The Relationship Between Childhood Abuse, Adult Physical Health and Health Care Utilization

by

Mariette J. Chartier

A thesis submitted to the Faculty of Graduate Studies

in partial fulfillment of the requirements of the degree of

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Department of Community Health Sciences

University of Manitoba

Winnipeg, Manitoba

THE UNIVERSITY OF MANITOBA

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ABSTRACT

Introduction: The long-term consequences of childhood maltreatment on adult mental health have been a major focus of research. Much less attention has been directed to the effects of childhood abuse on physical health outcomes. This study builds on research regarding the link between childhood physical and sexual abuse and adult physical health and health care utilization. The life course model was used whereby outcomes later in life are believed to be linked to early life events.

Methods: Using data from the Ontario Health Survey and the Mental Health Supplement (n=9953), the relationship between retrospective reports of childhood physical and sexual abuse and health and health care utilization indicators were examined. The influences of age, sex, other common adverse childhood experiences (lack of a close relationship with a parent or adult, having parents with low education, marital conflict or psychopathology) as well as childhood school difficulties and health risk behaviors were also explored in this relationship.

Results: An association of moderate strength was found between childhood abuse and multiple health problems, poor or fair self-rated health, pain that interferes with activities, disability due to physical health problems, and frequent emergency room and health professional visits. These effects were more pronounced in females and younger respondents. The study results also suggest a dose-response relationship whereby the risk of negative health outcomes increases with the number of adverse childhood experiences (including childhood abuse). Analyses suggest that childhood school difficulties, smoking, alcohol problems, obesity and multiple sexual partners partially mediated the effects of childhood abuse on health outcomes.

Conclusion: More research is required in understanding how these early behavioral, environmental and social factors work together in the development of long term health outcomes. Given the growing evidence of the long term effects of childhood abuse, greater efforts are clearly needed in developing more effective strategies for the prevention and treatment of child abuse.

ACKNOWLEDGEMENTS

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I would like to acknowledge the Canadian Institute for Health Research for generously funding the first two years of my doctoral program. It is also important to mention that this dissertation was based on a survey from the Ontario Ministry of Health that provided crucial information on both mental health risk factors and physical health indicators. Policies permitting secondary research on these unique population-based datasets have proven to be invaluable in extending our knowledge about important public health concerns.

Through my quest in gaining a greater understanding of determinants of child outcomes, I have crossed paths with the incredible team at Healthy Child Manitoba. Leanne Boyd, Robert Santos, Teresa Mayer and Darlene Girard have been an infinite source of inspiration through their constant and sincere efforts at improving the well-being of Manitoba children. I am also grateful for the continued friendship and support of my colleagues in anxiety disorders research.

Words will never express the profound gratitude I have for my family. The patience, humor, encouragement and love of my husband, Louis Paquin, and of my daughters, Francine and Josée, have carried me through the most trying moments. I am also indebted to my parents, Florence and Honoré Chartier, whose love of learning and belief in their children have played a vital role in my choosing this path. In more ways than one, this research has shown me the importance of early childhood influences in determining the life course.

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CHAPTER 1. INTRODUCTION

1.1 Overview

Child abuse clearly has a negative impact on children and can result in behavioural, cognitive, emotional and developmental difficulties (Kaplan, Pelcovitz & Labruna, 1999; Scannapieco & Connell-Carrick, 2005; Wekerle & Wolfe, 1996). It has also been recognized that these difficulties can extend into adulthood. The long-term consequences of childhood maltreatment on adult mental health have been a major focus of research (Chartier, Walker & Stein, 2001; Fergusson, Horwood & Lynskey 1996; MacMillan, Fleming, Streiner, Lin, Boyle, Jamieson et al., 2001). Wekerle & Wolfe (1996), in their review of child maltreatment, concluded that while many individuals with histories of childhood abuse develop into well-functioning adults, this group has higher rates of depression, sexual dysfunction, personality disorder, eating disorder, antisocial and abusive behaviour and substance abuse than those with no abuse histories.

Much less attention has been directed to the effects of childhood abuse on adult physical health and health care utilization. A number of studies suggest a link between childhood abuse and adult health. Using a primary care sample of women, McCauley and colleagues concluded that childhood physical and sexual abuse were associated with physical complaints, psychological distress, substance abuse, suicide attempts and suicidal ideation (McCauley, Kern, Kolodner, Dill, Schroeder, DeChant et al., 1997). Similarly, data from the Adverse Childhood Experiences (ACE) study show that individuals with a history of child maltreatment were more likely to engage in behaviours which posed a risk to their health and experience increased physical health problems (Edwards, Anda, Felitti & Dube, 2004). Other researchers report that a history of

childhood maltreatment is associated with high health care utilization rates in adulthood (Newman, Clayton, Zuellig, Cashman, Arnow, Dea et al., 2000; Finestone, Stenn, Davies, Stalker, Fry & Koumanis, 2000; Walker, Unutzer, Rutter, Gelfand, Saunders, VonKorff et al., 1999).

Given the high prevalence rates of childhood abuse, it is crucial to be aware of its long-term effects. Previous research examining the relationship between childhood abuse and adult health outcomes has been limited by its methodology and its scope. Few studies has examined the relationship between childhood abuse and adult health using a population-based sample (Thompson, Aria, Basile & Desai, 2002; Sachs-Ericsson, Blazer, Plant & Arnow, 2005). This is important because clinically based samples are more prone to selection biases that may give inaccurate estimates and these samples are not representative of the population as a whole. This question has not previously been examined using Canadian data. For policy makers, results from the Ontario Health Survey (OHS) used in this study can be more easily applied to Canadian society.

The OHS has assesses a combination of mental health risk factors and physical health indicators that were carefully collected with the guidance of survey specialists from Statistics Canada and the health research community. Comprehensive indicators on physical and mental health are rarely collected together in the same population. The health variables consist of comprehensive aspects of health such as self-rated health, pain that interferes with activities, disability due to physical health problems, and numerous specific health problems such as digestive problems, back pain, and arthritis. The OHS data makes it possible to address the paucity of research on the effects of childhood abuse on males. While childhood sexual abuse is more commonly reported in women, higher

rates of childhood physical abuse are found in men. The dataset also includes respondents with a wide age range to enable analysis by age groups.

There is limited understanding of the links between childhood abuse and adult health. It is currently believed that childhood maltreatment may have an adverse effect on health as a result of biological and psycho-social factors. Kuh, Power, Blane and Bartley (1997) suggest that the childhood environment will influence children's attitudes and beliefs as well as their biological resources and has an impact on their education and health behaviour. This may in turn produce long term effects on their physical health. Determining if health risk behaviors and childhood school difficulties are mediators in this relationship will shed light on our understanding of the mechanisms linking childhood abuse and adult health.

Earlier studies have not distinguished the impact of childhood abuse from the impact of an adverse childhood environment in general. This issue is very challenging as abuse is not an independent phenomenon. It is almost always accompanied by other adverse childhood experiences (Briere, 1992). This study will increase our understanding as of the relationship between childhood abuse and other adverse childhood experiences and adult health. Gaining a greater appreciation of how risk factors are working together will be valuable in developing effective strategies for prevention and intervention with childhood abuse and its long-term effects.

1.2 Research Objectives

The main goal of this research is to gain a greater understanding of the relationship between childhood abuse and physical health.

Using epidemiological cross-sectional data, the following questions will be addressed.

1. What is the nature and strength of the relationship between a history of childhood physical and sexual abuse and current physical health and health care utilization? (a) Does this relationship differ according to gender? (b) Does this relationship differ according to age group?
2. Is this relationship altered by other demographic factors and adverse childhood experiences?
3. Do health risk behaviours or childhood school difficulties mediate the relationship between childhood abuse and health indicators?

CHAPTER 2. BACKGROUND

A number of questions naturally arise from the research objectives. How is it possible for abuse occurring in childhood to have an effect on physical health later in life? How are abuse and health defined and measured? How reliable and valid are reports of childhood abuse which are based on retrospective recall? What are the methodological issues that have arisen from previous work examining childhood abuse? A discussion of these issues follows.

2.1 Explaining the Association Between Childhood Abuse and Adult Physical Health and Health Care Utilization

2.11 Models Explaining the Association

Various perspectives have been developed which attempt to explain the relationship between abuse and physical health. These will be reviewed beginning with individualistic early psychoanalytic views, followed by ecological models of human development, then by physiological and psychological responses to stress and finally by the accumulation of lifetime experiences, also known as the life course approach.

Early Psychoanalytic Views.

An popular hypothesis is one based on psychodynamic or psychoanalytical theory originally developed by Freud. It asserts that acts and thoughts are outer expressions of subconscious motives and desires which are often derived from early childhood experiences. In the early 1900s, this perspective represented an important shift, as the prevailing view at the time was that childhood events had little impact on later development. In his writings, Freud describes how his patients suffered from hysteria or

other mental and physical symptoms. He speculated that the origin of these symptoms was psychological in nature, rather than physical and that the symptoms were mechanisms for keeping emotionally charged memories out of the conscious mind (Gleitman, 1995). In his writings, edited by Brill (1938), Freud states:

> The hysterical vomiting of a female patient proved, on one hand, to be the fulfillment of an unconscious phantasy from the years of puberty, namely, the wish that she might be continually pregnant, and have a multitude of children and this was subsequently supplemented by the wish that she might have them by as many fathers as possible. (Brill, 1938, p.512)

Recent papers continue to allude to the idea that the subconscious mind plays an important role in the development of disease. Lechner and colleagues explain the relationship in this manner, "The violated body of a childhood sexual abuse victim may express the pain and damage of the assault in tangible, physical ways, in addition to the often described emotional sequelae of abuse." (Lechner, Vogel, Garcia-Shelton, Leichter, & Steibel, 1993, p.636). Some authors describe some of these theories, writing that "the guilt, repressed anger, and emotional conflict initiated by the abuse can later be manifested specifically as pelvic pain". Another author writes that women with a history of sexual abuse have "unfulfilled dependency needs and masochistic desires for punishment" (Rapkin, Kames, Darke, Stampler, & Naliboff, 1990, p.94), which were fulfilled by the abuse and the pain. Reiter and colleagues wondered if the somatic abnormalities in women who were sexually abused were "symptoms of underlying psychological disorders" (Reiter, Shakerin, Gambone, & Milburn, 1991, p.108).

Many ideas originating from psychoanalytic theory have been influential over the years. Relevant to this study is that early childhood is a critical period in human development and that this development occurs in stages. Psychoanalytic perspectives have been criticized as being too restrictive and victim-blaming. Multiple factors, other than a child's experiences during hypothesized psychosexual stages, play a role in human development (Berger, 1994). A model encompassing a greater number of dimensions is required to understand the association between childhood experiences and adult health.

Ecological Model of Development

Bronfenbrenner's model (1979) of the ecological environment represented a change from the very individually focused views of the psychoanalytic schools to viewing an individual in a social context. Bronfenbrenner, a developmental psychologist, argued that human development did not occur in social isolation and must rather be studied in a larger societal context. He proposed that the developing person is influenced by the immediate environment, the community, and other factors in society. The ecological environment is described as being a set of nested structures. In the centre is the immediate setting of the developing person, followed by the person's home and possibly the classroom. Other layers consist of societal factors such as social welfare services, neighbourhoods, mass media and the attitudes and ideologies of the culture.

Bronfenbrenner proposed that the social support networks and the connections between layers of the environment are influential in development. The individual is viewed as a dynamic entity that interacts with and restructures its environment. The relationship between the person and the environment is thus bi-directional. According to the model, childhood maltreatment is brought on by a variety of factors ranging from

those in the child's immediate environment to those in the broader context of society. The effects of maltreatment and other factors in the environment shape the child's development and health.

The contribution of the ecological model was to expand the scope of influences considered in our understanding of human development and of health. The model is continually being refined. Bronfenbrenner (1986) has recently included the dimension of time. The most recent model, referred to as the bioecological model has incorporated the biopsychological component into the ecological model (Bronfenbrenner & Evans, 2000). The challenge in conducting research within the paradigm is to account for the complexity of influences of the developing human being.

The Stress Model

While the ecological model of human development was very broad and complex, the stress model explains more specifically how demands of the environment can lead to poor health. The stress researcher, Selye (1974) described the effects of stress on the body and its role in the development of disease. He concentrated on the non-specific response of the body to any stress or demand made upon it. Which disease was produced in situations of excessive stress depended on the vulnerability of certain body systems. He noted that some body systems were more susceptible to the effects of stress which lead to conditions such as heart disease, ulcers and mental disturbances. By studying the physical response to cold, heat, trauma, nervous irritation, hemorrhage, and other stimuli, Seyle documented that the body adapted by reacting in a predictable manner. This reaction occurred in three stages and was called the general adaptation syndrome (G.A.S.). The initial stage was an alarm reaction, followed by a stage of resistance.

Finally if the external stress was prolonged, the stage of exhaustion set in. Selye noted that the effects of prolonged stress on the body were enlargement or hyperactivity of the adrenal cortex, shrinkage of the thymus gland and lymph nodes, and the appearance of gastrointestinal ulcers.

Psychologists later expanded the stress model to include individual differences in the response to stress. Lazarus and Folkman (1984) argued that whether a stimulus was a stressor or not depended on individual characteristics. They likened this to the concept in the medical model whereby an external organism can induce a disease when the host organism is in a susceptible state. They defined psychological stress as, "a relationship between the person and the environment that is appraised by the person as taxing or exceeding his or her resources and endangering his or her well-being" (Lazarus & Folkman, 1984, p.21). The effect of stress, therefore, depends on several factors. How people react to stress is dependent on their perception of the stressor, their belief systems and their perceived resources and social support. According to the authors, stress is an inevitable reality of life and individual coping strategies can help protect against its long-term effects.

Recent physiological developments of the stress model continue to elucidate the relationship between abuse and health. In response to stress, stress hormones such as cortisol and adrenaline are released to prepare the body for a perceived threat. Animal studies demonstrate that early experiences can alter the systems responsible for this response and can affect behavioural and endocrine responses to stress throughout life. (Plotsky, Thrivikraman, Nemeroff, Caldji, Sharma, Meaney, 2005; Coplan, Trost, Owens, Cooper, Gorman, Nermeroff et al., 1998). Disrupted interactions between care givers and

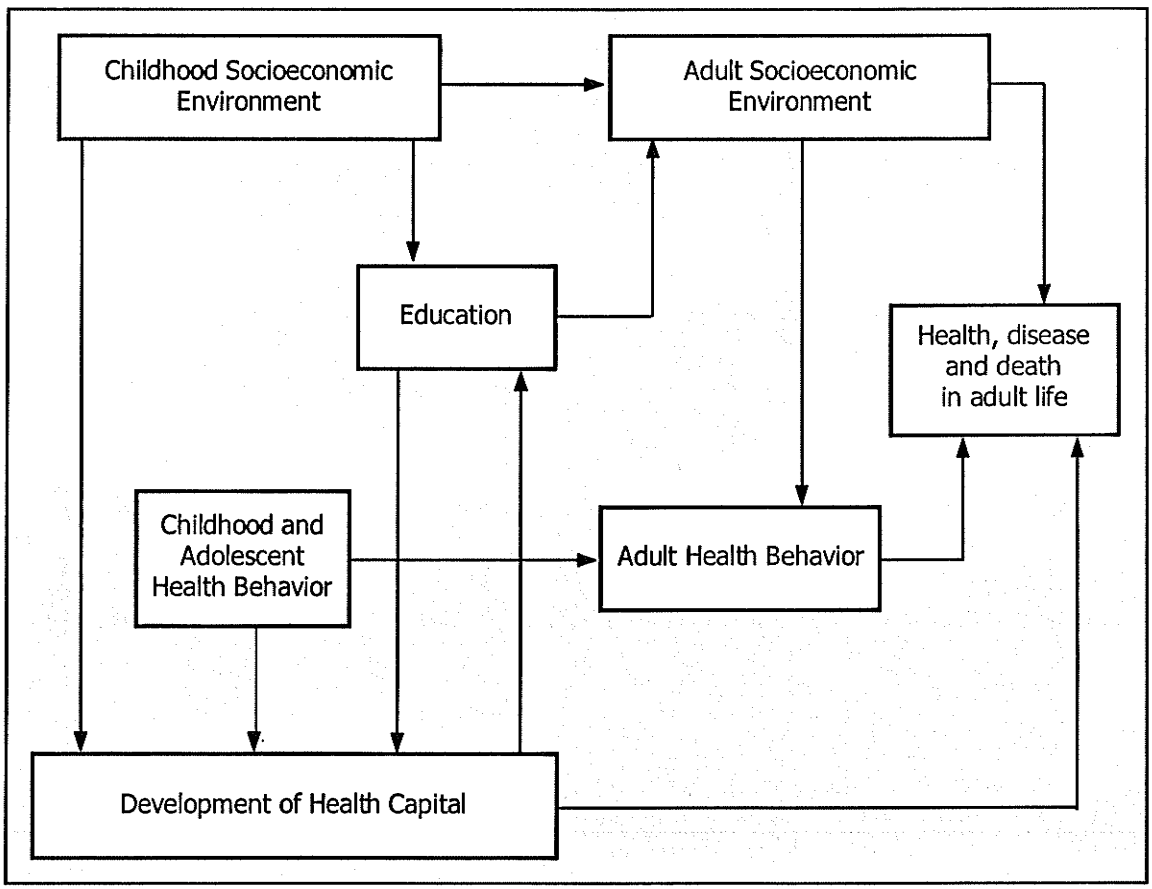
infants, neglect, abuse and malnutrition are examples of early stress experiences that can adversely affect this system. According to Gunnar (2000) the corticotropin-releasing hormone – hypothalamic-pituitary-adrenocortical (CRH-HPA) system plays a central role in managing threats to the human body. She explains that cortisol is the main glucocorticoid released and regulated by this system. Glucocorticoids act on almost every organ and tissue in the body. At low levels, they promote healthy mental and physical development. At high levels, their effects on the body can be detrimental. They suppress the immune system and compromise central nervous system functions. An overeactive CRH-HPA system has been associated with hypertension, cardiovascular disease, immunosuppression, vulnerability to inflammatory diseases, suppression of the reproductive system and accumulation of visceral fat which leads to hyperinsulinism and insulin resistance (Gunnar, 2000). Research suggests that chronic stress can accelerate artherosclerosis and the development of diabetes (McEwen & Seeman, 1999) and can affect the hippocampus which affects the memory (Glaser 2000).

The stress model provides a detailed explanation of how a stressful event such as childhood abuse leads to physiological consequences. More refined stress models account for individual characteristics when determining the effects of stress. The main limitation to this approach is that it is generally restricted to the individual and his or her immediate environment. A broader and more comprehensive model is required in understanding the relationship between childhood abuse and physical health in adulthood. The life course approach described below provides a more comprehensive framework.

The Life Course Approach

This life course approach linking childhood abuse to adult physical health views the state of an individual as a consequence of all his or her lifetime experiences. The life course concept is well recognized in developmental psychology and more recently in community health (Graham & Power, 2004; Kuh et al, 1997; Rutter, 1999). A model by Kuh and colleagues (Figure 1) is based on the life course approach. Kuh et al. (1997) suggest that beginning life in a socially compromised position and being exposed to

Figure 1. Framework describing pathways of childhood experiences to adult health
Kuh, Power, Blane & Bartley, 1997: Figure 8.1 (p. 170)



adverse factors during gestation, childhood or adulthood have long term effects on health. Factors included in the Kuh model are childhood socio-economic environment,

education, childhood and adolescent health behaviour, and development of health capital. These have long term influences on adult socio-economic environment and health behaviour which in turn impact health outcomes.

Rutter (1989) illustrates the life course perspective by describing how childhood influences lead to beneficial or detrimental behavioural changes which in turn lead to further positive or negative events. An example of a positive influence is that academic success leads to a better job, which leads to better health. Human development, according to Rutter, extends throughout the lifespan into adulthood. Reflecting on the Isle of Wight longitudinal studies[1], he suggests that understanding the mechanisms which influence development over the span of one's life is crucial to devising ways of improving the long-term gains of children suffering from adversity. Studying both protective and risk factors is important in elucidating development.

> "Most crucially, however, they (biological substrates and psychosocial influences) are not independent of one another. To an important extent the past helps to determine the present environment through a variety of different mechanisms. Chain effects are common and, if we are to understand the developmental process, we need to analyze each of the links in the chain, to determine how the links interconnect and to study how changes in life trajectory come about. In this way, life transitions have to be considered both as end products of past processes and as instigators of future ones - in data analysis terms as both independent and

[1] The Isle of Wight studies (1976) were a series of epidemiological studies of education, psychological and physical disabilities in a group of 9-11 year old children conducted in 1964 to 1969. The cross-sectional components were conducted to determine the prevalence of these disorders. The longitudinal studies allowed researches to follow the progress of the children over 4 years.

