2002

Determination of a physical health index based on the national population health survey and an evaluation of the index on a workplace sample

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THE DETERMINATION OF A PHYSICAL HEALTH INDEX BASED ON THE NATIONAL POPULATION HEALTH SURVEY AND AN EVALUATION OF THE INDEX ON A WORKPLACE SAMPLE

by

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A THESIS SUBMITTED IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE DEGREE OF

Master of Science

in the School of Kinesiology

November, 2002

Your file Votre référence
ISBN: 0-612-83423-9
Our file Notre référence
ISBN: 0-612-83423-9

ABSTRACT

There have been myriads of health factors identified in the literature that influence human health and well-being. Often times, health is broken up into several dimensions such as social, physical, spiritual, emotional, psychological, and intellectual. Physical health status, as opposed to health status, only focuses on the measures that influence physical health. In essence, it can be viewed as a complex on it's own; the complexity of the interactions that exist between the various measures of physical health. In the current investigation, the third wave (1998/1999) of the National Population Health Survey (NPHS) was used to derive a physical health index based on the number of chronic conditions reported. Regression analysis was conducted on the NPHS and identified variables that predict the number of chronic conditions reported. These variables were utilized to derive a physical health questionnaire which was delivered to 262 full-time Lakehead University employees yielding a response rate of 38%. Regression analysis performed on the workplace data identified five statistically significant ($p < 0.001$) predictors of the number of chronic conditions reported. These variables included the number of jobs an employee held, the level of physical activity for a usual day, the number of repetitive strain injuries, a distress score, and a measure of the respondent's general health. The physical health equation was then applied to individuals in the NPHS that worked full-time hours (>30 hrs/week) and were between the ages of 22 to 64 as identified in the demographics of the workplace data set. An independent t-test identified that the physical health index of the workplace (N=100, 1.75 ± 0.79,) was statistically different ($p < 0.001$) from the physical health index of the NPHS data set (N=6813, 281 ± 0.75). The variables that led to a statistical difference in the scores of the physical health index included the number of jobs, level of physical activity for a usual day, the number of RSI

reported and distress scores. More research is needed to validate the physical health index using a different sample. There is also a need to apply the physical health index to another Ontario or Canadian University as well as a different workforce, to determine if any of the characteristics of physical health are unique to the University in the present investigation.

ACKNOWLEDGMENTS

I would like to take this opportunity to thank my thesis supervisor Dr. Moira McPherson for her support, suggestions and guidance during my thesis process. I would also like to thank my thesis committee including Dr. William Montelpare, Dr. Robert Thayer and Dr. Jane Crossman for their keen insight and helpful comments.

To my family and friends, thank you for all your help and kind words along the way - your time, patience and encouragement were much appreciated. To the staff at Lakehead University, thank you for taking the time to be a part of my study.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

INTRODUCTION

Health is defined as "a state of complete physical, mental, and social well-being and not merely the absence of disease or infirmity" (World Health Organization, p.756). Optimal health has been defined as "a balance of physical, emotional, social, spiritual and intellectual health" (O'Donnell, 1986) which suggests that "health is a dynamic status that results from an interaction between hereditary potential, environmental circumstance, and lifestyle selection" (Carter & Wilson, p.5). Health has been described as not being the same as having a medical condition; that an individual can still be healthy with a medical condition and health status is a personal condition that an individual is responsible for: doing our own things, positive, negative thoughts, feelings or behaviours (Carter, 1984). Therefore, as detailed with the various definitions, health as a concept is seen as a resource for everyday life, not the objective for living. It is a positive concept that emphasizes social and personal resources as well as physical capabilities.

The challenges that face health begin with devising a simple global concept of it. The first problem lies in that health status cannot be measured directly as inferences can only be made from fallible indicators (Ware, Brook, Davies, & Lohr, 1981). These indicators are distinct concepts, yet they are substantially interrelated; one affects the state of the other (Ware et al., 1981). Secondly, there is no single accepted index to measure health status (Wetzler, 2000). Most researchers and professionals use different evaluation criteria (Wetzler, 2000). Often times, different aspects of health are analysed or assessed to place more emphasis on the various aspects of health (Wetzler, 2000). While it is important to address all the dimensions of health, valuable information in any one of the dimensions may get left out to keep the questionnaire from becoming lengthy.

Seven basic categories of health status have been described as: general health measures, measures of physical function, pain measures, social health measures, psychological measures, quality of life measures, and disease specific measures (Donovan et al., 1993; cited in Barrett & Victor, 1997). Trends in health status measures have specifically focussed in on: physical function, emotional function and social function, role performance, pain and other symptoms (Fitzpatrick et al., 1992; as cited in Barrett & Victor, 1997).

Physical health is one component of the health gestalt ("an organized whole that is perceived as more than the sum of its parts"; Bisset, 2000). The importance of physical health has been described by government actions and research studies on the promotion and understanding of physical health and well-being. Studies have reported the importance for physical functioning and overall physical health (Hagart & Billington, 1982). Various indices including direct measures using resting heart rate and blood pressure and indirect measures such as perception of general health and number of symptoms reported have been used to measure physical health.

The workplace has been identified as a rich source of health information for epidemiological studies (Jones & Pitt, 1999). Employees are often tested due to their accessibility within a researching company or for the primary purpose of studying employee health and wellness.

Many studies have focused on defining, identifying and calculating health status. There are few studies that have devised ways to define an 'index' of physical health status. To the researchers knowledge, there has been no study to date that has used a national data set and a workplace to derive an index of physical health status.

Definition of Health

According to Young (1998) the traditional definitions of "health" typically described health as a biomedical consideration. Outcomes of health are often expressed in negative terms, associating health with morbidity, mortality and manifestations of ill-health (Blanchet, 1990; Young, 1998). Progress toward a healthy society is typically measured by the reduction in morbidity (hospital use, visits to the doctor) (Shah, 1994) and mortality (decreases in crude death rates) (Shah, 1994) and the suggested relative outcomes such as decreased health care costs (Blanchet, 1990).

In 1948 the World Health Organization (WHO) explicitly re-defined health as "a state of complete physical, mental, and social well-being and not merely the absence of disease or infirmity" (World Health Organization, p.756). Despite this statement, health, especially in Canada was considered more from a biological perspective until 1974 when then Rt. Honourable Marc Lalonde released the Federal initiative entitled "A New Perspective on the Health of Canadians" (Health and Welfare Canada, 1974). This was followed in 1986 with the "Achieving Health for All" document of Health and Welfare Canada. In this new approach Canada's Federal health agencies took an active step toward considering health, not merely as the absence of disease or infirmity but as a positive state that individuals could strive for.

The current emphasis and definition of health now focuses on vitality (the presence of energy, enthusiasm and, in general, "aliveness"); and quality of life (MacArthur & MacArthur, 1999). Health is a gestalt. Thus regarded, health is a multi-dimensional "state" which draws from variable existence in each dimension of the Gestalt. For example, while an individual may have optimized their existence in the physical dimension they may be in a state of flux on their social or

emotional dimensions. This considered, health is a dynamic state which, at any single point is a demonstration of the individual's position in all related dimensions. To this end, one should consider health as a "complex" and therefore the measurement of health as a reflection of an individual's state within the complex.

Definition of Health Status

Previous research by Carter (1984) stated that health status "results from an interaction between hereditary potential environmental circumstance, and lifestyle selection" (p. 35). Considering Carter's description of health status in this regard, one can expect that health status is a complex. The complex consists of at least the following measures: income inequality, the psychosocial environment (social capital and sense of control over life's circumstances) and physical health (chronic conditions, restricted activities, self-rated general health, physical functioning capacity; Balis, Segall, Manhon, Chipperfield, & Dunn, 2001; overweight or obesity, high blood pressure, heart disease, osteoarthritis; Eckersley, 2001).

As stated previously, an individual may have achieved higher or lower states on the various dimensions of health at any given time, which can be measured and the measurements can be compared within and between the dimensions of the dynamic process. However, using health indicators and establishing specific contributing variables to the "index of health" is beyond the traditional descriptions of health as a function of demographics (Young, 1998).

The concept of a gestalt provides a reference from which one can refer to the measures of health contained within. From this gestalt one can conceptualize one's own health as a 'status' by reflecting on the measures of health that are contained within the gestalt and by ranking themselves according to their health along a continuum. Another method suggested by Young

(1998), is to create an 'index' called health status. Defining an individual's status of health results form the computation of measures of health for an individual. Comparing the status of an individual's health based on arithmetic computation creates an "index" where the term index is defined as mathematical formulas that draw from several health indicators, based on the complexity of the interactions that exist between the health attributes (Young, 1998). These derived formulas allow for the discrete measurement and comparability of an individual either within a given cohort or a larger population.

Indexing health allows for manageability, (manipulation) and representation of health. The practical application of health indices are that they are able to detect changes in health status over time. Among researchers there has been an increasing interest in applying multidimensional health indices to evaluate health (Kopec, Williams, To, & Austin, 2000). One such index that has gained attention in Canada is the Health Utilities Index (HUI) which was developed by Torrance and Colleagues at McMaster University. Previous versions of the HUI (Marks 1 and 2) were designed for clinical studies in children. The current Mark 3 version provides descriptions of functional health based on eight attributes: vision, hearing, speech, mobility, dexterity, cognition, emotion and pain/discomfort with each attribute having 5 or 6 levels of function (Kopec et al., 2000). Since 1990, the HUI has been implemented into several surveys in Canada one of them being the National Population Health Survey (NPHS) (Kopec, Williams, To, & Austin, 2001).

Definition of Physical Health

It is difficult to confirm a definition for physical health because most literature dealing with physical health defers to the absence of a disease (benign tumors indicating a physically healthy specimen) or the development of a condition such as achieving fitness. Rosenberg &

Tannenbaum (1991) argued that physiological testing alone is not representative of an individual's health. Often physical health has been measured by means of self-reports, symptom reporting and number of medications taken (Grau, West, & Gregory, 1998). External assessments suggested by Idler & Kasel (1991; cited in Grau et al., 1998) include measures of behavioural functional disability, in addition to symptoms, numbers and types of conditions, medication use and direct physical measurements. There are abundant tests and procedures available to measure direct physical health. One of the most commonly used direct measures is VO2max (maximum volume of oxygen consumed in one minute). This type of test and many other physical tests can be complex, time consuming and may require the expertise of professionals (Young, 1998). With the complexity and time consuming nature of some of these tests (including VO2max), it is more economical to determine physical health through methods suggested by Grau et al. (1998) as described above.

Most literature on health deals with the physical aspect of health. A prevalent notion is that physical activity contributes to better health. In 1996, the United States Department of Health and Human Services released a report on Physical Activity and Health. The U.S. Department of Health and Human Services (1996) reported that the evidence of linking physical activity to numerous health improvements was substantial and that higher states of physical health can be achieved through positive lifestyle changes. According to the position statements released by the American College of Sports Medicine (ACSM) (1994; cited in U.S. Department of Health and Human Services, 1996) and in Canada, The Canadian Society for Exercise Physiology (CSEP) (1998) to increase health, physical activity should be performed regularly at a moderate intensity. Both position statements concur that changes in physical health should be positive

lifestyle adaptations and that increases in physical health are related to positive 'levels' in the other determinants of health including the psychosocial, emotional, economical and spiritual environments.

Definitions of physical health are slowly emerging in the literature. A definition by Hales (1994) stated that "the various states of good and ill physical health can be viewed as points on a continuum. At one end is early and needless death; at the other is optimal wellness when you feel and perform at your very best" (p. 3). Hahn & Payne (1994) state physical health as "physiological and structural characteristics that are called upon to help accomplish developmental tasks" (p. 8). Combining these definitions of physical health implies that physical health is the combination of the dynamic physical and physiological states of the human body. Physical states would include such factors as: levels of physical activity, body functioning, symptom reporting, limitations to physical abilities and the presence of chronic conditions, where physiological states would include operational items such as: heart rate, blood pressure, height, weight and white blood cell count.

Definition of Physical Health Status

Physical health status suggests a measurement of an individual's state of "health" in relation to a baseline or bipolar continuum anchored by illness versus health. To this end, a measure of physical health status will be comprised of a myriad of physical health measures including blood pressure, resting heart rate (Eckersley, 2001), VO2max and flexibility (Young, 1998). An individual's health status would be evaluated through the balance between achievement on selected measures of physical health status and the presence of chronic conditions (heart disease, osteoarthritis, type II diabetes, restricted activities and physical functional

capacity). Likewise, many of the other determinants of health affect physical health. Such determinants include demographics and socioeconomic factors (income, education, employment, geographical disparities) (Wilson, Jerrett, & Eyles, 2001) and social factors (self-efficacy) (Fletcher & Babasik, 2001), and coping with stress (The Federal, Provincial and Territorial Advisory Committee on Population Health [ACPH], 1999; Canadian Fitness and Lifestyle Research Institute [CFLRI], 1997).

Hagart & Billington (1982) investigated the perceived importance of 24 health related variables. The researchers found that when asked to judge the importance of various health dimensions, medical and lay persons ranked physical functioning, physical state and physical symptoms within the top four of 24 health related variables, indicating the perceived importance of physical health (Hagart & Billington, 1982).

In a different study using data from the Human Population Laboratory of Alameda County, California, a relationship between seven health habits and physical health status with respect to mortality was determined (Breslow & Enstrom, 1980). The seven health habits included: never having smoked cigarettes, regular physical activity, moderate use of alcohol, 7-8 hours sleep per day regularly, maintaining proper weight, eating breakfast and not eating between meals (Breslow & Enstrom, 1980). The number of health practices showed an inverse relationship with age-adjusted mortality rates (Breslow & Enstrom, 1980). Specifically, men following seven health practices had a mortality rate 28% to that of men following zero to three health practices (Breslow & Enstrom, 1980). Women following 7 health practices had a mortality rate 43% to that of women following zero to three health practices (Breslow & Enstrom, 1980).

As with "health status", physical health status has the capability of measurement and

comparability at a cohort and population level. With the focus solely on physical health status, changing the focus from a group of health determinants to one single determinant should allow for greater manageability and understanding of the complexity of the interactions within health specifically related to the aspects within physical health. To date, no surveys or questionnaires have been designed to measure (or index) physical health alone. Within many surveys and questionnaires, questions pertaining to a person's physical activity levels (frequency, intensity, time, type), symptoms reported, chronic conditions (diabetes, asthma, arthritis), physical characteristics (height, weight) and physiological characteristics (heart rate, blood pressure) are asked.

From the definition of physical health stated previously as the dynamic physical and physiological states of the human body, questions pertaining to physical health from surveys and questionnaires could potentially provide an index of physical health status.

Workplace Health

Much of the research in the area of health has been conducted on employees. The workplace is rapidly changing with the increasing use of computer networks and has been identified as a rich source of health information for epidemiological studies (Jones & Pitt, 1999).

Most literature investigates the specific effects of health within the workplace. The effects of health have been studied on such maters including: workers' compensation costs (Musich, Napier, & Edington, 2001), sickness prevention (Manring, 1985), increases in productivity (Burton, Conti, Chen, Shultz, & Edington, 1999; Hunnicut, 2001; Riedel, Lynch, Baase, Hymel, & Peterson, 2001), and analyses of employee health and wellness (Stevens, Paine-Andrews, & Franciso, 1996).

Specifically related to the university as a workplace, research has investigated the effects of health related to social networks of support (Chor, Griep, Lopes, & Faerstein, 2001), workplace harassment and coping strategies (Richman, Rospenda, Flaherty, & Freels, 2001), gender differences in reporting minor morbidity (Emslie, Hunt, & Macintyre, 1999), medical costs (Kingery, Ellsworth, Corbett, Cowden, & Brizzolara, 1994; Eddington, 2001), job satisfaction and perceptions of health (Peterson & Wilson, 1996; Peterson & Dunnagan, 1998), productivity (Edington, 2001), development and validation of sense of support scales (Dolbier & Steinhart, 2000), and the induction and evaluation of health promotion programs (Timms, Abercrombie, Saccogna, Natvig, Douglas, Mayo, & Walton, 1997; Goetzel, Kahr, Aldana, & Kenny, 1996; Dunnagan & Haynes 1998).

Dolbier & Steinhardt (2000) developed a sense of support scale and evaluated this scale on a sample of university (N = 66) and corporate employees (N = 398). The particular study was pursued one step further in that the researchers also evaluated the scale on a sample of undergraduate university students (N = 120). The researchers investigated the relationship between the sense of support scale and symptoms of illness which were determined by a symptom of illness checklist which consisted of 20 items measuring physical and psychological symptoms. Symptoms found on the checklist included the detection of a common cold/flu, headaches, upset stomach and the feeling of being nervous/tense. The researchers found a main effect for their sense of support scale on symptoms of illness implying that social support has a beneficial effect on health regardless of whether an individual is under stress or not. In addition to this main effect, the researchers performed a linear regression using symptoms of illness as the dependent variable and negative affectivity, sense of support, and perceived stress as independent variables.

The results of the regression analysis suggested that negative affectivity, sense of support and perceived stress accounted for 49% of the variance in symptoms of illness (Dolbier & Steinhardt, 2000).

Emslie, Hunt, & Macintyre (1999) studied gender differences in self-reports of minor morbidity using full-time, white collar employees in a British university. The researchers also investigated whether the relationship between reported working conditions and health is similar for both men and women. The three indicators of morbidity included experience of malaise symptoms, physical symptoms and scores on a psychiatric screening instrument. Physical symptoms included detection of hay fever, constipation, trouble with eyes, a bad back, colds and flu, trouble with feet, kidney or bladder trouble, painful joints, trouble with ears, sinus trouble or catarrh and persistent cough. The researchers used white collar employees to control for participation in the formal labour market. As well, they considered the types of jobs the employees held within the university (junior academic, technical or clerical), sociodemographic variables (age, marital status, parental status and partners occupation), working conditions (lack of job stimulation, job drain, physical working conditions, low work ethic, physical and emotional energy) and orientation to gender roles (gender role orientation, attitude to traditional roles, job equality score, domestic workload, work/home conflict) (Emslie, Hunt, & Macintyre, 1999). Results indicated that female employees reported significantly more physical and malaise symptoms than male employees. However, average scores on measures of minor morbidity did not differ by gender. When the researchers controlled for occupational grade, perceived working conditions and orientation to gender roles, there were no differences between men and women in any of the three health measures. Such results suggest that the relationship between reported

working conditions and health is similar for both men and women when occupational grade, perceived working conditions and orientation to gender roles are controlled for.

To date, there has been no published literature on the evaluation of a sample of university employees and the health of a nation. However, in a study by Dunnagan & Haynes (1998), the researchers created a baseline of health indicators for wellness programming by evaluating a sample of employees at Montana State University (N = 243) to a sample of Montana residents (N = 1,189). The researchers demonstrated that existing data sets could be helpful in developing cost-efficient baseline measures of health status and health behaviours within workplace settings. Variables that were controlled included: racial and gender characteristics, age classifications, marital status, education levels and income (Dunnagan & Haynes, 1998). Variables that were evaluated included: blood pressure, high blood pressure, cholesterol, high cholesterol, physical activity status, body mass index, smoking status and seatbelt use (Dunnagan & Haynes, 1998). The researchers suggested that to make workplace data understood, the data should be presented within the context of meaningful reference groups including state-wide and national statistics.

Research such as presented by Dolbier & Steinhardt (2000), Emslie, Hunt, & Macintyre (1999) and Dunnagan & Haynes (1998), have identified the use of symptom reporting, the importance of information from state-wide statistics and the development of indices using university employees. However, research so far has not incorporated these concepts into one comprehensive study. That is, no research thus far has developed an index based on symptom reporting derived from a national survey and evaluated the index on full-time university employees.

Definition of the Determinants of Health

Determinants have been defined as causes, mediating factors and contextual influences (Edwards, 1999) and as factors that keep some people happy (why an individual's health status is what is it) (Young, 1998). This description suggests that determinants are specific, individual components that comprise health. Shah (1994) described determinants as categories that organize individual factors. This description suggests that determinants classify specific factors (i.e. where physical health is the determinant, resting heart rate and blood pressure are individual factors that comprise physical health which in turn comprises health).

In 1974, when the "Health Field Concept" from "A New Perspective on Health of Canadians" was released, four elements were outlined that influenced the health of Canadians (Lalonde, 1974). The elements listed were: Human Biology, Environment, Lifestyle and Health Care Organization. This was one of the earliest notions of health being depicted as determinants. Not until the 1990's did the concept of determinants become familiarized. Since the 1990's, there has been an abundance of research into the determinants of health.

Determinants provide a positive experience toward health. When health is examined from the view of determinants, this perception provides a better sense of prevention and education of the possible risks rather than looking at health from the perspective of risks where health is viewed as a treatment and as a reflection on personal experience. This concept is depicted in Figure 1.

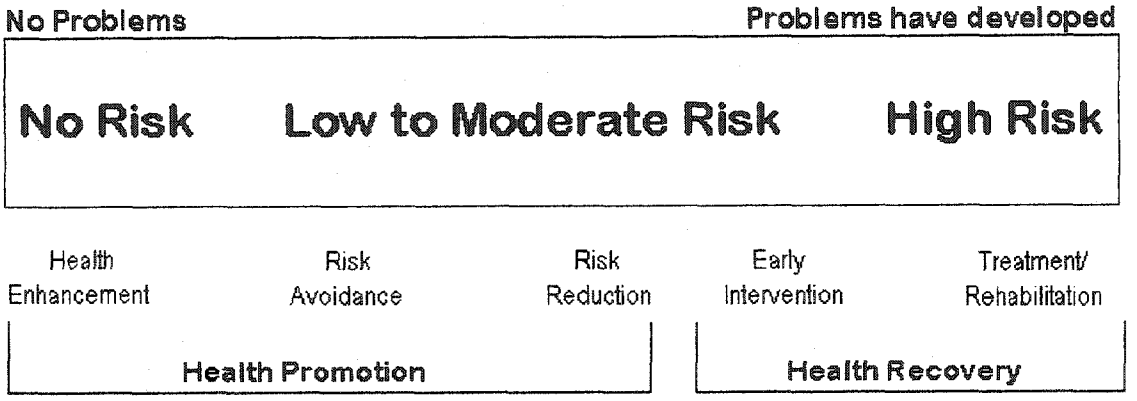


Figure 1. Continuum of Risk (The Ontario Ministry of Health, 1988; cited in Shah, p. 14)

The Known Determinants of Health

The pathways to health and disease involve the complex interaction of all the determinants of health with their respective factors influencing health and disease in varying degrees. Despite using different terminology, the elements which researchers hold to be fundamental to health are the same. The following determinants of health and their associated factors are listed under the terminology for determinants of health presented by Lalonde (1974).

Human Biology

Human biology encompasses the mental and physical aspects of health of the human body (Shah, 1994). Hereditary plays an important role in the causation of diseases (Young, 1998). Diseases may be congenital (present at birth) or familial (occurs in several close relatives) (Young, 1998). Genetic factors (inherited disorders and predisposition of disease), contribute to susceptibility, initiation and recovery from injuries (Young, 1998).

Maturation and ageing contribute to human biology as well (Shah, 1994; Young 1998). Positive stimulation early in life improves learning, behaviour and health into adulthood (Health Canada,1999). With age, Kind, Dolan, Gudex, & Williams (1998) found that rates of reported

health problems increased significantly ($p<0.001$). Kind's findings indicated that older individuals are more likely than younger individuals to have physical illnesses. The Federal, Provincial and Territotial Advisory Committee on Population Health (ACPH) (1999) reported gender differences with respect to rates of potential years of life lost before the age of 70. The report stated that the rates of potential years of life lost were almost twice as high for men than for women (ACPH, 1999). These rates of potential years of life lost were reported to be approximately three times as high among men aged 20-34 (ACPH, 1999). Although this suggested that women live longer, the report also stated that women were more likely to suffer depression, stress and overload (ACPH, 1999).

The Environment

The environment is described as all factors that are outside the human body that may affect health (Shah, 1994). Individuals often have little control over this environment though they may be able to control their exposure to some of the suggested factors (Shah, 1994). The environment is divided into two parts, the physical environment and the psychosocial environment.

Physical Environment

The physical environment is comprised of all that is external to the human body (Young, 1998). Elements of the physical environment include air, water and soil; products that humans may be exposed to (food and drugs); physical handling of disposal of waste; and control over excessive noise (Shah, 1994). Direct exposure to such things as radiation or chemicals, may affect health directly or indirectly (Shah, 1994). The physical environment can be organized according to nature of hazard (biological, chemical, physical); the source (natural industrial, agricultural); place of occurrence (air, water, soil, food); site of exposure (home, work, school, community);

and route of exposure (inhalation, ingestion, contact, bites) (Young, 1998).

