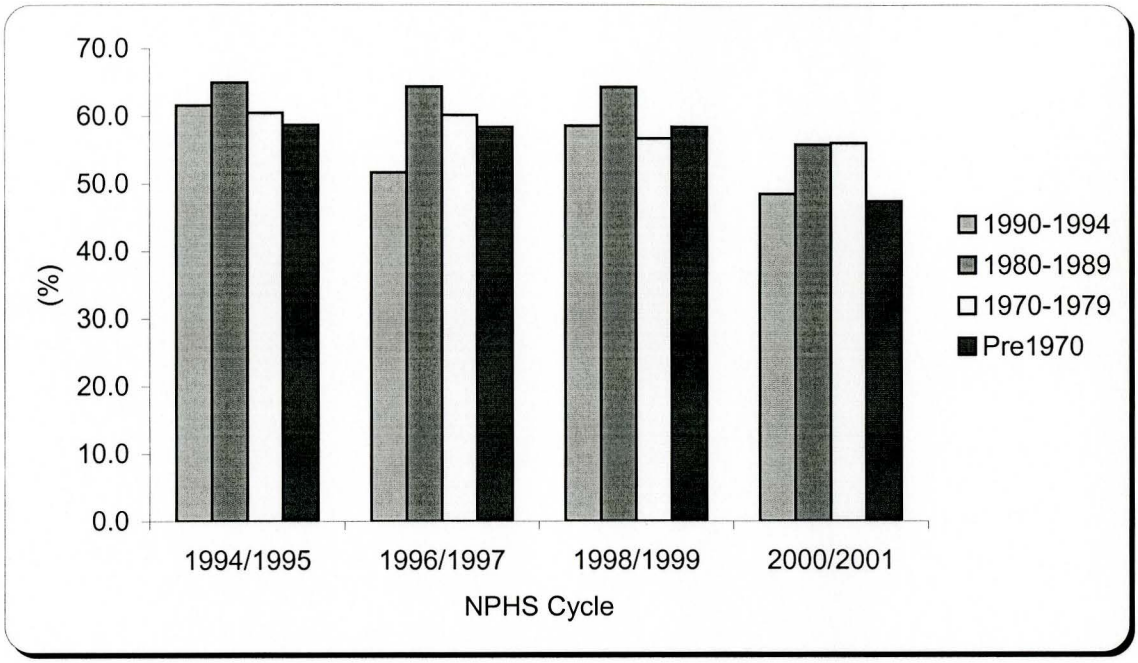


Figure 5.30
General Chronic Stress for Weighted Immigrant Sample by Arrival Cohort for Older Immigrants

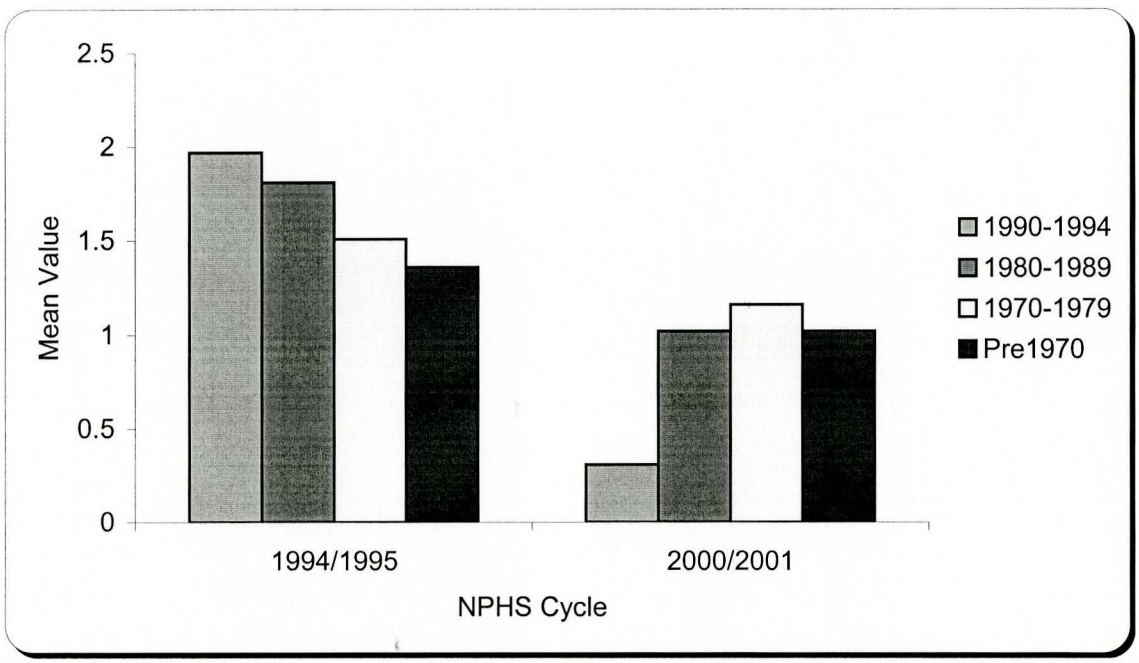


Figure 5.31
Heart Disease for Weighted Immigrant Sample by Arrival Cohort for Older Immigrants