> dependent variables. It is important to search for unifying principles in the mechanism underlying the diversity of pathways from childhood to adult life, but in so doing we must consider the pathways in personal terms and in the context of possible person-environment interactions. The elucidation of the process giving rise to these varied pathways should provide useful leads for both prevention and treatment through improved knowledge on how changes take place, for that is what development is all about." (Rutter, 1989, p. 46)

The life course approach may be viewed from an individual perspective to a population health perspective. Bartley, Blane and Montgomery (1997) indicate that a life course approach is necessary to understand social variations in health. Health in old age is influenced by social policy directed at various points of the life span. Keating and Mustard (1996) discuss the importance of gaining insight into population patterns arising from individual life courses and of understanding the biological pathways which explain childhood and adult outcomes. Hertzman and Weins (1996) point to the devastating effects on health of political changes in Eastern and Central Europe in the early 1990's to illustrate that "the diversity of conditions of life can somehow become imbedded in human biology, such that human vitality can be directly affected by social hierarchies in a consistent manner across wide expanses of space and time." (Hertzman & Weins, 1996, p. 1086).

Using data from the 1958 British Birth Cohort Study, Hertzman, Power, Mathews and Manor (2001) found that that reading ability, height, parent reading to child and socio-emotional status at age 7 predicted self-rated health at age 33. They discuss three processes that explain how early life environment influences health in later life: latency

factors, pathway factors and cumulative effects. The latency model explains how discrete events occur at critical and sensitive periods in human development. Research has shown that neglect of young rats is linked with biological changes that endure into adulthood (Heim, Owen, Plotsky & Nemeroff, 1997). Associations have been found between birth weight, placenta size and weight gain in the first year of life with cardiovascular disease in adulthood (Barker, 1998). Some developmental tasks, such as learning languages are best started early in life. Children who grow up in English-speaking homes have a reduced ability to make the guttural sounds common in German and Japanese (Cyander & Frost, 1999).

The pathway model describes a process acting over a longer period of time. Early childhood environments influence life trajectories that in turn affect adult health. For example, Kuh, Richards, Hardy, Butterworth & Wadworth (2004) found that mortality rates in males with lower cognitive ability in childhood were twice as high as males with higher cognitive ability in childhood. They explained that good cognitive ability can affect long term health through information processing, having a safe adult environment and engaging in healthy behaviors. Those with poor cognitive ability tended to have lower educational attainment and increased risk of poor health. In practice, distinguishing latent effects from pathway effects is not always possible.

The third process recognizes the importance of cumulative effects of risk factors over time. Duration and frequency of child abuse have been shown to influence child outcomes (Green, 1993). Intervening in pathway and cumulative effects involves rectifying difficulties at several points across the life span to move the individual along the pathway to healthier development. The processes have different policy implications.

Focusing on latency effects would target interventions on early childhood development while pathway and cumulative effects would include investments at various points in the life cycle. Hertzman (1994) argued that both latent and pathway effects are relevant. While there are critical periods in all primate development, for humans these periods may be better labeled as sensitive. Certain stimuli applied later in life can promote cognitive and emotional development.

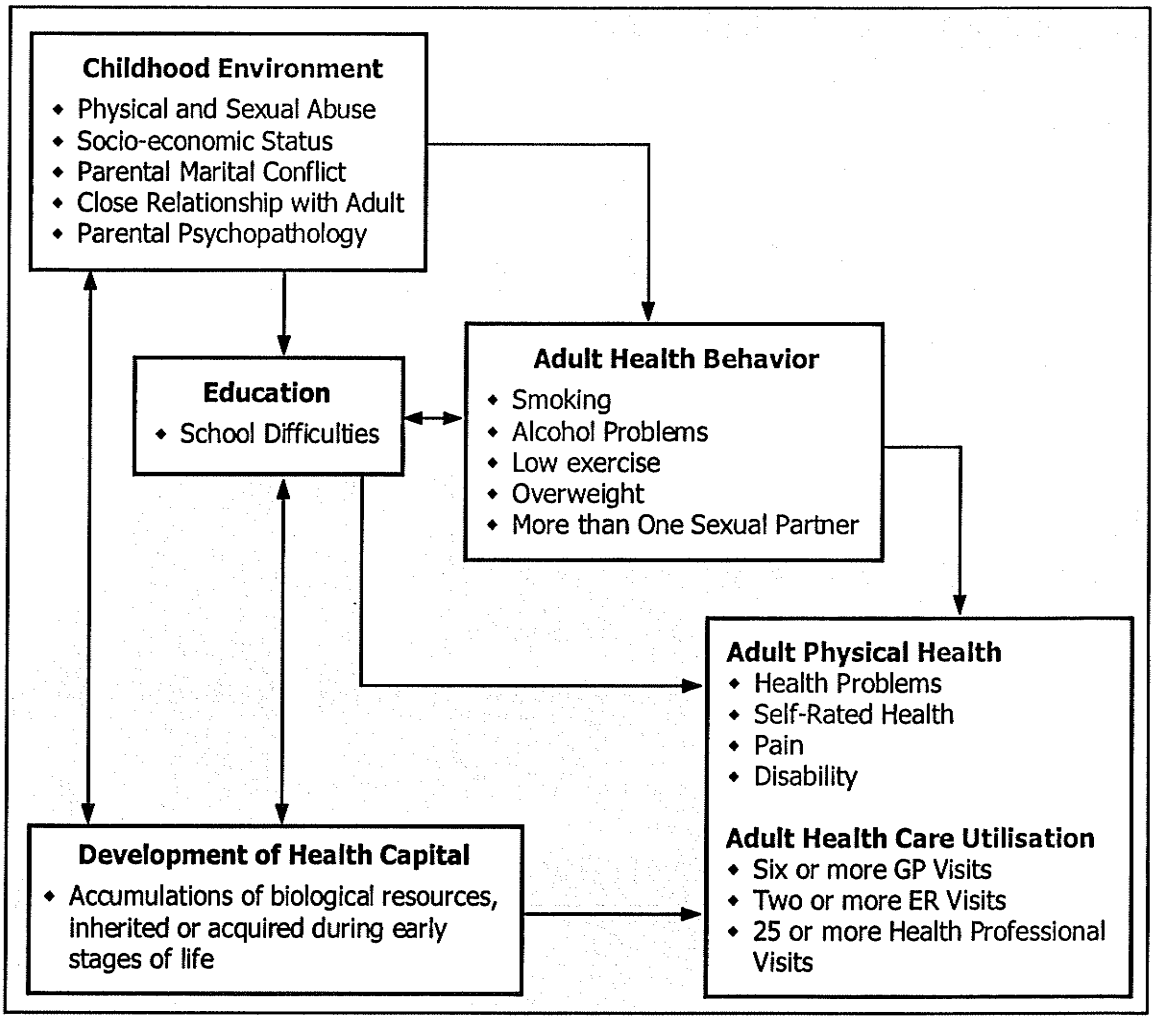
> "The worst possible outcome would be to reduce the argument to the notion that a cradle-to-grave social contract is the policy corollary of the pathways model and a one-shot early childhood social investment strategy is the policy corollary of the latency model. What is needed instead is a pragmatic approach which draws upon the strengths of each model." (Hertzman, 1994, p.117)

2.12 Description of Study Framework

While other models were considered, the life course approach was considered to be the most appropriate one for this study, since in addition to examining phenomena across the life span, it accommodates aspects of other models discussed previously, namely the stress and ecological models. A framework built on this approach illustrates the complex ways different factors can interact in the development of adult health. It encompasses psychosocial and biological factors. Latent and pathway effects are considered in the model. While the cumulative effects are deemed important, the cross-sectional design of this study prevented analysis of these effects. In the latent model, childhood can be deemed a critical period where the individual is particularly vulnerable to the effects of trauma. The pathway approach also applies as childhood abuse may trigger a series of other events which negatively affect health.

The framework used in this study to describe pathways between childhood physical and sexual abuse and current physical health, is a modified version of Kuh and colleagues' framework (illustrated in Figure 2; Kuh et al., 1997). While Kuh and colleagues' original model focused mostly on the socioeconomic environment, this model includes abuse and neglect as well as other characteristics of the child's environment. This framework illustrates how, through various pathways, early stages of the life course

Figure 2. Framework describing pathways of childhood experiences to adult health with study variables (Revised Model by Kuh, Power, Blane & Bartley 1997)



can influence health in later stages. Many of the arrows are bidirectional indicating that influence may occur in both directions. For example, academic achievement can affect the development of health risk behaviours which in turn can affect academic achievement.

Following is a description of the framework and how the factors in the framework are interrelated. The objective in presenting this framework in detail is to show the various possible pathways from factors in childhood to adult health. It is beyond the scope of this study to examine all the factors laid out in the framework. (Data on some factors were not available.) The study will focus on selected factors in the childhood environment and on current health indicators. Current health risk behaviours and childhood school difficulties were examined as intermediate factors.

Factors Included in the Model

Childhood Environment - The first item in the model displays the factors relating to the childhood environment. Whether or not child abuse or maltreatment occurs is determined by a variety of factors ranging from those in the child's immediate environment to those in the broader context of society (Bronfenbrenner, 1979). Research suggests that maltreatment does not happen in isolation, but rather occurs in an environment with many negative attributes. It is usually only one of many difficulties with which the developing child must cope (Straus & Smith, 1990; Wolfe, Wekerle & McGee, 1992). Child abuse is more likely to occur in families afflicted with poverty, domestic violence, mental health problems, and those lead by a single or teenage parent (Graham-Bunann, 2002; Kelley, 2002; Belsky, 1993; Meston, 1993). Research also shows that marital conflict and parental depression or alcohol abuse can lead to adverse

outcomes for children (Cummings, 1997; Dickstein, Seifer, Hayden, Schiller, Sameroff, Keitner G et al., 1998, Margolin, 2005; Wells, Horwood & Ferguesson, 2004; Willms, 2002). Evidence suggests that childhood socioeconomic status is tied to adult health (Rahkonen, Lahelma & Huuhka, 1997; Power & Hertzman, 1999, Lundberg, 1997).

Education – Education provides increased opportunities which pave the way towards fulfilling and well paying jobs. It also provides access to information which leads people to understand the importance of good health habits. Another positive effect of education may be its influence on self-esteem, self-efficacy and ability to use problem solving skills in coping with adversity. The framework in Figure 2 illustrates that factors in the childhood environment influence education and that education has been linked to adult health risk behaviours (Lynch, Kaplan & Saloen, 1997; Ross, 2000) and to adult health (Kuh et al., 2004; Ross & Wu, 1995; Shkolnikov, Leon, Adamets, Andreev & Deev, 1998). Some arrows are bi-directional because poor health behaviours and poor health capital can adversely affect education.

Research has shown that children subjected to abuse are less likely to succeed in school (Ciccetti & Toth, 1995; Kaplan et al., 1999; Whiting, 2001). Ciccetti & Toth (1995), in their review of the literature, report that maltreated children functioned more poorly on cognitive tasks and that many required special intervention services. Neglected children (a type of child maltreatment) in particular were described as anxious, inattentive, unable to understand their work, lacking initiative and heavily dependent on teachers for assistance. Studies found that on standardized tests, abused children scored lower on math and reading (Kaplan et al., 1999). O'Connor, Rutter, Beckett, Keaveney, Kreppner and the English and Romanian Adoptees Study Team (2000) found that

Romanian children exposed to severe deprivation had lower cognitive scores and lower general development compared to other children. A child's home environment influences the quality of schooling and academic performance. Brownell, Roos, Fransoo, Guèvremont, MacWilliam, Derkson and colleagues (2004) report that children from low SES groups have dramatically poorer academic performances than middle class or high SES children.

Development of Health Capital - Health capital is defined as "the accumulation of biological resources, inherited and acquired during the early stages of life, which determine current health and future health potential, including resilience to future environmental insults" (Kuh et al., 1997, p.173). The term capital which is chiefly used in economic contexts is useful in the model to capture the importance and concept of health investments. Arrows in Figure 2 show that early childhood environments by this definition influence health capital. Normal birth weights and placenta sizes are believed to be indicators of biological resources acquired during the very early stages of life that have been associated with long term health outcomes (Barker, 1998). Nurturing childhood environments lead to normal development in children, thereby building their health capital and increasing their chances at academic success. The concept of health capital is a dynamic and interactive one. Health capital, in determining current health, can also influence the childhood environment. For example, chronic illness, emotional disturbance and hyperactivity from diminished health capital, are associated with increased prevalence of child maltreatment (Hawkins & Duncan, 1985) which further depletes health capital.

Evidence is mounting which explains how childhood maltreatment can negatively impact biological systems and diminish health capital (Glaser, 2000). Changes in brain function due to child abuse and neglect have been documented. Brain development appears to be integrally related to environmental factors. A positive environment is one where young infants are handled, spoken to and responded to. Stressful stimuli and lack of positive stimuli adversely affect the development of synapses which in turn affect brain development and the stress response throughout the entire body. A series of biochemical reactions takes place when an infant's need for food warmth and security are met. Activation of dopaminergic fibers triggers high levels of endogenous opiates, which activate the sympathetic nervous system. Abuse or neglect could disrupt the maturation of the frontal lobes, making it difficult for that individual to learn self-regulation of affect. Changes to the brain in response to learning continue throughout childhood and into adulthood but in the latter, structural differences are not apparent (Glaser, 2000). Perry (2002) notes the importance of experience in shaping biological systems, particularly neurodevelopment occurring in childhood.

> The time in life, however, when the brain is most sensitive to experience – and therefore most easy to influence in positive and negative ways is in infancy and childhood. It is during these times in life when social, emotional, cognitive and physical experiences will shape neural systems in ways that influence functioning for a lifetime. (Perry, 2002, p.82)

The stress model discussed earlier explained how stressful events like childhood abuse can adversely affect health or health capital. Physiological studies suggest that persistent stress brings about changes in the nervous system, thereby predisposing an

individual to ill health (Gunnar, 2003; McEwen & Seeman, 1999; Sapolsky, 1995). McEwen and Seeman's research (1999) shows that repeated surges in blood pressure, brought about by chronic stress, accelerate atherosclerosis and the development of Type II diabetes. The resulting release of hormones from high stress can adversely affect tissues and organs. Stress suppresses the immune system, increases the level of circulating glucose and dampens fear responses to the stressor.

Research in animal and human studies points to long term negative consequences of childhood abuse on biological resources. Plotsky and colleagues (2005) compared adult rats that had experienced maternal deprivation with adult rats having experienced normal mothering. They found that adult rats with maternal deprivation had increased hypothalamic corticotropin-releasing factor and had higher plasma corticosterone in response to stress. Coplan and colleagues (1998) studied non-human infant primates with mothers randomly assigned to three foraging conditions. The condition where the foraging demands were inconsistent was believed to be most stressful for the mother thereby disrupting her mothering. The grown subjects raised by these stressed mothers had elevated levels of SOM (somatostatin), HVA (homovanillic acid) and 5-HIAA (5-hydroxyindoleacetic acid) but normal levels of MHPG (3-methoxy-4hydroxyphenethyleneglycol). These substances were positively correlated with CRF (corticotrophin releasing factor) which have been linked to psychopathology. Heim and colleagues' research (1997) observed alterations of the stress response in rats and non-human primates exposed to stressors early in life. Adult rats, having experienced maternal deprivation, exhibited long-term neuroendocrine alterations such as increased

concentrations of immunoreactive CRF (corticotrophin releasing factor) in the central nervous system, and abnormal reactions to stress.

Socioeconomic difficulties of Eastern Europe during the last quarter of the 20th century drove parents to abandon their children to the orphanages. Conditions in these orphanages included inadequate care giving, malnutrition, low stimulation and physical abuse. Difficulties observed in these children were delayed growth and development, sensory integration difficulties, speech delays, and cognitive and behavioural difficulties (Johnson, 2000). When the children were seven years old, higher cortisol levels were found in the Romanian children who had spent more than 4 months in the orphanages compared to Romanian children who spent less than 4 months in the orphanages and Canadian children raised in nurturing homes (Gunnar, 2000). It can be argued therefore that childhood abuse adversely influences the accumulation of biological resources or health capital, thereby negatively affecting future health.

Health Risk Behaviours - There is considerable evidence that links childhood abuse to health risk behaviours such as smoking, poor nutrition, sedentary lifestyle, high alcohol consumption, and higher-risk sexual practices (Bensley, Van Eenwyk & Simmons, 2000; Edwards et al., 2004; Mullings, Marquart & Brewer, 2000; Walker, Gelfand, Katon, Koss, Von Korff, Bernstein et al., 1999; Young & Katz, 1998). These health behaviours have been well established as causal risk factors in many illnesses. Kuh et al. (1997) suggest that parents can inadvertently promote poor health habits and lack of autonomy in children by failing to teach important skills, communicating poor attitudes and providing negative role models. Some authors suggest that psychological distress may be a mediator in this relationship (Anda, Williamson & Escobedo, 1990; DeWit,

MacDonald & Offord, 1999). Engaging in risk behaviours, such as smoking or consuming alcohol can bring about temporary relief from depression or anxiety (Felitti, Anda, Nordenberg, Williamson, Spitz, Edwards et al., 1998).

Figure 2 illustrates that childhood abuse is linked to adult health behaviour which in turn is linked to adult health. Poor health behaviours can negatively affect biological resources Statistical models with the Adverse Childhood Experiences (ACE) study data suggest that health risk behaviours mediate the relationship between adverse childhood experiences and ischemic heart disease (Dong, Giles, Felitti, Dube, Williams, Chapman et al., 2004) and liver disease (Dong, Dube, Felitti, Giles & Anda, 2003). Dong, Dube et al. (2003) posit that people engage in health risk behaviours to cope with the negative affective states and these behaviours mediate the relationship between childhood adversities and liver disease Using the ACE data, they found that the risk of liver disease increased with each ACE reported. When higher-risk behaviours such as alcohol consumption and sexual promiscuity were added to the model, the strength of the ACE-liver disease association was reduced by 38 to 50%. In a similar study, Dong, Giles et al. (2004) found that the health risk behaviours and depression mediate the relationship between childhood adversities and ischemic heart disease – as the odds ratios decreased by 50 to 100% when these factors were entered into the equation.

Factors Considered but not Included in the Model

Societal influences - The broader context of the community is deemed to be an important factor. Where children live influences the amount of violence to which they will be exposed (Krishnan & Morrison, 1995). Disadvantaged neighbourhoods have been shown to be associated with adverse lifestyles (Ross, 2000) and negative psychological

outcomes (Wandersman & Nation, 1998). Garbarino and Kostelny (1992) compared socio-economically similar neighbourhoods. In neighbourhoods where maltreatment was higher, social disorganization was high and social cohesiveness was low. In contrast in neighbourhoods where maltreatment was lower, people were more willing to talk about their communities, had respected political leaders, had more services available to them and felt their communities were decent places to live.

Biological Factors - There is considerable evidence demonstrating the role of genetics in long-term health (Rutter, 1999). A review of the literature shows that biological factors such as genetic predisposition to illness and physical disabilities influence child maltreatment rates and current physical health. Research suggests that the difficulty in caring for premature or low birth weight babies may precipitate higher rates of abuse in this group of children (Belsky, 1993). Chronic illness, emotional disturbance, hyperactivity, mental retardation and other physical handicaps in children are risk factors for child maltreatment (Hawkins & Duncan, 1985). In reviewing past health records, Sherrod, O'Connor, Vietze & Altemeier (1984) found that abused and neglected children had more records of ill health than the children in a control group. Similarly, Ammerman, Hersen, van Hasselt, Lubetshy, and Sieck (1994) reported that 61% of children with developmental disabilities had been abused by a care provider in their lifetime.

Childhood Attitudes and Beliefs - Through socialization, children learn and internalize attitudes, beliefs, and skills. These in turn determine health habits and important life choices such as selection of spouse and career (Kuh et al., 1997). Poor parental modeling of healthy behaviours and ineffective parenting are associated with early use of alcohol and tobacco (Jackson, Henriksen, Dickinson, & Levine, 1997).

Childhood sexual abuse may instill the belief that one cannot refuse unwanted sexual activities. This belief may persevere into adulthood and make it difficult to practice safe sex (Bensley et al., 2000). The lack of support and guidance in abusive families hamper children's ability to develop warm and supportive relationships and to respond to life's challenges. Bradshaw and Garbarino (2004) found that exposure to violence negatively affects children's social cognitions. These cognitions tended to increase aggressive behaviour and pose challenges to social and academic pursuit.