There is an increasing concern towards indoor air pollution (Young, 1998). Indoor air pollution has recently been considered more serious than exposure from the outdoor environment because the concentration of pollutants increases in enclosed spaces (Young, 1998). Main sources include tobacco smoke, cooking and heating, use of wood-burning stoves, kerosene heaters, gas fire stoves, furnishing and construction material (may contain asbestos), household chemicals and radon gas (can filter into house from underlying rocks) (Young, 1998). Biological agents (bacterial spores, mold, dust mites, dander) may also compromise the indoor environment (Young, 1998).

It has been reported that water sources (surface water, groundwater, precipitation), whether in the presence or absence of human activity, may potentially be exposed to pollution (Young, 1998). In foods, pesticides, food additives and unsatisfactory conditions for raising livestock may cause adverse health effects (Young, 1998).

Physical factors in the home may produce negative health outcomes (ACPH, 1999). Adverse conditions include lack of access to piped water and sanitary facilities, high levels of noise, poor indoor air quality, inadequate refuse storage, overcrowding, poor lighting, building defects and pests (ACPH, 1999). Poor housing facilities have been linked to increased rates of respiratory infection and other respiratory diseases (ACPH, 1999).

Negative effects of the physical environment on physical health include increases in: premature mortality, hospital admissions, emergency room visits, visits to the doctor, reduced physical performance, medication use, symptoms and impaired pulmonary function (ACPH, 1999).

The Psychosocial Environment

The psychosocial environment is determined by the social and physical environments that individual's are exposed to. Psychosocial environments include places of work, living, level of education, income and social supports. Socioeconomic status (SES) is commonly used as an indicator of the psychosocial environment. Socioeconomic status reports are based on either occupation, education, income or a combination of all three (Shah, 1994). No matter how socioeconomic classes are defined, there exists a gradient that has been consistently demonstrated for measures of morbidity, mortality and individual diseases (Young, 1998). Differences in socioeconomic status can be attributed to geographical locations, gender, race or ethnic origin and employment status (Shah, 1994). Differences in health and socioeconomic status have been studied extensively. Findings from the Canada Health Survey provides evidence that poorer health status exists in lower socioeconomic groups (Manga, 1987). There has been an increasing awareness that the socioeconomic environment greatly influences individual lifestyles. Variations in education and income have accounted for differences in physical health status and it has been suggested that these differences indirectly explain the differences in self-rated health status (Ratner, Johnson, & Jeffrey, 1998).

Income. Some studies have suggested that income is the single most important determinant of health: that as wealth increases, so does health (Canadian Institute of Health, 1990; ACPH, 1999; Central Kings Community Health Board, 1998; Pritchett & Summers, 1996). In Canada, it has been found that with each rung up the income ladder, Canadians experience less sickness, longer life expectancies, and improved health (ACPH, 1999; Central Kings Community Health Board, 1998). Aspects of health have been found to vary systematically by socioeconomic

status (McDowell, 2000) and income inequality has been found to be associated with poorer self rated health (Blakely, Kennedy, Glass, & Kawachi, 2000). In the federal report "Achieving Health for All" (Epp, 1986), disadvantaged groups were stated to have significantly poorer health than average Canadians. In Canada, 47% of Canadians in the lowest income bracket rated their health as very good or excellent, compared with 73% of Canadians in the highest income group (ACPH, 1999). Low income Canadians were found more likely to die earlier and to suffer more illnesses than Canadians with higher incomes, regardless of age, sex, race and place of residence (ACPH, 1999).

People with lower incomes have been found to be less physically active than those people with higher incomes (MacDougall, Cooke, Owen, Willson, & Bauman, 1997). Barriers to physical activity in relation to income include possible costs of equipment and user fees for recreational activities (ACPH, 1999). Such high costs were reported as reasons for not participating in physical activities (ACPH, 1999). The highest rates of leisure-time physical activity were reported by individuals with the highest income (ACPH, 1999).

Employment. Having a job has a positive influence on health (Highland Health Board, 1999). A job provides adequate income to support purchases for food, shelter and clothing (Canadian Institute of Health, 1990). There has been a strong link reported between health and meaningful employment. That is, employment provides personal sense of satisfaction and latitude for decision making (Canadian Institute of Health, 1990). People with more control over their work and less stress-related job demands have been found to be healthier (The Central Kings Community Health Board, 1998). Unemployed people have been reported to take more visits to a physician, have more hospital stays (Canadian Institute of Health, 1990), suffer from higher rates

of depression, panic attacks and substance abuse (Avison, 1998). Unemployment has been found to be a significant risk factor for mortality including physical and mental problems (Avison, 1998).

Workplace hazards and injuries are significant causes of health problems (The Central Kings Community Health Board, 1998). Unsatisfactory working conditions have been reported to cause stress and ill health (Highland Health Board, 1999).

Education. A persons level of education determines to a large extent, their capacity to write, read and manipulate numbers (Canadian Institute of Health, 1990). This in turn has a significant impact on employment options, personal and workplace safety conditions and accessibility to information upon which a person can make informed choices (Canadian Institute of Health, 1990). Education increases opportunities for income and job security and gives people a sense of control over life's circumstances (Central Kings Community Health Board, 1998). Researchers agree that health improves with level of education: as education increases, so does health (The Central Kings Community Health Board, 1998; Canadian Institute of Health, 1990; Kind et al., 1998). Persons with higher levels of education were found to report significantly lower rates of health problems (Kind et al., 1998)

In Canada, people with low literacy skills were more likely to be found unemployed and poor, to suffer poorer health, and to die earlier than Canadians with high levels of literacy (ACPH, 1999). Canadians with higher levels of education were reported to have better access to healthy physical environments and were better able to prepare their children for school than people with low levels of education.

Level of education has been related to levels of physical activity. MacDougall et al. (1997) found that people with no formal or primary education were more likely to have low levels

of activity. As well with each successive level of education, the chances of being overweight have been shown to decrease (ACPH, 1999).

Social Contacts. Social relationships provide individuals with emotional and financial support (Young, 1998). Social networks provide valuable contacts and information which may have both direct and indirect health benefits (Young, 1998). By offering mutual assistance, social intimacy and integration, and a sense of belonging an individual becomes reassured of his or her individual worth and contributions (Young, 1998). Some experts conclude that the health effects of social relations may be as important as known risk factors such as smoking, lack of physical activity, obesity and high blood pressure (Allison, Adalaf, Ialomiteanu, & Rehm, 1999; Central Kings Community Health Board, 1998).

Social conditions that encourage and support health choices and lifestyles are key as are a persons knowledge, goals, behaviours, and coping skills for dealing with life in a healthy way (Central Kings Community Health Board, 1998). Strong family and social networks have been linked to good health (The Highland Health Board, 1999). Support from family, friends and members of the community have been associated with better health (Central Kings Community Health Board, 1998). Research by Hayes (1997), has suggested that people are influenced by interpersonal dynamics operating at work sites or among clusters of neighbours and individuals in their routines of daily life.

Overall feelings of well-being have been intrinsically linked to perceptions of emotional well-being and a satisfying social life where positive emotional function equals frequent positive feelings and infrequent negative feelings (CLFRI, 1997). Individuals with high levels of social support have been found to report fewer health problems, higher rates of well-being and lower

levels of stress (The Canadian Institute of Health, 1990; Kind et al., 1998). People with higher social status have been reported to be generally more healthy and live longer (Evans, 1994).

Satisfaction with social life is positively associated with how active people are (CFLRI, 1997). For 70% of Canadian adults, family and friends have been reported to have a positive influence on health (Canadian Institute of Health, 1990). More specifically, Canadians who have made positive lifestyle changes said that information and support from their family and friends helped them make these changes (Canadian Institute of Health, 1990). Fewer social connections have been identified as factors for lower activity levels (MacDougall et al., 1997).

For men, marital status has been associated with better health suggesting that men may benefit more from social relationships than women (MacDougall et al., 1997). However, research by Cariney, Thorpe, Rietschlin, & Avison, (1999), has identified that single mothers are at a greater risk of both physical and mental health problems compared to married mothers. In the same research study, single mothers were more than twice as likely to report depression in the previous 12 months compared to married mothers (Cairney, Thorpe, Rietschlin, & Avison, 1999). These findings implicate that when children are involved, better health may be associated with being married for women.

Lifestyle

The activities in which people engage affect their health (Chappell, 1998). The aspects of an individual's behaviour and surroundings could have positive health outcomes (regular exercise, good nutrition, regular health care checks) or potential negative outcomes (cigarette and alcohol consumption) (Penning & Chappell, 1993). Negative health practices can create risk factors in heart disease, chronic bronchitis, asthma and numerous cancers (Highland Health Board, 1999).

Social, cultural and economic environments could effect an individual's decision to make informed choices towards positive health (peer pressure). Shah (1994) stated that various environments (social, cultural and/or economic) may effect the behaviours, values and attitudes of an individual. It has been widely recognized that personal behaviours are associated with the development of diseases and health problems (Young, 1998). Particular concerns are smoking, diet, substance use (alcohol, drug), physical activity, sexual behaviour and safety practices (Young, 1998).

Smoking

Smoking is considered one the most important determinants of health. Some individuals consider cigarettes an addictive substance (from the nicotine) and often view smoking as a 'disease' (Young, 1998). Over 4,000 chemical substances that are found in cigarettes (including nicotine), have been found to be responsible for the development of diseases and adverse health effects (Young, 1998). Some known carcinogens in cigarettes include carbon monoxide, hydrogen cyanide, arsenic, lead and nickel (Young, 1998). In Canada, tobacco use accounts for at least one-quarter of all deaths of adults between the ages of 35 and 84 (ACPH, 1999).

Kind et al. (1998) found that smokers reported significantly more health problems than non-smokers and Williamson (2000), found that health was negatively associated with the specific behaviour of smoking. Williamson (2000) stated that the negative impact of smoking on health is more pronounced at lower socioeconomic status levels than at higher socioeconomic levels.

Researchers have identified that initiation of smoking at a younger age is associated with smoking more cigarettes per day and that this association influences level of addiction (Carvajal, Wiatrek, Evans, Knee, & Nash, 2000; Cushman & Medline, 2001; Everett, Warren, Sharp, Kann, Husten, & Crossett, 1999). Research by Cushman & Medline (2001), has identified that smokers

rarely take up smoking after the age 18.

Alcohol

Alcohol has many implications on health outcomes. Alcohol poisoning from drinking to much in one session and long term affects include the impairment of normal liver function through diseases such as alcoholic hepatitis and cirrhosis (Young, 1998). Alcohol has also been reported to have negative social and economical implications (Young, 1998). Drinking to excess has been identified to influence physical and mental health and has been reported as a major factor in accidents and domestic violence (Highland Health Board, 1999).

Diet

Nutrition has been studied extensively and the effects of proper diet have been well established. Macronutrients and micronutrients comprise the basic components of nutrition (Young, 1998). An excess intake or absence of nutrients may produce negative health outcomes and risk factors for some diseases (Young, 1998). What we eat (especially the amount of fruits and vegetables) influences health (Highland Health Board, 1999). Dietary factors have been linked to incidence of cancer, heart disease and stroke (Highland Health Board, 1999).

Physical Activity

Increasing a population's participation in physical activity offers a broad range of health, social and economic benefits (CFLRI, 1997; MacDougall et al., 1997). It has been reported that physical exercise may delay the onset or progress of disease (Montoye, 1975). Physical activity has been shown to prevent some cardiovascular and musculoskeletal problems and promote well-being (Young, 1998). Benefits in moderate amounts of activity are comparable to benefits found in shorter more strenuous sessions of activity (Young, 1998). Physical activity reduces the risk of

chronic diseases and achieves an array of health-related benefits including: better health, reduced risk for chronic illnesses and longer life, protection against certain cancers, osteoporosis, contributes to general well being, can increase self-esteem, improve self-concept, enhance psychological well-being, increase physical competence, overcome boredom, provide positive leisure pursuits, enhance mood, positively affect emotional well being, improve ability to cope with stress and improve ability to cope with negative peer pressure (ACPH, 1999; CFLRI, 1997; Highland Health Board, 1999; MacDougall et al., 1997). Physical activity can also provide sense of belonging within family, friends and community (CFLRI, 1997).

Physical activity has been found to decrease with age (ACPH, 1999; MacDougall et al., 1997). In all age groups, males have been reported to be more active than females (ACPH, 1999).

Perceived health status and the ability to participate in everyday tasks can be positively affected by physical activity (CFLRI, 1997). Canadians that are more active are more likely to rate their health as very good (CFLRI, 1997).

Being physically fit and physically active has been reported to provide protection against risk of heart disease and cancer (specifically colon) (CFLRI, 1997). Long-term structured physical activity has been reported to play an important role in rehabilitation and treatment of patients who have suffered heart attacks and those who are being treated for heart disease (CFLRI, 1997). Such programs that include physical activity have identified a reduction in the risk of fatal heart attacks by 25% (CFLRI, 1997).

Sexual Behaviour

Important risk factors related to sexual behaviour and health include the use of contraceptives, the age of onset and frequency of sexual intercourse and the number of partners

(Young, 1998). Implications of poor sexual practices include unplanned pregnancies, sexually transmitted diseases and various forms of cancers (Young, 1998).

Safety Practices

Injuries are majors causes or morbidity and mortality, especially in children and young adults (Young, 1998). Most safety practices occur in the home environment (smoke detectors, control of water temperature, telephone access to emergency centres) and vehicle use (use of seatbelts, appropriate child restraint devices and in boating, the use of flotation devices) (Young, 1998). Safety practices have been reported to be associated with socioeconomic factors including household income, education, employment, ethnicity and family structure (Young, 1998).

Health Care Organization

Health care determinants include the elements of health that are available to individuals. Factors such as medical and dental practice, nursing, hospitals, chronic care facilities, rehabilitation, drugs, public health services and health services provided by allied health professionals (chiropractic, podiatric, optometric) influence the health of individuals (Shah, 1994). There has been increasing evidence of a link between primary care and improved health status. Primary care has been identified to strongly influence life expectancy and total mortality (Shi, Starfield, Kennedy, & Kawachi, 1999).

In Canada, health programs are designed to ensure that all residents of Canada have access to prepaid medical and hospital care. While in all provinces, basic hospital and medial services are provided under government health insurance plan, there is variability in what is provided through public or private insurance or personal expenditure. (Shah, 1994). Such findings reveal that depending on services sought, many Canadians may not have access to health services such as

emergency dental work if they do not have dental coverage/insurance. Other services may include: chiropractors, podiatrists, optometrists, physiotherapists, occupational therapists and social workers (Shah, 1994).

The Federal, Provincial and Territorial Advisory Committee on Population Health [ACPH] (1999) reported that low and moderate income Canadians were either limited or had no access to health services. Such disadvantaged circumstances affect the physical health of Canadians if they do not have access to seek help from professionals including medical doctors regarding ailments that need medical attention.

Disease and injury prevention activities in areas such as immunization and the use of mammography are showing positive results in increasing the health of Canadians (ACPH, 1999). Advances in the treatment of HIV/AIDS and other diseases have helped to increase the length of life and quality of life of people living with life-threatening illnesses (ACPH, 1999).

Symptom Reporting

Symptoms are perceptions, feelings or beliefs about the state of our bodies (Pennebaker, 1982). Symptoms have been declared as indicators of conditions that depart from normal function, sensation or appearance (Miller, Wilbur, Montgomery, Chandler, & Bezruczko, 2001) which suggest that symptoms can be considered as a change in physical or mental conditions which may be evidence of a disorder (Bisset, 2000).

Symptoms reflect internal state (Pennebaker, 1982). Pennebaker and Epstein (1983) reported that physical symptoms and sensations represent perceptions of physiological activity. Perception and sensation of symptoms are private and subjective experiences (Miller, Wilbur, Montgomery, Chandler, & Bezruczko, 2001; Pennebaker, 1982) that are appraised across many

receptors (Pennebaker,1982). Montelpare (1990) indicated that symptom reporting was one form of sensory perception and found that symptom reporting was significantly related to stimulus detection, appraisal and tolerance.

Symptom detection is important for survival (Pennebaker, Gonder-Frederick, Cox, & Hoover 1985). Perception and detection of physiological activity guide behaviour - that is, when one is hungry, one eats (Pennebaker, 1982; Pennebaker et al., 1985). This type of self-regulatory behaviour has been correlated with general physiology (Pennebaker et al., 1985).

Pennebaker and colleagues (1982; 1985) stated that symptoms can reflect general state but not actual physiology. A heart can beat just as fast in any setting, but the actual setting itself can influence a person's perception as to how fast their heart is beating (Pennebaker, 1982). Through the application of cluster analysis, symptom reporting has shown to be grouped into clusters of symptoms (Haley, Kurt, & Horn, 1997; Pennebaker, 1982; Pennebaker et al., 1985). These clusters of symptoms have been studied and reported to reflect general visceral changes (Pennebaker et al., 1985). This implies that having a general illness such as a common cold includes symptoms being reported such as sneezing, coughing and presence of a sore throat as opposed to another illness such as a flu which would present with symptoms of fever, nausea and general malaise. These types of general beliefs about symptoms associated with diseases are relatively common (Pennebaker & Epstein, 1983). Typical beliefs coupled with physiological information in symptom perception have been reported to be efficient indicators of illness (Pennebaker & Epstein, 1983). In a 1985 study, Pennebaker et al. found that general symptoms correlated highly with general physiological changes which led the researchers to determine that perceptual processes over time are reliable. In this particular study, diabetics reported symptoms

on a continual, timely basis where the study showed significance in a diabetics ability to detect when their glucose levels were low through the reporting of symptoms (Pennebaker et al., 1985).

Symptoms and Health

Everyone experiences sensations differently. Every individual exhibits unique perceptual, behavioural, and physiological responses across a variety of settings (Pennebaker & Epstein, 1983). Based on a person's perception of a symptom, health can be interpreted by an individual's personality, general beliefs about illness and anatomy (Pennebaker & Epstein, 1983) stress, coping skills, explanatory styles or attitudes (Sheridan, Mulhern, & Martin, 1998) and one's set of beliefs of naive theories about the relationship of symptoms to different physiological states and past experiences (Pennebaker, 1985). Complex interactions among biological, psychological, social and situational factors may also influence symptom experience and their interpretation (Miller et al., 2001; Pennebaker, 1985). For example, life changes have been commonly associated with levels of health or prevalence of illness (Sarason, Sarason, Potter, & Antoni, 1985) and sensations can be influenced by others if the sensation is considered undesirable (Pennebaker, 1982).

Symptom reporting has been related to various situations specific to health concerns. Researchers have identified that patients with chronic illnesses that report a high number of symptoms are at risk of future non-adherence to therapy (Duran, Spive, Raffi, Walter, Bouhour, Journot, Cailleton, Leport, & Moatti, 2001). Such reports allow for adjustment of already implemented therapy strategies to incorporate persons who are at risk for non-adherence which in turn would affect their health. Further research into symptom reporting may determine why people at high risk for non-adherence report a high number of symptoms.

Symptoms and Physical Health

Symptom reporting has been accepted as an index of physical health (Grau, West & Gregory, 1998; Pennebaker, 1982). Symptom reporting reflects an individuals knowledge, perception and intuition of their own health status (Grau, West, & Gregory, 1998). Experience of physical health symptoms has been logically associated with self assessments of one's health as excellent or poor (Grau, West, & Gregory, 1998).

Symptom reporting is divided into two categories - physical health (pertaining to the body) and mental health (pertaining to the mind) (Pennebaker, 1982; Sheridan, Mulhern, & Martin, 1998). As suggested by Sheridan et al (1998), it is important when using symptom reporting to measure physical health, that symptoms be focused on physical health and separated as much as possible from mental health. To differentiate between physical and mental symptoms, researchers often present subjects with a listed inventory to report symptoms (Montelpare, 1990; Pennebaker, 1982).

Researchers in the area of physical symptom reporting have identified that women consistently report more physical symptoms than men (Kroenke & Spitzer, 1998; Pennebaker, 1982; Weidner & Matthews, 1978). It has also been found that individuals with Type A behaviour patterns report fewer physical symptoms and perceive themselves to be healthier than their Type B counterparts (Hart, 1983; Pennebaker, 1982; Weidner & Matthews, 1978). Overall, Pennebaker (1982), described that any individuals in disadvantaged circumstances (i.e. low socio-ecomonic status, unemployment) are more likely to report more symptoms.

Uses of Symptom Reporting

Epidemiologists have traditionally considered symptom reporting as reliable and valid estimates of disease (Montelpare, 1990). Researchers have used symptoms scales and inventories throughout the health sciences (Miller et al., 2001; Pennebaker, 1982) as dependent variables to perceive depression, work related stress, fitness and health (Montelpare, 1990).

People are their own primary health resource (Idler, 1979). Physicians use this concept to assist in diagnoses. For example, interstitial cystitis (a debilitating bladder disease) is characterized by pelvic pain, urinary frequency and urgency (Lubeck, Whitmore, Sant, Alvarez-Horine, & Lai, 2001); Temporomandibular Disorders are characterized by tooth grinding and clenching, jaw pain, restricted jaw opening and clicking and treatment seeking behaviour (Pow, Leung, & McMillan, 2001).

Over the past seven years researchers have been using symptom reporting and cluster analysis reported by war veterans to build structural models (King, King, Foy, & Gudanowski, 1996) or to identify syndromes that may by linked to the Gulf War (Haley, Kurt, & Horn, 1997). Research has suggested that clusters of symptoms of many War veterans represented latent syndromes that appeared to reflect a spectrum of neurologic injuries involving the central, peripheral and autonomic nervous systems (Haley, Kurt, & Horn, 1997).

Researchers have also used symptom reporting to study the prevalence of self-reported symptoms and illnesses among deployed versus non-deployed military personnel (Iowa Persian Gulf Study Group 1997; Stretch, Beliese, Marlowe, Wright, Knudson, & Hoover,1995). Research thus far has indicated that deployed veterans have reported significantly more physical health symptoms than non-deployed veterans (Iowa Persian Gulf Study Group, 1997; Stretch et

al., 1995).

The above mentioned research has indicated the reliability and use of symptom reporting as a dependent measure on health outcomes. These studies have identified the use of physical symptom reporting in an array of settings - between gender, socio-economic status and personality traits. However, an important presentation of the use of symptom reporting lies in the use of symptom reporting as a dependent measure to build structural models. No study to date has developed an index derived from a national survey using symptom reporting as the dependent measure. Furthermore, no study has evaluated this index derived from a national survey on a smaller sample, specifically university employees.

National Population Health Survey

The National Population Health Survey (NPHS) is a national survey that is distributed across Canada. The first cycle began in 1994 and data is collected every two years. The NPHS collects general health information from all household members. Within each household, one person (over the age of 12) that was randomly selecting during cycle one answers a more in-depth interview.

The Household Component includes household residents in all provinces, with the exclusion of populations on Indian Reserves, Canadian Forces Bases and some remote areas in Quebec and Ontario. For cycle three, approximately 49,000 respondents answered the general portion of the questionnaire while approximately 17,000 answered the more detailed health portion. The response rate for the 1998-1999 cycle was 89.7%.

Sampling Strategy

Provincial samples were initially distributed proportionally to the population size. The longitudinal sample for 1998-1999 consisted of all longitudinal respondents that had been chosen in cycle 1 who had completed at least the general component of the questionnaire in 1994-1995 (no attempts were made to follow all household members over time). For cross sectional purposes all household members that were currently living with the longitudinal respondent were interviewed.

The actual sample selection occurred in two stages. First, homogeneous strata were formed where independent clusters were drawn from each stratum at which time dwelling lists were prepared for each cluster. Dwellings or households were then selected from the lists.

The questionnaire includes questions on health status, use of health services, determinants of heath, chronic conditions and activity restrictions. The components used to describe health include two week disability, health care utilization, restriction of activities, chronic conditions, socio-demographic characteristics (country of birth/year of immigration, ethnicity, language, race, change of residence), education, labour force, income, food insecurity, general health, height/weight, preventative health, self-care, insurance, family medical history, nutrition, health status (vision, hearing, speech, getting around, hands and fingers, feelings, memory, thinking, pain and discomfort), sense of coherence, physical activities, repetitive strain, injuries, drug use, smoking, tobacco alternatives, alcohol, mental health and social support.