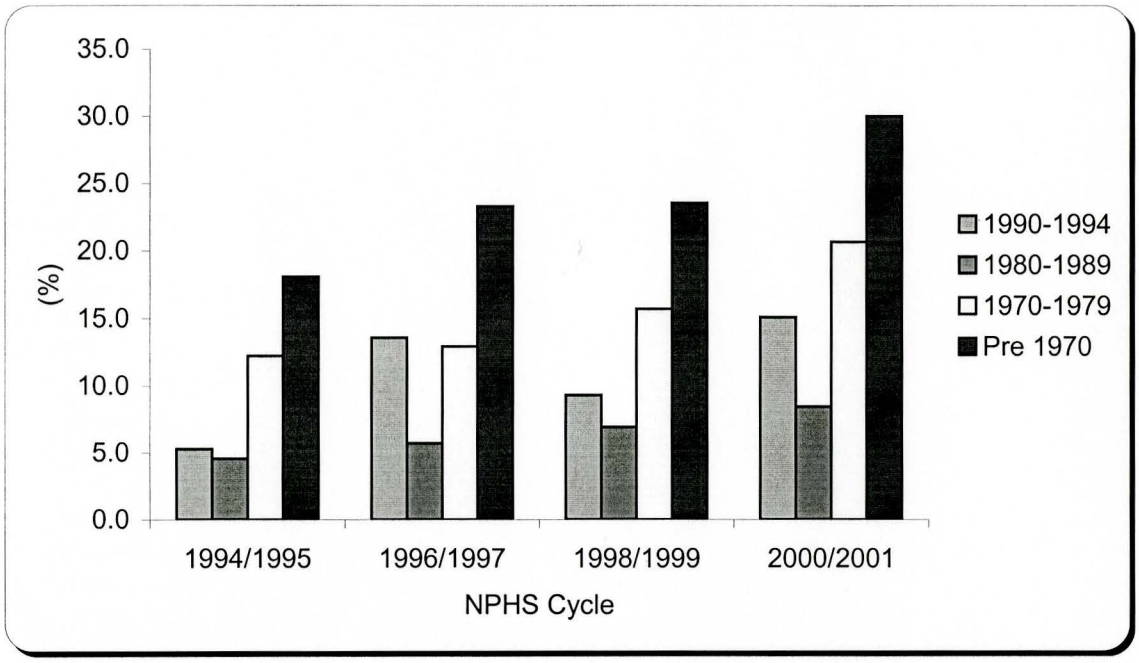


Table 5.1:
Self-Perceived General Health Status for Immigrant-Only Sample aged 55+ in 1994/1995

Variable	1994/1995			2000/2001			Diff 94/95-00/01
	B	SIG	p	B	SIG	p	
Intercept	-1.057		0.342	0.325		0.7843	0.849
Socio-Demographic Variables							
General Prac. Consultation	2.405	**	0.0166	1.355		0.094	-0.814
Married	-0.759	*	0.025	1.367	***	0.0011	3.939
Currently Working	-1.289	**	0.0125				
Age Group				-1.091	*	0.0496	
Lifestyle Variables							
Moderate Drinker				-0.778	**	0.0145	
Physically Active				-1.732	***	0.003	
Income and SES Variables							
Lower Mid Income	0.780		0.0569	2.149	***	<0.0001	2.047
Middle Income				0.831	*	0.035	
High Income				-1.596	**	0.0102	
Education Variables							
Less then High School				-0.837	*	0.0251	
High School	0.701		0.0577				
Post Secondary Ed.				-1.361	***	0.0011	
Stress and Mental Health							
Personal Stress Index	0.312	**	0.0197				
Self Perceived Happiness	-3.021	***	<0.0001	-2.480	**	0.0008	0.540
Place of Residence Variables							
Prairie				1.094		0.088	
British Columbia				0.936		0.0245	
N (unweighted)	*432*			*349*			
Rho-squared (P^2)	*0.2*			*0.3*			
Percent Concordant	*75.7*			*79.6*			
Likelihood Ratio	*70.28*			*99.17*			

Significance Level *** p <0.01 ** p <0.02 * p <0.05

Table 5.2:
Self-Perceived General Health Status for Pooled Sample aged 55+ in 1994/1995

Variable	1994/1995			2000/2001			Diff 1994-2000
	B	SIG	p	B	SIG	p	
Intercept	-0.800	*	0.0417	-1.138	***	0.0066	-0.589
Socio-Demographic Variables							
General Prac. Consultation	0.550	***	0.0026	0.917	***	<0.0001	1.261
Female (Gender)	0.228		0.0719	0.578	***	<0.0001	1.942
Currently Working	-0.619	***	0.0003	-1.312	***	0.0001	-1.831
Lifestyle Variables							
Heavy Drinker	-0.726	**	0.0143	-1.334	***	0.0003	-1.294
Moderate Drinker	-0.633	***	<0.0001	-0.493	***	0.0001	0.778
Physically Inactive	0.381	***	0.0033	0.875	***	<0.0001	2.593
Income and SES Variables							
Low Income	0.523	**	0.0119				
Lower Mid Income				0.485	***	0.003	
Upper Mid Income	-0.479	***	0.0013	-0.479	***	0.0016	0.000
High Income	-1.257	***	0.0003	-1.149	***	<0.0001	0.239
Education Variables							
Less then High School	0.874	***	<0.0001	0.266	*	0.0504	-2.911
High School				-0.416		0.0651	
Some Postsecondary Ed.	0.325		0.0938				
Stress and Mental Health							
Personal Stress Index	0.319	***	<0.0001	0.172	***	0.0058	-1.793
Self Perceived Happiness	1.583	***	<0.0001	-1.617	***	<0.0001	-7.582
Place of Residence							
Quebec	-0.385	***	0.0051				
Ontario				0.028		0.0402	
Alberta				0.604	***	0.0049	
N (unweighted)	*2238*			*1895*			
Rho-squared (P^2)	*0.1*			*0.1*			
Percent Concordant	*74.8*			*72.8*			
Likelihood Ratio	*301.52*			*294.18*			
Significance Level	*** p <0.01		** p <0.02		* p <0.05		

Table 5.3:
General Chronic Stress for Immigrant-Only Sample aged 55+ in 1994/1995

Variable	1994/1995			2000/2001			Diff 94/95-00/01
	B	SIG	p	B	SIG	p	
Intercept	-1.057		0.342	0.325		0.7843	0.849
Socio-Demographic Variables							
General Prac. Consultation	2.405	**	0.0166	1.355		0.094	-0.814
Married	-0.759	*	0.025	1.367	***	0.0011	3.939
Currently Working	-1.289	**	0.0125				
Age Group				-1.091	*	0.0496	
Lifestyle Variables							
Moderate Drinker				-0.778	**	0.0145	
Physically Active				-1.732	***	0.003	
Income and SES Variables							
Lower Mid Income	0.780		0.0569	2.149	***	<0.0001	2.047
Middle Income				0.831	*	0.035	
High Income				-1.596	**	0.0102	
Education Variables							
Less then High School				-0.837	*	0.0251	
High School	0.701		0.0577				
Post Secondary Ed.				-1.361	***	0.0011	
Stress and Mental Health							
Personal Stress Index	0.312	**	0.0197				
Self Perceived Happiness	-3.021	***	<0.0001	-2.480	**	0.0008	0.540
Place of Residence Variables							
Prairie				1.094		0.088	
British Columbia				0.936		0.0245	
N (unweighted)	*432*			*349*			
Rho-squared (P^2)	*0.2*			*0.3*			
Percent Concordant	*75.70*			*79.60*			
Likelihood Ratio	*70.280*			*99.170*			