Childhood Mental Health Status - Childhood maltreatment has repeatedly been shown to have negative consequences on self-esteem and to be associated with high levels of anxiety, depression and anger (Cicchetti & Toth, 1995; Kaplan et al., 1999; Rutter, 1999). These mental health difficulties may be partly responsible for schooling problems and poor health behaviour. Children with anxiety disorders, for example, tend to negatively evaluate situations, have difficulties completing tasks and have poor academic performance (Silverman & Ginsburg, 1995). Maltreatment is an indicator of a disrupted parent-child relationship, where a child is subjected to many everyday experiences which hamper growth and development (Wekerle & Wolfe, 1996). Margolin (2005) notes that families afflicted with violence are less available for physical and emotional caretaking.

Reviewing each of the childhood factors in the framework (Figure 2.) and their association with adult health illustrates possible models linking childhood abuse to adult physical health. A later discussion of the literature will examine more closely and systematically the empirical evidence of this relationship. Before conducting this review,

an examination of the definitions and measurement issues of childhood abuse and health is required to provide the necessary background for the discussion.

2.2 Defining Childhood Abuse

2.21 Issues in Defining Abuse

Child abuse can be defined as the physical, psychological, social, emotional and sexual maltreatment of a child whereby the survival, safety, self-esteem, growth and development of the child are endangered (Metson, 1993). Distinct types of child abuse are physical abuse, sexual abuse, psychological or emotional abuse, verbal abuse and neglect which can overlap (Trocmé, MacLaurin, Fallon, Daciuk, Billingsley, Tourigny et al. 2001, Briere, 1992). While all types of abuse and neglect are thought to be relevant to long-term health, the scope of this study is limited to childhood physical and sexual abuse.

Defining child abuse is not straightforward. Giovannoni (1989) wondered if the definition is relative to time and place or if it transcends history and culture. While there is no easy answer to this question, it is clear that abuse of children is not a new phenomenon. Freud traced back neurotic and hysterical symptoms to traumatic childhood sexual experiences. DeMause (1974) explains that most children before the 18th century would have been considered mistreated by today's standards and offers some gruesome examples of maltreatment of children throughout the ages. He writes that a schoolmaster, during the course of his career, had given out 527 strokes with a stick, as well as a number of lashes with the whip, slaps with the hand and boxes on the ear. DeMause writes,

> The history of childhood is a nightmare from which we have only recently begun to awaken. The further back in history one goes, the lower the level of child care, the more likely children are to be killed, abandoned, beaten, terrorized and sexually abused. (deMause, 1974, p.1)

While child abuse was common, it appeared to be generally accepted or at least tolerated by society (Scannapieco & Connell-Carrick, 2005). As attitudes toward children changed, interest in the effects of abuse began. Kempe, Silverman, Steele, Droegemueller, and Silver (1962) in their classic paper, described child abuse and brought it to the attention of the medical community and the public. Interestingly, there was little literature on sexual abuse prior to 1978. The Badgley Report (1984) summarized survey results on child sexual abuse in Canada, leading to some major policy and legal changes (Badgley, 1984; Dawson, 1987).

2.22 Childhood Physical Abuse

Childhood physical abuse was defined in this study as deliberate force being applied to a child's body by an adult. Items addressing this are *frequently* being pushed, grabbed, shoved, having something thrown at them, being hit with something or *at least once* being kicked, bitten or punched , being choked, burned or scalded or being physically attacked in some other way.

Currently, many definitions of abuse are used, which vary according to the different interests and perspectives of the disciplines. While researchers and clinicians are interested in broader definitions enabling them to understand the issues surrounding child abuse, policy makers and social agencies are interested in narrower definitions, including

more extreme forms where some intervention is required or mandated (Giovannoni, 1989; Demare, 2000). Giovannoni (1989) noted that legal definitions tend to be vague using phrases such as "failure to maintain a reasonable degree of interest, concern or responsibility for the child's welfare" (Giovannoni, 1989, p.11). On the other hand, medical definitions are clearer as their aim is to diagnose.

While definitions of physical abuse of children will continue to evolve, stating a clear definition will facilitate transfer to practical applications and comparison to other studies. The National Incidence Study, in the United States, defines physical abuse

> as present when a child younger than age 18 years has experienced injury (harm standard) or risk of injury (endangerment standard) as a result of having been hit with a hand or other object or having been kicked, shaken, thrown, burned, stabbed or choked by a parent or parent-substitute. (Kaplan et al., 1999, p. 1214).

The Canadian Incidence Study of Reported Child Abuse and Neglect (Trocmé et al., 2001) similarly defines physical abuse as

> the deliberate application of force to any part of a child's body, which results or may result in a non-accidental injury. It may involve hitting a child a single time or it may involve an ongoing pattern of incidents. Physical abuse also includes shaking, choking, biting, kicking, burning or poisoning a child, holding a child under water, or any other harmful or dangerous use of force or restraint. Child physical abuse is usually connected to physical punishment or is confused with child discipline. (Trocmé et al., 2001, p.12)

A number of issues should be considered in studying childhood abuse as it is likely to affect the results of the question under study. Clearly defining abuse, measuring the severity and frequency of abuse, the characteristics of the perpetrator, as well as the period of development when the abuse occurred are important considerations (Peters, Wyatt, Finkelhor,1990). Infants, for example, are very vulnerable to the effects of abuse. Physical abuse can be conceptualized as a categorical or continuous variable. It can be viewed on a continuum of tolerable to inappropriate and abusive parental behaviour (Demare, 2000). In general, researchers tend to analyze childhood abuse as a categorical variable.

Prevalence rates of child abuse vary depending on how abuse is delineated (Peters et al., 1990; Green, 1993; Briere, 1992). The types of behaviours included in the definition of abuse influence these prevalence results. MacMillan and colleagues (1997) reported prevalence rates of childhood abuse using two definitions. They estimated using a broad definition of abuse that 21% of females and 31% of males reported childhood physical abuse. Rates were decreased to 9% in females and 11 % in males when the definition of physical abuse was limited to more severe acts of abuse.

2.23 Childhood Sexual Abuse

Childhood sexual abuse for this study was defined as having an adult expose themselves to the child more than once, being threatened by an adult to have sex, having the child's sex parts being touched by an adult, having an adult attempt to have sex with the child or being sexually attacked.

According to Badgley (1991), author of a ground breaking Canadian study of child sexual abuse, defining sexual abuse is less problematic and more clear-cut than

physical abuse since sexual contact between adults and children is unacceptable in any form. Green (1993) notes that research on child sexual abuse has been hampered by problems with definition and failure to measure the severity of the abuse. Some studies include any type of sexual contact - verbal, visual or physical. Definitions of sexual abuse can include peers as perpetrators and specify the age difference between the child and the perpetrator. As with physical abuse, the severity and frequency will have an impact on the study. Peters et al. (1990) reviewed studies estimating prevalence rates of sexual abuse and found that these rates varied considerably. The rates differed depending on what ages, acts and types of relationships were included in the definition of child abuse. The authors remarked on the skepticism in the 1980`s about the feasibility of research in this area. Badgley's study (1991) dispelled the belief that respondents would be unwilling to discuss childhood sexual abuse.

Wyatt (1985) suggests that definitions should take into account multiple components: the range of sexual behaviours, the age of the subject, age of the perpetrator, relationship to perpetrator and their willingness to participate. The Canadian Incidence Study of Reported Child Abuse and Neglect (Trocmé et al., 2001) defines sexual abuse as "when an adult or youth uses a child for sexual purposes. Sexual abuse includes fondling, intercourse, incest, sodomy, exhibitionism and commercial exploitation through prostitution or the production of pornographic materials."

2.3 Measuring Childhood Abuse

2.31 Considerations in Measuring Abuse

Once abuse is adequately defined for research purposes, measurement issues must be considered. These include methods to collect the data on abuse and types of instruments chosen. The influence of measurement methods on subjects' responses should be considered as it will affect the outcome. Given that most studies of childhood abuse are based on retrospective recall, reliability and validity of information based on memory of abuse should be considered. Child abuse research has often been compromised by instruments of questionable reliability and validity (Walsh, Jamieson, MacMillan & Trocmé, 2004). Using a single general question is not likely to be sufficient. Multiple questions trigger more reports than single ones and specific questions are likely to result in greater accuracy than general questions (Hardt & Rutter, 2004). Some studies, for example, ask a very general question such as "Were you physically abused as a child?". Unless abuse is defined for responders, the answers could bring about a blurring of categories, where very mildly abused could be categorized as abused and moderately abused categorized as not abused. Methods used in collecting data and instruments used to measure child abuse will be discussed.

2.32 Methods of Collecting Data and Sources of Information

Widom (1988) listed sources of information normally used in the study of child abuse: official records from agencies, case files not specifically collected for abuse, parents in treatment centers, and self-report responses (through interviews, questionnaires, or surveys). The main advantage of using official records is that they

represent the most severe cases and thus provide more clear-cut evidence of physical and sexual abuse. The records are less likely to be biased from social desirability, retrospective recall or single perspective reporting than self-report methods (Widom, 1988). However, some limitations of official records have been described. An important and well-recognized problem is that the majority of abuse cases are not reported (Trocmé et al., 2001; Wyatt, 1985; Widom & Sheperd, 1996). Data from official records represent a biased sample of child abuse cases. For example, cases in lower socioeconomic groups may be over represented, since authorities are less likely to intervene in middle and upper class homes.

Information on childhood physical and sexual abuse may be collected by survey methods either through personal interviews or self-administered questionnaires. Personal interviews, by building rapport and decreasing cognitive burden, can encourage response rates and accuracy but can also lead to social desirability bias. Self-administered questionnaires increase perceived impersonality or confidentiality and may increase reporting of sensitive information (Bowling, 2005). To take advantage of both methods, it would be preferable to develop a rapport with the respondent, through a personal interview, using less threatening questions and then be available for clarification while he or she answers more sensitive questions with the self-administered questionnaire.

2.33 Measurement Instruments

The instrument used to measure abuse, must be stable over time, be reliable among interviewers and must accurately measure the construct (Bernstein, Stein, Newcomb, Walker, Pogge, Ahluvalia et al., 2003). To determine the usefulness of a measure, validity and reliability tests are carried out. Validity tests assess the degree to

which the instrument measures the construct. Bergner & Rothman (1987) discuss the different aspects of validity that can be evaluated; construct validity (is it measuring the intended concept or construct?), content validity (extent to which the measure represents the construct) and criterion-based validity (compare the measure to another measure of the same phenomenon). Reliability tests assess the degree to which the measurement can be replicated. Some aspects of reliability are inter-rater reliability (the degree to which two raters will have similar results), test-retest (the degree to which the result of the measure does not change over time in the same person assessed by the same technique) and internal consistency (extent to which items in the instrument measures a single characteristic). A variety of instruments have been developed to measure childhood abuse (Straus, 1990, Badgley, 1984, Wyatt, 1985, Finkelhor, 1979, Demare, 2000, Bernstein, Fink, Handelsman, Foote, Lovejoy, Wenzel, et al., 1994; Bernstein et al., 2003). Two measures pertinent to this study are described below.

Conflict Tactics Scale

The Conflict Tactics Scale has been widely used in measuring intra-family violence and has been adapted to measure childhood physical abuse. Straus (1990) reviews the psychometric properties of the scale and some its criticisms. This instrument has 19 items and been used in more than two hundred papers and several books. It is considered to have moderate internal consistency and concurrent validity. In terms of construct validity, it produces findings consistent with previous research. The scale has been criticized for several reasons: it includes a limited set of violent acts; items that deal with threats are counted as violence; acts that differ greatly in severity are given equal value or weight; the context in which the violence occurs is ignored; and the perpetrator

of the violence is often not specified. The Conflict Tactics Scale has been shortened or expanded for other studies and results have been reasonably consistent. Two principles are recommended to increase reliability and validity when using the scale. Items are not to be combined and only overt behaviour should be included (Straus, 1990). Following is a segment of the questionnaire (Straus, 1990 p. 33).

> Q36. Thinking back over the last 12 months you've been together, was there ever an occasion when (your spouse/partner)? Tell me how often (he/she),
>
> - Threatened to hit or throw something at him/her/you
> - Pushed, grabbed or shoved him/her/you
> - Kicked, bit or hit him/her/you with a fist
> - Used a knife or fired a gun

National Population Survey of Canada

The National Population Survey of Canada (Badgley, 1984) was conducted to investigate sexual offences against children in Canada. The report describes in detail the nature and extent of sexual offences which brought the prevalence of child abuse to the attention of professionals and the public. The survey contains a series of questions (Badgley Instrument) inquiring about unwanted sexual acts that have been committed against the individual during childhood as well as the age when these occurred. The questions have good face validity. The behaviours are described in a specific and clear manner and different aspects of sexual abuse are included. Examples of the questions are:

- Has anyone ever threatened to have sex with you when you didn't want this?
- Has anyone ever touched the sex parts of your body when you didn't want this?

Leserman and Drossman (1996) have assessed the reliability and validity of the Badgley instrument with a sample of 139 female patients from a gastroenterology clinic. When they re-administered the questionnaire 2 months later, there was an acceptable level of agreement of 81% between the two administrations (kappa = 0.63). In comparing the questionnaire to an in-depth interview, they found 81% overall agreement. They further calculated the sensitivity (71%), the specificity (91%), the positive predictive value (90%) and the negative predictive value (74%). In using this instrument, respondents who have answered affirmatively to the sexual abuse questions were very likely to have a history of childhood sexual abuse. False negative responses are the most likely bias in reports of childhood sexual abuse.

2.4 Measuring Health Outcomes

2.41 Defining Health

Determining the health of an individual is dependent on how health is defined. The definition of health is an area of debate (Bergner & Rothman, 1987, Bowling, 1991). Larson (1991) describes definitions of health based on different models: medical, holistic, wellness and environment models. The medical model, a widely accepted model, simply defines health as the absence of disease. While this is easily measured, critics point out that health is a more multi-dimensional concept. The holistic model defines health as physical but also extends the definition to encompass mental and social aspects. The World Health Organization definition includes these dimensions and defines health as "a state of complete physical, mental and social well being and not merely the absence of disease or infirmity" (Last, 1995, p.73). Next, Larson describes the wellness model which

focuses on a subjective feeling of physical well-being, comfort, energy and ability to perform. Finally, the environment model defines the health of an individual to the degree which he or she adapts to the environment (Larson, 1991).

2.42 Health Measures

As the concept of health evolves, indicators measuring the subtleties of health became necessary. Since it is not possible to measure health directly, valid health indicators are used to provide information about the health of the individual. There is no clear consensus on how best to measure health, but methods have been evolving over time (McDowell & Newell, 1987). A common approach to measuring population health is the study of mortality statistics e.g. infant mortality or crude death rates (Larson, 1991). These data are used in estimating the overall health of different countries. In developed countries, more subtle health indicators are sought. Commonly used indicators are medical tests such as blood and urine tests, blood pressure readings, electrocardiograms or physical examinations. These tests give objective data but are prohibitively expensive in large studies and may provide a very restricted range of health outcomes. Population health is usually studied through the use of questionnaires which ask the respondent about various dimensions of health. These self-report indices are widely used, simple to administer and are low in cost (Goldstein, Siegel & Boyer, 1984; Bowling, 2005).

Health measures can be divided into two broad categories; disease-specific measures and generic measures (Bergner & Rothman, 1987). The advantages of disease-specific measures are that they are sensitive, specific and relevant to the disease under study. Generic measurements on the other hand, are robust, have been tested in a variety of situations and allow direct comparisons of various populations. When addressing

questions of public health concern, the measures must discriminate at the positive end of the continuum, since most people in the general population exhibit minimal dysfunction. The Health Utilities Index- Mark III (HUI3), for example, is a comprehensive health status classification which assesses vision, hearing, speech, ambulation, dexterity, emotion, cognition (including memory and thinking ability) as well as pain and discomfort (Feeney, Torrance & Furlong, 1996) It is considered to be a generic approach for measuring health status of individuals with high levels of dysfunction. While this measure may work well in many clinical samples, it would not be useful for studying the population at large.

In deciding which health measure to use, one must consider several issues. First, the data produced by the measure must provide answers to the research question. Ideally, the measure should also take into account the various effects of health and illness. Moller, Kristensen and Hollnagel (1996) list medically diagnosed health, self-rated health and functional ability as important components to be measured. The health measure should have been demonstrated as being reliable and valid. Depending on the population being studied, some practical considerations must be taken into account, such as the time required for administration of the measure and the mode of administration. As in the case of abuse measures, it is better to have multiple questions than single items because this provides increased validity and reliability (Ware, 1976). Some lengthy instruments have been shortened and have successfully maintained the essential components of the measure intact. In reducing a health measure from the Medical Outcome Study (MOS) from 75 items to 20 items, Stewart, Hays &Ware (1988) found that the shorter version was still valid and reliable.

2.43 Issues Surrounding Self-Rated Health

Asking respondents to report on their health through the use of self-administered questionnaires has sparked considerable discussion in the literature. A common view is that self-rated health questions might be too vague and difficult to interpret for respondents. Lundberg and Manderbacka (1996) argue, however, that since health is a central issue in people's lives, they are likely to keep informed about their health through external sources. Asking participants subjective questions can bias the results because of social desirability, psychological states, hypochondriasis, misunderstanding of the questions, and non-truthful answers. One person may exaggerate symptoms, while another may minimize them (McDowell & Newell, 1987). Wide discrepancies are often found between how people judge their health and the health assessments conducted by professionals (Bowling, 1991). In answer to these concerns, it has been argued that the respondent's perspective should be measured. People are likely to be the best judges of their own health (Bowling, 1991).

In fact, research indicates that self-rated health is a good health indicator and may predict mortality more accurately than more objective measures. Mossey and Shapiro (1982) examined self-rated health as a predictor of mortality among the elderly. Self-rated health was defined by responses to the question, "For your age would you say, in general, that your health is excellent, good, fair, poor or bad?" The authors found that the risk of subsequent death was three times greater for those who rated their health as bad compared to those who rated their health as excellent. They found this indicator to be a better predictor of mortality than objective health indicators such as type and seriousness

of conditions reported by a physician or the individual and the occurrence of health problems that resulted in hospitalization and/or surgery.

Similar results were found by Moller and colleagues (1996) over a 16 year period, in a cohort of 1,052 men and women, all 40 years old. Their main finding was that a simple measure of self-rated health predicted the development of CHD (coronary heart disease) and mortality. After controlling for socio-demographic and other CHD risk factors, respondents who rated their baseline health as "miserable" were 18.6 times as likely to develop CHD compared to respondents who rated their baseline health as "excellent". At baseline, self-rated health was associated with other factors such as work absence, stress at work, social class, smoking and physical activity. The authors discuss a number of explanations for the link between self-rated health and mortality: subclinical disease; health risk behaviours; depression, anger or hostility; fatigue or insomnia; and psychophysiological mechanisms regulated by the CNS.

Lundberg and Manderbacka (1996) assessed the reliability of a self-rated health measure (How would you judge your health?) and found that it had good test-retest reliability. They found that at both interviews,conducted on average 22 days apart, between 85 and 90% of respondents gave the same answers. The kappa values ranged between 0.52 and 0.85 depending on the age groups studied. The authors also asked respondents a number of questions related to disease conditions such as bronchitis, allergies, high blood pressure, shoulder aches, back pains and aches/pains in joints. Reliability for these items ranged in kappa values from 0.597 to 0.804. For conditions such as blood pressure or asthma, 94% of the respondents gave the same answers at both interviews. Cousins (1997), using a sample of older women, 70 years old and older,

compared two interviews using a self-rating health measure and found the instrument to be valid and to a much lesser extent reliable. They asked respondents to describe their current state of health as poor, fair, good or excellent. Respondents rating their health as excellent were less likely to be taking medications or to report symptoms such as heart trouble, frequent pains in chest and heart, spells of severe dizziness or high blood pressure. The correlation coefficient between the two interviews (4 weeks apart) was 0.51. This measure may be less reliable in older populations where there may be more fluctuations in health concerns.

Stewart and colleagues (1988) studied the reliability and validity of the MOS short-form General Health Survey which asks 20 questions related to physical functioning, role functioning, social functioning, mental health, health perceptions and pain. The authors found that the reliability of each of the multi-item scales is acceptable for group comparisons and provided preliminary support for validity of the measure. The correlations between the health measures and the socio-demographic measures were similar to those observed in the longer version of the instrument. Patients reported poorer health than the general population as would be expected with a valid health measure.