Within the data set of the NPHS, several health indices exist. Specifically related to physical health, two indices are presented: The Physical Activity Index (PAI) and the Health Utilities Index (HUI). The PAI groups energy expenditure values (as calculated from variables

within the NPHS) into five categories from 'active' to 'inactive' and includes 'not applicable' and 'not stated'. The HUI describes functional health status levels on a continuum from -0.360 to 1.000 where perfect health is rated 1.000, death is rated 0.000 and negative scores reflect health states that are considered worse than death.

The NPHS will be conducted over approximately 20 years to provide a complete picture of the health status of Canadians. The NPHS has been used for many government and other research applications. Public Use Microdata Files (PUMF) are available at University Institutions across Canada. Using data contained within the NPHS research has been published on the measures and analysis of health status (Austin, Escobar ,& Kopec, 2000), health behaviours, health and income adequacy (Williamson, 2000), to determine if the Health Utilities Index can measure change (Kopec, Schultz, Goel, & Williams, 2001), cross-cultural comparisons of health status (Kopec, Williams, To, & Austin, 2001), differences between english and french speaking Canadians (Kopec, Williams, To, & Austin, 2000), the assessment of smoking and obesity on asthma among female Canadians aged 12 and older (Chen, Dales, Krewski, & Breithaupt, 1999), 12-month prevalence of depression among single and married mothers (Cairney, Thorpe, Rietschlin, & Avison, 1999) and prediction of health risk behaviours among young adults (Allison, Adlaf, Ialomiteanu, & Rehm, 1999).

To the researchers knowledge, there are no published studies that have applied the concept of data mining to identify if any trends or patterns exist within the NPHS data set. The only index that is being studied within the NPHS is the Health Utilities Index as indicted previously in the review of literature. There is a derived Physical Activity Index within the NPHS that is based on energy expenditure values. Using the Physical Activity Index, an individual is categorized into

one of three categories: active, moderate or inactive. To the researchers knowledge no study to date has used the Physical Activity Index as a measure of health as either a dependent variable or independent variable.

METHODOLOGY

Preamble

In epidemiological studies, researchers often utilize information from data sets drawn from samples of specific cohorts. The retrospective statistical evaluation of such large data sets, data warehouses, and/or data repositories, is referred to as "secondary data analysis" (Hearst & Hulley, 1988). Secondary data analysis has several benefits including reductions in the research costs and planning time. Secondary data analysis also provides direction in conducting additional research which evolves from the original research question.

The following procedures are proposed in the secondary analysis of a population health data set in an attempt to develop an index to describe physical health status. A schematic representation of the methodology is provided in Figure 2.

Stage 1: Exploratory Variable Identification for a Physical Health Index using the National Population Health Survey

1.1 Definition and Creation of a list of the Determinants of Health from the Literature

In the first step a thorough review of the available literature was conducted. The purpose was to identify and define those variables which were used to describe the determinants of health. These variables are identified in Table 1.

1.2 Creation of an index of Physical Health Status from the Literature

In the second step of this study, the researcher identified, from the literature, those variables which were used to describe physical health status. The variables included self-reporting, symptom reporting, number of medications taken, behavioural functional disability, direct physical measurements and physical activity status as indices of physical health status.

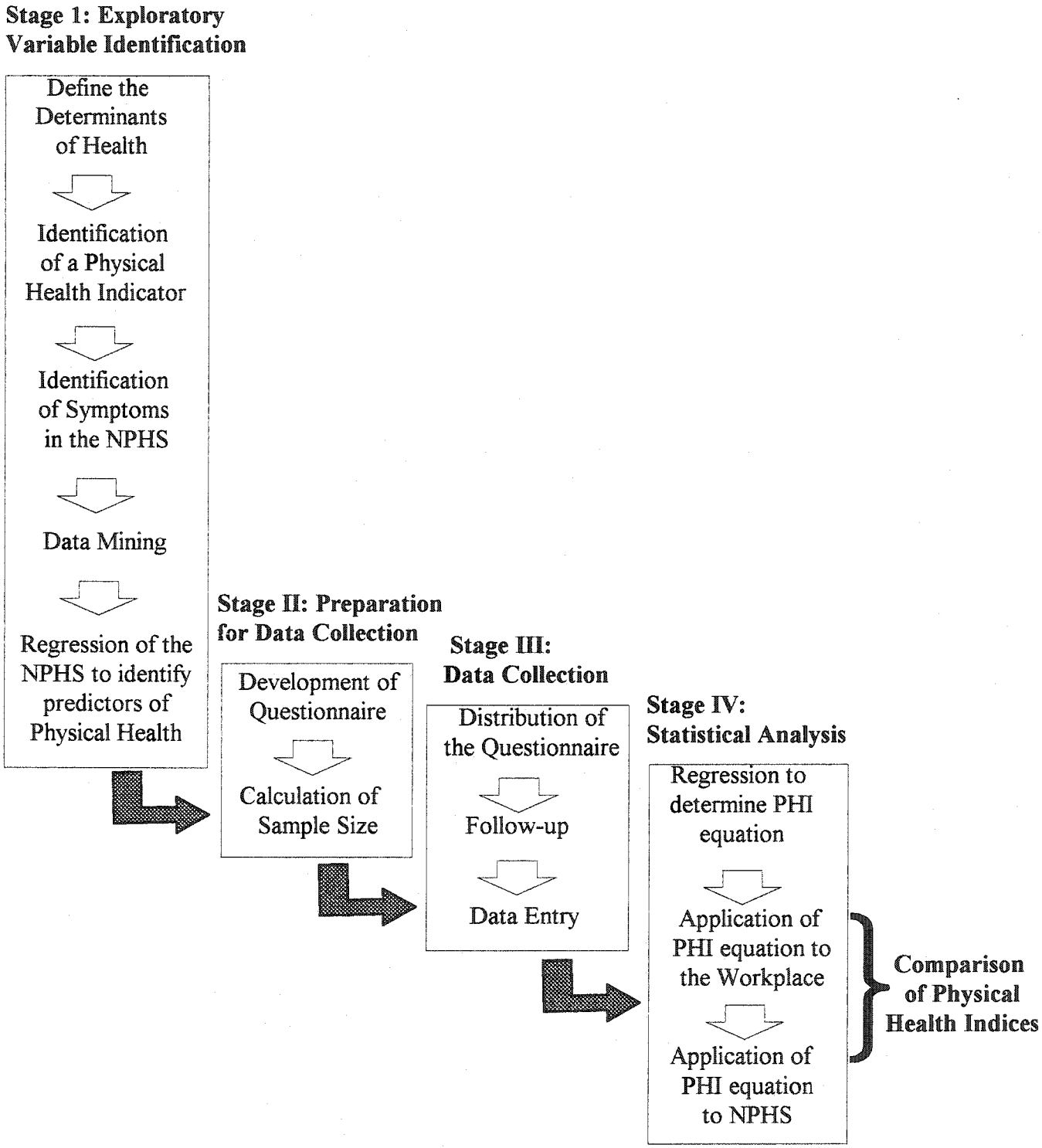


Figure 2. Schematic Diagram of the Methodology

Table 1
Determinants of health based on previously published literature

Determinant of Health	Related Factors
Human Biology[1,2,3,10]	Genetic Makeup[1,2,3,5,10]
	Hereditary Factors[3,10]
	Genetics[3,4,10]
	Maturation and Ageing[1,2,5,7]
	Gender[5,10]
The Environment	
Physical[1,2,3,4,5,6,10,13,20]	Air[1,2,3,10,13]
	Water[1,2,3,10,13]
	Soil[1,2,3,10]
	Food[1,2,3,20]
	Shelter[3,10,13,20]
Psychosocial[1,2,3,4,6,8,10]	Income[1,2,3,4,5,6,9,10,11,12,13,17,20]
	Employment[1,2,3,4,6,9,10,13,21]
	Education[1,2,3,4,5,6,7,9,10,13,20]
	Social Contacts[3,4,5,6,7,910,13,14]
Lifestyle[1,2,3,4,5,10,13,15,16]	Smoking[3,5,13,16,17]
	Alcohol[3,5,13,16]
	Diet[3,5,13,16]
	Physical Activity[3,5,18,13,14,16,18]
	Sexual Behaviour[3,5,13]
	Safety Practices[3,5,13]
Health Care Organization[1,2,5,10,20]	

[1]Lalonde, 1974
[2]Shah, 1994
[3]Young,1998
[4]CSEP, 1998
[5]ACPH, 1999
[6]AHOC,
[7]Kind et al., 1998
[8]Manga, 1987 (cited in Shah, 1994)
[9]Canadian Institute of Health, 1990
[10]Central Kings Community Health Board, 1998
[11]McDowell, 2000
[12]Blakely et al., 2000
[13]Highland Health Board, 1999
[14]CLFRI, 1992
[15]Chappell, 1998
[16]Penning & Chappell, 1993
[17]Williamson, 2000
[18]MacDougall et al., 1997
[19]Lynch et al., 2001
[20]WHO, 1986
[21]Avison, 1998

The review process focused on those studies which discussed the concept of an index of physical health status. The number of symptoms detected was identified in various research studies including Grau, West & Gregory, 1998 and Pennebaker, 1982, as an indicator of physical health and was selected as the index of physical health status for the current investigation.

1.3 Identification of the Symptoms listed in National Population Health Survey

Based on previous literature which used symptom reporting, a list of symptoms were identified in the National Population Health Survey. These symptoms included all of the 'chronic conditions' in the National Population Health Survey and the question "In the past month have you had a sore throat, cold/flu?" which was taken from the 'self-care' section.

1.4 Data Mining

Data mining was used to identify variables for the statistical analysis of this proposed research. The purpose of the data mining task was to distill the variables from the National Population Health Survey that underlie the determinants of physical health and more specifically, number of chronic conditions reported. In this process the researcher identified the variables from the NPHS that were representative of the set of determinants for physical health. Data mining was used as an exploratory exercise to evaluate the "data-events" that were to be used in statistical model development. The computer software used to explore the National Population Health Survey data set was SAS© Enterprise Miner.

Based on the literature, variables were identified from the National Population Health Survey which could be potential indicators of symptom reporting and physical health status. Variables from all sections of the NPHS were selected for analysis. Based on information gathered in the review of literature, some variables were rejected prior to subsequent analyses. To

decrease the complexity of some of the variables in the NPHS, selected variables were collapsed or rejected and represented by another variable or indicator of physical health status.

Several steps within the data mining procedure were performed. A schematic representation is presented in Figure 3. Initially, a library was set up containing the entire longitudinal data set from the National Population Health Survey 1998/1999 (Cycle 3). The data set was examined to make sure that all variables and all data were present. For the data mining procedure, the entire data set of 17,244 respondents was used. When all the data was present, various variables were transformed into grouped variables. The dependent variable and total family history of illness variable was created. In a subsequent variable transformation, physical activity status and medicine use were created. Once all these transformations occurred, the data set was explored again and all variables that contributed to the transformed variables were rejected to eliminate confounding. As well, the target or dependent variable was indicated in the data set.

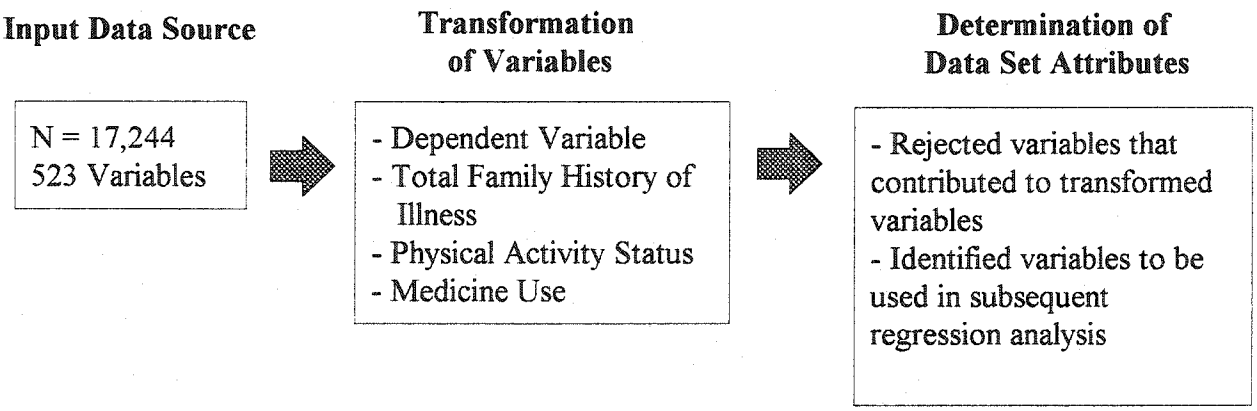


Figure 3. Schematic Representation of the Data Mining Process

1.5 Identification of Predictor Variables from the NPHS that describe Physical Health Status

Considering the information from the literature and the list of variables that were selected

in the data mining procedure, a dependent variable and a set of independent variables were created. The dependent variable was established from the number of chronic conditions reported and the presence of a sore throat, cold/flu within the past month. The independent variables were based on variables that support the determinants of physical health that were validated from the literature as determinants of physical health.

A backwards regression analysis was performed with the number of chronic conditions and presence of a sore throat, cold/flu within the past month reported as the dependent variable and all other variables were run through the analysis as independent. The regression procedure identified those variables that influenced the number of chronic conditions and presence of a sore throat, cold/flu reported within the NPHS and would subsequently be used in the physical health status survey. Due to the large content of information in the data set of the NPHS the regression was run on the SGI Origin 2000 located at Lakehead University using SAS© software.

Stage II: Preparation for Data Collection

2.1 Development of the Questionnaire

Variables selected from the backwards regression were used to derive the questions to be included in the questionnaire. Variables that were not found to be significantly predicted by the number of chronic conditions reported, but were identified in the literature as predictors of the number of symptoms reported, were also included in the survey.

Following the development of the predictive regression equation derived from the literature and the National Population Health Survey, a questionnaire was constructed to validate the selected variables in a random sample.

The questionnaire was constructed from the variables identified in the previous stages of

research and is presented in Appendix A. All questions taken from the NPHS were worded the exact same in the questionnaire except for the question asking the respondent to list any chronic conditions that they have. The question was changed from "We are interested in 'long-term conditions' that have lasted or are expected to last 6 months or more and that have been diagnosed by a health professional" to "Please check any of the following conditions that have lasted or are expected to last longer than 6 months or more." The words "and that have been diagnosed by a health professional" was removed to lessen the restriction of the question. The decision to remove the words "and having been diagnosed by a doctor" were based on the notion that individuals may not respond to chronic conditions they experience (e.g. migraine) but were not diagnosed by a doctor.

2.2 Calculation of Sample Size

The sample size was based on a population of 665 full-time Lakehead University employees. The sample size was calculated as follows:

$$n = \frac{(N \times p \times q) \times [Z_\alpha]^2}{(p \times q) \times [Z_\alpha]^2 + [N - 1] \times (error)^2}$$

Where: n = calculated sample size

N = the initial population

p = the expected proportion

q = (1-p)

Z_α = percent confidence

The initial population (N) was represented by 665 full-time employees, the expected proportion (p) was represented by the proportion of an individual reporting one or more

symptoms, the percent confidence (Z_{α}) was set a α=0.05 and the percent error was set at five percent. To account for non-responses, a 5% over sampling was added to the sample size. The sample size calculated was 241. With a 5% over sampling, the minimal sample size was expected to be at least 262 participants.

A random selection of participants was completed using a random number generator to select the "*i*th" place from the employee list. The sample was expected to be representative of a university employee population, ranging in age between 18 and 65 years. The current investigation commenced upon the approval from the Lakehead University Ethics Committee.

Stage III: Data Collection

3.1 Distribution of Questionnaire

The participants that were selected at random to participate in this study were contacted with an initial letter (Appendix B) and consent form (Appendix C) attached to the survey. The surveys were distributed to each specific area within the University. Each survey, consent form and envelope was numbered. The cover letter outlined the purpose and potential risks associated with participation in this study. The participants were informed that they were under no obligation to participate, that they may withdraw from the study at anytime and that all their information would remain confidential. Furthermore, potential participants were encouraged to ask questions at anytime during the study. Participants were asked to sign a consent form only after all questions had been answered. The participants were asked to return the survey within two weeks after distribution.

As the surveys were returned by the participants, a second researcher opened the envelope with the survey, detached the consent form and placed the consent form in one box and the survey

in another. By means of a coding process, all obtained information during the study was kept confidential so as to protect the anonymity of the participants.

3.2 Follow up to non respondents

Two weeks following the distribution of the survey, employees that had a university e-mail account were sent a follow up e-mail that thanked those participants who had completed and returned the survey and encouraged those participants who had not, to hand it in within the following week. Those individuals that did not have a university e-mail account were sent the same letter on paper via inter-office mail. The follow up letter is presented in Appendix D.

3.3 Data Entry

The questionnaire data were entered into a Word Pad file on a computer and the raw data forms were stored in a box in the main office of the C.J. Sanders Fieldhouse, Lakehead University for a period of up to seven years after the study commenced.

Stage IV: Statistical Analysis

4.1 Development of the Physical Health Index Equation

Using the University workplace data set, a stepwise regression was run to develop an equation to determine physical health. A hypothetical model of the equation was constructed. The structure of the equation is given below:

$$y = a_i x_i + \beta_o + error$$

Where: y = the number of chronic condition reported and presence of a sore throat, cold/flu

a_i = the coefficient of the independent variable

x_i = the independent variable

B_o = the intercept

4.2 Application of the Physical Health Index

The physical health equation developed from the workplace data set in the previous stage was applied to the NPHS data set to determine the physical health index for the population data set. The researcher stratified for age (22-62 years) and full-time employment status (>30 hours/week) in the NPHS data set to maintain the integrity of the demographics identified within the workplace data set.

4.3 Comparison of the Physical Health Indices

After both the sample and population physical health indices were calculated, an independent t-test using SAS© statistical software was conducted to determine if the two indices were statistically different.

RESULTS AND DISCUSSION

The purpose of this investigation was to create a physical health index derived from the National Population Health Survey and evaluate the index on a workplace sample. The outline of this section has been created to follow the processes presented in the methodology. The first section outlines the selection process and implications associated with the identification of the dependent measure of physical health for this study. The second section describes the variables used and transformed in the NPHS to identify those variables that predict physical health. The application and limitations of data mining techniques are presented in the third section. The results of the regression analysis are presented in the fourth section followed by the description of the subsequent questionnaire and participant demographics in the fifth and sixth sections, respectively. Issues related to the response rate of the workplace employees are outlined in the seventh section followed by the results of the workplace regression and the resulting derived physical health index (section eight). In the next section, the application of the derived physical health index is presented followed by the comparison of the derived physical health indices from the workplace and the NPHS. Lastly, the derived physical health index is discussed.

Identification of a Physical Health Index from the Literature

Number of symptoms reported was identified in the literature as an indicator of physical health status and was used in this study as the dependent variable. Symptoms were identified in the National Population Health Survey through the evaluation of symptom reports/inventories presented in the Literature. The SMU Health Questionnaire (Watson & Pennebaker, 1989), Pennebaker Inventory of Limbic Languidness (PILL) (Pennebaker, 1982) and the Symptom Inventory (Montelpare, 1990) were used to identify symptoms contained within the NPHS. The

number of chronic conditions reported and the presence of a sore throat, cold/flu in the past 14 days were identified as the dependent measure for this study.

Symptom reporting indices are often based on physiological functioning and are subjective and individual experiences. Chronic conditions however, are defined in the NPHS as conditions that have lasted or are expected to last longer than six months and have been diagnosed by a medical doctor. Therefore, chronic conditions as described in the NPHS are not subjective and individual experiences. Although the use of chronic conditions in this current study does not specifically represent symptom reporting, the use of chronic conditions has been identified in the literature to be related to many of the issues relevant to symptom reporting. In a study by Patten (2000), the researcher identified that individuals that suffer from one or more long-term medical conditions were found to be at risk for major depression. This finding is similar to findings reported by Pennebaker (1982), Miller et al. (2001) and Montelpare (1990) who have identified that symptoms scales and inventories are used throughout the health sciences as dependent variables to perceive depression, work related stress, fitness and health. Physicians use symptoms to assist in diagnosis of conditions which suggests a relationship between symptom reporting and chronic conditions. To decrease the restriction of reporting a chronic condition, the investigator in the current study identified chronic conditions as conditions that have or are expected to last longer than six months. The concept of diagnosis made by a doctor was eliminated on the questionnaire developed in this study.

Description of the NPHS

The NPHS household component survey (N=17,244) was used for subsequent regression analysis. Of the 523 variables in this data set 60 variables were selected for input into a

backwards regression analysis. The investigator identified those variables contained within the data set that coincided with those variables presented and discussed in the review of literature that represent physical health status. The full list of variables in the NPHS along with the 60 variables used in regression analysis are included in Appendix E.

Using data mining procedures, several variables were transformed (Table 1). The dependent variable was created from the sum of the number of chronic conditions (CCC8GNUM) and the presence of a sore throat, cold/flu in the past month (SC_8_1). To determine if a respondent had a family history of heart disease, high blood pressure, stroke, diabetes or cancer, a composite variable (TOTFMHST) was created from the presence of response from any family member having one of the above mentioned diseases. The variable PHYSACT was derived from the sum of physical activities that the respondent engaged in. Lastly, the number of medications (MEDS) was derived from the sum of medications that the respondent used (in the past month).

Table 2
Description of Transformed Variables

Derived Variable	Equation
Depvar	∑ number of chronic conditions (CCC8GNUM) + Had sore throat, cold/flu (SC_8_1)
TOTFMHST	Presence of birth mother ever having heart disease (FH_8_11), high blood pressure (FH_8_12) stroke (FH_8_13), diabetes (FH_8_14) or cancer (FH_8_15); Presence of birth father ever having heart disease (FH_8_21), high blood pressure (FH_8_22) stroke (FH_8_23), diabetes (FH_8_24) or cancer (FH_8_25); Presence of a sibling ever having heart disease (FH_8_31), high blood pressure (FH_8_32) stroke (FH_8_33), diabetes (FH_8_34) or cancer (FH_8_35);
PHYSACT	∑ type of physical activity for past month (PAC8_1A -- PAC8_X)
MEDS	∑ the number of medications taken in past month (DGC8_1A -- DGC8_1V)

Data Mining

From a community health perspective, many questions a researcher might ask can be explored first through existing data sets and then through deterministic sampling. This is particularly apparent within the context of population health where large surveys are used to collect volumes of data relevant to measures of health status.

Secondary data analysis is not however a replacement for primary research and data collection, since secondary analysis has implicit limitations, resulting from the primary data collection procedures. Such limitations include original issues related to sampling, such as size and representativeness, methodology, procedure, and equipment. Considering the limitations of

secondary analysis it is necessary to establish validity prior to moving forward with decisions based on the ordinal data sets (Davis, Boyd, & Schoenborn, 1990).

The application of uncovering previously unknown patterns in data is advantageous and can lead to many new discoveries and ideas pertaining to the data. Data Mining operates by selecting, exploring, modifying and modeling large amounts of data (SAS Institute Inc., 1998). Large data sets are often hard to explore or analyze due to the nature of the records. Often data contain missing records or they are qualitative in nature rather than quantitative (Groth, 1998; Gordis, 2000). Such databases are often undervalued and underutilized. Data mining is able to approach these data sets from multiple perspectives to make unexpected discoveries beyond the bound of expectations (Groth, 1998). Based on the discovery of interesting patterns, data may be re-sampled or new models may be formulated (Groth, 1998). These concepts present interesting ideas in the area of population health.

The use of large data sets is advantageous in that the data refer to real-world populations and issues of 'representativeness' and 'generalizability' are minimized (Gordis, 2000). However, the data is often gathered for fiscal and administrative purposes and may not be suitable for researching specific research questions addressed in the study (Gordis, 2000).

Data Mining in this study was used as an exploratory exercise to become familiar with the NPHS data set and the variables contained within. The actual statistical procedures were subsequently run on the Cray supercomputer.

Results of the Regression from the NPHS

Using the backwards regression method, the following variables listed in Table 2 were found to be statistically significant ($p < 0.1$) to the number of chronic conditions reported and the

presence of a sore throat, cold/flu (the dependent variable). Of the 60 variables that were entered into the regression analysis, 35 variables were identified as statistically significant. An additional 12 variables that were not statistically significant but were identified in the literature as predictors of physical health were kept for use in the questionnaire. In total, 47 variables were identified as predictors of physical health and were used to create the questionnaire.