Significance Level *** p <0.01 ** p <0.02 * p <0.05

Table 5.4:
General Chronic Stress for Pooled Sample aged 55+ in 1994/1995

Variable	1994/1995			2000/2001			Diff 1994-2000
	B	SIG	p	B	SIG	p	
Intercept	-0.800	*	0.0417	-1.138	***	0.0066	-0.589
Socio-Demographic Variables							
General Prac. Consultation	0.550	***	0.0026	0.917	***	<0.0001	1.261
Female (Gender)	0.228		0.0719	0.578	***	<0.0001	1.942
Currently Working	-0.619	***	0.0003	-1.312	***	0.0001	-1.831
Lifestyle Variables							
Heavy Drinker	-0.726	**	0.0143	-1.334	***	0.0003	-1.294
Moderate Drinker	-0.633	***	<0.0001	-0.493	***	0.0001	0.778
Physically Inactive	0.381	***	0.0033	0.875	***	<0.0001	2.593
Income and SES Variables							
Low Income	0.523	**	0.0119				
Lower Mid Income				0.485	***	0.003	
Upper Mid Income	-0.479	***	0.0013	-0.479	***	0.0016	0.000
High Income	-1.257	***	0.0003	-1.149	***	<0.0001	0.239
Education Variables							
Less then High School	0.874	***	<0.0001	0.266	*	0.0504	-2.911
High School				-0.416		0.0651	
Some Postsecondary Ed.	0.325		0.0938				
Stress and Mental Health							
Personal Stress Index	0.319	***	<0.0001	0.172	***	0.0058	-1.793
Self Perceived Happiness	1.583	***	<0.0001	-1.617	***	<0.0001	-7.582
Place of Residence							
Quebec	-0.385	***	0.0051				
Ontario				0.028		0.0402	
Alberta				0.604	***	0.0049	
N (unweighted)	*2238*			*1895*			
Rho-squared (P^2)	*0.1*			*0.1*			
Percent Concordant	*74.80*			*72.80*			
Likelihood Ratio	*301.520*			*294.180*			
Significance Level	*** p <0.01		** p <0.02		* p <0.05		

Table 5.5:
Heart Condition for Immigrant-Only Sample aged 55+ in 1994/1995

Variable	1994/1995			2000/2001			Diff 94/95-00/01
	B	SIG	p	B	SIG	p	
Intercept	-1.885	***	0.0036	1.285	***	<0.0001	4.489
Socio-Demographic Variables							
General Health	-0.583		0.0582	-0.745	**	0.0109	-0.383
Race	0.596		0.0744				
General Prac. Consultation	1.785	***	0.0003				
Married	-0.432		0.0816				
Speaks Other Lang.				-0.743		0.0559	
Lifestyle Variables							
Moderately Active	-1.105	***	0.0006				
Income and SES Variables							
Upper Mid Income				-0.883	***	0.0006	
Education Variables							
Post Secondary Ed.	-0.856	***	0.0026	-0.773	***	0.002	0.219
Arrival Cohort Variables							
Arrival Cohort 1970-1979	1.029	***	0.008				
Place of Residence Variables							
Quebec				-1.193	***	0.005	
Alberta				-0.839	*	0.0491	
N (unweighted)	*430*			*351*			
Rho-squared (P^2)	*0.1*			*0.1*			
Percent Concordant	*67.70*			*57.60*			
Likelihood Ratio	*67.220*			*46.550*			

Significance Level *** p <0.01 ** p <0.02 * p <0.05

Table 5.6:
Heart Condition for Pooled Sample aged 55+ in 1994/1995

Variable	1994/1995			2000/2001			Diff 94/95-00/01
	B	SIG	p	B	SIG	p	
Intercept	-0.668	***	0.0048	-0.891	***	<0.0001	-0.697
Socio-Demographic Variables							
General Health	-0.655	***	<0.0001	-0.610	***	<0.0001	0.284
Female (Gender)	-0.254	***	0.008				
Married	-0.307	***	0.007	-0.463	***	0.0029	-0.811
Speaks Other Lang.	-0.512	***	<0.001				
Lifestyle Variables							
Physically Active				0.277	***	0.0089	
Income and SES Variables							
Lower Mid Income				0.185		0.051	
High Income	-0.173		0.0884				
Education Variables							
Some Postsecondary Ed.	-0.461	***	0.0002				
N (unweighted)	*2670*			*2256*			
Rho-squared (P^2)	*0.1*			*0.1*			
Percent Concordant	*67.90*			*64.20*			
Likelihood Ratio	*269.200*			*166.350*			

Significance Level *** p <0.01 ** p <0.02 * p <0.05

Table 5.7:
Any Chronic Condition for Immigrant-Only Sample aged 55+ in 1994/1995

Variable	1994/1995			2000/2001			Diff 94/95-00/01
	B	SIG	p	B	SIG	p	
Intercept	3.565	***	0.0001	1.010		0.4838	1.492
Socio-Demographic Variables							
General Health	-2.472	***	0.001				
Race				-2.279	*	0.0504	
Country of Birth	-0.534		0.0661	-1.219		0.0977	0.865
General Prac. Consultation	1.404	***	<0.0001	1.536	***	0.0026	-0.222
Female (Gender)	-0.513	*	0.0308				
Age Group	-1.031	*	0.0231				
Lifestyle Variables							
Smoker in Household				2.510	***	0.0019	
Moderately Active				2.116	***	<0.0001	
Income and SES Variables							
Lower Mid Income				1.179		0.0598	
Upper Mid Income				-0.983	**	0.0111	
Education Variables							
Post Secondary Ed.				-1.173	***	0.001	
Arrival Cohort Variables							
Arrival Cohort 1990-1994				-4.319	***	0.0019	
Arrival Cohort 1980-1989	-1.747	***	0.0017	-5.229	***	<0.0001	2.511
Stress and Mental Health Variables							
Personal Stress Index	0.209		0.0941	0.437	*	0.0501	-0.892
Place of Residence Variables							
Quebec				-3.054	***	<0.0001	
British Columbia				1.274	*	0.0352	
N (unweighted)	*432*			*351*			
Rho-squared (P^2)	*0.2*			*0.3*			
Percent Concordant	*71.90*			*79.20*			
Likelihood Ratio	*83.350*			*107.230*			