2.5 Retrospective Recall

Reliability and validity of data from recollection of childhood abuse is repeatedly discussed in the literature (Brewin, Andrews & Gotlib, 1993, Hardt & Rutter, 2004). Last (1995) defines recall bias as,

> a systemic error due to differences in accuracy or completeness of recall to memory of past events or experiences. For example, a mother whose child has died of leukemia is more likely than the mother of a healthy living child to

> remember details of such past experiences as use of x-ray services when the child was in utero. (Last, 1995, p.141)

What exactly are the limitations of data collected by retrospective reporting? Two errors can be committed which are associated with memory - over reporting and under reporting. Over reporting can occur due to a telescoping effect or a compression-of-time. For example, the respondent may report having undergone a surgical procedure in the last 12 months, when in fact it occurred 16 months before (Bradburn, 1985). Under reporting can occur when the information is simply forgotten or the respondent prefers not to report it.

Widom and Sheperd (1996), in comparing the accuracy of adult recollection of childhood physical abuse to official records, found a substantial amount (40%) of under reporting. Some of the reasons for under reporting might be embarrassment, wish to protect parents, sense of having deserved abuse, conscious wish to forget past, lack of confidence or lack of rapport with the interviewer. Silverman, Reinherz and Giaconia (1997) found that the reports of childhood abuse were highly correlated between ages 18 and age 21, but could not verify these reports for accuracy.

Another common critique of retrospective reporting of childhood events is that the respondent's present psychological state may influence his or her perception of childhood (Bernstein et al., 1994). Some authors suggest that depressed individuals over report adverse childhood experiences. Lloyd and Lishman (1975) noted a retrieval bias in anxious and depressed patients, where they are more likely to remember negative events and fewer positive ones. They asked depressed and nondepressed individuals to recall pleasant and unpleasant memories in response to a neutral cue card. Some researchers, on

the other hand, found no evidence of this type of recall bias (Robins, Schoenberg, Holmes, Ratcliff, Benham & Works, 1985)

Research evaluating the validity of long term recall suggests that it is reasonably accurate if questions are based on multiple questions, specific behaviours and are free of confusing qualifiers (Kosten, Anton & Rounaville, 1992; Brewin et al., 1993; Hardt & Rutter, 2004). In comparing responses of 88 pairs of twins, Sher and Descutner (1986) report that the following question "Did your friends and relatives think your father was a normal drinker?" has lower reliability compared to the question "Has your father ever gone for help about his drinking?" They also found that questions which required a judgment or inference on the part of the respondents such as whether or not relatives thought the parent was an alcoholic or if the parent felt guilt about the drinking, had lower agreement among the siblings. There was high agreement on specific behaviours such as the parent seeking help or being arrested. Hardt and Rutter write, in their review of retrospective recall of adverse childhood events,

> The available evidence on abuse and neglect indicates that when abuse or neglect is retrospectively reported to have taken place, these positive reports are likely to be correct. The main concern over validity stems from the universal finding that, even with well-documented serious abuse or neglect, about a third of individuals do not report its occurrence when specifically asked about it in adult life. Accordingly, it is clear that retrospective reports are likely to provide underestimates of the incidence of abuse/neglect. (Hardt & Rutter, 2004, p.270)

In evaluating retrospective reports related to health status, accuracy varies depending on the nature of information gathered (Olson, Shu, Ross, Pendergrass &

Robison, 1997). In retrospective quality of life reports, Litwin and McGuigan, (1999) concluded that respondents tended to remember their functioning as better than it actually was. Steel, Henderson and Duncan-Jones (1980) examined the reliability of reporting life-events by administering on two occasions (7 to 14 days) and found that more distressing events appear to be less reliably reported. In terms of reporting health services, Jobe, White, Kelley, Mingay, Sanchez and Loftus (1990) concluded that services were underreported by 20 percent.

Fendrich, Johnson, Wislar and Nageotte (1999) found that memory decay appears to influence the quality of the reporting. The longer it had been since service had been sought, the less reliable was the data. There was a seven month difference on average between respondents who disclosed accurately and those who did not. Weissman, Levin, Chasan-Taber, Massagli, Seage and Scampini (1996) when compared medical records to self-reports, found good recall accuracy in a recall period of four months. Reporting was best for hospitalization and least for home care services, but that higher and lower users were more prone to inaccuracies. Limiting recall to shorter time periods (from four to twelve months) was recommended (Weissman et al., 1996; Steele et al., 1980, Fendrich et al., 1999).

While the literature points to a certain amount of recall bias, it also suggests that if the instruments are of reasonable quality, establishing whether childhood abuse occurred or not is likely to be accurate. A consistent finding is that childhood abuse is under reported which would attenuate the relationship between childhood abuse and adverse health. There is inconsistent research suggesting that respondents who are functioning poorly will recall unpleasant events on a more frequent basis than respondents who are

functioning well (Hardt & Rutter, 2004). If this bias exists, this could accentuate the relationship between childhood abuse and adverse health. Among the studies reviewed, under reporting of health care utilization seems to be a likely bias if the time frame is lengthy.

This chapter reviewed some theoretical and methodological issues to provide a foundation for the study. A number of models were discussed which explain how childhood abuse can influence health later in life. The life course approach was chosen as it accommodated aspects of other models previously discussed, namely the stress and ecological models. The life course approach views the state of an individual as a consequence of all his or her lifetime experiences and was illustrated in Figure 2.

Valid and reliable measures of childhood abuse and adult health were utilized in this study. Childhood physical abuse was measured by seven items from the Conflict Tactics Scale and childhood sexual abuse was measured by questions from the National Population Survey of Canada. A comprehensive manner of assessing health is to measure its many dimensions such as number of health problems, self-rated health, pain and disability. The literature supports that self-rated health accurately measures health status. To minimize the effects of recall bias, instruments used to measure abuse should be based on specific behaviours and free of confusing qualifiers. Asking multiple questions can jog the memory and ensure that specific aspects of abuse are addressed. To increase the reliability of health indicators, shorter time frames as well as clear and multiple questions should be used.

CHAPTER 3. LITERATURE REVIEW

In the following sections, research examining childhood abuse and its relationship to adult physical health and health care utilization will be reviewed. In addition, the evidence suggesting an association between childhood abuse and mental health will be summarized to gain a more comprehensive perspective. This review will also include a growing number of studies which have explored the role of health risk behaviours in the childhood abuse-adult health relationship. More recent work indicates that these behaviours may be mediating this relationship.

3.1 Methodological Issues in Childhood Abuse Studies

While studies have consistently shown associations between childhood abuse and all the factors mentioned above, several methodological limitations have been noted and will be discussed before reviewing the literature. Few studies examining the relationship between childhood abuse and adult health have used population based samples. The majority of these studies are from specialty or primary care clinics which limit our ability to make generalizations regarding the larger population. Samples from these settings may introduce what is termed Berkson's selection bias, where people with more difficulties (more abuse, more health problems) may be more likely to seek help than people with fewer difficulties (Last, 1995). More recent studies are based on large health maintenance organizations. The representativeness of these samples is improved, but they will still exclude uninsured people.

Almost all of the studies have been cross sectional in design. The main problem with cross sectional data is that the timing between exposure and outcome may be

difficult to ascertain. There may be measurement and selection biases associated with the exposure variables. While this is an important limitation, there are some very compelling practical and ethical barriers to a longitudinal design in child abuse studies. In addition to the usual hurdles of long-term studies (lengthy, complex and costly to conduct), it is not possible to identify abuse in young children without having a responsibility to report these cases and in doing so, triggering a series of interventions. Jurisdictions have laws to protect children. For example, according to the Child and Family Services Act of Manitoba, professionals have a legal obligation to report a child that is or might be in need of protection. Similar laws in Alberta prevented researchers from collecting data on childhood maltreatment before the subject had reached age 17 (Badgley and Mallick, 2000). Laws governing confidentiality do not override children's safety. As Langeland and Hartges (1998) point out, the truly prospective studies have been plagued by introducing a serious bias. Once abuse is detected, interventions are instituted such as social support, long-term substitute care or subsequent parental care as well as provision of treatment for the victims. These interventions may change the impact of the abuse.

Most of the studies reviewed have examined childhood sexual abuse in women. Very few have included men or have looked at other types of abuse such as physical or emotional abuse. The relationship between abuse and health may be different between genders and therefore the conclusions cannot be extended to men. Both physical and emotional abuse are prevalent and are just as likely as sexual abuse to be associated with adverse health outcomes (Briere & Runtz, 1989).

Many of the published studies do not control for confounding factors such as age, sex, socioeconomic status and other childhood adversities. The question that arises is:

how much does the childhood abuse itself contribute to the poor health status in comparison with the contribution of the disadvantaged childhood environment? (Fry, 1993; Weissman Wind & Silvern, 1994; Toro, 1982; Walker, Katon, Harrop-Griffiths, Holm, Russo & Hickok, 1988; Felitti et al, 1998; Drossman, Leserman, Nachman, Zhiming, Gluck, Toomey, et al., 1990). Child abuse may be an indicator of poor socialization practices (Wolfe et al., 1992). According to Briere (1988), since the abuse usually occurs within the context of a disturbed family environment, abuse that is not linked to family dysfunction may have little construct validity. Childhood abuse is usually associated with other adverse childhood circumstances such as low socioeconomic status, family disorganization, parental absence or incarceration, and parental drug abuse and mental illness (Green, 1993, Kaplan et al., 1999). These adverse childhood experiences are also associated with adverse health outcomes (Kuh et al., 1997; Rahkonen et al., 1997; Rutter, 1989; Syme, 1992).

Other common methodological limitations in the studies reviewed were small sample sizes, low response rates and non-validated measures of abuse. For example, Walker et al. (1988), based on a sample size of 22, report that women with chronic pain ($n = 15$) were more likely to experience some type of sexual abuse than women in the control group ($n = 7$). Springs and Friedrich (1992), based on a response rate of 38.7%, found a relationship between sexual abuse histories and health risk behaviours. McCauley et al. (1997) based their study on one question about sexual abuse and one question about physical abuse.

3.2 Studies Examining the Relationship Between Childhood Abuse and Adult Physical Health and Health Care Utilization

3.21 Childhood Abuse and Adult Physical Health

Table 1 shows the main findings and characteristics of studies which examine the relationship between childhood abuse and adult physical health. Earlier research occurred in specialized or primary care clinics in the United States. These studies have specifically examined childhood sexual abuse in women and a narrow range of physical disorders (Lechner et al., 1993; Springs and Friedrich, 1992), such as chronic pelvic pain (Reiter et al., 1991; Walker et al.,1988, Walker, Katon, Hansom, Harrop-Griffiths, Holm, Jones et al.,1992) or gastrointestinal problems (Felitti, 1991). More recently, a wider array of childhood abuse including physical, psychological and sexual abuse has been studied, generally in women (Drossman et al., 1990; Longstreth & Wolde-Tsadik.,1993; Moeller, Bachmann & Moeller,1993; Rapkin et al.,1990). These studies were found to have significant methodological problems and will not be reviewed in detail here. (Please refer to Table 1 for details.)

Some of the best evidence rests upon studies that utilized larger, more representative samples with adequate response rates (which ranged between 62 and 83%), that considered confounding variables that had adequate control groups, and that utilized reliable and valid instruments. Seven such studies were undertaken. Longstreth and Wolde-Tsadik (1993) in their study of male and female members of a large HMO aimed to provide a broad clinical profile of painful Inflammatory Bowel Syndrome (IBS)-type symptoms. They found that gastrointestinal (GI) symptoms were associated with childhood emotional, sexual and physical abuse. The severe IBS-type symptoms were

Table 1. Summary of Studies Examining the Association Between Childhood Abuse and Adult Health

Authors	Population	Instrument Used	n	Methodology	Main Findings
Drossman et al. (1990)	Women in a gastroenterology clinic	Self-administered questionnaire Used sexual abuse questions developed by the National Population Survey of Canada	228	90% response rate - unclear about controls	Compared with patients with organic disease diagnosis, patients with functional bowel disorders reported more experiences of sexual exposure, threatened sex, incest or rape, and frequent physical abuse. History of abuse related to greater symptom reporting and health care utilization
Rapkin et al. (1990)	Women in a pain management center	Questionnaire about physical and sexual abuse administered by a psychologist	173	---	Pelvic pain is unlikely to be specifically related to sexual abuse, but that any type of abuse may promote the chronicity of painful conditions.
Felitti (1991)	Men and women in a health maintenance organization	Medical questionnaire – one question on sexual abuse	131	Matched with control group for age and sex Other confounders not controlled	Patients with a history of sexual abuse were more likely to have depression , obesity, high utilization, gastrointestinal distress and headaches.
Reiter et al. (1991)	Women from a pelvic pain clinic at the San Diego Naval Hospital	Nurse practitioners using a structured interview – for sexual abuse	135	No details about confounders or stats used	Women with a history of sexual trauma had 2x physical and emotional problems
Walker et al. (1992)	Women from medical laporoscopy clinic.	Experienced clinicians using structured interview – for sexual abuse		Controlled for age, marital status, SES, mental health,	Predictors of severe childhood sexual abuse were medically unexplained symptoms.
Springs and Friedrich (1992)	Women from Rural Family Practice Clinic	Mail-out questionnaire on sexual abuse	511	No control for confounders 38.7% response rate	9 out of 38 medical problems were more common among women with histories of sexual abuse
Lechner et al. (1993)	Women from a family practice clinic	Anonymous self-administered questionnaire	523	78% response rate	Women with sexual abuse reported more respiratory, gastrointestinal, neurological
Moeller et al. (1993)	Women from a gynecologic practice	Self-report and assessed 3 types of abuse adequately	668	60% response rate no control for confounders	women reporting abuse had more hospitalizations for illnesses, more physical and psychological problems, and lower ratings of their overall health

Table 1 (continued)

Authors	Population	Instrument Used	n	Methodology	Main Findings
Longstreth & Wolde-Tsadik, (1993)	Men and women in Health Maintenance Organization	1 question each on emotional & physical abuse - 4 questions on sexual abuse	1,264	65% response rate no controls for confounders	Sexual abuse was an independent marker for IBS type symptoms. Sexual abuse was also correlated to other nongastrointestinal symptoms.
Talley et al. (1994)	Middle aged men and women from the Mayo Clinic list	4 items for sexual abuse from the National Population Survey of Canada	919	74% response rate (no difference between responders and non-responders	association between IBS, dyspepsia and heartburn and childhood & adulthood sexual, verbal and emotional abuse. More likely to visit a doctor if a patient had suffered abuse
Mc Cauley et al. (1997)	Women from 4 community-based primary care clinics	2 questions about physical and sexual abuse	1,931	81% response rate controlled for age, income, medical insurance and marital status	childhood physical and sexual abuse is associated with physical complaints, psychological distress, substance abuse, suicide attempts and suicidal ideation. No differences in the number of operations, miscarriages or medication use
Felitti et al. (1998)	Men and women from health maintenance organizations	Conflicts Tactics Scale Wyatt's definition of sexual abuse during childhood	9,508	Response rate was 70% Controlled for age, sex, education and race.	Relationship between 7 childhood events and health status and disease In a logistical model, they found a strong graded relationship between the number of adverse childhood experiences and reports of adverse adult health outcomes.
Walker, Gerland et al. (1999)	Women from a health maintenance organization	Mailed out questionnaire – used Childhood Trauma questionnaire	1,225	62% response rate controlled for marital status and education	Childhood physical abuse, sexual abuse, psychological abuse, physical neglect, or emotional neglect was associated with physical symptoms & physician coded diagnoses, greater levels of functional disability
Thompson et al. (2002)	Women from a nationally representative phone survey	Conflict Tactics Scale 5 questions about childhood sexual abuse	8,000	72.1% response rate, controlled for age, marital, education, employment, race, physical & sexual abuse	Physical abuse – poorer health & more injuries Sexual abuse – poorer health, more injuries, miscarriages and stillbirths
Goodwin & Stein (2004) Sachs-Ericsson et al. (2005)	Men & women from Population-based National Comorbity Survey	1 item for childhood physical abuse, 2 items for childhood sexual abuse, 1 item for childhood neglect	5, 877	83% response rate – controlled for age, sex, childhood adversities	Childhood abuse is associated with having a medical problem

highly correlated with all three types of abuse. When they entered all the variables into a model, only sexual abuse was significant. The total sample size was 1264 (65% response rate). Six questions were used to measure abuse, four of which pertained to sexual abuse.

Talley, Fett, Zinsmeister and Melton (1994) studied a sample of 919 men and women in a small northern U.S. county. The sampling frame was a list of middle aged (30-49) patients from the Mayo Clinic, essentially, the entire middle-aged population of Olmsted County in Minnesota. They found that respondents with current gastrointestinal disorders were two times more likely to report childhood sexual, verbal and emotional abuse than those without the disorders (irritable bowel syndrome; odds ratio (OR): 2.0, dyspepsia; OR: 2.2 and heartburn; OR: 2.4). The authors controlled for age, sex, marital status, education level, current psychological distress and social support.

Talley and colleagues' study examined three types of abuse, controlled for confounding variables and had a response rate of 74%, however their conclusions were limited to gastrointestinal problems. The authors stated that while their sample included a large segment of Olmsted County, it was not representative of the entire population. A four-item questionnaire from the National Population Health Survey of Canada (Badgley, 1984) was utilized for assessing sexual abuse (both child and adult). Physical and emotional abuse cases may have been missed because only one question touched on physical abuse and one question on emotional or verbal abuse. This is reflected by the high prevalence of childhood and adulthood sexual abuse (16.5%) in their sample and the lower rates of physical abuse (2.3%) and emotional/verbal abuse (8.3%).

McCauley and colleagues' study (1997) of 1,931 women, from four community-based primary care clinics concluded that childhood physical and sexual abuse were

associated with 19 out of 20 physical symptoms (crude prevalence ratios: ranging from 1.4 to 2.8), as well as psychological distress, substance abuse, suicide attempts and suicidal ideation. The three types of childhood abuse (sexual-only, physical-only and both) were analyzed together, given that, few differences in health outcomes were found among the types. Symptoms associated with childhood-only abuse were nightmares, back pain, headaches, pelvic/genital pain, binging and vomiting, frequent tiredness, problems sleeping, abdominal or stomach pain, vaginal discharge, breast pain, choking sensation, loss of appetite, problems urinating, diarrhea, constipation, chest pain, face pain, frequent or serious bruises and shortness of breath. Women in the group with childhood-only abuse were 3.5 times more likely than women with no history of abuse to have high somatization scores.

The response rate of 80.7% was excellent. The authors were not able to compare characteristics of the nonresponders with the responders to see if they differed in some important ways. Unfortunately, McCauley and colleagues (1997) limited their measure to two questions "Were you ever physically abused before age 18?" "Were you ever sexually abused before age 18?" to determine if women had suffered childhood abuse. They recognized that women abused as children are also abused as adults, making it more difficult to determine which type of abuse (childhood or adulthood) was associated with adverse health. Of the 1931 patients in the study, 424 (22%) reported having experienced sexual or physical abuse before 18 years old. Fifty percent of these women experienced both childhood and adult abuse. An additional 203 women reported abuse as adults. The group of women experiencing both childhood and adult abuse reported the highest level of symptoms.

Felitti and colleagues (1998), in a sample of 9,508 men and women from a large HMO, found a relationship between seven categories of adverse childhood events (including three categories of maltreatment) and adult health risk behaviours, health status and disease (ischemic heart disease; Odds ratio (OR):2.2, any cancer; OR:1.9, stroke; OR:2.4, chronic bronchitis or emphysema; OR:3.9, diabetes; OR:1.6, skeletal fracture; OR:1.6, hepatitis or jaundice; OR:2.4, fair or poor self-rated health; OR:2.2). A strong graded relationship was found between the number of adverse childhood experiences and reports of adverse adult health outcomes.

Felitti and colleagues' sample was based on a self-administered questionnaire and had a good response rate (70%). The authors controlled for potential confounders by including age, sex, race and educational attainment in their model. The ACE Study questionnaire developed for the study utilized questions from well-known instruments. Wyatt's Sexual History Questionnaire is a reliable measure of childhood sexual abuse (Wyatt, 1985). The Conflict Tactic Scale was utilized for measuring childhood physical abuse (reviewed in section 2.33).

A study by Walker, Gelfand and colleagues (1999), of 1,225 female patients of an HMO, showed that a history of childhood maltreatment (physical abuse, sexual abuse, psychological abuse, physical neglect or emotional neglect) was associated with 16 out of 18 physical symptoms as well as with physician coded diagnoses, greater levels of functional disability and a greater number of health risk behaviours. The number of categories of childhood exposures showed a graded relationship to adult health status.