Table 3
Results of Regression from the National Population Health Survey Variables

Variable	Variable Label	DF	t Value	Pr > |t|
Intercept		B	-8.38	<.0001*
DHC8GAGE	Age	1	17.03	<.0001*
DHC8_SEX	Sex	1	14.14	<.0001*
FIC8F1	Flag indicating food insecurity	1	1.75	0.0808*
TWC8_2	Number of days spent in bed	1	6.79	<.0001*
TWC8_4	Number of days cut down on things	1	12.4	<.0001*
TWC8DDDY	Total number of disability days	1	5.45	<.0001*
HCC8G1A	No. of nights as patient	1	-7.04	<.0001*
HCC8DHPC	Consultations/health professionals	1	-2.02	0.0435*
HCC8_4A	Attended self-help group	1	-4.57	<.0001*
HCC8_4	Consulted altern. health care provider	1	-1.93	0.0541*
HCC8_9	Received home care services	1	81.65	<.0001*
RAC8D6G	Need for help in series of tasks	1	-12.05	<.0001*
EDC8_1	Currently attending - school/col./univ.	1	-4.46	<.0001*
EDC8D3	Highest level of educ. - 4 lev.	1	-5.48	<.0001*
LFC8DJA	Number of jobs	1	-18.22	<.0001*
LFC8DHMN	Hours of work - main job	1	3.38	0.0007*
LFC8DTMN	Type of working hours - main job	1	2.51	0.0120*
BPC8_10	Ever had blood pressure taken	1	27.4	<.0001*
WHC8_20	Ever had PAP smear test	1	2.88	0.0039*
WHC8_5	Had a hysterectomy	1	3.69	0.0002*
NU_8DCON	Freq. cons. - vitamin/min. suppl.	1	9.74	<.0001*
PY_8DH1	Sense of coherence scale	1	25.11	<.0001*

PAC8_6	Level of physical activity for usual day	1	-2.91	0.0037*
PAC8DFR	Frequency of all physical activity	1	-2.33	0.0198*
RPC8_2	Number of repetitive strain injuries	1	2.1	0.0358*
SMC8_2	Type of smoker	1	-6.01	<.0001*
SMC8_4A	Ever smoked cigarettes	1	-5.1	<.0001*
SMC8_8	Age stopped smoking daily - former	1	3.01	0.0026*
TAS8D1	Use of tobacco products	1	6.29	<.0001*
ALC8_2	Frequency of drinking alcohol	1	-1.76	0.0788*
ALC8_6	Regularly drank > 12 drinks a week	1	-2.89	0.0038*
MHC8G1L	No./consult. - prof./ment.health	1	-3.31	0.0009*
MHC8DDS	Distress Scale	1	-2.07	0.0387*
MED	No. of meds	1	7.05	<.0001*
PHYSACT	Total physical activity	1	3.57	0.0004*
TOTFMHST	Family history of disease	1	6.89	<.0001*
INC8DHH	Total hhld inc. from all sources	1	0.3	0.7657
DHC8GMAR	Marital status	1	0.44	0.6572
TWC8_5	Has regular medical doctor	1	-1.19	0.2327
HCC8GMDC	No. of consultations - medical dr.	1	0.98	0.3262
HCC8_6	Health care needed but not received	1	0.42	0.6751
WHC8_30	Ever had mammogram	1	1.47	0.1426
SMC8_1	Household member smokes inside house	1	1.04	0.2998
SMC8_3	Age started smoking daily-daily smoker	1	1.37	0.1711
SMC8_4	No. cig. smoked each day-daily smoker	1	-0.15	0.8807
SSC8_101	No. of close friends/relatives	1	-0.5	0.6183
GHC8_1	Respondent's general health	1	0.52	0.6026

*$p < 0.1$

Description of the Questionnaire

Based on the predictor variables identified from the regression analysis, a questionnaire was created. The questionnaire was eight pages long and was comprised of 58 questions. All questions taken from the NPHS were worded the exact same in the questionnaire except for the question asking the respondent to list any chronic conditions that they currently have. The question was changed from "We are interested in 'long-term conditions' that have lasted or are expected to last 6 months or more and that have been diagnosed by a health professional" to "Please check any of the following conditions that have lasted or are expected to last longer than 6 months or more". The words "and that have been diagnosed by a health professional" were removed to lessen the restriction of the question based on the conception that individuals may not respond to chronic conditions they experience (e.g. migraine) but were not diagnosed by a doctor.

Description of Subjects

As a result of the sample size calculated in the methodology, 241 participants were required for this study. With a five percent over-sampling inflated upon the sample size to account for non-responses, the final sample size was calculated at 262.

The surveys were personally distributed by the researcher to the various units within the University. Of the 272 surveys, ten surveys were not handed out to employees on sabbatical, maternity leave, or if they were no longer a full-time employee at the University. Of the questionnaires that were returned, three questionnaires were not used in the study; two questionnaires were not returned with a consent form and one questionnaire was returned with a consent form signed "ANON" and the ID code on the questionnaire was blacked out. After the first two weeks of data collection, 57 surveys were returned. After a follow up e-mail or letter,

the final questionnaire count was 100. The final response rate was 38%.

Demographics of the subjects are presented in the following figures.

Of the 100 participants in the study, 8 people did not state their gender. Within the rest of the sample, 30% were males and 62% were females (Figure 4). As compared to the NPHS, 57% of the respondents were males and 43% were females.

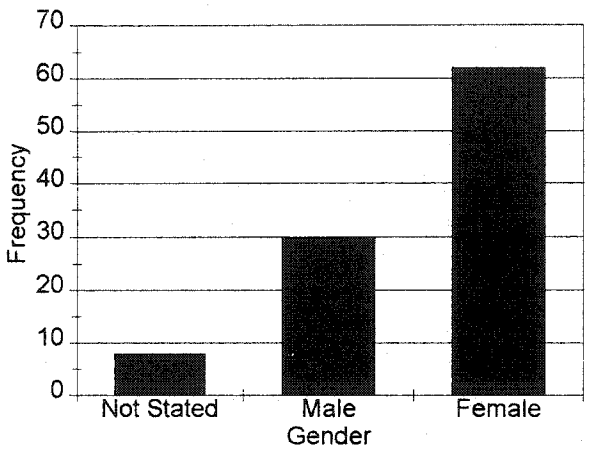
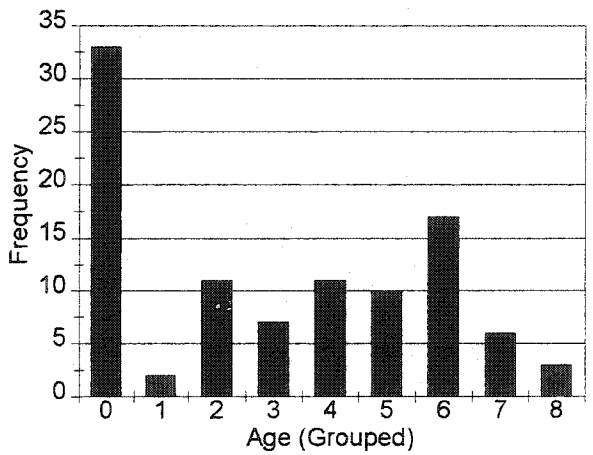


Figure 4. Frequency distribution of gender.

Due to issues of confidentiality in the NPHS, age was transformed into a grouped variable. The workplace sample was also transformed in the same respect and the age groups are depicted in Figure 5. The mean age was 40.46 (± 14.17) and the age range was from 28-62 years old.



0 - Not Stated
1 - 25-29
2 - 30-34
3 - 35-39
4 - 40-44
5 - 45-49
6 - 50-54
7- 55-59
8 - 60-64

Figure 5. Frequency distribution of age.

In conjunction with the information available in the NPHS, marital status was transformed into a grouped variable. Figure 6 illustrates the distribution of marital status in this study. The data are positively skewed with the majority of the participants being either married, living common law or living with a partner.

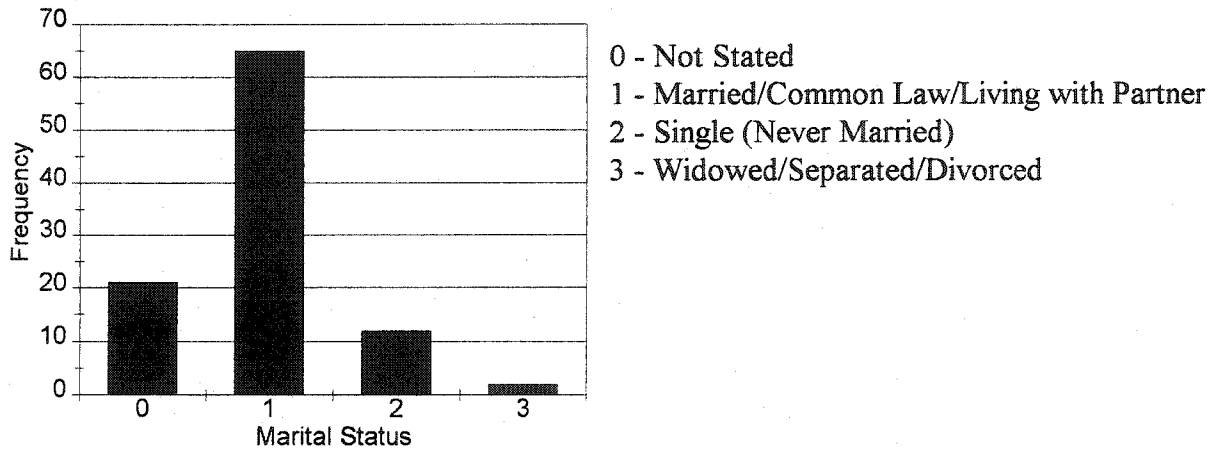


Figure 6. Frequency distribution of marital status.

Participants in the study were asked if they were currently attending school. Figure 7 illustrates the distribution of employees that were currently attending school. The data are negatively skewed with 89% of the participants not currently participating in any form schooling.

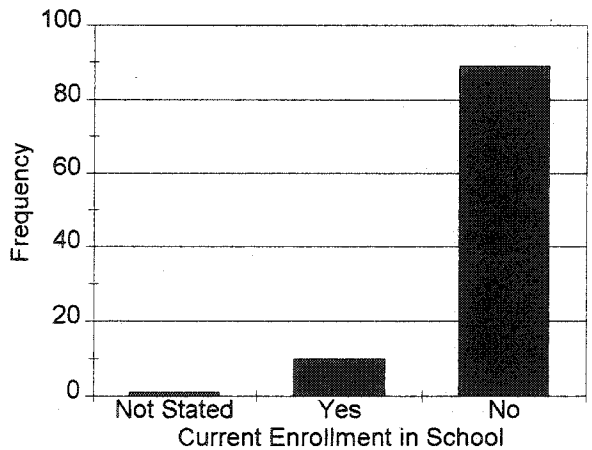
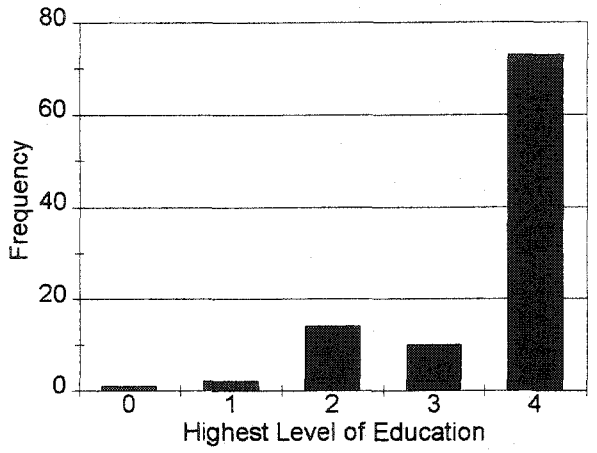


Figure 7. Frequency distribution of employees that were currently attending school.

Individuals reported the highest level of education that they had attained. There were four

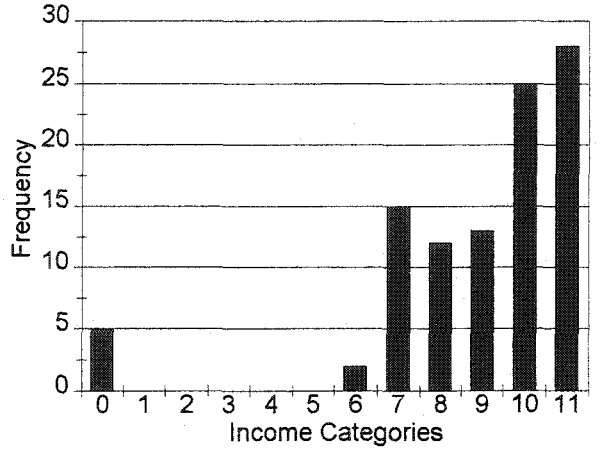
potential responses a participant could provide. Figure 8 illustrates the distribution of education. The data are negatively skewed with 73% of the individuals having attained post-secondary graduation.



0 - Not Stated
1 - Less than secondary school graduation
2 - Secondary school graduation
3 - Some post-secondary
4 - Post-secondary graduation

Figure 8. Frequency distribution of highest level of education.

Total household income was divided into categories of income levels. Categories ranged from no income to $80,000 or more. Five participants did not state their income category. Figure 9 illustrates the frequency distribution of total household income. The data are negatively skewed with most individuals reporting total household income of $50,000 or more.



0 - Not Stated
1 - No Income
2 - Less than $5,000
3 - $5,000 to $9,999
4 - $10,000 to $14,999
5 - $15,000 to $19,999
6 - $20,000 to $29,999
7 - $30,000 to $39,999
8 - $40,000 to $49,999
9 - $50,000 to $59,999
10 - $60,000 to $79,000
11 - $80,000 OR MORE

Figure 9. Frequency distribution of total household income from all sources.

Workplace Response Rate

The response rate of the current investigation had a low response rate. The response rate of 38% may be attributable to the campus climate at the school. At the time of the study, there was another survey that was distributed by the University regarding the University climate. Although it was explicitly stated in the cover letter and consent form that this study was not related to any administrative body at Lakehead University and that the results of this study were only going to be used for this specific research investigation, participants may have felt that this study may have been associated with the survey on campus climate and that their data may be used later in the future as an indication of work ethic and job performance.

Due to the low response rate, there was a resultant loss in power of the test. However, to accommodate for this, the researcher increased the precision of $\propto$ from $\underline{p} < 0.05$ to $\underline{p} < 0.001$ to decrease the chance of a type 1 error.

Results of the Workplace Regression

The 47 variables that were identified as predictors of physical health status in the NPHS regression were used in the workplace regression. Using the backwards, stepwise procedure, a multiple regression model was computed to derive an equation of physical health. The results are presented in Table 4.

Table 4
Results of Regression from the Workplace Questionnaire

Variable	Variable Label	Parameter Estimate	Standard Error	Pr > |t|
Intercept		2.34	0.92	0.01*
LFC8DJA	Number of jobs	0.52	0.23	0.03*
PAC8_6	Level of physical activity for usual day	-0.36	0.2	0.07*
RPC8_2	Number of repetitive strain injuries	0.69	0.21	0.002*
MHC8DDS	Distress Scale	-0.06	0.03	0.04*
GHC8_1	Respondent's general health	0.31	0.17	0.07*

*$p < 0.1$

$R^2 = 0.3042$ Mallow's C(p) = -9.7867 Mean Square Error = MS=10.23
SSE=51.16 F-Value = 7.00 Model<0.001

The physical health index equation derived from the workplace data set was:

Y = 2.34 + 0.52*LF8DJA - 0.36*PAC8_6 + 0.69*RPC8_2 - 0.06*MHC8DDS + 0.31*GHC8_1

Where: LF8DJA = Number of jobs

PAC8_6 = Level of physical activity for usual day

RPC8_2 = Number of repetitive strain injuries

MHC8DDS = Distress Scale

GHC8_1 = Respondent's general health

The R^2 which indicates the amount of variance explained by the predictors was 0.3042. The F-value was 7.00 and the model was significant ($p<0.001$). Mallow's C(p) was -9.7867 which indicated the best model with the least bias.

Individuals reported the number of chronic conditions and presence of sore throat, cold/flu

observed in the past 6 months. The potential number of conditions a respondent could list ranged from 0 to 22. The number of conditions listed by individuals in the present study ranged between 0 and 7. Figure 10 illustrates the list of the number of conditions reported in this sample. The data are positively skewed with most individuals reporting less than two conditions.

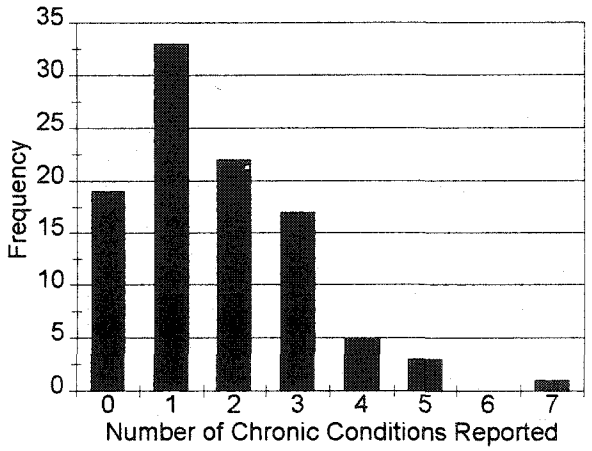


Figure 10. Frequency distribution of the number of chronic conditions reported.

The number of jobs a participant held was capped at a maximum of three jobs. Figure 11 depicts the distribution of the number of jobs individuals held. The data are positively skewed with most individuals only working at their full-time positions within the University.

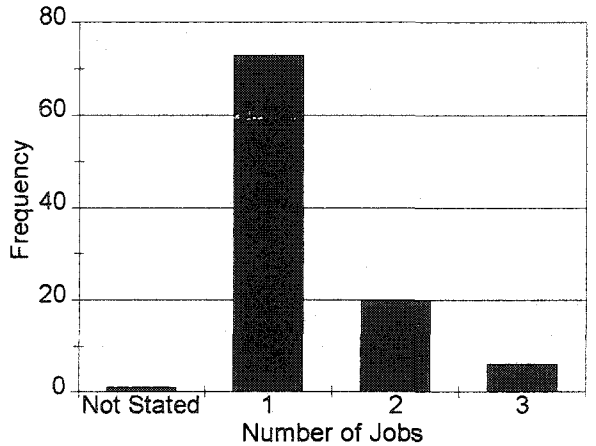
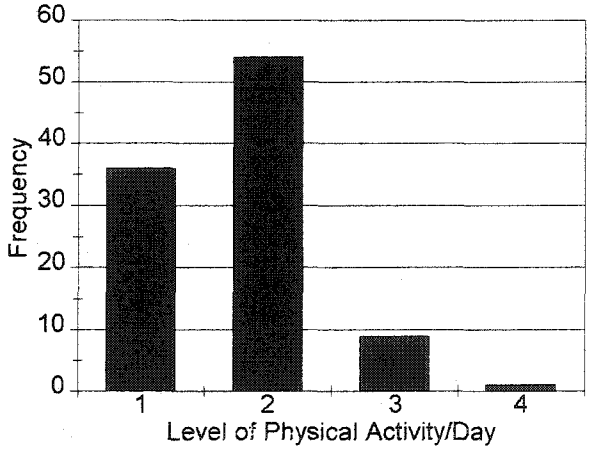


Figure 11. Frequency distribution of the number of jobs.

No reported studies found that the number of jobs influences physical health. Studies have

only identified the negative health effects of not having a job or long-term unemployment. It is difficult to interpret the finding that the more jobs (beyond one full-time job) influences the number of chronic conditions reported in this research investigation. With future research, it could be speculated that with a workforce that works full-time, as in the sample in this study, having one or more jobs along with a full-time job could potentially affect physical health. Full-time work is approximated with 37 hours of work per week. If a person works one or more jobs on top of a full-time position, they are taking time away from family and social contacts which have been identified to affect health.

Participants were asked to identify their level of physical activity for a usual day. Responses varied from sitting most of the day to lifting and carrying heavy loads. Figure 12 illustrates the distribution of the level of physical activity for a usual day. The data are positively skewed with most individuals reporting that they either sit (36%) or stand or walk quite a lot and do not carry or lift heavy things (54%).



1 - Sit (do not walk around very much)
2 - Stand/walk quite a lot, don't carry/lift things
3 - Lift/carry light loads or climb stairs/hills
4 - Heavy work

Figure 12. Frequency Distribution of the level of physical activity for a usual day.

Research has identified that even minimal amounts of exercise, regardless of age or medical history, can have a dramatic impact on one's health. The current investigation identified

that the more inactive a person is during the day predicts the number of chronic conditions that individual will report. This finding is consistent with research findings by Chakravarthy, Joyner, & Booth (2002) stating that physical inactivity increases the risk of many chronic disorders including Type II diabetes, obesity, cardiovascular disease, and many types of cancers. This result identifies the importance of some sort of activity for a usual day and the concept of an active lifestyle which many health promotion programs are now emphasizing. The concepts of a healthy lifestyle and vitality are recommended by national bodies including the American College of Sports Medicine [ACSM] (1994) and the Canadian Society for Exercise Physiology [CSEP] (1998).

It is interesting to note that the number of physical activities and the frequency of physical activity involvement was not part of the equation. Research has identified that physical activity improves mood, reduces the risk of premenopausal breast cancer, can slow, stop and even reverse clogged arteries, change biological age, decrease chronic fatigue syndrome, ease arthritis pain and decrease chance of winter cold (Parachin, 2001). Moderate amounts of physical activity have been viewed as a primary therapy to prevent other more costly therapies (Chakravarthy, Joyner, & Booth, 2002). Results of the current investigation suggest, that the encompassing notion of physical health goes beyond just exercising at a moderate intensity three to four times a week as suggested by position statements released by national health agencies. Such a result suggests that an active work atmosphere promotes healthy living and could in turn have serious implications on improving or enhancing workplace health.

The number of repetitive strain injuries reported by participants in this study ranged from zero to four. Figure 13 illustrates the distribution of the number of repetitive strain injuries reported. The data are positively skewed with 17% of participants reporting that they have at

least one repetitive strain injury.

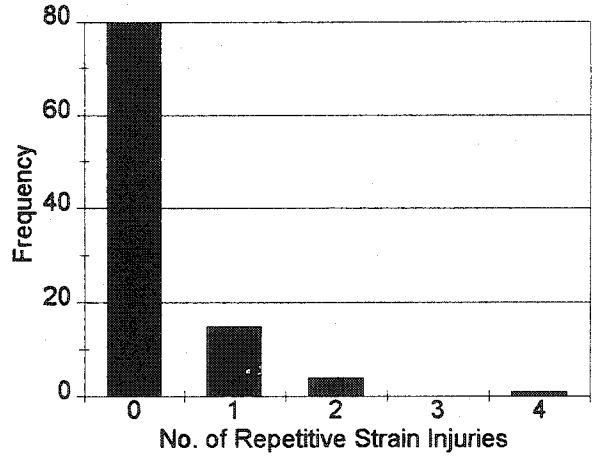


Figure 13. Frequency Distribution of the number of repetitive strain injuries.

The current investigation identified that the more repetitive strain injuries (RSI) an individual reported predicts the number of chronic conditions reported. The Central Kings Community Health Board (1998) reported that workplace hazards and injuries are significant causes of health problems. The National Institute of Occupational Safety and Health (1997; as cited in Keyserling, 2000) reviewed over 600 epidemiological studies of occupational musculoskeletal disorders. They found 'strong evidence' or 'evidence' of causal relationships between workplace exposures to forceful exertion, repetition, and awkward posture and musculoskeletal disorders of the neck, upper extremity, and low back pain (Keyserling, 2000).

Repetitive strain injuries affect muscles and tendons due to repeated actions, constrained postures or both which cumulatively overload the muscles beyond the capacity for immediate recovery (Isernhagen, 1988). RSI directly affect physical health in that they are debilitating to the point that an individual's capacity to work is impaired (Arskey, 1998). At times, surgery may also be required further limiting an individuals capacity to perform daily tasks and to continue in the workplace.

Level of Distress was calculated by the sum of six questions ranging in scores from one to five. A lower score indicated higher distress. In the current investigation, the average distress score was 26.06 (± 5.49). The range of scores was from 16 to 30 with the data negatively skewed.