Significance Level *** p <0.01 ** p <0.02 * p <0.05

Table 5.8:
Any Chronic Condition for Pooled-Sample aged 55+ in 1994/1995

Variable	1994/1995			2000/2001			Diff 94/95-00/01
	B	SIG	p	B	SIG	p	
Intercept	-2.624	***	<0.0001	-2.001	***	<0.0001	1.464
Socio-Demographic Variables							
General Health	1.881	***	<0.0001	1.492	***	<0.0001	-1.187
General Prac. Consultation				0.395	***	0.0016	
Female (Gender)	0.220	*	0.0431				
Married	0.541	***	<0.0001	0.651	***	0.0002	0.539
Speaks Other Lang.	0.448	***	0.0082				
Age Group				-0.650	***	<0.0001	
Lifestyle Variables							
Non-smoker	-0.672	*	0.05				
Daily Smoker	0.311	***	0.0044				
Heavy Drinker	0.215	*	0.0395	0.339	**	0.0114	0.729
Non-drinker				0.307		0.0642	
Education Variables							
High School	-0.230		0.0637	-0.291		0.0703	-0.301
Post Secondary Ed.	-0.228	***	<0.0001	-0.303	***	<0.0001	-0.803
Place of Residence Variables							
Atlantic Provinces				-0.466	*	0.0373	
Quebec	0.302	***	0.0091	0.385	***	0.0094	0.443
N (unweighted)	2670			2256			
Rho-squared (P^2)	*0.1*			*0.1*			
Percent Concordant	72.90			75.60			
Likelihood Ratio	399.710			254.980			
Significance Level	*** p <0.01		** p <0.02		* p <0.05		

Chapter Six

Discussion and Conclusions:

Concluding Thoughts, Contributions, and Extensions for Future Research

6.0 Recapping the Research Objectives

The three original objectives of this research project were to:

1. *To explore the role of stress and mental health upon immigrant health status;*
2. *To investigate the influence and role of age (and arrival cohort) on immigrant health status;*
3. *To gain insights into how chronic conditions influence the health of immigrants*

Each of these objectives was accomplished, and useful information about the health status of immigrants, the various determinants that impart influence on immigrant health status, and how the health status of immigrants differs from the health status of native-born individuals was achieved. Questions still remain unanswered about the influence of health determinants on health status, the influence of arrival cohort on the health status of immigrants, and further research is required to determine how exactly stress, distress, and depression are perceived by immigrants and the cumulative or longitudinal influences these conditions have upon health status. As well, future research will need to investigate what chronic conditions are most influential on immigrant health status, which conditions immigrants are most at risk of developing, and further investigation is required to fully understand how immigrant health changes with time.

Despite these remaining questions this project was successful in providing comprehensive information about how immigrant and native-born health differ within a longitudinal context.

6.1 Summary of the Findings

In most cases the results observed from the present analysis are congruent with the premises presented in the literature, but some of the outcomes diverge from what has been proffered in the past. Traditionally within the literature and immigrant health research, the majority of health variances between the immigrant and native-born group have been attributed largely, and almost exclusively to, the Healthy Immigrant Effect. Although recently there have been some alternative theories offered that would explain health variances, such as restructuring of the Canadian health care system (Birch and Gafni, 1999), a medical system that does not provide culturally sensitive and appropriate care (Anderson *et al.*, 1993; Bentham *et al.,* 1995; Deinard and Dunnigan, 1987), and recognizing that immigrants embody varying perceptions of health relative to the broader public (Anderson, 1987), most researchers still acknowledge the HIE and believe that it exerts a considerable influence on the health trends and patterns present between the immigrant and native-born groups. However, this is where the present analysis diverges from what has been written in the past. The current analysis suggests the HIE may not apply to all health conditions, and may be, as some researchers have theorized "more apparent than real" (Newbold, 2004). While it is true that the current analysis revealed

differences between the immigrant and native-born groups, not all of the observed outcomes are congruent with what has been offered in the literature.

6.2 Discussing Self-Perceived General Health Status and Happiness

Generally speaking, the results observed for the analyses completed on self-perceived general health status and happiness reveal that immigrants and native-born are similarly quite pleased with their health status, with the majority of respondents, regardless of nativity status, ranking their health as excellent or very good and reporting themselves as happy. These results are encouraging and suggest that immigrants, regardless of the hardships they reportedly experience upon immigrating, are happy with their health status. For the most part, the results observed from the analysis are congruent with what is expected. For example, older groups tend to report lower rates of excellent or very good health relative to the younger groups, males report better health relative to females, and Europeans and white respondents rank their health as better relative to their non-European and non-white counterparts. While these results are supported from findings in the literature the variances that are described are somewhat concerning, suggesting that despite a universal health care system and countless efforts to address the health variances present between these various groups, differences in health status persist. In addition, the results further indicate that with time, health status declines, with corresponding increases in the proportion of individuals ranking their health status as 'good' or as 'fair or poor' and individuals reporting themselves as 'unhappy'.

6.3 Discussing Mental Health and Stress

Overall, results from the NPHS analysis revealed that reported stress, distress, and depression rates were low amongst the immigrant and native-born groups, regardless of the various response variables being analyzed. That being said, the native-born group continually reported greater levels of depression, distress, general chronic stress, specific chronic stress, and personal stress relative to the foreign-born respondents. While it is reasonable to assume that the native-born population would report low levels of stress, distress, and depression, as the occurrence of such conditions is most likely attributed largely to daily annoyances and personal tensions within professional and personal relationships, it was not expected that they would report greater levels relative to the immigrant group. These lower levels of stress, distress, and depression reported by immigrants are seemingly out-of place given what has been described within the literature. There are numerous studies, based on self-reported accounts by recent immigrants, stating that the process of immigration is an extremely trying and stress-inducing experience. Immigrating foreign-born individuals are forced to essentially re-establish themselves within the alien host-community, financially, professionally, and socially. Accomplishing such a task would undoubtedly require an unimaginable effort; the process being one of intense stress and frustration. It was therefore expected that the immigrant population, regardless of country of origin, race, age, gender, or when they immigrated to the nation (although each of the factors were also expected to exert some level of influence) would report greater levels of stress relative to the native-born.