While most of the information in Walker and colleagues study was gathered through a self-administered questionnaire, the health indicators were corroborated by the

women's physician records. Sixty-two percent of the mailed questionnaires were returned. Researchers used the Childhood Trauma Questionnaire (CTQ) which is considered reliable and valid measure in assessing childhood maltreatment (Bernstein, Ahluvalia, Pogge, & Handelsman, 1997, Bernstein & Fink, 1998). No significant differences were found between the demographic characteristics of the responders and non-responders but the authors discussed the possibility of response bias. Women with a history of child maltreatment may have avoided the questionnaire as it could have provoked painful memories. The authors controlled for marital status and education which attenuated the strength of the association.

Thompson, Aria, Basile and Desai, (2002) using a nationally representative American telephone survey of women, found that childhood physical and sexual abuse were associated with three out of four health outcomes. Compared to women with no history of abuse, women with a history of childhood sexual abuse more likely to report poor perceived health (OR:1.41), to have a sustained serious injury (OR:1.34) and to have had a miscarriage or stillbirth (OR:1.37). Women with a history of childhood physical abuse report poorer perceived health (OR:1.22) and more sustained serious injury (OR:1.44) than women with no history. They also found that respondents with both types of abuse were more likely to have had a miscarriage or stillbirth. There were no significant differences between the abuse groups and the comparison group for chronic physical conditions such as high blood pressure, severe headaches and asthma.

The survey consisted of 8000 women from 50 states and had a response rate of 72.1%. The authors controlled for age, marital status, education, employment status, race, ethnicity, physical and sexual victimization in adulthood and sexual or physical abuse in

childhood. Childhood physical abuse was assessed using 12 items from the Conflict Tactics Scale which has good reliability and validity (see section 2.33). Childhood sexual abuse was assessed using 5 questions but the source of the questions was not identified. The questions were numerous and specific enough to suggest that they adequately measured sexual abuse. Some limitations are that it did not include men nor control for other childhood adversities.

Using the National Comorbidity Survey (NCS), Goodwin and Stein (2004) found an association between childhood adversities (neglect and physical and sexual abuse) and many of the specific health problems examined. The adjusted odds for these relationships ranged from 2.1 to 10. Childhood physical abuse was associated with arthritis, ulcers, hernia, lung, cardiac, kidney, neurological and autoimmune disorders. Childhood sexual abuse was associated with hernia, ulcer, hypertension and lung, cardiac, gastrointestinal, kidney and neurological disorders. They also reported that childhood neglect was associated with arthritis, diabetes, hernia, lung, gastrointestinal, kidney, neurological and autoimmune disorders. Gender specific analyses were conducted, and some differences were noted between male and female respondents. The authors did not report on interactions between childhood trauma and gender in predicting physical disorders, therefore it is difficult to determine if these were actual differences or were due to chance.

The NCS is a population-based sample of the 5,877 American households which had an 83% response rate. Childhood sexual abuse was assessed by two questions (you were raped, you were sexually molested), childhood physical abuse was assessed with one question (you were physically abused) and childhood neglect was assessed by one

question (you were seriously neglected as a child). Multiple questions and questions about specific actions may have improved accuracy in classifying respondents with childhood trauma. The authors adequately controlled for the influences of age, gender, race, marital status, income and education. When they entered depressive and anxiety disorders, the relationships between childhood adversities and physical disorders were attenuated.

The prevalence rates for some of the physical disorders were low because the NCS respondents were relatively young (15-54 years old). For example, there were only 6 respondents with childhood neglect and hernia, 10 respondents with childhood sexual abuse and kidney disorder, and 4 respondents with childhood physical abuse and stroke. These low cell sizes influence the reliability of the estimates and the power of the analysis. The high odds ratio and the wide confidence interval found between childhood neglect and autoimmune disorders (OR: 10 (4.9 - 20.2)) may be very different in other samples.

Sachs-Ericsson, Blazer, Plant and Arnow (2005) using the same survey (NCS), found an association between childhood physical (odds ratio: 2.23) and sexual abuse (odds ratios: 2.23 and 1.39 respectively) and having a medical problem. The list of 19 self-reported health problems included conditions such as arthritis or rheumatism, asthma, blindness or deafness, bronchitis or tuberculosis, cancer, and diabetes. The authors controlled for age and sex and for other childhood adversities such as parental psychopathology, parent's socio-economic status, parental divorce, parental abandonment and family conflict. These estimates are more likely to be reliable because the medical conditions were grouped together providing more cases per cell for comparisons.

3.22 Childhood Abuse and Health Care Utilization

Examining health care utilization in individuals with histories of childhood abuse provides a practical perspective on the effects of health problems. People generally seek help from a health care provider when they perceive that their health is compromised. It can be assessed in a numerous ways: frequency of visits to a health professional, frequency of hospital admissions, number of medical procedures or prescriptions. As health care costs continue to rise, the issue of health care utilization is a salient one. The studies examining the relationship between childhood abuse and health care utilization are summarized in Table 2. Research indicates that while people are unlikely to consult health care providers for assault related reasons (Kilpatrick, Saunders, Veronen, Best, & Von, 1987), people with histories of abuse are more likely to seek health care services for a variety of problems (Moeller et al., 1993; Felitti, 1991; Walker et al., 1992). Utilization of services comes at a substantial cost. Walker, Unutzer et al. (1999), in a sample of 1,225 women in a health maintenance organization (HMO), found that annual health care costs for women reporting abuse were $97.00 greater than women not reporting abuse. Moreover, health costs for women specifically reporting sexual abuse were $245.00 greater than other women. These results are based on a 62.4% response rate. The authors controlled for marital status and education, bur no description of the non-responders was offered.

One of the earlier studies examining health care utilization and abuse was by Felitti (1991). In a study of 181 men and women from an HMO, they found that 22% of respondents with histories of sexual abuse visited their doctor frequently (10 or more times in the preceding year) compared to 6% of the control group when controlled for age

Table 2. Summary of Studies Examining the Association Between Childhood Abuse and Health Care Utilization

Authors	Population	Instruments	n	Methodology	Main Findings
Felitti (1991)	Men and women in a health maintenance organisation	Medical questionnaire – one question on sexual abuse	131	Matched with control group for age and sex	22% of the study group visited their doctor 10 or more times in the last year compared to 6% of the control group
Moeller et al. (1993)	Women from a gynecologic practice	Self-report and assessed 3 types of abuse adequately	668	60% response rate no control for confounders	Women reporting abuse had more hospitalizations for illnesses.
Salmon & Calderbank (1996)	Men and women from an undergraduate program	4 questions on sexual abuse similar to the National Population Health Survey and one question for physical abuse	275	Almost 100% response rate - separate analysis for men and women	Respondents with a history of sexual abuse and physical abuse had more operations, hospital admissions, and GP
Mc Cauley et al. (1997)	Women from 4 community-based primary care clinics	2 questions about physical and sexual abuse	1,931	81% response rate -controlled for age, income, medical insurance and marital status	No differences in the number of operations, miscarriages or medication use
Walker, Unutzer, et al. (1999)	Women in Health Maintenance Organization	Mail out questionnaire based on the Childhood Trauma Questionnaire that asks about 5 types of child maltreatment	1,225	62.4% response rate Controlled for marital status and education	Women reporting abuse had annual health care costs that were $97 greater han women with no abuse. Women with sexual abuse had costs that were $245 greater. The health care costs increased for women with more types of abuse
Arnow et al. (2000)	Women in health maintenance organization	Used questions from the National Population Health Survey	218	No controls for confounders	Women with both types of abuse were more likely to have more emergency room visits and more outpatient visits than women with only one type of abuse.
Rosenberg et al. (2000)	Men and women from a medical facility	Trauma History Questionnaire asking about childhood and adult physical and sexual abuse	107	Unclear what was controlled for in regression	Total number of physical and sexual abuse traumas was associated with medical utilization.
Finestrone et al. (2000)	Women from a group therapy program	Self-administered using questions for childhood sexual abuse from the National Population Health Survey	80	Used nurses as a control group 81% response rate	Women with childhood sexual abuse had more surgeries, hospitalizations, and visits to family doctors
Hulme (2000)	Women in primary care clinic	Mail-out questionnaire asking 13 questions about childhood sexual abuse	395	30% response rate	Women with childhood sexual abuse visited the clinic more frequently and incurred $150 more (over 2 years) in health care costs than women with no history
Newman et al. (2000)	Women from HMO	National Population Health Survey questions for childhood sexual abuse	602	80% response rate -adjusted for age, income, marital status and childhood physical abuse	More self-reported doctors visits among group with childhood sexual abuse

and sex. Only one question on sexual abuse was asked which is inadequate in measuring sexual abuse. The sample was made up of white, middle-class and working adults. The findings from this sample cannot be generalized to the general population. A study of young undergraduate students (male and female), showed that students with a history of abuse (either sexual or physical) reported more hospital admissions and surgeries (Salmon & Calderbank, 1996). The response rate was almost 100%. The questionnaire had 4 questions on sexual abuse from the National Population Health survey (described in section 2.33) and only 1 question on physical abuse. One question is unlikely to give a reliable and valid measure of physical abuse. The sample cannot be generalized to a larger population.

Hulme (2000) studied a sample of 395 patients in a primary care setting and found that women with a history of childhood sexual abuse visited the primary care clinics 1.33 times more than women with no childhood abuse. Over a two year period, this resulted in costs averaging $150.00 more for women with a history of childhood abuse. The authors found that women with childhood sexual abuse had a lower socioeconomic status, were more likely to use public aid, were less likely to be married and less likely to have children. However, they did not control for these factors in their analysis. The methods used had a number of limitations and compromised the findings of the study. The study consisted of a mail-out questionnaire with 13 sexual abuse questions. There was no discussion of the validity and reliability of their questionnaire. The data on health care utilization appears to be more valid as it was based on chart reviews and charges corresponding to health care visits. The response rate was low at 30% with no attempt to describe the non-responders.

Newman and colleagues (2000) studied a sample of 608 women from an HMO in California for somatic symptoms and medical utilization. Researchers used self-report measures but also used medical records for 136 respondents. Over a 2-year period, women with childhood sexual abuse reported more doctor visits than those with no abuse. The differences were apparent among internal medicine and outpatient surgical clinics, but not significant in ear-nose-throat, emergency room, gynecology, ophthalmology and psychiatry/psychology visits. The authors found a significant interaction in women who were depressed and had experienced childhood sexual abuse. In the group of people who had been subjected to childhood sexual abuse, respondents who suffered higher levels of depression experienced more emergency room visits and doctors visits than respondents who with low levels of depression. These differences between depressed and non-depressed respondents were not found in the group which had not been subjected to childhood sexual abuse.

The sample is representative of women in an HMO and had a very good response rate (80%). They controlled for age, income, marital status and childhood physical abuse. The visits were determined through self-report in a 12-month time frame which is considered acceptable for reliability and validity. The authors noted that 46% of the sample underestimated the number of visits when comparing self-reports to clinical records. Fortunately, there were no significant differences between the abused versus the non-abused group, in this pattern of reporting.

In a Canadian study, women reporting childhood sexual abuse had more surgeries, hospitalizations and visits to family doctors than women in the comparison group (Finestone et al., 2000). The comparison group, consisting of nurses, was unlikely

to be similar in socioeconomic status or other background characteristics to the group with histories of abuse. They found no significant differences between women reporting childhood sexual abuse and women with psychiatric illness but no childhood sexual abuse. The authors obtained a very good response rate of 81% and used a self-administered questionnaire from the National Population Health Survey (described in section 2.33).

There is some evidence that the level of health care utilization is related to the severity of abuse or the number of types of abuse. Arnow, Hart, Hayward, Dea and Taylor (2000) showed, in their study of 218 women from an HMO, an association between high utilization rates and severity of childhood abuse. Individuals with more severe abuse reported more emergency room visits and (non-psychiatric) outpatient visits. A study's strength is that detailed data was collected on the frequency and time the physical and sexual abuse occurred using the National Population Health Survey questions. They used the HMO's health records to determine utilization. They unfortunately did not control for any confounders. The response rate was not stated in the paper.

Moeller and colleagues (1993) suggest that being exposed to many types of abuse (physical, sexual, emotional) increase rates of health care utilization. In their study of 668 women from a gynecologic practice, they reported that women subjected to many types of childhood abuse experiences are more likely to report being hospitalized for illnesses and surgeries than women exposed to only one type of abuse. The study is based on a series of self-rated questions about abuse, health and health care utilization. Definitions of physical, sexual and emotional abuse were provided in the questionnaire. The test-

retest reliability coefficients for the questionnaire ranged from 0.88 to 0.99 for the different types of abuse. There were no controls for confounders. The response rate was 60%. The women in this study were not necessarily representative of the population in general. They were predominantly Caucasian, well-educated, middle class and ranging from 16 to 76 years old.

In attempting to explain the link between childhood abuse and health care utilization, Rosenberg, Wolfore, Manganiello, Brunette and Boynton (2000) hypothesized that individuals with histories of abuse may have higher rates of post-traumatic stress disorder (PTSD) which in turn lead to higher health care utilization rates. Researchers showed increased rates of medical utilization for individuals with histories of abuse but not for patients with PTSD, a finding that did not support the hypothesis. The sample included 107 men and women from a medical facility. They used the Trauma History Questionnaire to assess physical and sexual abuse. It was unclear which variables were used as covariates in the regression model.

Unlike most published studies, McCauley and colleagues (1997), in her sample of 1,931 women from primary care clinics, found no association between childhood abuse and higher health care utilization rates. There were no differences in the number of operations, miscarriages or visits to the emergency department. However, women reporting childhood abuse and abuse as adults experienced more visits to the emergency department in the last 6 months than women with no abuse histories. This study had a high response rate of 80.7% and controlled for sociodemographic characteristics. The main limitation was that a blurring of categories between the abuse and non-abuse groups

may have occurred since only 2 questions were asked. One reason for the negative findings may be that they chose health care utilization items with low base rates.

Together the studies reviewed point to some evidence of a weak to moderate association between health care utilization and childhood abuse. Many of the studies have had considerable methodological limitations which weaken their conclusions. Most samples are from specialty or primary care clinics, limiting the ability to generalize to the larger population. Samples from these settings may introduce what is termed Berkson's selection bias, where people with more difficulties (more abuse, more mental health problems) may be more likely to seek help than people with only one problem (Last, 1995). Some of the more recent studies are based on large health maintenance organizations. The representativeness of these samples is improved, but still excludes uninsured people. All of the studies have been cross sectional in design - which limits our understanding of cause and effect. The majority of studies examining this relationship focus on women with histories of childhood sexual abuse. Very few studies have studied men or other types of abuse. Most studies have failed to adequately control for confounders.

3.23 Childhood Abuse and Mental Health

While the relationship between childhood abuse and adult physical health and health care utilization has recently been considered, the link between childhood abuse and mental health has been extensively studied in clinical samples and in to a lesser extent, in community samples. Wekerle and Wolfe (1996), in their review of child maltreatment, conclude that while many individuals with histories of abuse develop into well-functioning adults, in general these individuals experience more depression, sexual

dysfunction, personality disorders, eating disorders, antisocial and abusive behaviour and substance abuse than those with no abuse histories. Few studies have examined this association in a prospective manner to establish a causal relationship. The link between childhood abuse and subsequent mental health problems is not straightforward. Not all people with a history of abuse develop future psychological distress. Other factors appear to mediate the relationship. Following is a description of some of the studies that have examined this association.

Clinical Samples

The majority of the research in childhood abuse and mental health is based on clinical samples which are not necessarily representative of the general population. These studies will not be reviewed exhaustively. Childhood physical and sexual abuse appears to be associated with anxiety, depression and substance abuse (Briere & Runtz, 1988; Felitti, 1991; Stein, Walker, Anderson, Hazen, Ross, Eldrige et al., 1996; Windle, Windle, Scheidt & Miller, 1995; Yama, Tovey & Fogas, 1993). Many studies have found alarming rates of suicidal ideation and suicide attempts in this group of people. In their review of 29 studies, Santa Mina and Gallop (1998) found substantial evidence of a strong association between childhood physical and sexual abuse and adult self-harm and suicidal behaviour. They noted that while some of the earlier studies lacked comparison groups, had unclear definitions of abuse and did not control for confounders, the consistency of the studies was convincing. Important factors related to the magnitude of the association included experiencing sexual abuse with penetration, abuse of long duration and whether or not the perpetrator has been known to the victim. Langeland and Hartgers (1998) in reviewing the literature on alcohol abuse and child sexual and physical

abuse concluded that there is an association for women with an abuse history and alcohol abuse but insufficient evidence to reach the same conclusions for men. They caution that while this association appears to be consistent, the mechanism of the relationship is not clear.

Community Samples

Recent research examining the association between abuse and psychophathology has been based on larger and more representative samples. Attempts to control for confounders have been more consistent and measurements of both childhood abuse and psychopathology have been refined. The main difficulty with the following studies is that they are cross-sectional in design which limits conclusions about causality. McCauley and colleagues (1997) reported higher rates of psychological distress, substance abuse, suicidal ideation and suicidal attempts in women with a history of physical or sexual abuse compared to women with no history. This study (which was reviewed earlier) was based on a sample 1931 women from a health maintenance organization with a response rate of 81%. They controlled for age, income, medical insurance and marital status, but not other childhood adversities. The definition of abuse was based on only two questions.

Kessler, Davis and Kendler (1997), using the U.S. National Comorbidity Survey (NCS), examined 26 childhood adversities and an array of adult psychiatric disorders. The childhood adversities they studied included interpersonal traumas (rape, physical attacks, paternal and maternal aggression), loss events (e.g., parental death) and parental psychopathologies (e.g., maternal depression). They found that childhood adversities were associated with the onset of mood, anxiety, substance abuse and conduct disorders, but not with the persistence of these disorders. Many of the associations between specific

childhood adversities and specific disorders were attenuated when controlled for other adversities and disorders. The relationship between some adversities (parental separation and divorce, parental psychopathothogy and repeated molestation and rape) and psychiatric disorders remained statistically significant after being controlled for other adversities and sociodemographic variables. The authors noted that multiple adversities increase the probability of developing psychopathology. The study has many strengths. The NCS is nationally representative sample of 8098 men and women with a response rate of 82.4%. They controlled for age, sex, race, childhood socioecomomic status, other adversities and psychiatric disorders.

Molnar, Buka and Kessler (2001) using the NCS focused on sexual abuse in women. They found that certain characteristics of sexual abuse were associated with the probability of developing mood, anxiety and substance abuse disorders in women. These factors were the chronicity of the abuse, knowing the perpetrator and being raped (versus molestation). The association between childhood sexual abuse and psychopathology remained significant after controlling for age, race, divorced parents, parental psychopathology and parental verbal and physical abuse.

In a similar Canadian study, MacMillan et al. (2001) found a strong association between history of childhood physical and sexual abuse and lifetime adult psychopathology. Among women, a strong association was found between anxiety disorders, affective disorders, substance abuse disorders and antisocial behaviour in adulthood and childhood physical and sexual abuse. Among men, all disorders except for major depressive disorder and drug abuse/dependence were associated with physical abuse. Other findings were that physical abuse is as important a correlate as sexual abuse

and that these relationships tend to be stronger for women than for men. MacMillan and her colleagues used data from the Ontario Health Survey, a representative sample of the population of the province. The sample included 8116 men and women aged 15 to 64 and a 67.4% response rate. Definitions of childhood abuse were based on a series of questions from scales with known reliability and validity. The authors controlled for childhood socioeconomic status, age and gender, but not for other adversities.

Longitudinal Samples

The most compelling evidence for the relationship between childhood abuse and long-term mental health comes from longitudinal community studies. The studies reviewed have followed cohorts of children, but have not inquired about abuse until late adolescence or adulthood. A recent New Zealand study (Christchurch Health and Development Study) followed a birth cohort of 1,265 young people annually to the age of 16 and then did follow-ups at age 18 and age 21 (Fergusson et al., 1996). This study determined prevalence rates, stability and continuity of the mental disorders as well as the contribution of risk factors to the development of mental disorders. Researchers did not ask about childhood abuse until late adolescence. Fergusson and colleagues (1996) found that childhood sexual abuse is associated with psychological distress in late adolescence and early adulthood. This association remains strong after controlling for other childhood adversities (family socio-demographic background, family stability, parent-child relationships and parental adjustment). To determine if sexual abuse occurred, they asked some screening questions and amassed detailed narratives about the subject's childhood sexual abuse experience. The design of the study is longitudinal but the data on childhood

sexual abuse was collected retrospectively. There is likely to be some recall bias. The confounding variables were collected over time.