Chronic conditions have been identified to force individuals to modify their lifestyles in ways that include changes in diet, and treatment/medication regimes as in the case of individuals with diabetes. The current study identified that individuals with lower distress scores (higher distress) influences the number of chronic conditions reported. The demands of chronic conditions have been associated with increases in emotional distress (Dewar & Lee, 2000). Griffin, Friend, Kaell, Bennett, & Wadhwa (1999) identified that chronic illnesses lead to increases in negative affectivity (psychological distress) and that chronic stress (life strains) such as problematic roles and relationships can engender depression and other health conditions, and may also be related to risk behaviours.

Patten (2001) used data from the first (1994/1995) and second wave (1996/1997) of the NPHS to explore the relationship between long-term medical conditions and major depression. Individuals suffering from one or more long-term medical conditions such as migraine headaches, sinusitis and back problems doubled the risk of major depression (Patten, 2001).

General health was reported on a scale from one (excellent) to five (poor). Figure 14 identifies the responses of self-rated general health from the workplace sample in this study. The data are positively skewed with the majority of the participants rating their general health as either excellent or very good.

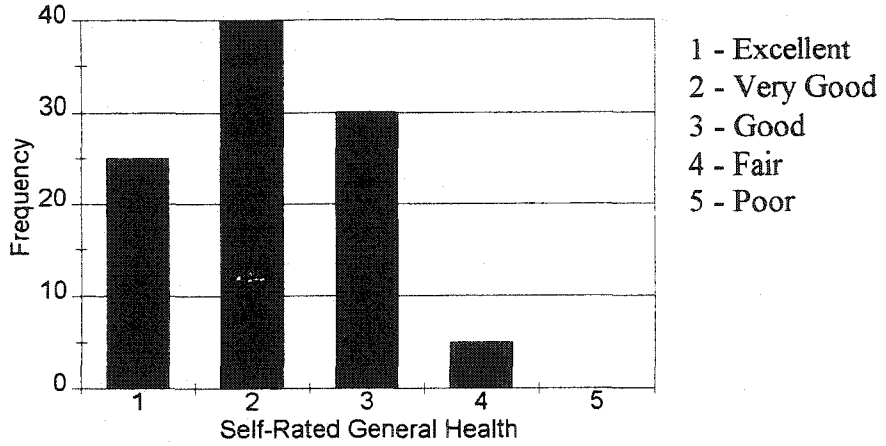


Figure 14. Frequency distribution of respondent's general health.

Self-rated health has been used extensively as a method to capture diverse components of health status (Wade & Vingilis, 1999). Research investigations have shown that self-rated health is a strong and independent predictor of mortality and has good test-retest reliability (Chandola & Jenkinson, 2000). Despite concerns that different social groups interpret health in different ways, Chandola & Jenkinson (2000) identified that the use of a single item measure of self-rated health to measure health status in different ethic groups is valid.

The current investigation identified that poorer rated general health predicts number of chronic conditions reported. This finding coincides with validation research by Wade & Vingilis (1999) which has identified that self-rated health principally reflects physical health problems, notable limitations on physical functioning and chronic and acute conditions.

It is interesting to note that self rated health was not a significant predictor variable of the number of chronic conditions reported in the NPHS but was significant in workplace sample.

Application of the Physical Health Index

The Physical Health Index (PHI) equation derived from the workplace data set was applied to the workplace and the NPHS data set. Within the NPHS data set, age and job status were stratified so that only individuals between the ages of 22 and 62 and were working full-time

hours (>30 hours per week) were included in the calculation of the NPHS PHI. After stratification, the number of participants available from the NPHS for analysis was 6813. The following figures identify the descriptive information of each of the variables identified in the PHI for the NPHS data set (N = 6813). The number of chronic conditions reported in the NPHS data set ranged from zero to ten. Figure 15 illustrates that the majority of the participants reported either no chronic conditions (45%) or one chronic condition (28%). The data is positively skewed.

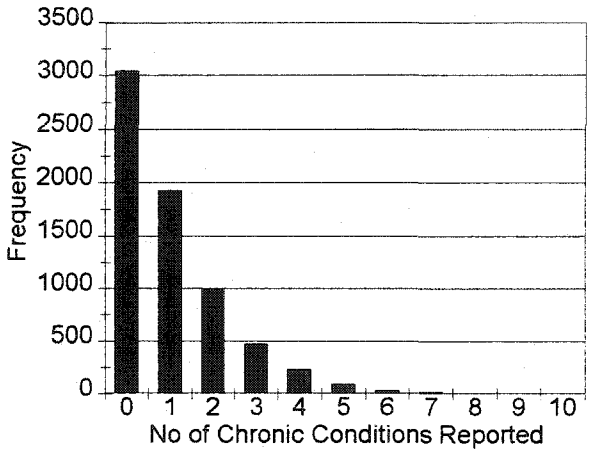


Figure 15. Frequency distribution of the number of chronic conditions reported (NPHS).

Of the participants that worked in a full-time job (>30 hours/week), the majority of the participants worked at their full-time job only (85%, N = 5793), 13% worked at another job (2 jobs in total) and 2% worked at two other jobs (3 jobs total). Figure 16 illustrates that the data are positively skewed.

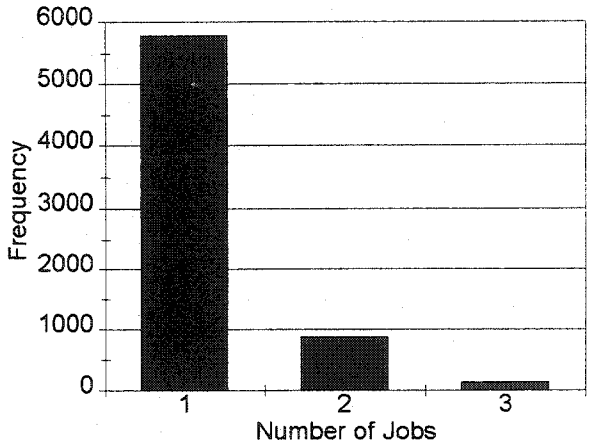
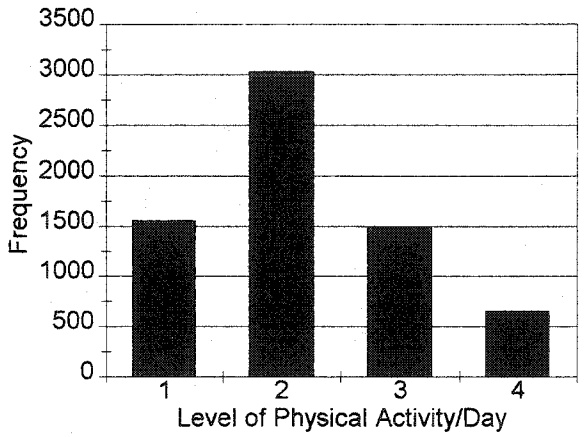


Figure 16. Frequency distribution of the number of jobs (NPHS).

The majority of the individuals from the NPHS data set (45%, N = 3031) stated that their level of physical activity for a usual day was standing or walking quite a lot without carrying or lifting heavy objects (Figure 17).



1 - Sit (do not walk around very much)
2 - Stand/walk quite a lot, don't carry/lift things
3 - Lift/carry light loads or climb stairs/hills
4 - Heavy work

Figure 17. Frequency distribution of level of physical activity for a usual day (NPHS).

The number of repetitive strain injuries that participants in the NPHS data set reported ranged from zero to twenty. The majority of the participants (89%, N = 6055), did not report having any repetitive strain injuries. The average number of RSI reported was 0.16 (± 0.71). The data is positively skewed.

The average level of distress score for the NPHS data set was 4.25 (± 13.16). The range of scores was from zero to twenty-eight. The data is positively skewed.

Self-rated general health was rated from one (excellent) to five (poor). The majority of the participants within the NPHS (Figure 18) rated their health as either excellent (27%), very good (44%) or good (25%). The data are positively skewed.

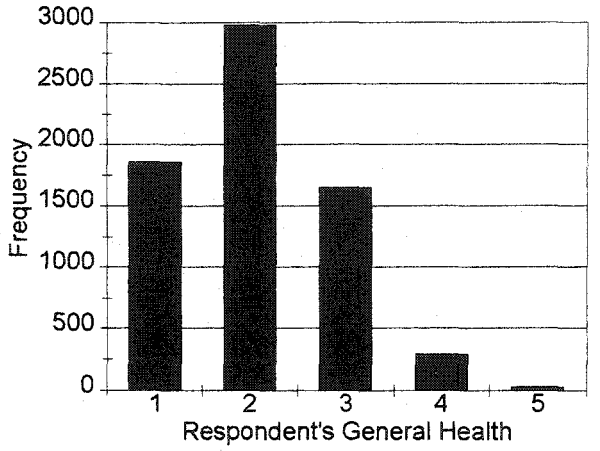


Figure 18. Frequency Distribution of respondent's general health (NPHS).

Calculation and Comparison of the Physical Health Index

The average PHI for the workplace was 1.75 (± 0.79). The average PHI for the NPHS (N=6813) was 2.81 (± 0.75). Full results are given in table 4.

Table 5
Comparison of the Workplace and NPHS Physical Health Indices

	N	$\bar{x}$ PHI	Standard Deviation
Workplace	100	1.75	0.79**
NPHS	6813	2.81	0.75**

**p<0.001

An independent t-test was used to compare the workplace PHI and the NPHS PHI. With the response rate at 38% and a resultant loss in power, the precision of the alpha was increased to $\propto = 0.001$ to reduce the chance of a type I error. The t-test resulted in a significant difference ($\underline{p}$ <

0.001) between the workplace PHI and the NPHS PHI.

Physical Health Index

The physical health index (PHI) for the workplace was statistically different from the PHI from the NPHS. One explanation for this may be the difference in the proportion of males and females between the two studies. In the present study there was a higher proportion of females (62%)compared to the NPHS (43%). Previous research has identified that women consistently report more physical symptoms (Kroenke & Spitzer, 1998; Pennebaker, 1982; Weidner & Matthews, 1978). Therefore, the findings in the present study maybe a result of more women reporting more symptoms than males in the workplace study as compared to in the NPHS.

The distribution of the respondent's general health for both the workplace and the NPHS data set were similar. Within both data sets, the majority of the respondents reported their health as 'Good' (40% in the workplace, 44% in the NPHS).

The main factors that led to a statistical difference in scores of the physical health index include the number of jobs, level of physical activity for a usual day, the number of RSI reported and distress scores.

The distribution of the number of jobs was skewed more positively in the NPHS. More individuals reported only working one job (85%) as opposed to within the workplace (73%). Within the NPHS, 13% identified they worked two jobs and 2% stated that they worked three jobs (20% and 6% within the workplace, respectively).

Within the workplace, over half of the participants identified their activity for a usual day as standing or walking and not carrying or lifting heavy objects. Sitting and not walking around much was the next most frequently observed level of activity. Within the NPHS, less than half of

the individuals rated their level of activity for a usual day as standing or walking and not carrying or lifting heavy objects and NPHS individuals rated their activity as sitting and lifting/carrying light loads and/or climbing stairs hills almost equally. The results show that the data of the NPHS are not as positively skewed as identified in the workplace.

The number of repetitive strain injuries (RSI) as reported by the workplace ranged from zero to four with the majority of the participants (80%) indicating that they did not have any RSI. Within the NPHS, the range of the number of RSI was larger (0 to 20) and more individuals identified that they did not have any RSI (89%). This resulted in a greater skewing of the data in the NPHS as compared to the workplace.

Distress scores were positively skewed for the NPHS ($\bar{x} = 4.25 \pm 13.16$) whereas the scores for the workplace data set were negatively skewed ($\bar{x} = 26.06 \pm 5.49$). The data for the present study are consistent with the score for the NPHS. Although the scales differed in direction because of differences in the direction of the scaling of scores, the negative skewing of the distribution in the workplace is equivalent to the positive skewing of the distribution in the NPHS. In both data sets the distributions support a positive mental state.

In summary, the problem of the study was to develop a physical health index based on the National Population Health Survey and then evaluate the derived index on a workplace sample. Applications of data mining were applied to the NPHS data set (N = 17244) to comprehend and organize the data to be selected for subsequent regression analysis to determine predictors of physical health. Regression analysis identified 35 statistically significant ($p<0.1$) variables as predictors of physical health and another 12 variables were added as identified in the literature. A questionnaire was then created based on the predictor variables and distributed to a sample of full-

time University employees. After three weeks of data collection including a follow-up letter or e-mail the response rate yielded was 38%. Regression analysis on the workplace questionnaire identified five statistically significant ($p<0.1$) indicators of physical health. These indicators included the number of jobs, the level of physical activity for a usual day, the number of repetitive strain injuries, a distress score and the respondent's general health.

Upon application of the derived physical health index (PHI) to the NPHS, an independent t-test identified that the PHI of the workplace and the NPHS were statistically different ($p<0.001$). Even though the PHI values were statistically different, the graphs show that the trend of the individual variables identified in the workplace are consistent with NPHS Limitations of this study are addressed as recommendations for future research.

CONCLUSIONS

The following conclusions were derived from this study:

1. Data Mining is a dynamic tool which proved to be useful for organizing data contained within a very large data set such as the National Population Health Survey.
2. The NPHS proved to be a rich source of health information related to the development of a physical health index.
3. A university workplace provided a valuable source of information which was able to be used for the development of physical health index.
4. The number of jobs, the level of physical activity for a usual day, the number of repetitive strain injuries, distress score and general health were shown to be indicators of the number of conditions reported and the presence of a sore throat, cold/flu within the past 14 days.
5. The mean Physical Health Index for the workplace and the National Population Health Survey were determined to be statistically different as a function of the number of jobs, level of physical activity for a usual day, the number of repetitive strain injuries and distress score.

RECOMMENDATIONS

From this study, the following recommendations are made:

1. There is a need to validate the Physical Health Index using a different sample.
2. The Physical Health Index derived from this study should be applied to another Ontario or Canadian University population to determine if any of the characteristics of physical health identified in this study are unique to Lakehead University.
3. The Physical Health Index derived from this study should be applied to the data collected at a different workplace to determine if any of the characteristics of physical health are unique to the university workplace.
4. There is a need to increase the sample size in future studies.
5. There is a need to locate a sufficient computer source to identify the existence of any trends in the NPHS data set using data mining applications.

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Appendix A

Physical Health Status

Based on Questions derived from the National Population Health Survey (NPHS)

ID Number _____ **Age** _____ **Gender** ❑ M ❑ F

Marital Status: ❑ Married ❑ Common Law ❑ Living with a Partner
❑ Single (never married) ❑ Widowed ❑ Separated
❑ Divorced

Two-Week Disability

During the last 14 days:

6. How many days did you stay in bed for all or most of the day? ____ Days

7. (Not counting days in bed) How many days did you reduce your activities for all or most of the day? ____ Days

8. Do you have a regular medical doctor? ❑ Yes ❑ No

Health Care Utilization

9. For how many nights in the past 12 months have you been an overnight patient in a hospital, nursing home or convalescent home? ____ Nights

10. (Not counting when you were an overnight patient) In the past **12 months**, how many times have you seen or talked on the telephone with the following health professionals about your physical, emotional or mental health?

a.	Family doctor or general practitioner	____ times
b.	Eye specialist (ophthalomologist, optometrist)	____ times
c.	Other medical doctor (surgeon, allergist, orthopedist, gynaecologist or psychiatrist)	____ times
d.	A nurse for care or advice	____ times
e.	Dentist or orthodontist	____ times
f.	Chiropractor	____ times
g.	Physiotherapist	____ times
h.	Social Worker or counsellor	____ times
i.	Psychologist	____ times
j.	Speech, audiology or occupational therapist	____ times

7. In the past 12 months, have you attended a meeting of a self-help group such as AA or a cancer support group? ❑ Yes ❑ No

8. People may also use alternative or complementary medicine. In the past 12 months, have you seen or talked to an alternative health care provider such as an acupuncturist, homeopath or massage therapist about your physical, emotional or mental health? ❑ Yes ❑ No

9. During the past 12 months, was there ever a time when you felt that you needed health care but you didn't receive it? ❑ Yes ❑ No

10. Have you received any home care services in the past 12 months? ❑ Yes ❑ No

Restriction of Activities

11. Because of any condition or health problem, do you need the help of another person in: (Please check all that apply)

❑ preparing meals
❑ shopping for groceries or other necessities
❑ in doing normal everyday housework
❑ in doing heavy household chores
❑ in personal care such as washing
❑ in moving about inside the house

Chronic Conditions

12. In the past month have you had a sore throat, cold or flu? ❑ Yes ❑ No

13. Please check any of the following conditions that have lasted or are expected to last longer than 6 months or more

❑ Food Allergies
❑ Any other allergies
❑ Asthma
❑ Arthritis or rheumatism
❑ Back Problems, excluding arthritis
❑ High blood pressure
❑ Migraine headaches
❑ Chronic bronchitis or emphysema
❑ Sinusitis
❑ A bowel disorder such as Crohn's Disease or colitis
❑ Alzheimer's disease or any other dementia
❑ Heart Disease
❑ Cancer
❑ Stomach or intestinal ulcers
❑ Effects of a stroke
❑ Urinary incontinence
❑ Diabetes
❑ Epilepsy
❑ Cataracts
❑ Glaucoma
❑ A thyroid condition
❑ Any other long-term condition. *Please Specify* _____

Education

14. Are you currently attending a school, college or university? ❑ Yes ❑ No

15. What is the highest level of education that you have EVER attained?

❑ Less than secondary school graduation
❑ Secondary school graduation
❑ Some post-secondary
❑ Post-secondary graduation

Labour Force

16. How many jobs have you worked at in the past 12 months?
(Please include part-time jobs, seasonal work, contract work, self-employment, baby sitting and any other paid work)
____ Jobs
(max 3)

17. About how many hours per week do you usually work at your main job? ____ Hours

18. Which of the following best describes the hours you usually work at your main job?

❑ Regular (day/night/shift - no weekend)
❑ Rotating/Split (no weekend)
❑ Irregular/On Call (no weekend)
❑ Regular (day/night/shift - with weekend)
❑ Rotating/Split (with weekend)
❑ Irregular/On Call (with weekend)
❑ Other (no weekend) *Please Specify* _____
❑ Other *(with weekend) Please Specify* _____

Income

19. What is your best estimate in which your household income falls?
❑ NO INCOME
❑ Less than $5,000
❑ $5,000 to $9,999
❑ $10,000 to $14,999
❑ $15,000 to $19,999
❑ $20,000 to $29,999
❑ $30,000 to $39,999
❑ $40,000 to $49,999
❑ $50,000 to $59,999
❑ $60,000 to $79,000
❑ $80,000 OR MORE

Food Insecurity

20. In the past 12 months, did you or anyone else in your household:
(Please check all that apply)
❑ worry that there would not be enough to eat because of lack of money?
❑ not have enough food to eat because of a lack of money?
❑ not eat the quality or variety of foods that you wanted to eat because of lack of money?

Preventative Health

21. Have you ever had your blood pressure taken? ❑ Yes ❑ No

For women:

22. Have you ever had a Pap smear test? ❑ Yes ❑ No
23. Have you ever had a mammogram, that is, a breast x-ray? ❑ Yes ❑ No
24. Have you ever had a hysterectomy? ❑ Yes ❑ No

Family History

25. Did anyone in you immediate family (i.e. birth parents and birth siblings) ever have: (Please check all that apply)

❑ heart disease ❑ high blood pressure (excluding during pregnancy)
❑ a stroke ❑ diabetes (excluding during pregnancy)
❑ cancer

Nutrition

26. In the past 4 weeks, did you take any vitamin or mineral supplements? ❑ Yes ❑ No
27. Did you take them at least once a week? ❑ Yes ❑ No
28. Last week on how many days did you take them? ____ Days

Sense of Coherence

Next is a series of questions relating to various aspects of people's lives. For each question please circle a number between 1 and 7. Take your time to think about each question before answering.

29. How often do you have the feeling that you don't really care about what goes on around you? 1 means very seldom or never and 7 means very often.

1	2	3	4	5	6	7
Very Seldom/Never						Very Often

30. How often in the past were you surprised by the behaviour of people whom you thought you knew well? 1 means it never happened ad 7 means it has always happened

1	2	3	4	5	6	7
Never Happened						Always Happened

31. How often have people you counted on disappointed you? 1 means it never happened and 7 means it has always happened.

1	2	3	4	5	6	7
Never Happened						Always Happened

32. How often do you have the feeling you're being treated unfairly? 1 means very often and 7 means very seldom or never.

1	2	3	4	5	6	7
Very Often						Very Seldom/Never

33. How often do you have the feeling you are in an unfamiliar situation and don't know what to do? 1 means very often and 7 means very seldom or never.

1	2	3	4	5	6	7
Very Often						Very Seldom/Never

34. How often do you have very mixed-up feelings and ideas? 1 means very often and 7 means very seldom or never.

1	2	3	4	5	6	7
Very Often						Very Seldom/Never

35. How often do you have feeling inside that you would rather not feel? 1 means very often and 7 means very seldom or never.

1	2	3	4	5	6	7
Very Often						Very Seldom/Never

36. Many people - even those with strong character - sometimes feel like sad sacks (losers) in certain situations. How often have you felt this way in the past? 1 means very seldom or never and 7 means very often.

1	2	3	4	5	6	7
Very Seldom/Never						Very Often

37. How often do you have the feeling that there's little meaning in the things you do in your daily life? 1 means very often and 7 means very seldom or never.

1	2	3	4	5	6	7
Very Often						Very Seldom/Never

38. How often do you have feelings that you're not sure you can keep under control? 1 means very often and 7 means very seldom or never.

1	2	3	4	5	6	7
Very Often						Very Seldom/Never

39. Until now has you life had no clear goals or purpose or has it had very clear goals and purpose? 1 means no clear goals or purpose and 7 means very clear goals and purpose.

1	2	3	4	5	6	7
No clear goals or no purpose at all						Very clear goals and purpose

40. When something happens, do you generally find that you overestimate or underestimate its importance or you see things in the right proportions? 1 means overestimate or underestimate importance and 7 means you see things in the right proportions

	1	2	3	4	5	6	7
Overestimate/Underestimate its importance							See things in the right proportion

41. Is doing the things you do every day a source of great pleasure and satisfaction or a source of pain and boredom? 1 means a source of great pleasure and satisfaction and 7 means a source of pain and boredom

	1	2	3	4	5	6	7
A great deal of pleasure and satisfaction							A source of pain and boredom

Physical Activity

42. Thinking back over the past 3 months, which of the following best describes your usual daily activities or work habits?

- ❑ Usually sit during the day and don't walk around very much
- ❑ Stand or walk quite a lot during the day but don't have to carry or lift things very often
- ❑ Usually lift or carry light loads, ir have to climb stairs or hills often
- ❑ Do heavy work or carry very heavy loads

43. Please mark which of the following activities you have done in the past month and how many times (in the bracket following the activity):

❑ Walking (___)	❑ Gardening/Yard Work (___)	❑ Swimming (___)
❑ Bicycling (___)	❑ Popular or social dance (___)	❑ Home exercises (___)
❑Jogging or running (___)	❑ Golfing (___)	❑ Exercise class/aerobics (___)
❑ Downhill skiing (___)	❑ Bowling (___)	❑ Baseball/softball (___)
❑ Tennis (___)	❑ Weight-training (___)	❑ Fishing (___)
❑ Volleyball (___)	❑ Basketball (___)	❑ Ice hockey (___)
❑ Ice skating (___)	❑ In-line skating/rollerblading (___)	

❑ Other *Please specify* _____ (___)

❑ NO PHYSICAL ACTIVITY

Repetitive Strain

44. In the past 12 months, how many injuries due to repetitive strain have you had which were serious enough to limit your normal activities? ____ Injuries

Drug Use

45. In the past month did you take any of the following medications:

- ❑ pain relievers (asprin/tylenol, arthritis medicine and anti-inflammatories)
- ❑ tranquillizers (valium)
- ❑ anti-depressants
- ❑ cough/cold remedies
- ❑ medicine for the heart
- ❑ diuretics or water pills
- ❑ insulin
- ❑ sleeping pills
- ❑ thyroid medication (Synthroid, Levothyroxine)
- ❑ allergy mediation (Selane or Chlor-Tripolon)
- ❑ asthma medications (inhalers, nebulizers)
- ❑ diet pills
- ❑ codeine, demerol or morphine
- ❑ penicillin or other antibiotics
- ❑ medicine for blood pressure
- ❑ steroids
- ❑ pills to control diabetes
- ❑ stomach remedies
- ❑ laxatives
- ❑ OTHER *Please specify* _____
- ❑ birth control pills *(women only)*
- ❑ hormones for menopause or aging symptoms *(women only)*

Smoking

46. Does anyone in your household smoke regularly inside the house? ❑ Yes ❑ No

47. At the present time do you smoke cigarettes daily, occasionally or not at all?
    - ❑ Daily
    - ❑ Occasionally
    - ❑ Not at all

48. At what age did you begin to smoke cigarettes daily? ____ Age

49. How many cigarettes do you smoke each day now? ____ Number of cigarette

50. Have you ever smoked cigarettes at all? ❑ Yes ❑ No

51. At what age did you stop smoking (cigarettes) daily? ____ Age

52. In the past month have you smoked cigars, a pipe, used snuff, used chewing tobacco? ❑ Yes ❑ No

Alcohol

During the past 12 months:

53. How often did you drink alcoholic beverages?
    - ❑ Less than once a month
    - ❑ Once a month
    - ❑ 2 to 3 times a month
    - ❑ Once a week
    - ❑ 2 to 3 times a week
    - ❑ 4 to 6 times a week
    - ❑ Every day

54. Did you ever regularly drink more than 12 drinks a week? ❑ Yes ❑ No

Mental Health

55. In the past 12 months, how many times have you seen or talked on the telephone to a health professional about your emotional or mental health? ____ Times

56. During the past month, how often did you feel:

	Always	Most of the time	Some-times	A little of the time	Never
...so sad that nothing could cheer you up?	1	2	3	4	5
...nervous?	1	2	3	4	5
...restless or fidgety?	1	2	3	4	5
...hopeless?	1	2	3	4	5
...worthless?	1	2	3	4	5
...everything was an all out effort?	1	2	3	4	5

Social Support

57. About how many close friends and close relatives do you have, that is, people you feel at ease with and can talk to about what is on your mind? ____ People

General Health

58. In general, would you say your health is:

- ❑ Excellent?
- ❑ Very Good?
- ❑ Good?
- ❑ Fair?
- ❑ Poor?