While these results are encouraging for the immigrant population, such outcomes were also unexpected and contradict anticipated outcomes. More recent arrivals and immigrants in general, should report more stress relative to the native-born. Unfortunately, due to the lack of research exploring stress and mental health conditions amongst immigrants it is difficult to compare such results against previously observed outcomes, but based on the limited literature that addresses such issues it was anticipated that immigrants would report greater levels of stress, distress, and depression relative to the native-born. Such literature proffers that immigrants experience numerous stressors and hardships throughout the immigration process, and that coupled with the difficulties associated with acculturation following immigration, the foreign-born generally report high levels of stress upon arrival in the destination location. Why then do results from the NPHS contradict these expected results?

Perhaps it is because of the nature of the variables utilized, with the variables inappropriate measures of stress amongst the immigrant group. However, this seems unlikely given the number of stress variables analyzed and because each variable was derived from numerous questions addressing various different types of stress and stressors. Another, more likely, explanation for the divergence from the literature is that while immigrants do report stress, depression, and distress, they may simply not perceive such conditions as having adverse impacts on their health status. As a result of different cultural beliefs, traditions, outlooks, and practices, immigrants may acknowledge stress, hence they would positively report such conditions, but may feel that relative to other determinants of health the influence of stress is minimal, or they may potentially discount

the influence of stress altogether. Finally, stress levels may be low as a result of the changing demographic profiles of recent immigrants to the nation. Recent immigrants may better be able to deal with stress and anxiety following immigration, and may be more able to cope with stressful experiences following resettlement. Again, such differences in the perception of stress may be related to cultural or ethnic differences, or may potentially be due to increasing awareness of the ill effects of mental health conditions on health status by Canadians. As a result a greater number of social services may be provided to immigrants, which may be increasing existing social networks or aiding with the development of new networks.

When stress is analyzed by the various response variables, many of the observed outcomes are reasonable, but concerning to say the least. For example, when stress, distress, and depression are analyzed by gender, the results generally reveal that females reported higher levels of stress relative to males. Some literature has proffered that some immigrant females simply do not perceive stress as a problem and therefore would reasonably report low levels of the condition (Anderson *et al.*, 1993). However, the results from the NPHS analysis seemingly report that regardless of nativity-status, country of birth, race, and age, females do report greater levels of stress; which is a problem. If females consistently report greater levels of stress, then it may be symptomatic of some larger problem, such as too few services being available to them. Of course, the variance between the male and female group may simply be related to different perceptions of stress. Females, for example, may simply be 'more in touch' with their health and be more perceptive of stress, however, results from the literature

would suggest that both male and female immigrants are not necessarily 'in touch' with health, especially among recently arrived immigrants who may be pre-occupied with securing food, shelter, and employment. Even if this is true, then policy must be directed towards immigrants to educate them of the adverse influence of stress upon health status.

Furthermore, results indicate that when predictor variables are analyzed by country of birth and race, that non-European and non-white respondents typically report greater levels of stress, distress, and depression relative to their European and white counterparts. Although previous studies have failed to specifically examine mental health conditions when controlling for such response variables, the literature does state that non-Europeans and non-whites are increasingly likely to report chronic conditions, disabilities, increased activity limitation, and worse self-perceived general health (Chen, Ng, and Wilkins, 1996; Chen, Wilkins, and Ng, (1996). If such groups are increasingly likely to report these outcomes, it may be reasonable that such groups would also report stress, distress, or depression. While it is difficult therefore to say whether the observed outcome is appropriate, the results are reasonable.

The results from the regression analysis typically produced results congruent with what is presented in the literature, although again there are small variances and divergences present. For the most part however, observed outcomes match the anticipated outcomes. Furthermore, the analysis shows that only depression and distress are associated especially with the immigrant variable, suggesting that immigrants are less likely to report depression and more likely to report distress. There is little literature written about the mental health and stress characteristics of the immigrant population,

therefore it is difficult to tell if these observed signs are actually correct, but for the most part they do seem reasonable. The cross-tabulation analysis illustrated that immigrants reported low levels of stress, distress, and depression, which seemingly explains the negative association between immigrants and depression. The results however, do not support the positive association between immigrants and distress. This outcome could again simply be related to various perceptions and interpretations of stress and distress by the immigrant group relative to the native-born group.

6.4 Discussing the Influence of Age

The analysis demonstrates that differences exist between the young and old groups, and that such differences persist into old age, so that the young-old and old-old show similar differences in health status. Overall, the results observed for age are congruent with the literature. Regardless of nativity status, increasing age corresponds with increases in chronic conditions and decreases in self-perceived general health status and happiness. These observed differences between the young and old groups are reasonable and can be explained by the natural and inevitable process of aging.

The results did produce one considerable divergence from the literature or expected results, however, and was observed when the various mental health and stress predictor variables were analyzed. The analysis surprisingly revealed that mean rates of stress were actually greater among the young group (i.e., young and young-old), compared to the old group (i.e., old and old-old). These results were unanticipated, as it was believed that similar to the observed increase in chronic illness with age, the

anticipated level of stress experienced would also increase with age. Despite seemingly contradicting the anticipated outcomes, these results can be interpreted as reasonable, because younger immigrants have been within the county for a relatively shorter period of time, are more active within the labour force, and have greater responsibilities relative to the older group. These factors translate into younger immigrants having had relatively less time to acculturate and adapt to unfamiliar social, economic, political, and health care orientated community, provincial, and national structures. Increased labour force participation may suggest respondents are more physically exhausted and drained due to responsibilities, tensions, and anxieties endured throughout the workday. However, the ability to work should indicate that respondents are healthy, as the ability to work and be productive inherently requires some degree of healthiness. It may be, therefore, that despite being healthy, the cumulative stressors experienced throughout the day still influence such individuals and therefore contribute to higher reported levels of mean stress. Younger groups may also have a greater number of responsibilities relative to older groups, such as having more pressure to raise young families, provide household income, and establish a secure sense of socio-economic status.

Although the levels of reported mean stress between immigrants and native-born are essentially equivalent, reported rates of self-perceived general health status and self-perceived happiness reveal that the native-born group report greater rates relative to the immigrants for the young and old groups; the young-old and old-old native-born group similarly report greater levels of self-perceived general health status, but the young-old and old-old immigrant and native-born groups report nearly equivalent rates of happiness.