Widom (1999), in a case-control study of 1,196 men and women, reported that adults with a history of childhood abuse and neglect were twice as likely to develop current and lifetime post-traumatic stress disorder. However, when a number of confounders were introduced into the logistic regression model, this association became insignificant. These confounders included childhood adversities such as parent arrested, parent had drug problems, parent on welfare, five or more children in the family, behaviour problems before age 15 and adult adversities such as marital problems, less than a college degree, DSM-III-R diagnosis of alcohol/drug abuse. They found that respondents with a history of abuse were more likely than respondents with no history to experience traumatic events such as rapes and injuries. The sample of adults with a history of childhood abuse and neglect was derived from 676 official criminal records confirming a history of abuse or neglect. The comparison group was well chosen to match the group with the history of abuse and neglect. The confounders used may not have been entirely appropriate. It is conceivable that some of the so-called confounders are actually mediators of the relationship between abuse and psychopathology.

From a smaller cohort of 290 females living in Calgary, Badgley and Mallick (2000) reported an association between childhood sexual abuse and emotional problems (but not conduct disorder) at age 17. They found that prolonged sexual abuse is more likely to be associated with long-term psychopathology. Adolescents most likely to have impaired emotional functioning experienced a combination of prolonged sexual abuse, family disruption, poverty and impaired coping skills. All the factors in this study were

collected longitudinally except for childhood sexual abuse which was measured at age 17. They controlled for a number of possible confounders such as physical and emotional abuse, temperament, weak bonding to parents, negative family climate, maternal stress and poverty. The main limitation of this study was the sample. It has a response rate of 58% and the sample over represented children with certain risk factors (e.g. whose early histories have been marked by difficult pregnancy and birth, low birth weight, early CNS illnesses). It is therefore more difficult to generalize these results to the general population.

Using a sample of 375 respondents from a community longitudinal study, Silverman and colleagues (1997) examined the relationship between childhood sexual and physical abuse and psychopathology at ages 15 and 21. Children were not questioned about abuse before age 18, consequently some degree of recall bias may exist. Higher rates of depressive symptomatology, anxiety, psychiatric disorders, emotional-behavioural, suicidal ideation and attempts were found at age 15 and 21 among respondents with a history of abuse compared to respondents without a history of abuse. A striking example of their findings is that 88% of female adolescents with sexual abuse histories (14 out of 16) reported suicide ideation compared to 26% in the female adolescents who did not have abuse histories. About 80% of respondents with abuse histories reported a psychiatric disorder. There were some gender differences, where the magnitude of the relationship between abuse and psychopathology was greater for women than for men.

While the study began when the 777 children were five years old, the data on childhood abuse was collected retrospectively when the participants were 15 years old.

The authors addressed the issue of recall bias in their study. They verified the reliability of abuse reporting, finding that the reports were highly correlated at ages 18 and age 21. They felt that recall may be less of an issue due to the young age of the respondents. The attrition rate was high, where roughly half of the sample were lost. The non-participants did not differ from the study participants on key demographic, behavioural, academic and emotional variables. Only two questions were asked about physical and sexual abuse: "At any time in your life were you sexually abused or forced to have sex without your consent?"

Johnson, Cohen, Kasen and Brook (2002) in a community longitudinal study of 782 mothers and their children, found an association between eating disorders and childhood maltreatment. The authors also found that eating disorders were associated with maladaptive parental behaviour. These associations were significant after controlling for age, difficult temperament, childhood eating problems and parental psychopathology. The data were from a longitudinal study, but not all of the information on childhood maltreatment was collected before the information on eating disorders. Some data was derived from official records and some from self-report and parent reports.

In summary, a large body of research supports the association between childhood sexual and physical abuse and mental health problems. Childhood sexual abuse in women has been studied more extensively. The studies reviewed are based on retrospective reports of childhood abuse. The best evidence comes from the large representative samples with good response rates that attempted to assess the recall bias and that have controlled for confounding variables. Controlling for other childhood adversities tended to attenuate the association between the two factors. Severe types of abuse are more likely to be

associated with psychopathology than less severe types (Fergusson et al., 1996). Adults with a history of numerous adversities are more likely to develop psychopathology than adults with history of limited adversities (Badgley & Mallick, 2000).

3.24 Summary of Evidence Linking Childhood Abuse to Adult Health and Health Care Utilization

In summary, there is consistent evidence among the studies reviewed which suggest an association of moderate strength (OR: 1.9 to 2.5) between childhood abuse and adult health problems. The evidence is less consistent for an association between childhood abuse and health care utilization. In terms of specificity, one type of abuse does not appear to be associated with a specific adverse outcome (Kessler et al., 1997). Rather childhood abuse is associated with a variety of physical disorders and health care use. Felitti et al. (1998) and Walker, Gerland et al. (1999) found a strong graded relationship between the number of adverse childhood experiences and reports of adverse adult health outcomes. A temporal relationship is likely but cannot be ascertained due to cross-sectional design. Research in developmental psychology and neurobiology offers plausible explanations linking childhood abuse and adult health.

In making definitive conclusions about the causal role of childhood abuse in adult physical health and health care utilization, studies are lacking which adequately control for factors influencing health throughout the life span. In fact, most of the studies reviewed controlled very little for confounding factors. This may prove to be important in understanding the relationship between abuse and health. Only one population based study provided evidence of the association. No longitudinal studies have been found which have examined this relationship. A number of animal studies associate abuse and

neglect to long-term biological reactions. Other than the natural experience of the Romanian orphanages, there are no existing human experiments of this kind. In theory, large well-designed population based longitudinal studies which control for confounding variables would evaluate of the association between abuse and health, however these are not feasible in practice. In the interim, population studies which control for confounding variables can provide evidence that such an association merits preventive action and further investigation.

3.31 Childhood Abuse and Adult Health Risk Behaviours

Health risk behaviours have been posited to mediate the relationship between childhood abuse and adult health. It is widely recognized that behaviours such as smoking, poor nutrition, sedentary lifestyle, obesity, high alcohol consumption, use of illicit drugs, higher-risk sexual practices and dangerous driving practices are well established as risk factors for many illnesses and injuries. These behaviours are not randomly distributed in the general population. Certain groups of people are more likely to engage in health risk behaviours than others, for example, people in lower socioeconomic groups (Lynch et al., 1997; Ross, 2000). Less established is why some individuals develop these behaviours, while others do not. A number of studies have reported that individuals with childhood maltreatment engage in more health risk behaviours than individuals with no such background. The smaller studies will be reviewed first, followed by the larger studies.

The relationship between childhood abuse and health risk behaviours were examined in a range of populations, from general population to women prisoners. Instruments used in measuring theses factors varied greatly which explain to some extent

differences in the strength of association found across studies. All of the studies were cross-sectional. Some of the most convincing studies were those using large representative samples, those controlling for confounders and those using reliable and valid instruments. A number of studies reporting on specific populations were also reviewed. These studies dealt with sexual abuse only and most examined only women. The generalizability of these studies is somewhat limited but viewed together they provide evidence supportive of a relationship between abuse and health risk behaviours. I will review the smaller studies first and then the larger more representative studies.

Smaller Studies of Specific Populations

Mulling, Marquart and Brewer (2000), in a random sample of 500 newly admitted women prisoners, found that women inmates reporting childhood sexual abuse were more likely than those not reporting abuse to engage in substance abuse and HIV risk behaviours. These behaviours included smoking crack (66% v. 51%), injecting drugs (56%v. 44%), sex with an IV drug user (13% v. 6%), sex with crack user (14% v. 5%), anal sex (3% v. 1%), multiple sexual partners (17% v. 6%), trading sex for money/drugs (10% v. 1%) and engaging in prostitution (32% v. 19%).Two behaviours were not significantly different between the two groups. These included using shared needle with HIV infected people (2% v.1% - not significant) and having sex with an HIV infected person (0% v. 1%).

Young and Katz (1998) found a relationship between sexual abuse (having occurred in childhood or adulthood) and certain health risk behaviours in a group of Aboriginal and non-Aboriginal women (n = 1003). Compared to women with no history of abuse, women with a history of abuse were more likely to have first sexual intercourse

before age 12 (OR: Aboriginal-6.59; non-Aboriginal-6.50), were more likely to have multiple partners in the previous year (OR: Aboriginal-3.37; non-Aboriginal-3.09), were more likely to have multiple partners in their lifetime (OR: Aboriginal-6.44; non-Aboriginal-2.99) and more likely to smoke (OR: Aboriginal-2.87; non-Aboriginal-1.99).

Springs and Friedrich (1992) surveyed 511 women from a rural family practice clinic about sexual abuse histories and health risk behaviours. Women with histories of sexual abuse had, on average, started smoking 1.6 years earlier than women without such histories. As well, while women with abuse histories considered themselves to be as normal in their drinking habits as women without abuse histories, they more frequently reported the need to decrease their consumption of alcohol. Women with abuse histories were on average 2 years younger at time of first intercourse, had more sexual partners before age 18 and had more lifetime sexual partners than women without a history of sexual abuse.

Bartholow, Doll, Joy, Douglas, Bolan, Harrison et al. (1994) reported that men (both homosexual and heterosexual) with histories of sexual abuse were significantly more likely then men with no history of sexual abuse to have receptive anal sex (50% v. 43%), any unprotected anal intercourse (59% v. 51%), exchange sex for money or drugs (36% v. 21%) and to use IV drugs (29% v. 14%). Also, men with histories of sexual abuse were more likely then men with no history of sexual abuse to have used tobacco (78.4% v. 68.7%), cocaine (72.9% v. 66.6%), crack (18.4% v. 11.6%), stimulants (63% v. 44.8%), hallucinogens (62.4% v. 53.3%) and opiates (28.6% v. 17.6%).

Studies of Teenage Populations

Adult health risk behaviours are likely to have developed throughout the life cycle. A few studies have examined the relationship between childhood abuse and teenage health risk behaviours. These studies serve to bridge our knowledge of childhood health risk behaviours and adult health risk behaviours and are not contaminated by events that may have occurred in adulthood. Walker, Gerland et al., (1999) remarked that other adult factors may predispose to engaging in high risk behaviours such as adult rape, domestic violence, family disorganization or unemployment.

Riggs, Alario and McHorney (1990) surveyed 600 high school students regarding the prevalence of physical and sexual abuse. They reported that students with a history of physical abuse were three times more likely to drink alcohol and smoke and twice as likely to use illicit drugs. Students reporting sexual abuse were three and one half times more likely to be sexually active compared to students not reporting sexual abuse. The response rate was high (94%) and was from a non-clinical sample in an urban public high school. The study was controlled for age, gender, SES, ethnicity and living arrangements. A clear definition of abuse was apparently not provided.

From a survey of high school students, Nelson, Higginson and Grant-Worley (1994) report significant differences in health risk behaviours between those with and without a history of sexual abuse. Teenage females who had been sexually abused were more likely to be smoking (40% v. 19%), to have used alcohol (59% v. 33%), to have used marijuana (22% v. 7%), to have used cocaine (16% v. 3%), to have had sex (67% v. 34%), to have had more than three sexual partners (40% v. 12%) and to have ever been pregnant (19% v. 4%). Similar results were reported among young men. Those who had

been sexually abused were more likely to be smoking (63% v. 23%), to have used alcohol (82% v. 46%), to have used marijuana (61% v. 16%), to have used cocaine (58% v. 7%), to have ever had sex (91% v. 47%), to have had more than three sexual partners (71% v. 24%) and to have ever gotten someone pregnant (33% v. 4%), compared to young men who had not been exposed to abuse.

The sampling frame of Nelson and colleagues was designed to select a statewide representative sample of all Oregon public schools. Fifty-eight percent of the schools selected agreed to participate and 82% of the students in those schools completed the questionnaire, making it difficult to generalize the results across the entire state. Unfortunately no information was given with regard to schools that chose not to participate. The study population was quite large (n = 2,332) and included both males and females. The questions appeared to be clear, however no mention of the instrument's validity or reliability was made.

Large Representative Studies

Felitti and colleagues (1998) found a relationship between seven categories of adverse childhood events (including 3 categories of maltreatment) and several adult health risk behaviours. Comparisons were made between respondents with no reports of childhood adversities and respondents reporting from one to four or more adversities. Among respondents with no reports of adverse childhood events, 56% did not engage in any of the risk behaviours. In contrast among those who reported 4 or more events, only 14% did not engage in any of the risk behaviours. Respondents reporting 4 or more events compared to respondents reporting no events were more likely to: smoke (OR:2.2), be severely obese (OR: 1.6), have low physical activity (OR: 1.6), consider

themselves an alcoholic (OR:7.4) and have multiple (50 or more) sexual partners (OR 3.2). Researchers found a strong graded relationship between the number of adverse childhood experiences and reports of adult health risk behaviours. This study was discussed at length earlier in this chapter.

Similarly, Bensley and colleagues (2000) in a population based, telephone survey found a strong association between physical and sexual abuse and two health risk behaviours in women and men. Very early and chronic sexual abuse histories in women, unaccompanied by physical abuse were associated with a 7-fold increase risk of HIV risk behaviours compared to those with no history of abuse. Combined physical and any sexual abuse in women were associated with a 5-fold risk of HIV risk behaviours and a six-fold increase in risk of heavy drinking compared to no history of abuse. Similar associations were discovered in men. History of sexual abuse was associated with an 8-fold increase in risk of HIV risk behaviours and history of physical abuse in men was associated with a 3-fold increase in risk of HIV risk behaviours compared to no history of abuse. A history of physical abuse was associated with a three-fold increase in risk of heavy drinking.

Finally, Walker, Gerland et al. (1999) found an association between a history of childhood maltreatment and health risk behaviours. Respondents reporting childhood maltreatment (physical, sexual, emotional, physical and emotional neglect) were more likely than respondents with no history to have driven a car while intoxicated (2.0 for sexual maltreatment; 2.8 for non-sexual maltreatment), to have had sex with partners before knowing sexual history (1.8 for sexual maltreatment; 1.4 for non-sexual maltreatment), to have a sedentary lifestyle (1.8 for sexual maltreatment; 1.4 for non-

sexual maltreatment), to have probable alcoholism (1.5 for sexual maltreatment; not significant for non-sexual maltreatment), to have high BMI (1.4 for sexual maltreatment; not significant for non-sexual maltreatment) and to not wear seat belt (1.4 for sexual maltreatment; not significant for non-sexual maltreatment). Health risk behaviours found not to be associated with histories of maltreatment were consuming alcohol and smoking during pregnancy and smoking. The authors found a dose-response relationship in which the likelihood of developing health risk behaviours increased with the types of childhood maltreatment.

In summary, all studies reviewed above, save one, consistently showed an association between childhood abuse or adversities and adult health risk behaviours. There is evidence of an association between childhood maltreatment or adversities and the following health risk behaviours: smoking, high BMI, sedentary lifestyle, heavy drinking/alcoholism, driving while intoxicated, alcohol and drug use among teenagers, sexual activity in teenagers, multiple sexual partners, have sex with partners before knowing sexual history and HIV risk behaviours. There is little or no evidence of the following health risk behaviours: seat belts usage, pregnancy in teenagers and to smoking and consuming alcohol during pregnancy. The strengths of association varied from moderate to strong associations. Moderate associations (1.4 to 1.8) were linked childhood maltreatment to high BMI and sedentary lifestyle and very high associations were found between childhood maltreatment and engaging in HIV risk behaviours and heavy drinking. Two of the papers reviewed found a dose-response relationship between childhood maltreatment and health risk behaviours.

CHAPTER 4. METHODS

4.1 Description of Sample

4.11 Overview

Data from the Ontario Health Survey (OHS) and its Mental Health Supplement were used to address the research questions under study. This study is therefore dependent on the OHS's design and chosen measures. The OHS is a comprehensive population health survey commissioned by the Ontario Ministry of Health designed to provide information on general health for health planning and policy development purposes. Since a complete assessment of mental health problems and potential risk factors was beyond the scope of the OHS, the mental health supplement was subsequently collected from subsample of the OHS respondents. This supplement was conducted for the purpose of studying prevalence, severity and risk factors of psychiatric disorders and to gather data on mental health services. It was a province-wide, epidemiologic, cross-sectional study of psychiatric disorders among those aged 15 years and over living in households in Ontario (Boyle, Offord, Campbell, Catlin, Goering, Lin et al., 1996).

4.12 Target Population

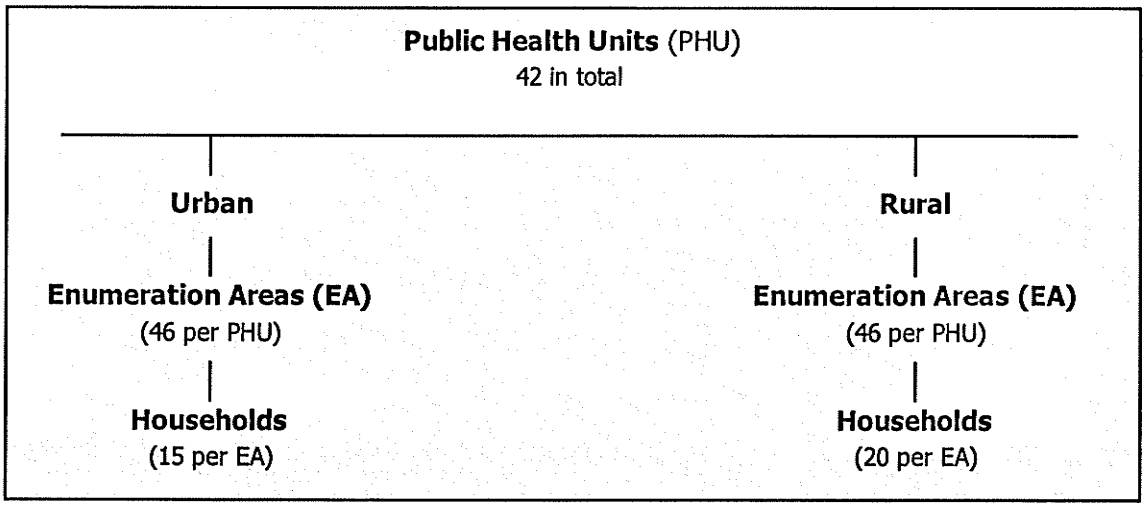
The target population for the OHS and MHS consisted of all individuals, aged 15 years or older who lived in dwellings in Ontario between August through November of 1990. It should be noted that a number of Ontarians were excluded: foreign service personnel, homeless people, people living in institutions (for example, hospitals, prisons),

First Nations people living on reserves and residents of extremely remote locations (Boyle et al., 1996).

4.13 Design

This survey used a multi-stage design with stratification and clustering. The latter techniques are used to ensure representation and feasibility. Boyle and his colleagues (1996) provide a more comprehensive description of the Ontario Health Survey and the Mental Health Supplement. Figure 3 illustrates the various stages of the complex survey design. Ontario is divided into 42 Public Health Units (PHU). Each PHU contains numerous geographical units for which census counts can be returned. These are called enumeration areas (EA). Each urban EA has on average 375 dwellings and each rural EA has on average 125 dwellings.

Figure 3. Design of the Ontario Health Survey
(Boyle, Offord, Campbell, Catlin, Goering, Lin et al., 1996)



The OHS survey was conducted in 2 stages:

1) A probability sample averaging 46 enumeration areas (EA) was selected from each Public Health Unit (PHU). The probability of being selected was adjusted for each

EA; the larger the number of households per EA, the larger the probability of being selected.

2) A probability sample of 15 households was selected from the urban enumeration areas and 20 households were selected from the rural enumeration areas.

For each PHU, an equal number of households (760) was selected to ensure that the sample sizes and statistical reliability at this level would be comparable. The EAs were sorted into urban and rural strata. This stratified sample gives estimates that are more precise per unit cost than simple random sampling. Since the groups are homogeneous, the within stratum sample is smaller. Selected EAs were then randomly divided into four parts or quarters and each household was assigned a survey month for the interview to be conducted. The Mental Health Supplement was selected from the 3rd and 4th quarters.

Cluster sampling of the households was used to decrease costs of data collection. This clustering effect was less pronounced in urban areas by the selection of fewer dwellings per EA. The urban EAs were more numerous, more compact and less expensive to list. The cluster effect in rural areas was higher due to fewer clusters. To offset this design effect in rural areas, more households were selected per EA. One respondent from each household was interviewed. To increase statistical reliability of the 15 to 24 age group, this group was over sampled. If no one in the household was between 15 to 24, all members in the households had equal chances of being selected. Computer-generated random numbers were used to select the subjects.