Thank you for your time and co-operation

Appendix B

18 February 2002

Dear Participant,

I am a second year graduate student in the School of Kinesiology, at Lakehead University, specializing in health research. I am particularly interested in how we may be able to predict physical health status from several measures of lifestyle behaviours and the detection of symptoms.

My study is entitled *The determination of a physical health index based on the National Population Health Survey and an evaluation of the index on a workplace sample.* My study is being conducted under the supervision of Dr. Moira McPherson, Associate Professor and Director, School of Kinesiology.

The purpose of my study is to derive a physical health index from the National Population Health Survey and to evaluate the index in a sample of employees from a given workplace. The survey includes questions about symptom detection, physical activity behaviours, use of medication, and lifestyle.

Your participation in this study is voluntary and you maintain the right to withdraw from the study at anytime without recourse. This study is part of a student thesis project and is not related to any administrative body at Lakehead University. Your participation/lack of participation will not influence your job status in anyway. There are no known risks to you by participating in this study.

Your responses on the accompanying survey will be kept confidential. Your survey will be assigned an ID code that will be kept only by me. Your responses will be entered into the computer according to the ID code and there will be no way for any individual to recognize your responses from those of other participants. After completion of this research study, the results will be stored securely for at least seven (7) years. Your results will be made available to you upon request. The Research Ethics Board of Lakehead University has approved this research.

Thank you in advance for your interest in this research study. **Please return the survey via Inter-Office mail to Irene Rey, Kinesiology, by Friday March 1, 2002.** Should any questions or concerns arise, please contact me.

Sincerely,

Irene Rey, HBK
School of Kinesiology, Lakehead University
(807) 346-7815
ihrey@mail.lakeheadu.ca

Appendix C

Letter of Informed Consent

For participants in the following research study:

The determination of a physical health index based on the National Population Health Survey and an evaluation of the index on a workplace sample

Principle Investigator: Irene Rey, HBK
Supervisor: M. McPherson, Ph.D
School of Kinesiology
Lakehead University
Thunder Bay, Ontario P7B 5E1
(807) 346-7815

I _____, consent to participate in this study. I understand that by
(Please print name)

agreeing to participate in this study I will be required to complete a survey that includes questions about my lifestyle including smoking, drinking, use of over the counter medications and prescription drugs, as well as involvement in physical activity, family support, income, job type, and symptom detection.

I have read and I understand all of the statements in the attached cover letter. I understand that if I have any questions about this research study I may ask Irene or members of her thesis committee at any time.

I understand that my participation in this research study is voluntary and I have the right to withdraw from the study and have my data erased from the study at anytime without recourse. I understand that this study is a part of a student research project and is not related to any administrative body at Lakehead University. I am also aware that all the risks and benefits of engaging in this study have been outlined clearly. I understand that my responses will be entered into the computer according to an ID code and there will be no way for any individual to recognize my responses from those of other participants. After completion of this research study, the results will be stored securely for at least seven (7) years. I understand that my results will be made available to me upon request. I also understand that the Research Ethics Board of Lakehead University has approved this research.

_____

Signature of Participant Date

_____

Signature of Witness Date

Appendix D

4 March 2002

Dear Participant,

On February 18th 2002, a Physical Health Survey was delivered to your mailbox requesting your participation in a master's thesis. I am sending this message to encourage you to complete the survey.

Your participation is important to the completion of my thesis. The more responses received, the better the quality of the analyses. Your participation is greatly appreciated.

For anyone who has completed and returned the survey, I take this time to thank you for your co-operation. Your input is very much appreciated.

Please return the survey via Inter-Office mail to **Irene Rey, Kinesiology, by Friday March 8, 2002.** If you no longer have possession of the original survey, please contact me and I will send you one immediately. Should any questions or concerns arise, please contact me.

Sincerely,

Irene Rey, HBK
School of Kinesiology, Lakehead University
(807) 346-7815
ihrey@mail.lakeheadu.ca

Appendix E

* indicates those variables used to identify predictor variables of the dependent variable to be used in the questionnaire
** indicates those variables used as the dependent variable
†indicates variables that were transformed as identified in the methodology

AM68_RNO = 'Record number on Health Microdata file'
PRC8_CUR = 'Province of residence'
GE38GURB = 'Rural and urban area - (D,G)'
GE38GCMA = 'Census Metropolitan Area - (D,G)'
*DHC8_OWN = 'Dwelling owned by a household member'
*DHC8GBD5 = 'Number of bedrooms - (G)'
DHC8GLE5 = 'Any pers. <= 5 years old in hhld - (D,G)'
DHC8G611 = 'Any pers. 6-11 years/in hhld - (D,G)'
DHC8DLVG = 'Living arrangements/selected resp. - (D)'
DHC8GEF7 = 'Household type - (D,G)'
*INC8G2 = 'Total hhld inc. - main source - (G)'
*INC8DHH = 'Total hhld inc. from all sources - (D)'
INC8DIA5 = 'Income adequacy - 5 groups - (D)'
INC8GPER = 'Total pers. inc. from all sources - (G)'
INC8CCPI = 'Consumer Price Index'
*DHC8GAGE = 'Age - (G)'
*DHC8_SEX = 'Sex'
*DHC8GMAR = 'Marital status - (G)'
FIC8_1 = 'Worried about a lack of money to eat'
FIC8_2 = 'Not enough to eat because/lack of money'
FIC8_3 = 'Did not eat satisf. because/lack money'
*FIC8F1 = 'Flag indicating food insecurity'
TWC8_1 = 'Stayed in bed/hos. due to illness/injury'
*TWC8_2 = 'Number of days spent in bed'
TWC8_3 = 'Cut down/things done due to illness/inj.'
*TWC8_4 = 'Number of days cut down on things'
*TWC8_5 = 'Has regular medical doctor'
*TWC8DDDY = 'Total number of disability days - (D)'
HCC8_1 = 'Overnight patient'
*HCC8G1A = 'No. of nights as patient - (G)'
HCC8G2A = 'No. of consult. - fam. doctor/g.p. - (G)'
HCC8G3A = 'Place/most recent cont. - fam. dr. - (G)'
HCC8G2B = 'No. of consult. - eye specialist - (G)'
HCC8G2C = 'No. of consult. - other med. doc. - (G)'
HCC8G3C = 'Place/most recent cont. - other med. dr.'
HCC8G2D = 'No. of consult. - nurse - (G)'

HCC8_3D = 'Place/most recent cont. - nurse'
HCC8G2E = 'No. of consult. - dentist/ortho. - (G)'
HCC8G2F = 'No. of consult. - chiropractor - (G)'
HCC8G2G = 'No. of consult. - physiotherapist - (G)'
HCC8G2H = 'No. of consult. - soc. wk./couns. - (G)'
HCC8G2I = 'No. of consult. - psychologist - (G)'
HCC8G2J = 'No. of consult. - speech/aud./O.T. - (G)'
*HCC8DHPC = 'Consultations/health professionals - (D)'
*HCC8GMDC = 'No. of consultations - medical dr. - (D)'
*HCC8_4A = 'Attended self-help group'
*HCC8_4 = 'Consulted altern. health care provider'
HCC8_5A = 'Altern. health care - massage therapist'
HCC8_5B = 'Altern. health care - acupuncturist'
HCC8_5C = 'Altern. health care - homeopath/naturo.'
HCC8_5E = 'Altern. health care - relaxation ther.'
HCC8_5H = 'Altern. health care - herbalist'
HCC8_5I = 'Altern. health care - reflexologist'
HCC8_5J = 'Altern. health care - spiritual healer'
HCC8G5L = 'Alternative health care - other - (G)'
*HCC8_6 = 'Health care needed but not received'
HCC8_7A = 'Care not received - not avail. in area'
HCC8_7B = 'Care not received - not av. when require'
HCC8_7C = 'Care not received - wait too long'
HCC8_7D = 'Care not received - felt/be inadequate'
HCC8_7E = 'Care not received - cost'
HCC8_7F = 'Care not received - too busy'
HCC8_7G = 'Care not received - didn"t get around it'
HCC8_7H = 'Care not received - didn"t know where'
HCC8_7I = 'Care not received - transportation prob.'
HCC8_7J = 'Care not received - language problem'
HCC8_7K = 'Care not received- pers./fam. resp.'
HCC8_7L = 'Care not received - dislikes dr./afraid'
HCC8_7M = 'Care not received - decided not to seek'
HCC8_7N = 'Care not received - other reason'
HCC8_8A = 'Type/care not rec. - phys. health prob.'
HCC8_8B = 'Type/care not rec. - emot./mental prob.'
HCC8_8C = 'Type/care not rec. - regular check-up'
HCC8_8D = 'Type/care not rec. - injury'
HCC8_8E = 'Type/care not rec. - other'
*HCC8_9 = 'Received home care services'
HCC8_10A = 'Home care received - nursing care'
HCC8_10B = 'Home care received - other health care'
HCC8_10C = 'Home care received - personal care'

HCC8_10D = 'Home care received - housework'
HCC8_10E = 'Home care received - meal prep./delivery'
HCC8_10F = 'Home care received - shopping'
HCC8_10G = 'Home care received - respite care'
HCC8_10H = 'Home care received - other type'
*HCC8_11 = 'Received health care services in U.S.'
HCC8_12 = 'Went to U.S. primarily/receive care'
RAC8F1 = 'Flag indicating restriction of activity'
RAC8GC7 = 'Main health problem - 7 groups - (D,G)'
RAC8G5 = 'Cause of health problem - (G)'
RAC8_6A = 'Needs help - preparing meals'
RAC8_6B = 'Needs help - shopping for necessities'
RAC8_6C = 'Needs help - housework'
RAC8_6D = 'Needs help - heavy household chores'
RAC8_6E = 'Needs help - personal care'
RAC8_6F = 'Needs help - moving about inside house'
*RAC8D6G = 'Need for help in series of tasks - (D)'
CCK8_1 = 'Frequency of infections - nose/throat'
CCK8_2 = 'Has had otitis'
CCK8_3 = 'Number of times had otitis since birth'
CCC8_1A = 'Has food allergies'
CCC8_1B = 'Has allergies other than food allergies'
CCC8_1C = 'Has asthma'
CCC8_C5 = 'Asthma - had symptoms/attacks'
CCC8_C6 = 'Asthma - took medication'
CCC8_1D = 'Has arthritis/rheumatism'
CCC8_D5 = 'Arthritis/rheum. - received treat./med.'
CCC8_D6A = 'Arthritis/rheumatism treatment - drug'
CCC8_D6B = 'Arthritis/rheumatism treatment - diet'
CCC8_D6D = 'Arthritis/rheum. treat. - exerc./physio'
CCC8_D6C = 'Arthritis/rheumatism treatment - other'
CCC8_1E = 'Has back problems excluding arthritis'
CCC8_1F = 'Has high blood pressure'
CCC8_F5 = 'High b. p. - received treatment/med.'
CCC8_F6A = 'High b. p. treatment - drug'
CCC8_F6B = 'High b. p. treatment - diet'
CCC8_F6C = 'High b. p. treatment - other'
CCC8_F6D = 'High b. p. treatment - exercise/physio'
CCC8_1G = 'Has migraine headaches'
CCC8_G5 = 'Migraines - received treatment/med.'
CCC8_G6A = 'Migraines treatment - drug'
CCC8_G6B = 'Migraines treatment - diet'
CCC8_G6D = 'Migraines treatment - exercise/physio'

CCC8_G6C = 'Migraines treatment - other'
CCC8_1H = 'Has chronic bronchitis/emphysema'
CCC8_1I = 'Has sinusitis'
CCC8_1J = 'Has diabetes'
CCC8_J5 = 'Diabetes - takes insulin'
CCC8_J6 = 'Diabetes - takes treatment other/insulin'
CCC8_J7A = 'Diabetes treatment - drug'
CCC8_J7B = 'Diabetes treatment - diet'
CCC8_J7D = 'Diabetes treatment - exercise/physio'
CCC8_1K = 'Has epilepsy'
CCC8_1L = 'Has heart disease'
CCC8_1M = 'Has cancer'
CCC8_1N = 'Has stomach/intestinal ulcers'
CCC8_1O = 'Suffers from the effects of a stroke'
CCC8_1P = 'Has urinary incontinence'
CCC8_1Q = 'Has bowel disorder-Crohn"s Dis./colitis'
CCC8_1R = 'Has Alzheimer"s disease/other dementia'
CCC8_1S = 'Has cataracts'
CCC8_1T = 'Has glaucoma'
CCC8_1U = 'Has a thyroid condition'
CCC8_1V = 'Has other chronic condition'
CCC8DANY = 'Has a chronic condition - (D)'
**CCC8GNUM = 'Number of chronic conditions - (D,G)'
SDC8GCB4 = 'Country of birth - (G)'
SDC8FIMM = 'Flag indicating/respondent is immigrant'
SDC8GRES = 'Length/time in Canada since imm. - (D,G)'
SDC8GLNG = 'Language/which resp. can converse - (G)'
SDC8GRAC = 'Derived race of respondent - grouped'
*EDC8_1 = 'Currently attending - school/col./univ.'
EDC8_2 = 'Full-time student/part-time student'
*EDC8D3 = 'Highest level of educ. - 4 lev. - (D)'
EDC8DLF = 'Labour force activity of students - (D)'
LFC8G17A = 'Reas. not work.-most recent period - (G)'
LFC8G17B = 'Reason for not working - currently - (G)'
LFC8GO25 = 'SOC for main job - 25 groups - (G)'
LFC8GI16 = 'SIC for main job - 16 groups - (G)'
LFC8DCWS = 'Working status in last 12 months - (D)'
LFC8DDA = 'Work dur. without break > 30 days - (D)'
LFC8DHA = 'Pattern of working hours/all jobs - (D)'
*LFC8DJA = 'Number of jobs - (D)'
LFC8DGA = 'Number of gaps of 30 days or more - (D)'
LFC8DJGA = 'Pattern of number of jobs - (D)'
LFC8DCMN = 'Main job is the current job - (D)'

LFC8DDMN = 'Work duration - main job - (D)'
*LFC8DHMN = 'Hours of work - main job - (D)'
*LFC8DTMN = 'Type of working hours - main job - (D)'
LFC8DD1 = 'Work duration - job 1 - (D)'
LFC8DD2 = 'Work duration - job 2 - (D)'
LFC8DD3 = 'Work duration - job 3 - (D)'
LFC8DH1 = 'Hours of work - job 1 - (D)'
LFC8DH2 = 'Hours of work - job 2 - (D)'
LFC8DH3 = 'Hours of work - job 3 - (D)'
LFC8DT1 = 'Type of working hours - job 1 - (D)'
LFC8DT2 = 'Type of working hours - job 2 - (D)'
LFC8DT3 = 'Type of working hours - job 3 - (D)'
*GHC8_1 = 'Respondent"s general health'
GHC8DHDI = 'Health description index - (D)'
HWC8GHT = 'Height - (G)'
HWC8G3KG = 'Weight in kilograms - (G)'
HWC8GBW = 'Birth weight - (G)'
HWC8GBMI = 'Body Mass Index - (D,G)'
HWC8GSW = 'Standard weight - (D,G)'
*BPC8_10 = 'Ever had blood pressure taken'
BPC8_12 = 'Last time blood pressure was taken'
*WHC8_20 = 'Ever had PAP smear test'
WHC8_22 = 'Last time had PAP smear test'
*WHC8_30 = 'Ever had mammogram'
WHC8_32 = 'Last time mammogram was done'
GHC8_21 = 'Gave birth since last interview'
GHC8G23 = 'Used services of doctor/midwife - (G)'
HWC8_1 = 'Currently pregnant'
*WHC8_5 = 'Had a hysterectomy'
WHC8_5A = 'Age had a hysterectomy'
WHC8_5B = 'Reason had a hysterectomy'
**SC_8_1 = 'Had sore throat, cold/flu'
SC_8_7 = 'Cold - took over-the-counter medication'
SC_8_8 = 'Cold - used herbal/vitamin supplements'
SC_8_9 = 'Cold - old prescription/someone else"s'
SC_8_10 = 'Cold - used home remedies'
SC_8_11 = 'Cold - cut down on act. & got more rest'
SC_8DFCT = 'Attitude toward self-care'
ISC8_1 = 'Insurance - prescription medications'
ISC8_2 = 'Insurance - dental expenses'
ISC8_3 = 'Insurance - eye glasses/contact lenses'
ISC8_4 = 'Insurance - hospital charges'
ISC8D1 = 'No. of types of medical insurance - (D)'

†FH_8_10 = 'Has some know./birth fam. health hist.'
FH_8_11 = 'Birth mother ever had - heart disease'
FH_8_12 = 'Birth mother ever had - high b. p.'
FH_8_13 = 'Birth mother ever had - stroke'
FH_8_14 = 'Birth mother ever had - diabetes'
FH_8_15 = 'Birth mother ever had - cancer'
FH_8_16A = 'Mother"s type of cancer - breast'
FH_8_16B = 'Mother"s type of cancer - ovarian'
FH_8_16C = 'Mother"s type of cancer - cervical'
FH_8_16D = 'Mother"s type of cancer - colorectal'
FH_8_16E = 'Mother"s type of cancer - skin(melanoma)'
FH_8_16F = 'Mother"s type of cancer - stomach'
FH_8_16G = 'Mother"s type of cancer - uterus'
FH_8_16H = 'Mother"s type of cancer - kidney'
FH_8_16I = 'Mother"s type of cancer - leukem./lymph.'
FH_8_16J = 'Mother"s type of cancer - lung'
FH_8_16K = 'Mother"s type of cancer - bladder'
FH_8_16L = 'Mother"s type of cancer - other'
FH_8_161 = 'Mother"s age - breast cancer'
FH_8_162 = 'Mother"s age - ovarian cancer'
FH_8_163 = 'Mother"s age - cervical cancer'
FH_8_164 = 'Mother"s age - colorectal cancer'
FH_8_165 = 'Mother"s age - melanoma cancer'
FH_8_166 = 'Mother"s age - stomach cancer'
FH_8_17 = 'Birth mother - now living'
FH_8_18 = 'Birth mother - age of death'
FH_8_19 = 'Birth mother - cause of death'
FH_8_21 = 'Birth father ever had - heart disease'
FH_8_22 = 'Birth father ever had - high b. p.'
FH_8_23 = 'Birth father ever had - stroke'
FH_8_24 = 'Birth father ever had - diabetes'
FH_8_25 = 'Birth father ever had - cancer'
FH_8_26A = 'Father"s type of cancer - prostate'
FH_8_26B = 'Father"s type of cancer - colorectal'
FH_8_26C = 'Father"s type of cancer - stomach'
FH_8_26D = 'Father"s type of cancer - kidney'
FH_8_26E = 'Father"s type of cancer - leukem./lymph.'
FH_8_26F = 'Father"s type of cancer - lung'
FH_8_26G = 'Father"s type of cancer - bladder'
FH_8_26H = 'Father"s type of cancer - other'
FH_8_261 = 'Father"s age - prostate cancer'
FH_8_262 = 'Father"s age - colorectal cancer'
FH_8_263 = 'Father"s age - stomach cancer'

FH_8_27 = 'Birth father - now living'
FH_8_28 = 'Birth father - age of death'
FH_8_29 = 'Birth father - cause of death'
FH_8_30 = 'Has/had biological brothers/sisters'
FH_8_31 = 'Siblings ever had - heart disease'
FH_8_32 = 'Siblings ever had - high blood pressure'
FH_8_33 = 'Siblings ever had - stroke'
FH_8_34 = 'Siblings ever had - diabetes'
FH_8_35 = 'Any biological sister ever had - cancer'
FH_8_36A = 'Sister"s type of cancer - breast'
FH_8_36B = 'Sister"s type of cancer - ovarian'
FH_8_36C = 'Sister"s type of cancer - cervical'
FH_8_36D = 'Sister"s type of cancer - colorectal'
FH_8_36E = 'Sister"s type of cancer - skin(melanoma)'
FH_8_36F = 'Sister"s type of cancer - stomach'
FH_8_36G = 'Sister"s type of cancer - uterus'
FH_8_36H = 'Sister"s type of cancer - kidney'
FH_8_36I = 'Sister"s type of cancer - leukem./lymph.'
FH_8_36J = 'Sister"s type of cancer - lung'
FH_8_36K = 'Sister"s type of cancer - bladder'
FH_8_36L = 'Sister"s type of cancer - other'
FH_8_37 = 'Any biological brother ever had - cancer'
FH_8_38A = 'Brother"s type of cancer - prostate'
FH_8_38B = 'Brother"s type of cancer - colorectal'
FH_8_38C = 'Brother"s type of cancer - stomach'
FH_8_38D = 'Brother"s type of cancer - kidney'
FH_8_38E = 'Brother"s type of cancer - leuk./lymph.'
FH_8_38F = 'Brother"s type of cancer - lung'
FH_8_38G = 'Brother"s type of cancer - bladder'
FH_8_38H = 'Brother"s type of cancer - other'
*NU_8D1 = 'No./med. reas. - choose/avoid foods -(D)'
*NU_8D2 = 'No./content reas. - choosing foods - (D)'
*NU_8D3 = 'No./content reas. - avoiding foods - (D)'
*NU_8DCON = 'Freq. cons. - vitamin/min. suppl. - (D)'
HSC8GVIS = 'Vision trouble - function code - (D,G)'
HSC8GHER = 'Hearing problems - function code - (D,G)'
HSC8GSPE = 'Speech trouble - function code - (D,G)'
HSC8GMOB = 'Mobility trouble - function code - (D,G)'
HSC8GDEX = 'Dext. trouble - function code - (D,G)'
HSC8DEMO = 'Emotional problems - function code - (D)'
HSC8GCOG = 'Cognition - function code - (D,G)'
HSC8DPAD = 'Act. prevented/pain - function code-(D)'
*HSC8DHSI = 'Health Utility Index (HUI3) - (D)'