These results were unexpected as the literature reports that immigrants should have better health relative to the native-born. However, because the HIE relates exclusively to recent immigrants, but the age analysis focuses exclusively on age, and does not control for time of arrival, the results may actually be reasonable. Results concerning the various chronic conditions analyzed were mixed, with young and old and young-old and old-old immigrants having greater rates of heart disease relative to the native-born groups, but native-born groups reporting greater levels of respiratory disease and any chronic conditions relative to the immigrant respondents. Chen, Ng, and Wilkins (1996) and Chen, Wilkins, and Ng (1996) concluded chronic conditions were less common among immigrants than among the Canadian-born population and that immigrants were less likely than the Canadian-born population to have any long-term disability; which supports findings observed for the respiratory and any choric condition rates. However, the results observed for rates of heart disease contradict the literature. Again, the increased levels of reported heart disease by immigrants relative to the native-born group may be related to the lack of control for arrival cohorts. While it is difficult to say why immigrants would report greater levels of heart disease relative to the native-born, the results suggest that further research is required to investigate this startling trend.

Results from the regression analysis reveal that immigrants belonging to the old-old group seemingly increase the probability of reporting general chronic stress and a chronic condition, but even more interesting is that the regression results suggest that the nativity status response variables was not at all significant in any of the models. The lack of association between the immigrant variable and predictor variables suggests that

immigrants do not particularly have an increased probability of reporting a chronic condition. However, such an outcome may arise because the models are examining the older segment of the population exclusively; potentially suggesting that with increasing age nativity status is not important as a health determinant but rather that with increasing age all individuals are equally as likely to experience various health conditions or in this instance not experience health conditions. Despite nativity status not being an important or significant determinant of health, the other health determinants such as lifestyle choices, income, and education have a greater impact on deciding individual health status.

6.5 Discussing the Influence of Arrival Cohort

Generally speaking, when the various predictor variables included in this analysis are analyzed by arrival cohort, the observed outcomes contradict the anticipated outcome for both the young and old and young-old and old-old groups. Although it was expected that recent immigrants would have the highest levels of stress, report the lowest levels of chronic conditions, and have the highest levels of self-perceived general health status and happiness relative to the other arrival cohort groups, this was not always the case. When self-perceived general health status was analyzed by arrival cohort, the most recently arrived immigrants (1990-1994) and those immigrants that arrived the earliest (Pre 1970) typically reported lower levels of excellent or very good health relative to the other arrival cohorts. Even if recently arrived immigrants reported lower levels of excellent or very good health due to anxieties and conflicts endured throughout the immigration

process, it was anticipated that immigrants who had been in the nation the longest would report much higher levels of self-perceived health. Such individuals would have had the opportunity to establish good socio-economic status, acculturated to the various social systems established in Canada, and any lingering anxieties endured from the immigration process would have long faded. Such trends among the earliest arrived immigrants may be linked to the fact that these individuals would most reasonably represent the older segment of the age group (i.e., oldest proportion of the old and old-old age groups). If these individuals are older, then lower levels of self-perceived health status may be related to increasing chronic conditions, failing overall health, and personal issues. Despite these various factors and conditions, the observed pattern is still surprising and suggests that an 'adjustment phase' may follow immigration and influence health status. Such a phase is proposed when discussing the HIE, suggesting that upon entering the nation immigrants are healthier than the native-born population but that the health status of these individuals deteriorates with increasing time in the nation. Although most commonly the HIE refers to chronic conditions and activity limitations exclusively, if it is thought of in the broader sense, it suggests that most recently arrived immigrants should be healthiest, but this analysis has shown that this is false. The observed adjustment phase observed in this analysis suggests that in fact, most recently arrived immigrants report lower levels of excellent or very good health relative to those immigrants that arrived in 1980-1989 and 1970-1979. Therefore the pattern suggests that only after being in the nation for some time that immigrants rank their health to be the highest.

When self-perceived happiness was analyzed by arrival cohort the results revealed mixed results. The level of happiness reported by each of the arrivals cohorts seemingly fluctuates from one cycle of the NPHS to the next. Despite these fluctuations, one trend is clearly visible in the results, that from 1994/1995 to 2000/2001, regardless of arrival cohort the results typically reveal decreasing levels of self-perceived happiness. The justification for such fluctuations in the levels of self-perceived happiness are unclear, but the results are congruent with what has been observed in most of the descriptive analysis outputs, that with increasing time the levels of happiness decrease.

When the mental health and stress predictor variables are analyzed by arrival cohorts for the young and old group, the results reveal that recently arrived immigrants (1990-1994) report low levels of stress relative to the other arrival cohort. As well, immigrants who arrived between 1980-1989 and 1970-1979 typically report greater levels of stress relative to the 1990-1994 and pre-1970 groups. Furthermore, from cycle one to cycle four the majority of respondents report decreasing levels of stress, distress, and depression. Such results contradict the literature, which states that recent immigrant report high levels of stress as a result of troubles endured throughout the immigration process. Again, these results suggest that an adjustment phase is encountered following immigration in which immigrants do not fully experience the maximum levels of stress until they have resided in the country for a longer duration. While the overall low levels of reported stress by immigrants may be related to different perceptions of stress, this does not explain why most recently arrived immigrants and respondents that arrived the earliest report lower levels of stress relative to those individuals that arrived in 1980-1989

and 1970-1979. Therefore, the observed outcomes, may suggest that those immigrants who arrived most recently may have excellent coping skills or are so optimistic of the changes they have just made that they simply do not experience stress. It is not only until the immigrants have been in the nation for an extended period, and have potentially encountered problems associated with acculturation that they report high levels of stress. Eventually, immigrants are either completely acculturated or have passed through this transition phase and no longer report higher levels of stress. Further research, perhaps of a qualitative nature, may be required to further investigate these observed outcomes.

The results for distress and depression break from the pattern observed for the other mental health and stress conditions. Levels of distress and depression fluctuate between the NPHS cycles (especially when depression is analyzed by arrival cohort), which shows no clearly discernible trends or patterns. These results suggest that depression is a special condition, which fluctuates in intensity depending on personal situations and conditions. It is difficult to establish a general trend for depression due to the instability in results. Further analysis is therefore required to gain better insight into how different arrival cohorts perceive and report depression.