The sampling frame for the Mental Health Supplement consisted of all the files of fully or partially completed interview forms from the 3rd and 4th quarters or the second

half of the Ontario Health Survey. Pilot studies were conducted in the 1st and 2nd quarters. These quarters were designed to be complete replicates of each other to ensure that the representativeness of the Supplement sample would not be affected.

The Ontario Health Survey and the Mental Health Supplement had three stages; an interview with a household informant which gathered health data, a self-report questionnaire which was left with the informant to be returned at a later date and finally the Mental Health Supplement was conducted. The data on health problems were collected between January and November 1990 through the Ontario Health Survey. The health risk behaviors questions (except for the diagnostic criteria for alcohol abuse) were included in the self-report questionnaire and were returned after the interview. Despite the interviewers' best efforts, 1372 were never returned. And finally the Mental Health Supplement included questions on childhood abuse, other adverse childhood experiences, childhood school difficulties, current alcohol abuse as well as health care utilization and was conducted between November 1990 and March 1991. Response rates to the Ontario Health Survey and the Supplement are included in Table 3

4.14 Nonresponders

Data from nonresponders were compared to the responders of the MHS-OHS. Relative to responders, non-responders tended to be male, to live in urban settings, to be older, to be born outside of Canada, to speak a language other than English at home and to have fewer health problems. Selection bias is unlikely to be a concern as little difference was found between nonresponders and responders on important measures related to health status such as education, income and marital status. A weighting procedure was used to

compensate for the nonresponse at the Ontario Health Survey and the Mental Health Supplement level.

Table 3. Ontario Health Survey and Supplement Response

Sample	Number	Percentage
Ontario Health Survey		
Total households	14,758	
Participating households	13,002	88.1
Non participating households	1,756	11.0
No contact	660	4.5
Refusal	553	3.7
Sickness, death , language	368	2.5
Other	175	1.2
Mental Health Supplement		
Total households	13,002	
Total eligible individuals	35,690	
Total individuals selected	13,002	
Participating individuals	9,953	*76.5*[1]
Non participating individuals	3,049	23.5
No contact	744	5.7
Refusal	751	5.8
Sickness, death , language	431	3.3
Document destroyed	845	6.5
Other	278	2.1

[1] 67.4% of original sample

4.2 Description of Study Variables

Study variable frequencies are found in Table 4. Some variables were derived by the OHS team. Others were created by the author based on the distribution of responses contributing to the variable. Appendix A summarizes the distribution graphs made of each study variable. This appendix contains descriptions of rates of variable occurrence in the sample, variation in age groups and gender and the rationale used in categorizing variables. Among health indicators, special attention was devoted to how health varies by age groups and how best to control for age in the analysis.

4.21 Demographic Factors

Certain demographic factors have been shown to have independent effects on health and these effects were taken into account for the analyses. Data for the demographic variables were collected by the interviewer and are listed below with a brief description.

Age: depending on the health outcome studied, the variable age was used as a continuous variable or a categorical variable.

Sex: male and female

Marital status: marital Status was divided into three categories: Married, Single and Divorced/Separated/Widowed. Two dummy variables were created with Married as the reference category.

- Single
- Divorced, separated or widowed

Low education: The categories for this variable were created taking respondents' ages into account. For respondents born before 1930, low educational attainment was primary school or less. For respondents born in 1930 or later, low educational attainment was some secondary school or less.

4.22 Childhood Abuse

Responses for childhood physical and sexual abuse in the OHS (MHS) were collected through a self-report questionnaire. During the course of the face to face interview, respondents were asked to complete the questionnaire and return it to the

Table 4. Frequency of Study Variables[1]

Variables	Present		Absent	Missing
Health Outcome	n	%	n	
Skin Diseases	821	8	9,099	33
Allergies	1,747	18	8,173	33
Back pain	944	10	8,976	33
Arthritis	1,629	16	8,291	33
Bone problems	525	5	9,395	33
Asthma	411	4	9,509	33
Respiratory Problems	302	3	9,618	33
Hypertension	1,080	11	8,840	33
Circulatory Problems	351	4	9,569	33
Heart Disease	524	5	9,396	33
Diabetes	299	3	9,621	33
Stomach Ulcers	316	3	9,604	33
Digestive Problems	395	4	9,525	33
Thyroid Problems	296	3	9,624	33
Eye Problems	450	5	9,470	33
Multiple Health Problems	2,276	23	7,677	0
Poor Self-Rated Health	955	11	7,564	1,434
Pain that interferes with activities	890	11	7,544	1,519
Disability	1,584	16	8,141	228
High GP Use	2,080	21	7,803	70
High ER Use	782	8	9,139	32
High Professional Use	1,118	11	8,808	27
Confounders				
Sex	4,515[2]	45	5,438[3]	0
Age (Under 40 years old)	5165	52	4,788	0
Marital Status – Single (Reference is Married)	2328	24	7,591	34
Marital Status – Divorced, Separated or Widowed (Reference is Married)	1645	17	8,274	34
Low Education	3407	35	6,463	83
School Difficulties	2708	28	7,003	242
Low Parental Education	3773	41	5,376	804
Parental Psychopathology	3231	34	6,308	414
Parental Marital Conflict	2240	23	7,551	162
Lack of a close relationship	1660	17	8,135	158
Total Adverse Childhood Experiences	787 (4-6)	8	2,668	162
	6,336 (1-3)	65		
Health Risk Behaviors				
Smoking	2,338	29	5,996	1,619
Alcohol Problems	1,045	11	8,711	197
Low Exercise	3,941	46	4,640	1,372
Obesity	1,071	14	6,806	2,076
More than One Sexual Partner	694	9	6,669	2,658
Childhood Abuse				
Childhood Physical Abuse	2,407	26	6,882	664
Childhood Sexual Abuse	855	9	8,414	684

[1] unweighted data
[2] male
[3] female

interviewer in a sealed envelope. Having established a rapport with the interviewer, there was an opportunity for the respondent to ask for clarification of the questions.

The variables representing abuse are:

Childhood Physical Abuse: defined as *often or sometimes* being pushed, grabbed, or shoved, *often or sometimes* having something thrown at the respondent, *often or sometimes* being hit with something, *often, sometimes or rarely* being kicked, bitten or punched, or *often, sometimes, or rarely* being choked, burned or scalded, or *often, sometimes, or rarely* being physically attacked in some other way.

Childhood Sexual Abuse: defined as having an adult expose themselves to the respondent more than once, being threatened by an adult to have sex, having the respondent's sex parts being touched by an adult, having an adult attempt to have sex with the respondent or being sexually attacked.

The questions for childhood physical abuse were based an abridged version of the Conflict Tactics Scale (Straus, 1990) and the questions for childhood sexual abuse were from the National Population Survey of Canada (otherwise known as the Badgley Study; Badgley, 1984). Appendix B (Ontario Ministry of Health, 1994) contains the self-administered questions. Seven questions are related to the presence and frequency of physical abuse and four questions related to the presence of sexual abuse. Respondents who gave the responses within the solid lines (see Appendix B) were said to have a history of childhood abuse. Note that being slapped or spanked often is not included in the definition of physical abuse. Also, being pushed, grabbed, or shoved or having something thrown at the respondent is included as abuse only if the respondent reports a frequency of "sometimes" or "often".

As the sample sizes for each of the variables are adequate to examine most of the adult health indicators, childhood physical abuse and childhood sexual abuse will be analyzed as separate variables. Widom (1988) argued that keeping the types of abuse separate may be conceptually and empirically important. For example, sexual abuse is more often reported in females than males. Some types of abuse may be associated with certain ill effects (Briere & Runtz, 1989).

Tables 5 and 6 display response patterns by gender to the separate items related to childhood abuse questions. The experiences most frequently reported were being slapped or spanked (not included in definition of abuse). The experiences that were least frequently reported were being choked, burnt, or scalded, or being kicked, bit, or punched. In general, men more often report the physical abuse and women more often sexual abuse.

Table 5. Childhood Sexual Abuse Responses by Item for Males and Females

Items on Childhood Sexual Abuse Questionnaire	Responses of Items by Gender†							
	Yes				No			
	Male		Female		Male		Female	
	%	n	%	n	%	n	%	n
Adult exposed themselves	2	74	6	275	98	4,440	94	4,413
Threatened to have sex	1	49	4	164	99	4,449	96	4,494
Touched parts of your body	3	139	9	422	97	4,36	91	4,292
Adult sexually attacked you	2	87	5	233	98	4,421	95	4,456

† weighted number and percentages

Table 6. Childhood Physical Abuse Responses by Item for Males and Females

Items on Childhood Physical Abuse Questionnaire	Responses of Items by Gender†															
	Often				Sometimes				Rarely				Never			
	Male		Female		Male		Female		Male		Female		Male		Female	
	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n
Adult pushed, grabbed or shoved you	3	120	3	148	14	616	8	376	31	1,408	18	858	52	2,396	71	3,381
Adult threw something at you	1	56	1	63	7	320	4	166	15	659	9	436	77	3,456	86	4,062
Adult slapped or spanked you	5	244	6	278	37	1,691	30	1,466	42	1,913	40	1,958	16	755	24	1,161
Adult kicked, bit, or punched you	1	48	1	39	4	158	3	126	9	427	5	221	86	3,941	92	4,431
Adult hit you with something	2	91	2	113	11	484	8	365	24	1,096	14	679	64	2,913	76	3,659
Adult choked, burnt, or scalded you	0.2	10	0.1	5	0.3	12	0.5	24	0.9	40	0.7	35	99	4,490	99	4,742
Adult physically attacked you	1	36	1	57	2	97	2	105	6	283	4	199	91	4,146	93	4,467

† Weighted number and percentages

4.23 Adverse Childhood Experiences

Since childhood abuse often coexists with other adverse childhood experiences, a number of these experiences were examined. It is important to consider how adverse childhood experiences are related to childhood abuse in influencing adult health. The individual influence of specific adverse childhood experiences on health was observed in the models to determine if the adverse experiences were overlapping risk factors. Kraemer, Stice, Kazdin, Offord and Kupfer (2001) suggest that "When there are multiple risk factors, all proxy risk factors for one global risk factor, they should be aggregated to gain clearer understanding of what the causal processes might be (p.851)." To further examine if adverse childhood experiences may be proxy risk factors for a more global construct such a stressful home environment or dysfunctional parenting, an aggregate measure of all these measures was created and tested for its influence on health.

The variables considered in this analysis are listed below.

Low Parental Education: This was used as a measure of childhood SES and was derived from the question, "What was the highest level of school that (he/she – parent or person who financially supported your family) completed?" Since education levels are higher today then they were generations ago, the respondent's age was considered in creating the variable. For respondents aged less than 35 years old (born after 1965), low parental education existed if the parent did not complete high school. For respondents aged 35 years old or older (born in 1965 or before), low parental education existed if the parent had education limited to primary school.

Parental Psychopathology: Respondents were asked a series of questions to determine if their biological parents suffered from possible problems with depression

(including suicidal ideation), mania, psychosis, or antisocial behaviours. If respondent stated that their parents had experienced these mental health problems, then parental psychopathology was coded as being present.

Parental Marital Conflict: This variable was coded as being present if the respondent answered affirmatively to, "Did your parents (or the people who raised you) ever have serious problems getting along?"

Lack of Close Relationship: This variable was coded as being present if the respondents answered negatively to "Did you have a close and confiding relationship with either of your parents or with some other adult during your childhood?"

Number of Adverse Childhood Experiences: This variable was created by adding the number of adverse childhood experiences reported: childhood physical abuse, childhood sexual abuse, low parental education, parental psychopathology, parental marital conflict and lack of close relationship. There were too few respondents with six adverse childhood experiences to form a separate category, so the highest category was five or six adverse childhood experiences.

4.24 Health Indicators

Following are descriptions of the variables measuring health. According to the OHS User's Manual, the questions were constructed by the Working Group, which drew on the scientific literature (Ontario Ministry of Health, 1994). These variables are essentially self-rated health indicators. The questions asked in the OHS were similar to the questions asked in instruments that have been tested for reliability and validity. There are essentially two types of health indicators, the specific health problems and the global

health problems that asked respondents about number of problems, self-rated health, pain that interferes with activities and disability due to physical health problems.

Specific Health Problems: Respondents were asked if they had any of the following medical conditions.

> "Do your have.... skin allergies or diseases, hay fever or other allergies, back pain, arthritis or rheumatism, serious joint or bone problems, asthma, emphysema, chronic bronchitis or cough, high blood pressure or hypertension, circulatory problems, heart disease, diabetes, stomach ulcers, digestive problems, goiter or thyroid trouble or eye problems?"

Multiple Health Problems: This variable was derived from different questions than the specific health problems listed above. Ten open-ended questions about health problems in specific situations were asked at various points in the interview. For example: "What were the health problems for the visits or consultations, during those 14 days?" or "What was the health problem responsible for staying in bed?" The health problem descriptions were recorded in detail by the lay interviewers. These descriptions were then sent to Statistics Canada and coded into ICD-9 codes. Each respondent could identify as many as eight problems. Respondents reporting more than two health problems or more in response to these open-ended questions were coded as having multiple health problems.

Poor Self-rated health[2] : Respondents were asked, "In general, compared to other people your age, would you say your health is ... excellent, very good, good, fair, or

[2] This question was collected through a self-completed questionnaire where 1372 were not returned despite the best efforts of the interviewers

poor". Those who answered that their health was fair or poor were coded as having poor self-rated health."

Pain that interferes with activities[3]: Respondents were asked, "Which of the following sentences best describes the effect of pain or discomfort you usually experience? Those who answered pain or discomfort in *some or most* activities were coded as having pain."

Disability due to physical health problems: This variable provided a summary measure of current dysfunction due to a physical health problem. The variable is based on a series of 44 questions inquiring about the degree of disability respondents were currently experiencing, including limitations in work, school, home, or leisure activities. Examples are:

> M2. Are you limited at all in your ability to do this kind of work around the house because of a physical health problem? M15. You've told me about difficulties you have (getting around the neighbourhood, getting out of your home, with personal care), is this (are these) difficulty due to a physical health problem? N20A. Are there certain jobs or careers not open to you because of a physical health problem you have? N23A. Are you currently working part-time because of a physical health problem you have? N28. In the current job, are you limited at all in the kind or amount of work you can do because of a physical health problem you have?

[3] This question was collected through a self-completed questionnaire where 1372 were not returned despite the best efforts of the interviewers

Respondents who answered that they had experienced any disability due to a physical health problem were coded as having a disability.

4.25 Health Care Utilization

Three variables were used to examine the effects of childhood abuse on health care utilization. Respondents were asked to recall their health care use in the last 12 months.

High GP Use: Respondents were asked, "How many times did you go to see a general practitioner about your health during the past 12 months?" If a respondent answered six visits or more to a general practitioner, this variable was coded as high GP use.

High ER Use: This variable is based on the question, "During the past 12 months, did you use an emergency room at a hospital? How many times? If a respondent answered two or more visits to the emergency, this variable was coded as high ER use.

High Professional Use: Respondents were asked about the frequency of visits to a family doctor, specialist, nurse, dentist, pharmacist, psychologist, etc. For example, they were asked, "How many times did you go see a specialist about your health during the past 12 months." If a respondent reported 25 or more visits, this variable was coded as high professional use.

4.26 Health Risk Behaviours and Childhood School Difficulties

Health risk behaviours and barriers to educational attainment such as having childhood school difficulties are seen as potential intermediate variables. Some researchers have hypothesized that the relationship between abuse and health can

partially be explained by the adoption of unhealthy behaviours (Bensley et al., 2000; Felitti et al., 1998; Walker, Gerland et al., 1999). Limited educational attainment has been associated with poor health (Feldman, Makuc, Kleinman & Cornoni-Huntley, 1989; Ross & Wu, 1995; Shkolnikov et al., 1998). The time frame for the health risk behaviours varied.

School Difficulties in Childhood: Respondents were asked if they had ever failed a grade or required special education in their childhood. Those who reported these experiences were coded as having school difficulties.

Smoking[4]: If respondents stated that they currently smoked any amount of cigarettes or cigars on a daily basis, the variable was coded as smoking. Respondents who reported smoking in the past or who reported smoking only on occasion were not classified as smokers.

Alcohol Problems: Respondents were asked a series of questions about alcohol which were based on DSM-III-R criteria for alcohol abuse and dependence. Respondents meeting criteria for either diagnosis were defined as having alcohol problems. The time frame for these questions was 12 months.

Low Exercise[5]: Respondents were asked whether they had participated in a variety of physical activities within the past month. There were 19 activities in all ranging

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[4] This question was collected through a self-completed questionnaire where 1372 were not returned despite the best efforts of the interviewers

[5] This question was collected through a self-completed questionnaire where 1372 were not returned despite the best efforts of the interviewers

from walking, golfing and ice skating to downhill skiing. The 20th category was called "other activities". These activities were recoded to make up a more stringent definition of being physically active. Estabrooks, Glasgow and Dsewltowski (2003) cite the Surgeon General, the CDC and the American College of Sports Medicine as recommending 30 minutes of moderate activity on most – preferably all days.

For each physical activity, respondents were asked about the number of times per month that they participated in the activity and the approximate duration in minutes that they spent doing the exercise every time they participated in the activity. To create the exercise variable, the frequency and duration for each exercise was multiplied. The products of each exercise were then was added to obtain a total number of minutes per month that they participated in some type of physical activity. Respondents with less than 900 minutes (30 minutes per day x 30 days) of exercise per month were classified as being physically inactive.

Obesity[6]: This is measured by the Body Mass Index (BMI = Weight in kg / (Height in Meters) squared). A BMI of 30.0 and over is associated with an increased risk of developing health problems (World Health Organization, 1997). For this study, respondents with a BMI of 29.5 and over were considered obese.

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[6] This question was collected through a self-completed questionnaire where 1372 were not returned despite the best efforts of the interviewers

More than One Sexual Partner[7]: Respondents were asked "In the last year how many sexual partners did you have?" Those with more than one partner were categorized as having more than one sexual partner.

4.3 Ethics and Safeguards to Protect Privacy

Permission was granted allowing access to the Ontario Health Survey (OHS) and to the Mental Health Supplement (MHS) by the Ontario Ministry of Health. Sensitivity of the information included in the Supplement and the OHS is acknowledged. Members of the committee are either members of a health care team or, as a result of their research or clinical backgrounds, have extensive experience in dealing with confidential material. Dr. Walker authored a study which associated anxiety disorders and childhood abuse (Stein et al, 1996). The Department of Community Health Sciences at the University of Manitoba utilizes large health-related databases to provide information on general health for health planning and policy development purposes. The data were not shared with anyone other than the Advisory Committee. No attempts were made to identify or contact the respondents and the data files were not linked to other databases.

4.4 Analysis

The study objective is to examine the relationship between retrospective reports of childhood physical and sexual abuse, physical health indicators and health care utilization. The analysis will further our understanding of the strength and nature of these relationships and shed some light on how the relationship is influenced by the presence of

[7] This question was collected through a self-completed questionnaire where 1372 were not returned despite the best efforts of the interviewers

other variables such as other adverse childhood experiences, demographic characteristics and health risk behaviours. The following sections will provide a detailed description of the analytic approach for this study.

4.41 Overview of Data Analysis Plan

According to Rothman and Greenland (1998), a good data analysis has a number of distinct steps. One of the first steps was to understand how variables are distributed and interrelated. The next step was to examine the relationships among the variables by creating contingency tables. Stratification analysis was then conducted considering important factors such as age and gender and by each of the confounding and potentially mediating variables.

In the last step of analysis, statistical tests were used to study the relationship between abuse and health. Regression coefficients were examined as variables were added to logistic regression models. The first variables included were childhood abuse, then adverse childhood experiences, followed by demographic characteristics. Where sample sizes were large enough, relationships were examined by age group and gender. The relationship between childhood abuse and adverse childhood experiences and their collective effect on health were examined. Finally, tests (described by Baron and Kenny, 1986) were conducted to determine if health risk behaviour and school difficulties mediated the relationship between abuse and health.