*PY_8DH1 = 'Sense of coherence scale - (D)'
†PAC8_1A = 'Act./last 3 months - walking'
PAC8_1B = 'Act./last 3 months - gardening/yard work'
PAC8_1C = 'Act./last 3 months - swimming'
PAC8_1D = 'Act./last 3 months - bicycling'
PAC8_1E = 'Act./last 3 months - pop./social dance'
PAC8_1F = 'Act./last 3 months - home exercises'
PAC8_1G = 'Act./last 3 months - ice hockey'
PAC8_1H = 'Act./last 3 months - ice skating'
PAC8_1Y = 'Act./last 3 months - in-line skat./roll.'
PAC8_1J = 'Act./last 3 months - jogging or running'
PAC8_1K = 'Act./last 3 months - golfing'
PAC8_1L = 'Act./last 3 months - ex. class/aerobics'
PAC8_1I = 'Act./last 3 months - downhill skiing'
PAC8_1N = 'Act./last 3 months - bowling'
PAC8_1O = 'Act./last 3 months - baseball/softball'
PAC8_1P = 'Act./last 3 months - tennis'
PAC8_1Q = 'Act./last 3 months - weight-training'
PAC8_1R = 'Act./last 3 months - fishing'
PAC8_1S = 'Act./last 3 months - volleyball'
PAC8_1T = 'Act./last 3 months - basketball'
PAC8_1U = 'Act./last 3 months - other (#1)'
PAC8_1V = 'Act./last 3 month - none'
PAC8_1W = 'Act./last 3 months - other (#2)'
PAC8_1X = 'Act./last 3 months - other (#3)'
PAC8_2A = 'No. times partic. - walking for exercise'
PAC8_3A = 'Time spent - walking for exercise'
PAC8_2B = 'No. times partic. - gardening'
PAC8_3B = 'Time spent - gardening'
PAC8_2C = 'No. times partic. - swimming'
PAC8_3C = 'Time spent - swimming'
PAC8_2D = 'No. times partic. - bicycling'
PAC8_3D = 'Time spent - bicycling'
PAC8_2E = 'No. times partic. - popular/social dance'
PAC8_3E = 'Time spent - popular/social dance'
PAC8_2F = 'No. times partic. - home exercises'
PAC8_3F = 'Time spent - home exercises'
PAC8_2G = 'No. times partic. - ice hockey'
PAC8_3G = 'Time spent - ice hockey'
PAC8_2H = 'No. times partic. - ice skating'
PAC8_3H = 'Time spent - ice skating'
PAC8_2Y = 'No. times partic. - in-line skat./roll.'
PAC8_3Y = 'Time spent - in-line skate/rolleblade'

PAC8_2J = 'No. times partic. - jogging/running'
PAC8_3J = 'Time spent - jogging/running'
PAC8_2K = 'No. times partic. - golfing'
PAC8_3K = 'Time spent - golfing'
PAC8_2L = 'No. times partic. - ex. class/aerobics'
PAC8_3L = 'Time spent - exercise class/aerobics'
PAC8_2I = 'No. times partic. - downhill skiing'
PAC8_3I = 'Time spent - downhill skiing'
PAC8_2N = 'No. times partic. - bowling'
PAC8_3N = 'Time spent - bowling'
PAC8_2O = 'No. times partic. - baseball or softball'
PAC8_3O = 'Time spent - baseball/softball'
PAC8_2P = 'No. times partic. - tennis'
PAC8_3P = 'Time spent - tennis'
PAC8_2Q = 'No. times partic. - weight training'
PAC8_3Q = 'Time spent - weight training'
PAC8_2R = 'No. times partic. - fishing'
PAC8_3R = 'Time spent - fishing'
PAC8_2S = 'No. times partic. - volleyball'
PAC8_3S = 'Time spent - volleyball'
PAC8_2T = 'No. times partic. - basketball'
PAC8_3T = 'Time spent - basketball'
PAC8_2U = 'No. times partic. - other activity (#1)'
PAC8_3U = 'Time spent - other activity (#1)'
PAC8_2W = 'No. times partic. - other activity (#2)'
PAC8_3W = 'Time spent - other activity (#2)'
PAC8_2X = 'No. times partic. - other activity (#3)'
PAC8_3X = 'Time spent - other activity (#3)'
PAC8_4A = 'No. of hours spent - walking work/school'
PAC8_4B = 'No. of hours spent - biking-work/school'
PAC8_5 = 'Frequency of bike helmet use'
*PAC8_6 = 'Level of physical activity for usual day'
PAC8DLEI = 'Participant - leisure physical act.- (D)'
PAC8DFM = 'Monthly freq./phys. act. >15 min. - (D)'
*PAC8DFR = 'Frequency of all physical activity - (D)'
PAC8DFD = 'Partic./daily phys. act. >15 min. - (D)'
PAC8DEE = 'Energy expenditure - (D)'
PAC8DPAI = 'Physical activity index - (D)'
RPC8_1 = 'Had repetitive strain injuries'
*RPC8_2 = 'Number of repetitive strain injuries'
RPC8_3 = 'Body part affected by repetitive strain'
RPC8_4A = 'Repetitive/injury caused - act. at home'
RPC8_4B = 'Repet./injury caused - act. work/school'

RPC8_4C = 'Repetitive/injury caused - leisure act.'
RPC8_4D = 'Repetitive/injury caused - other act.'
IJC8_1 = 'Injury - limits normal activities'
IJC8_2 = 'Injury - number of times'
IJC8_3 = 'Injury - type'
IJC8_4 = 'Injury - body part affected'
IJC8G5 = 'Place of occurrence of injury - (G)'
IJC8G6 = 'Reason for injury - (G)'
IJC8_7 = 'Injury - work-related'
IJC8_8A = 'Precaution taken - gave up the activity'
IJC8_8B = 'Precaution taken - being more careful'
IJC8_8C = 'Precaution taken - safety training'
IJC8_8D = 'Precaution taken - protective gear'
IJC8_8E = 'Precaution taken - change phys. situat.'
IJC8_8F = 'Precaution taken - other'
IJC8_8G = 'Precaution taken - none'
IJC8D1 = 'Type of injury by body site - (D)'
IJC8GD2 = 'Cause of injury/place of occur. - (D,G)'
†DGC8_1A = 'Medication - pain relievers'
DGC8_1B = 'Medication - tranquilizers'
DGC8_1C = 'Medication - diet pills'
DGC8_1D = 'Medication - antidepressants'
DGC8_1E = 'Medication - codeine/Demerol/morphine'
DGC8_1F = 'Medication - allergy'
DGC8_1G = 'Medication - asthma'
DGC8_1H = 'Medication - cough/cold remedies'
DGC8_1I = 'Medication - penicillin/other antibiot.'
DGC8_1J = 'Medication - heart'
DGC8_1K = 'Medication - blood pressure'
DGC8_1L = 'Medication - diuretics'
DGC8_1M = 'Medication - steroids'
DGC8_1N = 'Medication - insulin'
DGC8_1O = 'Medication - pills to control diabetes'
DGC8_1P = 'Medication - sleeping pills'
DGC8_1Q = 'Medication - stomach remedies'
DGC8_1R = 'Medication - laxatives'
DGC8_1S = 'Medication - birth control pills'
DGC8_1T = 'Medication - hormones for menopause'
DGC8_1U = 'Medication - thyroid'
DGC8_1V = 'Medication - other'
DGC8F1 = 'Flag for medications taken'
DGC8_2 = 'No. of different medications/past 2 days'
DGC8G3A = 'Drug code - drug 1 - (G)'

DGC8G3B = 'Drug code - drug 2 - (G)'
DGC8G3C = 'Drug code - drug 3 - (G)'
DGC8G3D = 'Drug code - drug 4 - (G)'
DGC8G3E = 'Drug code - drug 5 - (G)'
DGC8G3F = 'Drug code - drug 6 - (G)'
DGC8G3G = 'Drug code - drug 7 - (G)'
DGC8G3H = 'Drug code - drug 8 - (G)'
DGC8G3I = 'Drug code - drug 9 - (G)'
DGC8G3J = 'Drug code - drug 10 - (G)'
DGC8G3K = 'Drug code - drug 11 - (G)'
DGC8G3L = 'Drug code - drug 12 - (G)'
DGC8_4 = 'Medication - other type'
DGC8G5A = 'Code/health product - product 1 - (G)'
DGC8G5B = 'Code/health product - product 2 - (G)'
DGC8G5C = 'Code/health product - product 3 - (G)'
DGC8G5D = 'Code/health product - product 4 - (G)'
DGC8G5E = 'Code/health product - product 5 - (G)'
DGC8G5F = 'Code/health product - product 6 - (G)'
DGC8G5G = 'Code/health product - product 7 - (G)'
DGC8G5H = 'Code/health product - product 8 - (G)'
DGC8G5I = 'Code/health product - product 9 - (G)'
DGC8G5J = 'Code/health product - product 10 - (G)'
DGC8G5K = 'Code/health product - product 11 - (G)'
DGC8G5L = 'Code/health product - product 12 - (G)'
*SMC8_1 = 'Household member smokes inside house'
*SMC8_2 = 'Type of smoker'
*SMC8_3 = 'Age started smoking daily - daily smoker'
SMC8G3 = 'Age started daily - daily smoker - (G)'
*SMC8_4 = 'No. cig. smoked each day - daily smoker'
*SMC8_4A = 'Ever smoked cigarettes'
SMC8_5A = 'Smoked >=100 cigarettes - former smokers'
SMC8_5B = 'No. of cig. smoked - occasional smoker'
SMC8_5C = 'No. of days smoked >=1 cig.- occ. smoker'
SMC8_5 = 'Ever smoked daily'
SMC8_6 = 'Age started smoking daily - former'
SMC8G6 = 'Age started daily - former smoker - (G)'
SMC8_7 = 'No. of cig. daily - former daily smoker'
*SMC8_8 = 'Age stopped smoking daily - former'
SMC8G8 = 'Age stopped daily - former smoker - (G)'
SMC8DTYP = 'Type of smoker - (D)'
SMC8DYRS = 'Number of years smoked - (D)'
SMC8_2_1 = 'Time of first cigarette after awake'
SMC8_2_2 = 'Tried quitting smoking'

SMC8_2_3 = 'Number of times - tried to quit smoking'
SMC8_2_4 = 'Considers quitt. smoking - next 30 days'
SMC8_2_5 = 'Considers quitt. smoking - next 6 months'
SMC8_2_6 = 'Smoking restiction at work'
*TAS8D1 = 'Use of tobacco products - (D)'
ALC8_1 = 'Drank alcohol in past 12 months'
*ALC8_2 = 'Frequency of drinking alcohol'
*ALC8_3 = 'Frequency of having 5 or more drinks'
*ALC8_5 = 'Drank alcohol in past week'
ALC8_5A1 = 'Number of drinks - Monday'
ALC8_5A2 = 'Number of drinks - Tuesday'
ALC8_5A3 = 'Number of drinks - Wednesday'
ALC8_5A4 = 'Number of drinks - Thursday'
ALC8_5A5 = 'Number of drinks - Friday'
ALC8_5A6 = 'Number of drinks - Saturday'
ALC8_5A7 = 'Number of drinks - Sunday'
ALC8_5B = 'Ever had a drink'
*ALC8_6 = 'Regularly drank > 12 drinks a week'
ALC8_7A = 'Reason reduced drinking - dieting'
ALC8_7B = 'Reason reduced drink. - athletic train.'
ALC8_7C = 'Reason reduced drinking - pregnancy'
ALC8_7D = 'Reason reduced drinking - getting older'
ALC8_7E = 'Reason reduced drinking - drink too much'
ALC8_7F = 'Reas. reduced drink. - aff. work/studies'
ALC8_7G = 'Reas. reduced drink. - interf./fam. life'
ALC8_7H = 'Reas. reduced drink. - aff. phys. health'
ALC8_7I = 'Reas. reduced drink. - aff. social rel.'
ALC8_7J = 'Reas. reduced drink. - aff. financ. pos.'
ALC8_7K = 'Reas. reduced drink. - aff. happiness'
ALC8_7L = 'Reas. reduced drink. - fam./friends inf.'
ALC8_7M = 'Reason reduced drinking - other'
ALC8G7 = 'Single reas. reduce/quit drinking - (G)'
ALC8DTYP = 'Type of drinker - (D)'
ALC8DWKY = 'Weekly total of alcohol consumed - (D)'
ALC8DDLY = 'Average daily alcohol consumption - (D)'
MHC8_1J = 'Freq. - experiences interfere with life'
MHC8_1K = 'Mental health - consulted health prof.'
*MHC8G1L = 'No./consult. - prof./ment.health - (G)'
MHC8_1MA = 'Mental health, consulted - family doctor'
MHC8_1MB = 'Mental health, consulted - psychiatrist'
MHC8_1MC = 'Mental health, consulted - psychologist'
MHC8_1MD = 'Mental health, consulted - nurse'
MHC8_1ME = 'Mental health, cons. - soc. work./couns.'

MHC8_1MF = 'Mental health, consulted - other'
*MHC8DDS = 'Distress Scale - (D)'
MHC8DCH = 'Chronicity Distress Impair. Scale - (D)'
MHC8DSF = 'Depr. Scale - Short Form Score - (D)'
MHC8DPP = 'Depr. Scale - Predicted Prob. - (D)'
MHC8DWK = 'Number of weeks felt depressed - (D)'
MHC8DMT = 'Specific month when felt depressed - (D)'
*SSC8_101 = 'No. of close friends/relatives'
SSC8DTNG = 'Tangible social support - MOS - (D)'
SSC8DAFF = 'Affection - MOS subscale - (D)'
SSC8DSOC = 'Positive social interaction - MOS - (D)'
SSC8DEMO = 'Emot./info. support - MOS subscale - (D)'
WT68 = 'Sampling weight - selected respondent'

Appendix F

All descriptives of the variables used in the questionnaire are described in this appendix. The variables are divided into the following sections; health, health behaviours, lifestyle, social and psychological. Those variables described in the results section (demographic and those variables identified in the PHI) are not listed here.

Health

Individuals were asked to identify how many days they spend in bed within the last 14 days prior to the study (Figure F1). The majority of the participants (90%) had identified that they did not spend any days in bed where 6% identified having stayed in bed once, 3% twice and 1% three times in the past 14 days.

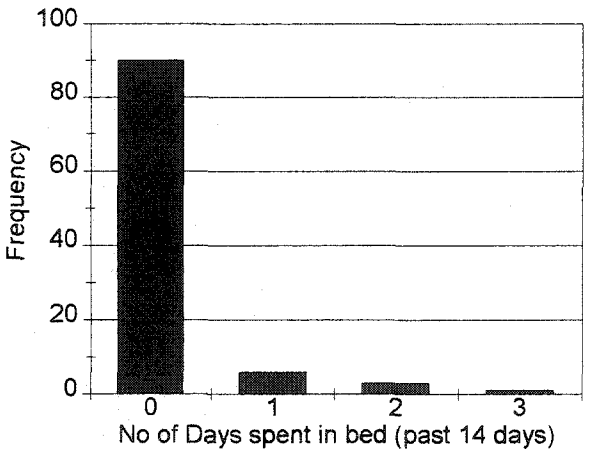


Figure F1. Frequency distribution of the number of days spent in bed.

Within the past 14 days prior to the study, individuals reported the number of days they cut down on activities (not counting the days they spent in bed as identified in the previous variable). As identified in Figure F2, 68% of the individuals stated that they did not cut down on any activities, 17% identified cutting down on activities on one day, 5% for two days, 2% for

three and four days, 1% for five and six days and 4% identified having cut down on activities for 7 days.

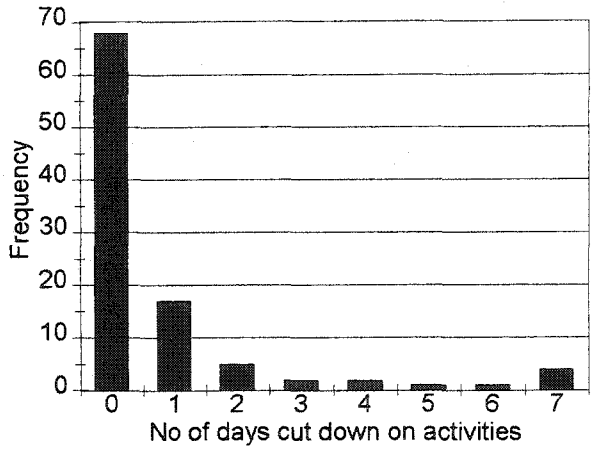


Figure F2. Frequency distribution of the number of days cut down on activities.

Of the participants in the study, 8% did not indicate if they had a regular medical doctor, 71% indicated that they did have a regular medical doctor and 21% indicated that they did not have a regular medical doctor. The frequency distribution is illustrated in Figure F3.

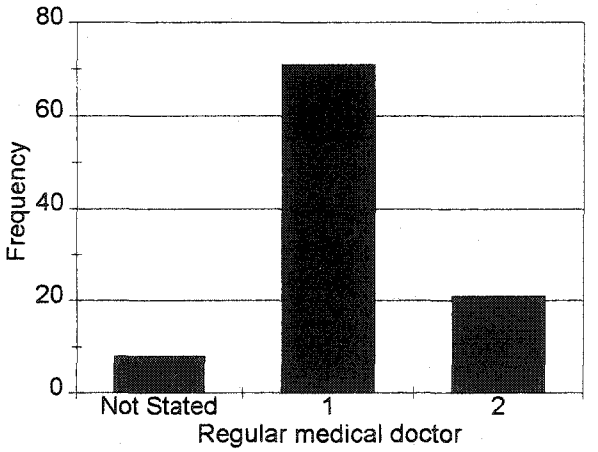


Figure F3. Frequency distribution of having a regular medical doctor.

The total number of disability days was calculated from the sum of the number of days spent in bed and the number of days an individual cut down on activities in the past 14 days. In the current investigation (Figure F4), over half (66%) of the participants did not have any

disability days, 17% had one disability day, 3% had two disability days, 5% had three, 3% had four, 1% had five and six, 2% had seven and 1% had nine disability days.

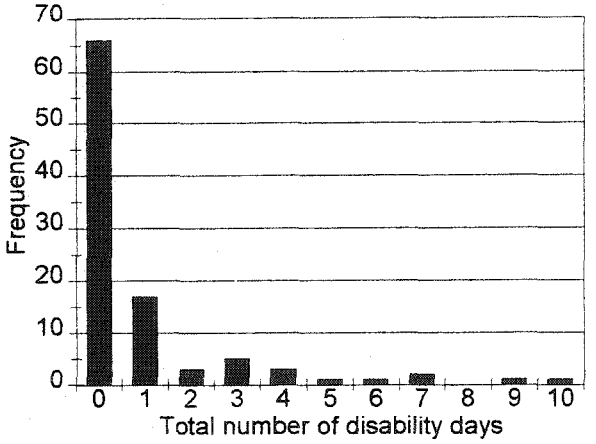


Figure F4. Frequency distribution of the total number of disability days.

Participants in the study were asked to identify if they needed help from another person in a series of tasks because of any condition or health problem. The types of tasks included preparing meals, shopping, housework, heavy chores, personal care, and moving about in the house. The majority of the participants did not identify that they needed help (98%). Only 2% identified that they did need help (Figure F5).

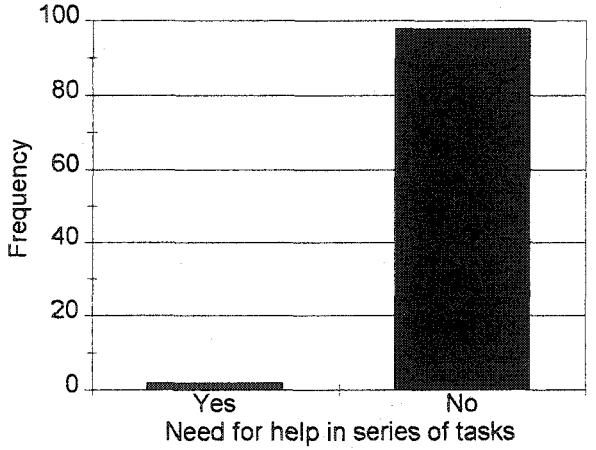


Figure F5. Frequency distribution of the need for help in a series of tasks.

Health Behaviours

Individuals identified if they had attended a self-help group within the 12 months. As depicted in Figure F6, 19% of the participants had attended a self-help group and 81% did not.

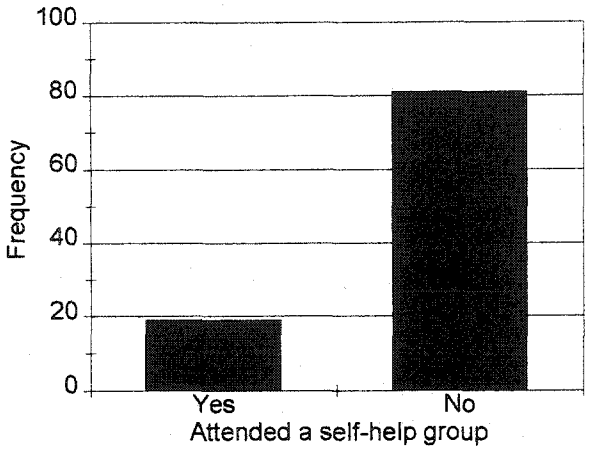


Figure F6. Frequency distribution of attendance at a self-help group.

Participants were asked to identify if they consulted an alternative health care provider in the past 12 months. Figure F7 illustrates the use of alternative health care providers. Only 1% of the participants did not state having consulted an alternative health care provider where 17% did and 82% did not report having consulted an alternative health care provider.

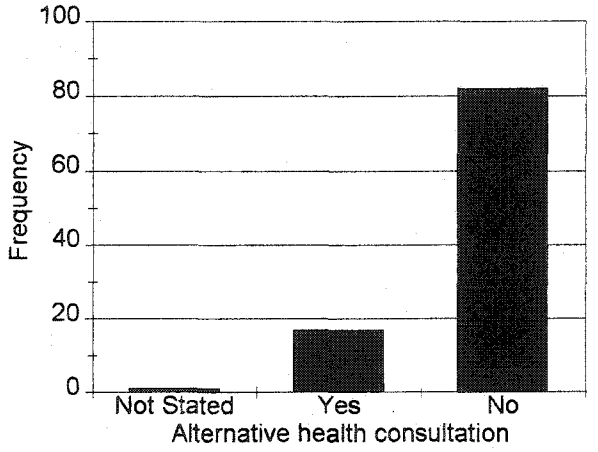


Figure F7. Frequency distribution of consultation with alternative health care.

Figure F8 illustrates those participants that felt that they needed health care, but did not receive it. Of the participants in the study, 1% did not state whether they did not receive health care although they felt they needed it, 19% identified that they did need health care, but did not receive it and 80% of the participants stated that there was never a time in the past 12 months that they felt that they needed health care and did not receive it.

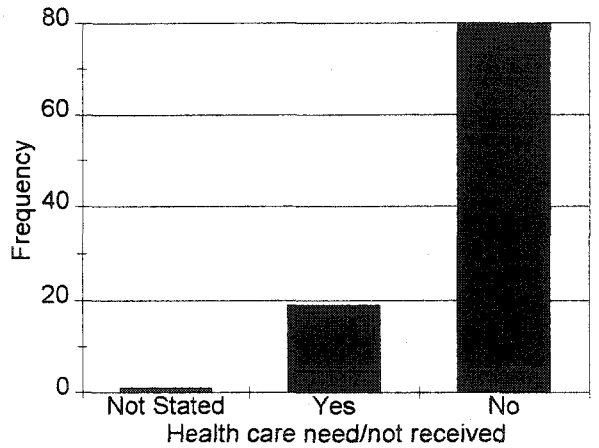


Figure F8. Frequency distribution of health care needed but not received.

Participants were asked to identify if they received any home care services in the past 12 months. Figure F9 indicates that 1% of the participants did not identify if they received home care services, 2% indicated that they did receive home care services and 97% indicated that they did not receive any home care services in the past 12 months.

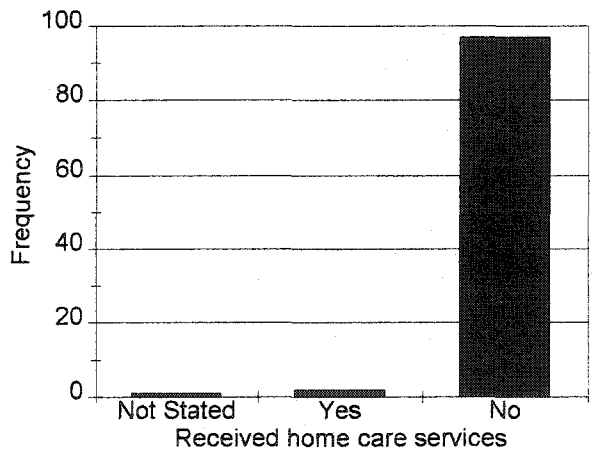


Figure F9. Frequency distribution of having received home care services (past 12 months).