When the predictor variables are analyzed for the young-old and old-old age group by arrival cohort, the results are very surprising. Although the observed trends for self-perceived health status reflect what was observed for the young and old age groups, which have been previously discussed, the results for general chronic stress and heart disease reveal some unusual outcomes. Results for general chronic stress are very unorthodox, and the difference between results observed in 1994/1995 are very different

from those observed in 2000/2001. In the first cycle of the NPHS, most recently arrived immigrants report the highest levels of stress, with each subsequent arrival cohort reporting increasingly lower levels of stress relative to the previous group. In the most recent NPHS cycle, the results are essentially the opposite of those observed in 1994/1995. In 2000/2001, immigrants that arrived between 1990-1994 have the lowest levels of stress with immigrants arriving between 1980-1989 and 1970-1979 reporting increasingly greater amounts, and immigrants that arrived before 1970 reporting a slight decrease in stress levels. The justifications for such outcomes are unclear. While these trends may arise because only the older segment of the population is being investigated, it is difficult to explain why this would have such a large impact on the outcome and why such a large difference between the two time periods is visible.

Although the results for heart disease when analyzed by arrival cohort for the young-old and old-old group are similar to the anticipated outcome with immigrants that arrived earlier, and therefore are older, typically reporting greater proportions of heart disease, the pattern observed for those immigrants that arrived between 1980-1989 are somewhat perplexing. Although results for this arrival cohort do for the most part show the customary increase in reported levels of heart disease from 1994/1995 to 2000/2001, the rates reported by this arrival cohort are considerably lower than rates reported by all other arrival cohorts. Why immigrants that arrived between 1980-1989 would report lower levels of heart disease relative to other arrival cohorts is uncertain and warrants further investigation and observation in future NPHS cycles.

6.6 Research Shortcomings

Despite having access to the full longitudinal sample, which generally included broader variable definition relative to the information available in the publicly released data files, the analysis was still forced to aggregate some variables in order to meet the regulations imposed by Statistics Canada. Future research may be able to derive further in-depth information cornering some of the observed variances between groups by disaggregating response and predictor variables (i.e., by focussing upon specific sources of stress or by exclusively examining heart disease, blood pressure, chronic bronchitis, or emphysema and asthma) and by focusing upon other chronic conditions that could not be explored due to low response rates (i.e., diabetes, arthritis or rheumatism, cancer, etc.).

In addition, not all the variables derived as relevant to immigrant health status could be analyzed, either because the NPHS did not simply collect data regarding them (e.g., community-based social support), or because the variables were not consistent with time and therefore did not 'fit' into the current longitudinal format (i.e., reasons for respondents not seeking health care). Future research will have additional NPHS cycles against which to compare results, enabling the determination of whether or not the observed trends are longitudinal and continuous or unstable and only temporary. By examining more cycles, analysis of the NPHS data will provide further insight into how the health status of immigrants is further changing with time and increasing with age.

Although it may be said that by only analyzing certain variables in 1994/1995 and 2000/2001 the investigation is not a 'true' longitudinal analysis, but to make such an assumption is unfounded. While it is true that the analysis does not follow the traditional

longitudinal format, the analysis does follow the same sample through time and therefore provides insight into the dynamic nature of health. The reason for omitting cycles two and three from some of the analysis was not a voluntary decision, but rather was forced due to limitations of the NPHS study. Despite the presence of these unavoidable limitations, steps were taken to reduce the impact they imparted upon the research, and as a result the project did achieve all of the objectives initially proposed.

6.7 Research Contributions

This research paper contributes to the literature in three different ways. First, the analysis fills gaps within the literature, by offering ideas concerning the Healthy Immigrant Effect and provides new information about the health status of immigrants relative to the native-born population. As well, it presents information concerning how health status is influenced by some of the seemingly underrepresented variables in the immigrant health literature. In particular, arrival cohort and mental health and stress variables, which are both underrepresented in current immigrant health literature, were derived as having significant influences on health status. As a result of these observed influences, such variables should no longer be neglected and researchers should integrate the exploration of these variables into all future investigation of immigrant health status.

Secondly, by utilizing the longitudinal component of the NPHS, the paper contributes empirically to the literature primarily because it analyzes data within a longitudinal context providing comprehensive information about the dynamic nature of immigrant and native-born health status. Although researchers have in the past compared

native-born and foreign-born health status and attempted to elucidate the interaction of the determinants of health with immigrant health, the majority have failed to analyze the data using a longitudinal format. It is the utilization of such data that sets this analysis apart from those previously completed. Although difficulties were still encountered throughout the analysis, and questions remain unanswered about why certain trends and relationships are present in the outcomes, the analysis has provided greater insight into how age, arrival cohort, chronic conditions, and stress and mental health conditions influence immigrant health status, and into how immigrant health status differs from native-born health.

Third, the paper contributes theoretically by presenting information about immigrant health status, discussing some of the differences in health observed between immigrants and native-born, and by observing how various forces, factors, and variables interconnect and influence health status. The paper could further contribute theoretically, by aiding with the direction of policy implementation in order to address the health requirements of immigrants and native-born. For example, policy should be directed at reducing stress levels amongst females. As well, policy could be implemented which attempts to monitor mental health and stress rates amongst immigrants. Finally, policy could be derived and implemented which addresses the differences between the immigrant and native-born groups and attempts to prevent deterioration of immigrant health status with increasing duration in the country. The policy could also be directed at immigrants who arrived between 1970-1979 and 1980-1989 who typically report greater

levels of stress, distress, depression, and overall ill health or worsening health relative to the other groups.

Variable Label	Variable Definition	Variable Category	Variable Type
Age Group	Age of respondent	Socio-Demographic Characteristic	Self-reported
Alberta	Respondent resides in Alberta	Province of Residence	Self-reported
Atlantic Provinces	Respondent resides in either New Brunswick, Nova Scotia, Prince Edward Island, or Newfoundland and Labrador		
British Columbia	Respondent resides in British Columbia		
Ontario	Respondent resides in Ontario		
Prairie Provinces	Respondent resides in either Saskatchewan or Manitoba		
Quebec	Respondent resides in Quebec		
Any Chronic Condition	Respondent has any type of chronic condition diagnosed by a health professional	Chronic Condition	Derived
Heart Disease	Respondent has answered positively to having heart disease[1]		Self-reported
Respiratory Disease	Respondent has answered positively to having respiratory disease[2]		
Arrival Cohort 1970-1979 Arrival Cohort 1980-1989 Arrival Cohort 1990-1994 Arrival Cohort Pre 1970	Respondent's year of immigration	Arrival Cohort	Self-reported
Country of Birth	Origin nation of respondent (Europe or Other)	Socio-Demographic Characteristic	Self-reported
Currently Working	Employment status (currently working, not currently working, never worked, or not currently in the work force)	Socio-Demographic Characteristic	Derived
Daily Smoker Nonsmoker Occasional Smoker	Type of smoker	Lifestyle Variable	Derived
Depression (Scale)	Respondent is depressed	Stress and Mental Health Variables	Derived
Distress (Scale)	Respondent is distressed		
General Chronic Stress (Scale)	Respondent has general chronic stress		
Personal Stress Index	Respondent has personal stress		
Self-Perceived Happiness	Self-perceived happiness ranking (happy or unhappy)		
Specific Chronic Stress	Respondent has specific chronic stress		
Female (Gender)	Gender or respondent (male or female)	Socio-Demographic Characteristic	Self-reported

Appendix 1.1 con't...

Variable Label	Variable Definition		Variable Category	Variable Type
General Practitioner Consultation	Respondent has consulted with a general practitioner in the last 12 months		Socio-Demographic Characteristic	Self-reported
Heavy Drinker Moderate Drinker (Occasional) Nondrinker	Type of drinker		Lifestyle Variable	Derived
	Income Adequacy			
	Income Level	Household Size		
Low Income	< $10, 000 < $ 15, 000	1 – 4 5+		
Lower Middle Income	$ 10, 000 - $ 14, 999 $ 10, 000 - $ 19, 999 $ 15, 000 - $ 29, 000	1 – 2 3 – 4 5+		
Middle Income	$ 15, 000 - $ 29, 000 $ 20, 000 - $ 39, 000 $ 30, 000 - $ 59, 000	1 – 2 3 – 4 5+	Income and SES Variable	Derived
Upper Middle Income	$ 30, 000 - $ 59, 000 $ 40, 000 - $ 79, 000 $ 60, 000 - $ 79, 000	1 – 2 3 – 4 5+		
High Income	$ 60, 000+ $ 80, 000+	1 – 2 3+		

Variable Label	Variable Definition	Variable Category	Variable Type
Less than High School	Highest level of education (respondent has not completed high school)	Income and SES Variable	Derived
High School	Highest level of education (respondent has completed high school)		
Some-Post Secondary Education	Highest level of education (respondent has completed some post-secondary education)		
Post- Secondary Education	Highest level of education (respondent has completed post-secondary education)		
Immigrant	Type of immigrant (Native-born or Immigrant)	Nativity Status	Self-reported
Married	Marital status (married, single, divorced, or widowed)	Socio-Demographic Characteristic	Self-reported
Physically Active Moderately Active Physically Inactive	Level of physical activity [physical activity index = inactive (<1.5 kcal/kg/day energy expenditure) / moderately active (1.5-2.9 kcal/kg/day energy expenditure) / highly active (>3 kcal/kg/day energy expenditure)]	Lifestyle Variable	Derived
Race	Respondent's race (White or Other)	Socio-Demographic Characteristic	Self-reported
Self-perceived general health status	Self-perceived general health status ranking (excellent or very good, good, and fair or poor)	Socio-Demographic Characteristic	Derived
Smoker in Household	Household member smokes inside house	Lifestyle Variable	Self-reported
Speaks Other Language	Respondent speaks a language other than English or French	Income and SES Variable	Derived

1 Aggregated variable combining heart disease and elevated blood pressure

2 Aggregated variable combining chronic bronchitis or emphysema and asthma

Appendix 2.1

Variable Label	1994 / 1995	1996 / 1997	1998 / 1999	2000 / 2001
Age Group	✓	NA	NA	NA
Alberta	✓	✓	✓	✓
Any Chronic Condition	✓	✓	✓	✓
Arrival Cohort 1970-1979	✓	NA	NA	NA
Arrival Cohort 1980-1989	✓	NA	NA	NA
Arrival Cohort 1990-1994	✓	NA	NA	NA
Arrival Cohort Pre 1970	✓	NA	NA	NA
Atlantic Provinces	✓	✓	✓	✓
British Columbia	✓	✓	✓	✓
Country of Birth	✓	NA	NA	NA
Currently Working	✓	✓	✓	✓
Daily Smoker	✓	✓	✓	✓
Depression (Scale)	✓	✓	✓	✓
Distress (Scale)	✓	✓	✓	✓
Female (Gender)	✓	NA	NA	NA
General Chronic Stress (Scale)	✓	X	X	✓
General Practitioner Consultation	✓	✓	✓	✓
Heart Disease	✓	✓	✓	✓
Heavy Drinker	✓	✓	✓	✓
High Income	✓	✓	✓	✓
High School	✓	✓	✓	✓
Immigrant	✓	NA	NA	NA
Less then High School	✓	✓	✓	✓
Low Income	✓	✓	✓	✓
Lower Mid Income	✓	✓	✓	✓
Married	✓	✓	✓	✓

Appendix 2.1 con't...

Variable Label	1994 / 1995	1996 / 1997	1998 / 1999	2000 / 2001
Middle Income	✓	✓	✓	✓
Moderate Drinker (Occasional Drinker)	✓	✓	✓	✓
Moderately Active	✓	✓	✓	✓
Non-drinker	✓	✓	✓	✓
Non-smoker	✓	✓	✓	✓
Occasional Smoker	✓	✓	✓	✓
Ontario	✓	✓	✓	✓
Personal Stress Index	✓	X	X	✓
Physically Active	✓	✓	✓	✓
Physically Inactive	✓	✓	✓	✓
Post -Secondary Education	✓	✓	✓	✓
Prairie Province	✓	✓	✓	✓
Quebec	✓	✓	✓	✓
Race	✓	✓	✓	✓
Respiratory Disease	✓	✓	✓	✓
Self-perceived general health status	✓	✓	✓	✓
Self-Perceived Happiness	✓	✓	✓	✓
Smoker in Household	✓	✓	✓	✓
Some Post-Secondary Education	✓	✓	✓	✓
Speaks Other Language	✓	✓	✓	✓
Specific Chronic Stress	✓	X	X	✓
Upper Middle Income	✓	✓	✓	✓

✓ Variable is present in this cycle

X Variable is absent from this cycle

NA Variable is not applicable (variable was previously established)

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