Figure F10 illustrates the number of nights any of the participants spent in a hospital as an overnight patient within the past 12 months. The majority of the participants did not identify having spent any nights in a hospital (97%), 1% identified having spent one night, 1% identified having spent two nights and 1% identified having spent three nights as an overnight patient in a hospital.

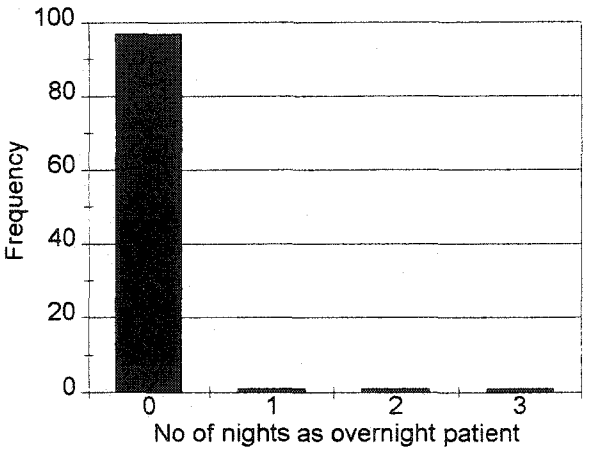


Figure F10. Frequency distribution of the number of nights as an overnight patient.

Participants were also asked to identify how many times in the past 12 months they had seen or talked to a medical doctor. Figure F11 identifies that the majority of the participants sought advice less than three times in the past 12 months. More specifically, 22% of participants did not seek advice from a medical doctor, 22% sought advice once, 13% twice, 8% three times, 6% four times, 2% five times, 5% six times, 3% seven times, 2% eight times and 3% twelve times.

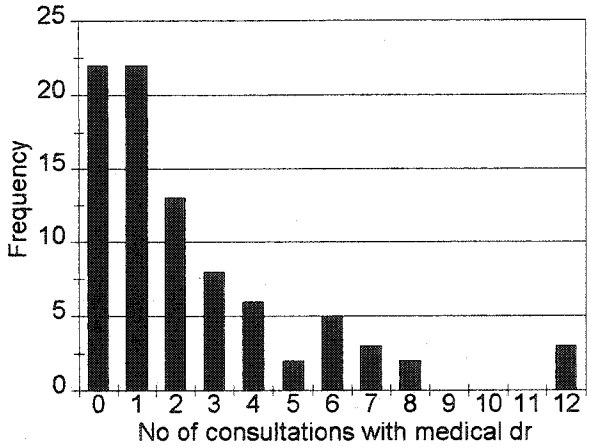


Figure F11. Frequency distribution of the number of consultations with a medical doctor.

Participants identified the number of times in the past 12 months that they saw or talked to a health professional about their emotional or mental health. Figure F12 illustrates that the majority of the participants (89%) did not seek any advice regarding their emotional or mental health, 1% identified that they sought advice once, 5% sought advice twice, 2% sought advice twice as well as 5 times and 1% sought advice ten times within the past 12 months.

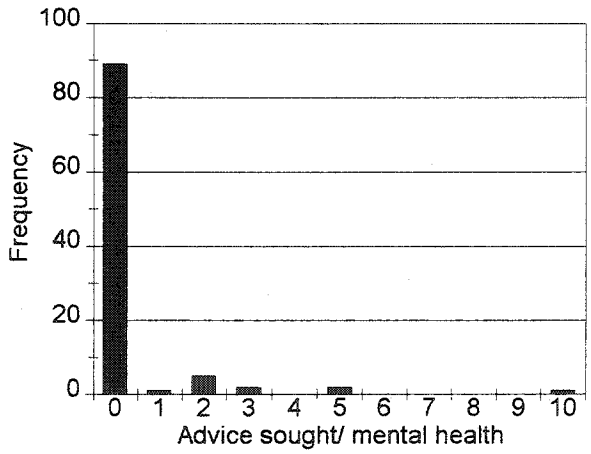


Figure F12. Frequency distribution of the number of consultations regarding emotional health.

Lifestyle

Participants were asked to identify if they had ever had their blood pressure taken. Figure F13 illustrates that 1% of the participants did not state whether they had ever had their blood pressure taken. The majority of the participants (97%) have had their blood pressure taken and 1% had never had their blood pressure taken.

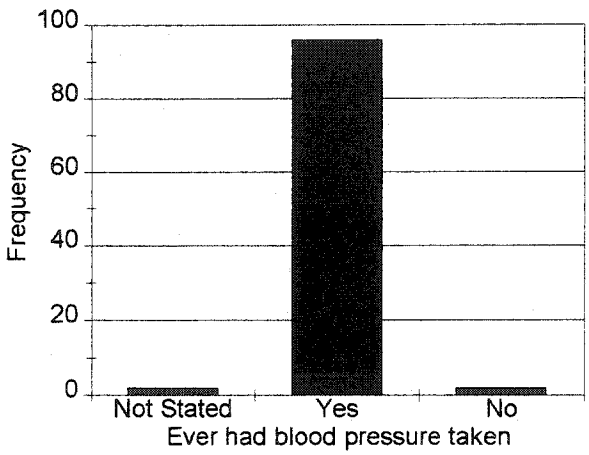


Figure F13. Frequency distribution of ever having had blood pressure taken.

The female participants were asked to identify if they had ever had a Pap smear test. Of the females that participated in this study (N = 62), 64% indicated that they have had a PAP Smear test and 36% indicated that they had never had one done (Figure F14).

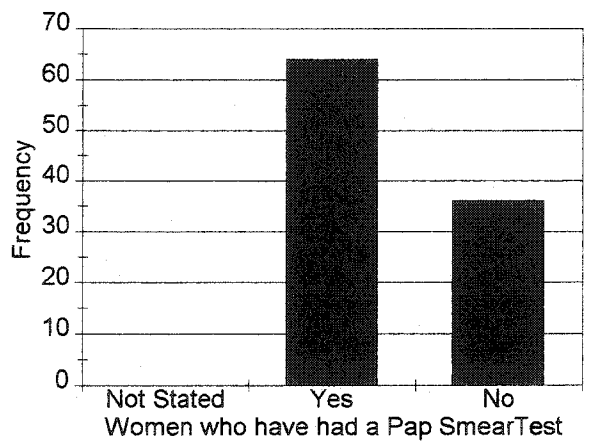


Figure F14. Frequency distribution of ever having had a pap smear.

Female participants were also asked if they had ever had a mammogram. As illustrated in Figure F15, 38% of female participants in this study did not state whether they had ever had a mammogram, 36% indicated that they have had a mammogram and 26% stated that they have never had a mammogram.

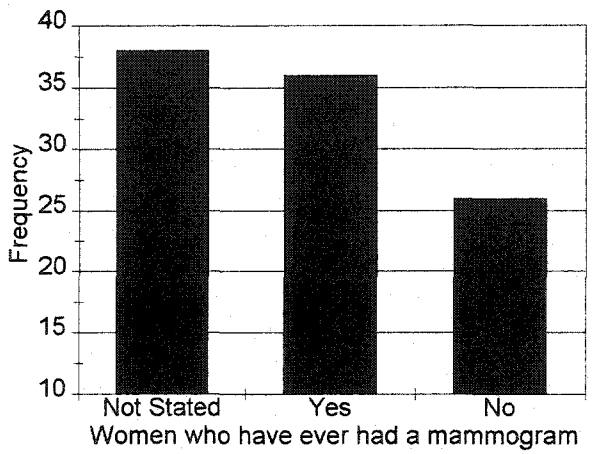


Figure F15. Frequency distribution of ever having had a mammogram.

Another question directed to the female participants included ever having had a hysterectomy. Female participants in this study as illustrated in Figure F16, 38% did not indicate whether they had a hysterectomy or not, 7% stated that they had a hysterectomy and 55% stated they had not had a hysterectomy.

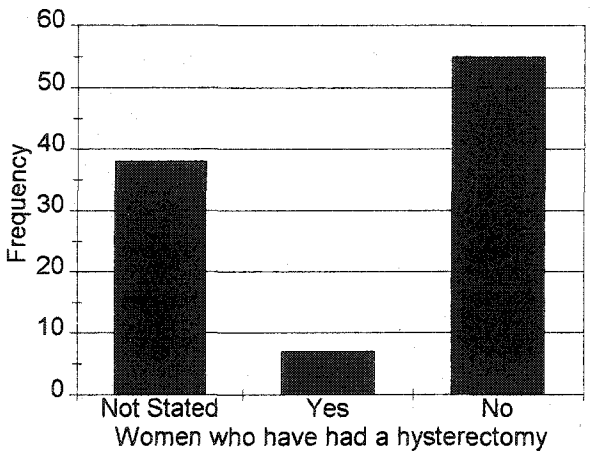
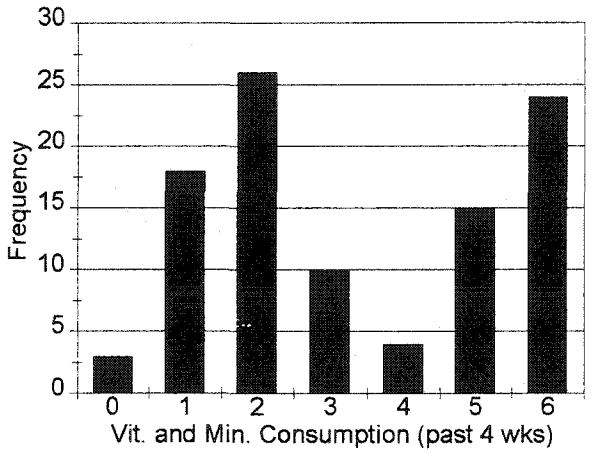


Figure F16. Frequency distribution of hysterectomy's among female participants.

The frequency of vitamin and mineral consumption was classified by non-user, occasional user and regular user within the past 4 weeks. Figure F17 indicates that 3% of the participants did not identify if they took any supplements, 18% were identified as non-users, 26% as occasional users, 10% as regular users for one to two days in the past four weeks, 4% three to four days in the past four weeks, 15% five to six days in the past four weeks and 24% seven days in the past four weeks.



0 - Not Stated
1 - Non User
2 - Occasional User
3 - Regular User (1-2 Days)
4 - Regular User (3-4 Days)
5 - Regular User (5-6 Days)
6 - Regular User (7 Days)

Figure F17. Frequency distribution of vitamin and mineral consumption.

The level of physical activity a participant engaged in was transformed into a grouped variable. Figure F18 identifies that 13% of participants did not state whether they engaged in physical activity or not, 25% of participants regularly engaged in physical activity (≥12 times/month), 33% engaged in physical activity occasionally (≥4 but ≤11 times/month) and 26% engaged in physical activity infrequently (≥0 but ≤3 times/month).

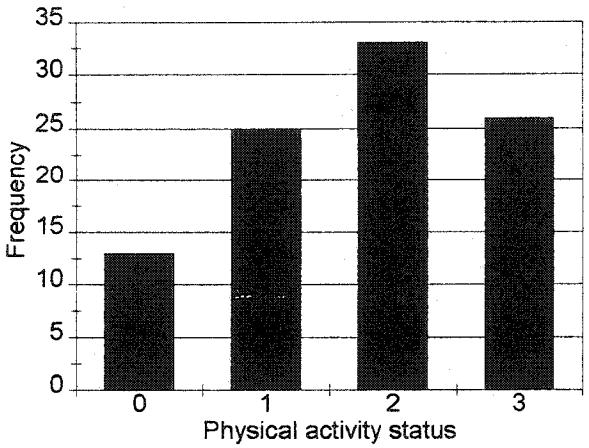


Figure F18. Frequency distribution of physical activity status.

Participants were asked to identify if any member of their household smokes inside the house. Figure F19 illustrates that 81% of the participants did not state if a household member smoked inside the house, 3% indicated that someone does smoke inside the house and 16% indicated that no one smokes inside their house.

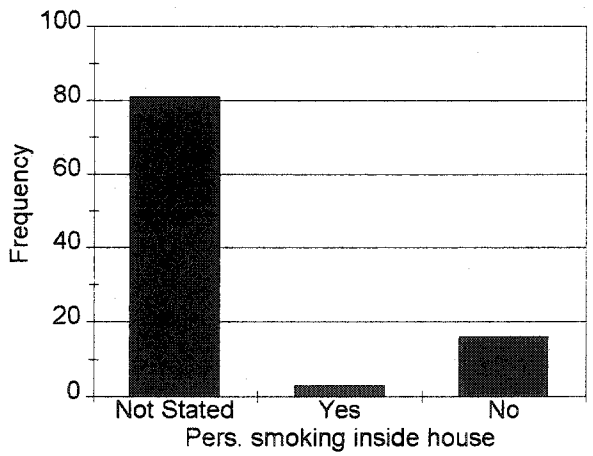


Figure F19. Frequency distribution of persons smoking in the household.

Participants were asked if they presently smoked cigarettes. Figure F20 indicates that 4% did not indicate whether they smoked cigarettes or not, 14% identified that they smoked daily, 6% smoked occasionally and 75% did not smoke at all.

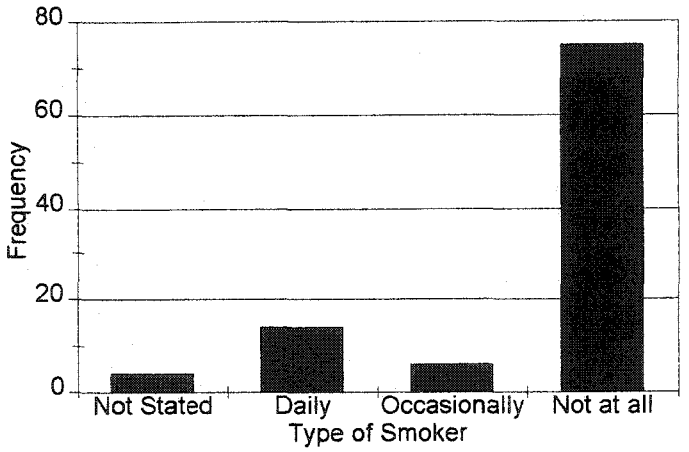


Figure F20. Frequency distribution of type of smoker.

Participants were asked if they had ever smoked cigarettes. Figure F21 identifies that 12% of participants did not state whether they had smoked cigarettes or not, 53% indicated that they had smoked and 35% indicated that they had never smoked cigarettes.

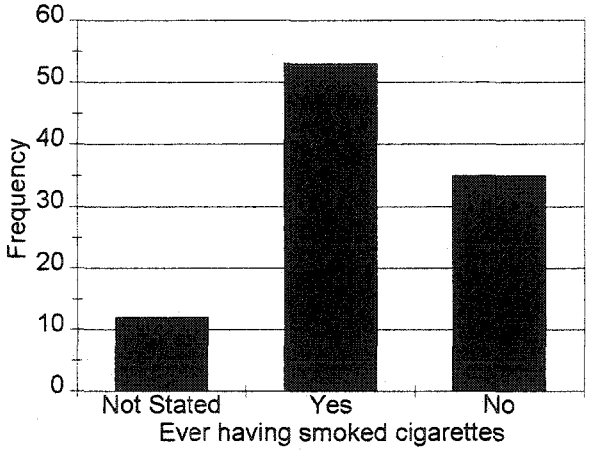


Figure F21. Frequency distribution of cumulative incidence of smoking.

Participants were asked if they had ever used alternate tobacco products including cigars, pipes, snuff or chewing tobacco in the past month. Figure F22 illustrates that 20% of participants did not identify if they had used alternate tobacco products, 6% identified that they did use alternate tobacco products and the majority of the participants (74%) indicated that they did not use alternate tobacco products.

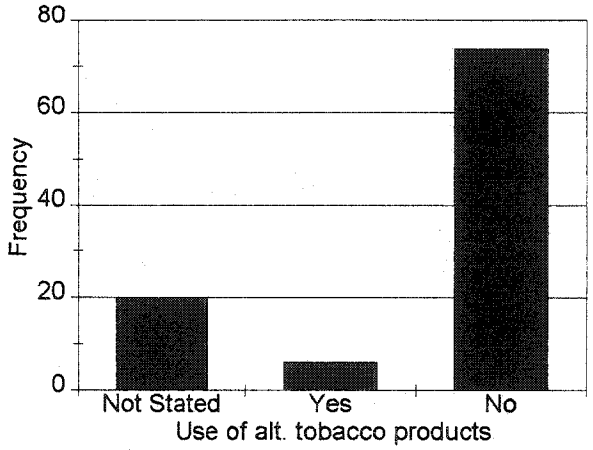
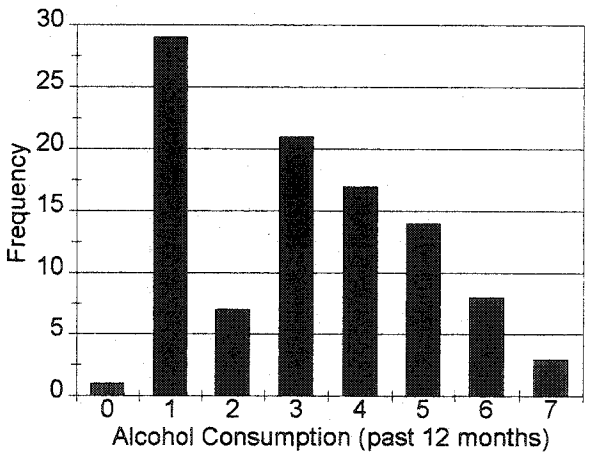


Figure F22. Frequency distribution of use of alternative tobacco products.

Participants were asked about their alcohol consumption in the past 12 months. Figure F23 indicates that 1% of participants did not indicate having had alcohol in the past 12 months, 29% identified having alcohol less than once per month, 7% once a month, 21% two to three times a month, 17% once a week, 14% two to three times a week, 8% four to six times a week and 3% everyday.



0 - Not Stated
1 - Less than once a month
2 - Once a month
3 - 2-3 times a month
4 - Once a week
5 - 2-3 times a week
6 - 4-6 times a week
7 - Everyday

Figure F23. Frequency distribution of alcohol consumption in the past 12 months.

Participants were asked to identify if they ever drank more than 12 drinks in a week. Figure F24 indicates that 1% of participants did not indicate if they ever drank more than 12 drinks in a week, 16% have drank more than 12 drinks in a week and 83% have not ever had more than 12 drinks in a week.

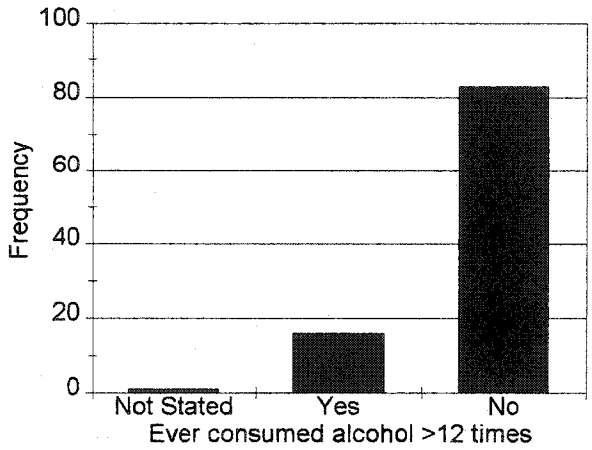


Figure F24. Frequency distribution of ever having consumed > 12 alcoholic drinks in a week.

Social

Individuals in the study were asked to identify the type of working hours at their main job. Figure F25 indicated that 1% of participants did not state their type of working hours, 71% indicated that they worked regular shift with no weekend, 16% worked regular shift with weekend, 1% worked a rotating split with no weekend; with weekend; irregular/on call with weekend; other with no weekend and 8% worked other hours with weekend.

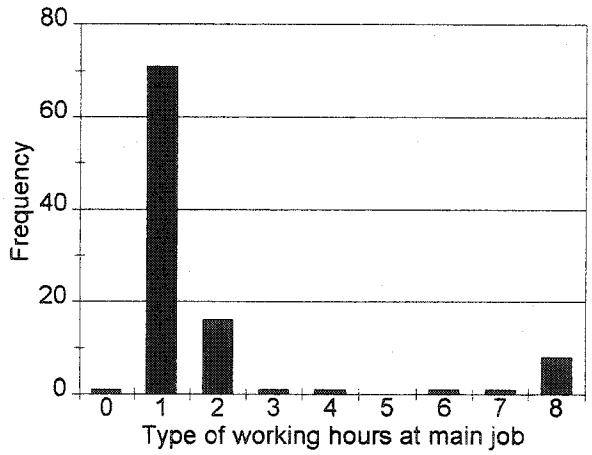


Figure F25. Frequency distribution of type of working hours at main job.

Individuals in the study were asked if anyone in their immediate family ever had a history of heart disease, high blood pressure, a stroke, diabetes or cancer. Figure F26 illustrates that 83%

of participants have had a family member with one or more health conditions and 17% indicated that they did not have a family member with any of the listed health conditions.

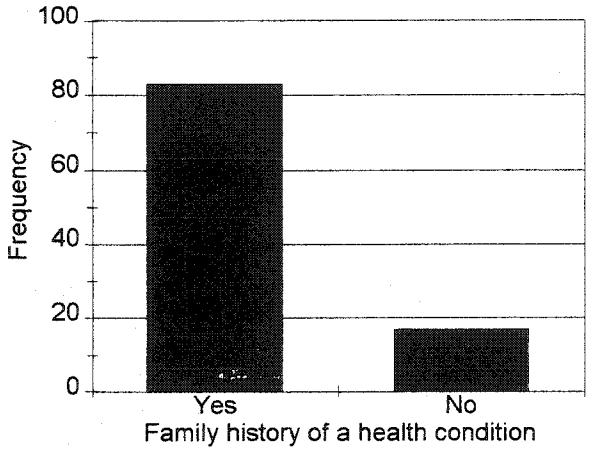


Figure F26. Frequency distribution of a family member having a health condition.

Participants were asked if they ever worried that there would not be enough food to eat because of lack of money, if they did not have enough food to eat because of lack of money or that they did not eat the quality or variety of foods they wanted because of lack of money. Figure F27 indicates that 8% of participants were 'flagged' for having a food insecurity and 92% were not 'flagged' for having food insecurities.

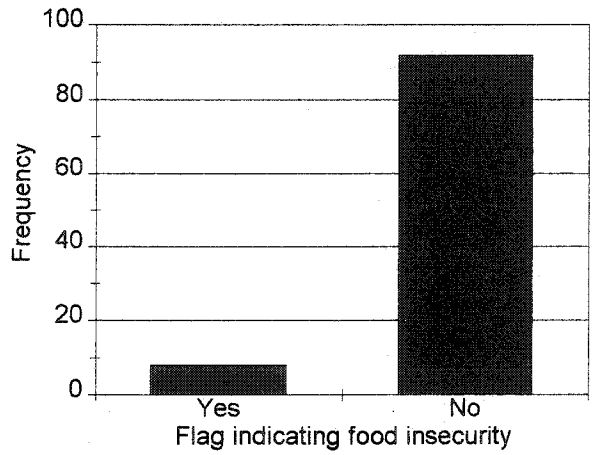


Figure F27. Frequency distribution of individuals flagged for food insecurity.

Table F1
Descriptives of Continuous Variables within the Workplace Data Set

Variable	$\bar{x}$	± SD
Participation in Physical Activity in the past month	2.48	2.43
Age began smoking daily	17.5	3.05
No. of cigarettes smoked each day	13.5	5.12
Age stopped smoking daily	30.18	9.46
Hours worked per week	40.37	9.75
No. of close friends/relatives	6.34	6.4
Sense of Coherence Score	56.75	11.5

Table F1 identifies descriptives of those variables within the workplace data set that were continuous in nature.

Individuals in the study were asked to identify how many times they engaged in physical activity in the past month. The average number of participation in physical activity among participants was 2.48 (± 2.43).

The average age that smokers began to smoke cigarettes was 17.5 (± 3.05). Of the participants that were still smokers, the average number of cigarettes smoked daily was 13.5 (± 5.12). Of those participants that had quit smoking, the average age that they had quit was 30.18 (± 9.46).

Individuals in the study identified the number of hours they worked at their full-time job. The average amount of hours a participant worked a week 40.37 (± 9.75).

Participants were asked to identify the number of close friends and relatives they had that they felt they could talk freely with. The average number of friends and relatives participants identified was 6.34 (± 6.4).

Participants were asked a series of questions relating to various aspects of people's lives. In total, 13 questions were asked. Answers were circled on a likert scale ranging from one to seven. The maximum score for the composite variable was 78. Higher scores indicated a stronger sense of coherence.