4.42 Examining Variable Distribution

The initial step of the analysis was to gain an understanding of how childhood abuse, health indicators, demographic characteristics, adverse childhood experiences and

health risk behaviours were distributed and interrelated. The distribution of each variable was examined. This process helped in considering violations of assumptions and in categorizing variables. The relationship between age, gender and health was studied extensively since health varies by age and gender. The relationships among the variables were examined by creating contingency tables. In epidemiology, most of the pertinent information is in these contingency tables. This determined whether or not certain categories of variables have sufficient cases for analysis. Studying the health-abuse relationship across strata was useful in understanding and interpreting how this relationship is influenced by the presence or absence of other pertinent factors. Authors working with the Adverse Childhood Experiences (ACE) study repeatedly underscore the importance of studying abuse within the larger environmental context (Dong, Anda, Dube, Giles & Felitti, 2003; Edwards, Holden, Felitti & Anda, 2003).

Once the relationships among the variables were examined, crude estimates were calculated across different levels of variables that may affect the abuse-health relationship. Stratification analysis is considered to be an important interim tool by epidemiologists (Rothman & Greenland, 1998). Patterns in the data can be studied in a clearer way by stratifying than by other approaches. It assists in the evaluation and control of confounding and also in the evaluation and description of effect-measure modification. Confounders exist because of the interrelationship of the confounding variable, the exposure and the disease. Effect-measure modification is defined as " the variation in the magnitude of a measure of exposure effects across levels of another variable." (Rothman & Greenland, 1998). If the strength of the relationship between childhood abuse and health status varied significantly across strata of a certain variable

(e.g. by sex), it was described in the findings. If the strength of the associations varied very little within each stratum, the findings was simply reported for the total sample and not specified by strata.

Barriers related to the study design impeded stratification for some variables. According to the User's Manual of the Ontario Health Survey, researchers cannot release or publish an estimate if the number of respondents (the numerator) that contributes to the estimate is less than 30. If the sample size is more than 30, there are guidelines based on the coefficient of variation of the estimate. If the sampling variability associated with an estimate is too high (coefficients larger than 25.0), the estimate must be suppressed (Ontario Ministry of Health, 1994). Some of the less prevalent health problems were not analyzed for this reason.

4.43 Statistical Analysis

The analysis proper consisted of two main steps; testing the relationship between childhood abuse and health (when possible by age and gender) and to determine if school difficulties and health risk behaviours mediated this relationship.

Logistic Regression Analysis

According to Kelsey, Whittemore, Evans and Thompson (1996) regression is the method of choice for analyzing multiple variables. Since the outcome variables in the study could be summarized into two categories, logistic regression was utilized (Evans, 1988). A strength of logistic regression is its ability to explore the impact of childhood physical and sexual abuse on health outcomes while controlling the effects of other confounding variables. This process would be almost impossible were other methods

used (Hassard, 1997). A more detailed description of logistic regression analysis is found in Appendix C.

Logistic regression was used to test the relationship between childhood abuse and health outcomes and childhood abuse controlling for demographic factors. Odds ratios (ORs) and 95% confidence intervals were reported. To examine the relationship between childhood abuse, other adverse childhood experiences and health outcomes, three steps using logistic regression were conducted. The first step was to test separate models examining the relationship between six adverse childhood experiences (physical and sexual abuse, parental marital conflict, parental psychopathology, low parental education and lack of close relationship) and health outcomes when other childhood experiences were not in the model. The second step examined the relationship between these adverse childhood experiences and health outcomes with all six childhood experiences in the same model. The third step examined the relationship between a composite measure of all six adverse childhood experiences (number of adverse childhood experiences) and health outcomes. The analyses were conducted using SPSS for Windows 10.

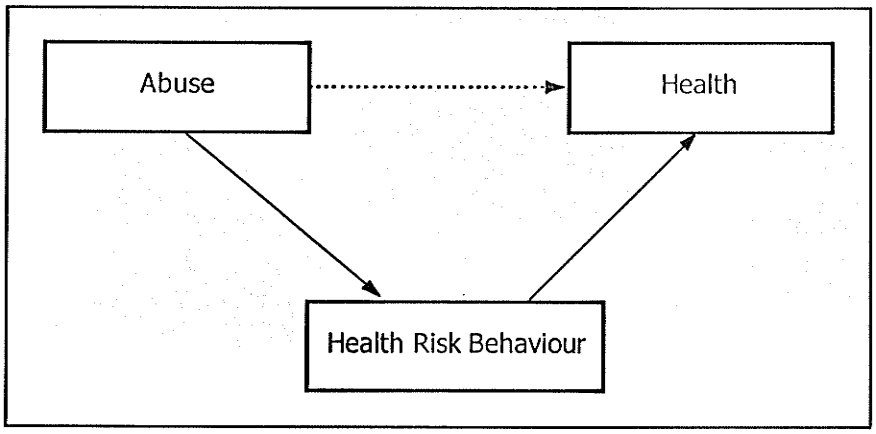
Testing for Mediators

Mediators can speak to how and why a predictor variable can affect an outcome variable (Baron & Kenny, 1986). In this study, health risk behaviours and school difficulties were hypothesized as being mediator between abuse and health. According to BaronandKenny (1986), to test if a variable is a mediator, three regression equations should be estimated. (see Figure 4)

1. Regress mediator (health risk behaviour) on predictor variable (abuse)
2. Regress outcome variable (health) on predictor variable (abuse)

3. Regress outcome variable (health) on predictor variable (abuse) and mediator (health risk behaviour)

Figure 4. Health risk behavior mediating the relationship between childhood abuse and adult health



The variable is said to function as a mediator when the following conditions hold: 1) the predictor variable (abuse) must account for variation in the presumed mediator (health risk behaviour); 2) the predictor variable must account for variation in the outcome variable (health); 3) the mediator must account for variation in the outcome variable while the predictor variable is in the equation and a previously significant relationship between the predictor variable and the outcome variable must be significantly decreased. Perfect mediation holds if the predictor variable has no effect on the outcome variable when controlled for the mediator variable. Since there are many factors affecting health, a more realistic goal in evaluating a mediator, is that the mediator significantly attenuates the relationship (Baron & Kenny, 1986).

Two assumptions are required to use multiple regression to estimate a mediational model; that there be no measurement error in the mediator variable and that the outcome variable not cause the mediator (Baron & Kenny, 1986 p. 1177). The second assumption

is not likely to be an issue, however, there is likely to be some measurement error due to recall bias. If the health risk behaviour is underreported for example, the effect of the mediator is likely to be attenuated. In this study, health risk behaviours were evaluated over a relatively limited time frame and so the impact of health risk behaviours (such as smoking) over previous years would not be identified.

Health risk behaviours (smoking, alcohol problems, low exercise, obesity, more than one sexual partner) and childhood school difficulties were tested in this manner to determine if they had a mediator role in the relationship between abuse and health. A few clarifications should be made in interpreting this test. To be a mediator, the assumption was made that abuse preceded health risk behaviour and that both of these factors precede the current health indicator. Because of the cross-sectional design of the study, some ambiguity concerning the direction of influences exists. For example, it is entirely possible that a particular health problem could occur (for example joint pain) and then be followed by the development of a health risk behaviour (for example, low exercise). It should be stated then, that this test cannot determine causality but can only conclude that it is consistent with what we might expect.

4.44 Study Design Considerations

Survey designs influence analysis of the data. The OHS used a multi-stage design that includes stratification and clustering. Statistical tests assume simple random sampling where each subject has an equal chance of being selected. This assumption is not valid in this sample. Adjustments using sampling weights and design effects must be considered (Bellhouse, 1997; Lee, Forthofer & Lorimor, 1989). Sampling weights, also referred to as probability weights or relative weights, can be used to represent the

probability of a particular individual being included in the sample (Lee et al., 1989). Weights can also be used to represent the number of people in the population that each case represents and to account for other factors such as adjustments for characteristics of nonresponders (Goel, 1993).

The OHS design affects the estimation of standard errors and consequently was considered when analyzing the data. If the design effect is not taken into account, the estimates calculated tend to underestimate the true variance, leading to confidence intervals which are too small. This increases the possibility of a Type I error, that is, finding that a comparison is statistically significant when it is not. Lee et al. (1989) state that generally (though not necessarily the case) stratified sampling gives a smaller variance than simple random sampling and cluster sampling leads to a larger sampling variance.

There are several approaches to dealing with variance estimation. Replication techniques can be used, such as balanced repeated replication (BRR) or jackknife repeated replication (JRR), which estimate the variance by calculating a large number of variances using subsamples of the whole sample. Calculating a Taylor series is another method. This very computer intensive method is used by a software application called SUDAAN (LaVange, Stearns, Lafata, Koch & Shah, 1996). LaVange and colleagues (1996) explain how the software estimates the variance in a linear regression.

> "Briefly, a linearized variable is defined for a particular statistic by forming the first order Taylor series approximation of the deviation of the estimator for its expected value. The variance of the estimator is then computed by substituting the

> linearized value into the variance formula appropriate for the sample design specified."

A potential difficulty with using SUDAAN in analysis of the OHS, is the need for variables specifying the respondent's enumeration area and household. These were not available in the public use files. Policies protecting the confidentiality of respondents have made it difficult to obtain these variables.

Another relatively simple approach consists of using a published design effect, calculated by Statistics Canada to be 2.2. Lee and colleagues (1989) explains the procedure,

> "Multiplying the variance by the design effect allows one to recalculate the test statistic and to reassess the significance level. Though simple, this method cannot substitute for a direct estimation of variance since the true design effect for a variable cannot always be predicted well from that of other variables." (Lee et al., 1989, pp.46)

Using the published design effect gives estimates and confidence intervals that are very close (within a fraction of a decimal point) of the estimates generated by SUDAAN. Goel (1993) calculated the estimates and the confidence intervals of a number of variables in the OHS to demonstrate the different results from using different methods of variance estimation (See Appendix D). In general, the estimates and confidence intervals resulting from the published design effect were slightly more conservative than the estimates from SUDAAN, and Goel suggested that the use of the design effect was an effective approach to the OHS data.

4.45 Other Considerations

Cohort Effect

Cohort effects were considered in this sample. Cohort or generational effect is the variation in health status arising from the different causal factors to which each birth cohort is exposed, as the surrounding environment and society change (Last, 1995). Growing up in 1930 was very different than growing up in 1970. Major differences existed in diet, sanitation, medical practices and mortality rates (McKeown, Record & Turner, 1975; Dubos, 1968). Societal factors vary across generations as well. Prevalence rates of child abuse may differ (DeMause, 1975), divorce was less common and sexual attitudes have since changed (Badgley, 1991). Some researchers have found that older respondents report less childhood abuse (MacMillan et al., 1997). These respondents grew up in a time where child abuse may have been denied or suppressed and therefore they may perceive the experience differently. On the other hand there may be real differences across cohorts in the rate of various adverse experiences.

Cohort effects were examined by conducting a separate analyses on three age groups to see if the strength or nature of the relationship between childhood abuse, health outcomes and health utilization vary from cohort to cohort (Klerman, 1988). The OHS sample is large enough to detect cohort effects in some of the variables if these are present. The three age groups were established, based on the changing attitudes towards children in the last century. DeMause (1975) notes that until the forties and fifties, people were generally unaware of the effects of parenting on the development of their children. Public attitude and awareness of physical and sexual abuse may have been limited. Questioning discipline practices was becoming more common in the forties and fifties.

By the sixties and seventies, an awareness arose regarding the existence and unacceptability of abuse. The three groups therefore being used are: prior to 1940 (51 years old or older), 1940 to 1959 (between 31 and 50 years old), 1960 to 1975 (between 15 and 30 years old). It was not possible to determine if differences in histories of abuse are due to a cohort effect, an age effect or a recall bias.

Missing Values

Missing values were found among several variables (See Table 4). While the proportions of missing values on the individual variables were relatively low, this proportion rises when many variables are included in a multivariate analysis. This is most pronounced when the six adverse childhood experiences and demographic variables were all included in the same model, 1707 (17.2%) cases were missing. Other models had lower proportions such as the one that includes the total number of childhood adversities and demographic variables (273 or 2.7% of cases).

Many reasons appear to be responsible for the missing data. Some of the health indicators (poor self-rated health and pain) and all the health risk behaviours were evaluated in a self-administered questionnaire that was to be mailed back or retrieved at a later visit by the interviewer. 1372 of these questionnaires were not returned despite the best efforts of the interviewers. To determine if respondents who did not return their questionnaires were different from those who did, comparisons were made on a number of factors. Respondents who did not return the questionnaires were similar to those who did on marital status, education, adverse childhood experiences, disability due to physical health problems and health care utilization. However they were more likely to be male, younger, and were less likely to have multiple health problems.

The remainder of variables with missing data were collected by interviewers or answered on a self-completed questionnaire (childhood physical and sexual abuse) that was immediately returned to the interviewer. Respondents with missing values on childhood physical and sexual abuse were compared to the total sample. Respondents with this type of missing data differed from the rest of the sample in that they were more likely to be older and widowed and to have lower rates of adverse childhood experiences. They also reported higher rates of adverse health.

Interestingly, the pattern of missing data for childhood physical and sexual abuse is different than the pattern for the other adverse childhood experiences. Bowling (2005) notes that respondents have been shown to give more socially desirable responses in a face to face interview than in a self-administered survey. Respondents with missing data on adverse childhood experiences did not have different rates of health problems (in some cases had less health problems). For parental marital conflict and lack of close relationship, respondents were more likely to be men, more educated and more middle-aged. For low parental education and parental psychopathology, respondents with missing data were similar to respondents with non-missing data for sex, age and education. Respondents with missing data an adverse childhood experience generally reported less parental psychopathology, less childhood sexual abuse, and reported higher parental education, but they also reported higher rates of childhood physical abuse.

Determining reasons for these missing values was not possible as they were coded as incomplete data, refused or missing in the database. Ninety one of the respondents were coded as senior with severe organic brain syndrome. Discomfort with the questions,

inability to answer the self-completed questionnaire due to age or poor health or interviewer error may have contributed to the incomplete data.

Tabachnick and Fidell (2001) comment that the pattern of missing data is more serious than the amount of missing data. Since for some analyses, a significant proportion of the data is missing and that the missing data is not randomly distributed across other variables, strategies for dealing with the missing data were implemented for these analyses. Allison (2002) warns that many of the methods developed to deal with missing data can introduce substantial bias, so consequently these methods were used sparingly and when there was a substantial amount of data missing. Imputation methods were not used because the data is not randomly missing. The methods used were deletion of cases from the analysis and dummy variable adjustment.

The amount of missing data reaches high levels when all the childhood adversities are in one model. Therefore for the analysis where the relationship between childhood physical and sexual abuse and other adverse childhood experiences are explored in one model, a dummy variable adjustment was added to the regression model. Adverse childhood experiences were assigned a dummy variable where the variable was coded 1 if a value was missing and 0 if a value was present (Cohen & Cohen, 1983). The missing values in the variable were replaced by the constant 0. (So, two variables represented each variable with the reference category being absence of the adverse childhood experience.) This method preserves cases where the data point was missing and controls for the effects of the "missingness" of the data. As suggested by Tabachnick and Fidell (2001), the analysis was carried out with and without the dummy variable adjustment to assess if the estimates changed substantially. The coefficients using the dummy variable

adjustment were slightly stronger and their confidence levels were narrower than using the deletion of cases method.

Cohen and Cohen (1983) advise that missing cases on the outcome variables should not be included in the analysis, therefore cases missing on health were deleted from the analysis. Fortunately, the statistical technique used will likely increase the chance of unbiased estimates. Allison (2002) observed that deleting cases with missing data gave unbiased estimates when using logistic regression if either the explanatory variables or the outcome variables were not missing at random (p.85).

Collinearity Diagnostics

A potential difficulty worth mentioning is multicollinearity which is present if the predictor variables are highly correlated. An extreme case of multicollinearity is when the independent variables are perfectly correlated ($r = 1$). Neter and colleagues (1990) illustrate that when there is perfect correlation among the independent variables, an infinite number of different response functions (with as many different regression coefficients) could fit the data. In this case, any one set of coefficients cannot reliably reflect the true magnitude of effect of the independent variables on a dependent variable.

In practice independent variables are rarely perfectly correlated, but they are often correlated among themselves and with other variables that are not included in the model. If they are highly correlated important difficulties may occur. Neter et al. (1990) explain that the estimated regression coefficients will vary widely from sample to sample and only imprecise information about the true regression coefficients can be obtained. The usual assertions of the regression coefficients will not be fully applicable. Since the independent variables are correlated, as one independent variable changes, so will the

other independent variables. In this case, the regression coefficient really only reflects a partial effect. The reduction in the total variation of the model as ascribed to one variable must be viewed in the context of the other variables.

Since some of the childhood adversity variables could be highly correlated, informal tests were conducted by examining the pairwise correlations, by looking for large changes in the regression coefficients when other independent variables are added and by noting wide confidence intervals for regression coefficients representing important independent variables. Table 7 shows that while adverse childhood experiences are correlated, these are far from perfect correlations. In examining the regression models, the changes in the coefficients and the confidence intervals were not unusual. A further formal test was conducted to verify the variance inflation factor (VIF). A VIF higher than 10 is often an indication that multicollinearity is a problem (Neter et al., 1990). The diagnostics were conducted on seven global indicators with all the explanatory variables. The highest VIF was 1.5 (for age) and the lowest tolerance was 0.651 (for age). These values are well within the acceptable ranges indicating that multicollinearity is not a problem in these regression models.

Risk of Reporting Other Adverse Childhood Experiences Among Respondents With These Experiences

Adverse Childhood Experience	Percentages and Odds Ratios of Reporting Another Adverse Childhood Experience†											
	Total Sample	Respondents with Physical Abuse		Respondents with Sexual Abuse		Respondents with Parental Marital Conflict		Respondents with Parental Psycho-pathology		Respondents with Lack of Close Relationship		Respondents with Low Parental Education	
	n = 9953[2]	n = 2414[2]		n = 798[2]		n = 2224[2]		n = 3112[2]		n = 1594[2]		n = 3158[2]	
	%	%	OR[1]	%	OR[1]	%	OR[1]	%	OR[1]	%	OR[1]	%	OR[1]
Physical Abuse	26	---	---	55	4.10	42	2.71	36	2.13	42	2.48	29	1.19
Sexual Abuse	9	18	4.10	---	---	18	3.65	15	3.25	13	1.81	9	1.13
Parental Marital Conflict	23	37	2.71	49	3.65	---	---	45	6.03	35	2.13	24	0.95
Parental Psychopathology	34	46	2.13	59	3.25	65	6.03	---	----	42	1.64	35	0.96
Lack of Close Relationship	16	26	2.48	25	1.81	25	2.13	21	1.64	---	---	17	1.09
Low Parental Education	34	37	1.18	36	1.13	41	0.95	42	0.96	43	1.09	---	---

† - weighted number and percentages; odds ratio calculated on weighted data

[1] OR – Odds Ratio

[2] This number of respondents varies with each percentages and calculation of the odds ratio because data on adverse childhood experiences was missing in varying degrees.

Multiple Comparisons

The confidence limits for this study were set at 95%, meaning that if 100 confidence intervals were examined, there would be five that would not have the true value within the confidence interval. A large number of statistical tests were conducted to examine the relationship between childhood physical and sexual abuse and health. There were 58 tests conducted on the total sample, 116 conducted on the sample stratified by gender and 116 on the sample stratified by age. We would expect 5% of these to miss the corresponding true value. The potential misuse of multiple testing would be to only report the associations that were statistically significant and ignore those with no associations.

Rothman and Greenland (1998) discuss the use of Bonferroni adjustments when making multiple comparisons. For this sample the adjustment would be 0.05/58 = 0.00086. 1 – 0.00086 = 99.91%. This would produce very wide and conservative confidence levels and produce estimates that would be more imprecise than necessary. The authors recommend that

> "Most audiences will find acceptable a presentation of the results of all single-inference procedures (e.g. confidence intervals for all examined associations). When this is not possible and one must select associations to present based on statistical criteria, one should at least take care to note the number and nature of the associations examined and the probable impact of such selection on the final results (for example, the high probability that at least a few intervals have missed their target)."

No Bonferroni adjustments were made for the multiple comparisons conducted in this study. However all statistical tests were presented and considered in interpreting the results. Approximately three estimates of the 58 tested could be expected to have their true values outside the confidence interval. The stratified testing served to illustrate existing interactions between abuse and gender and abuse and age. In examining the confidence intervals in the stratified samples, about six estimates of the 116 tests stratified by gender and about six estimates of the 116 tests stratified by age could have their trued values outside the confidence intervals.

4.5 Differences Between Existing Studies and the Present Study

The main difference between existing studies and the present study is that this study is from a representative rather than clinically based population and that it is based on Canadian rather than American data. Also, the instruments used in previous studies differed from this study. Some of the existing studies have identified respondents with childhood abuse using one or two questions, while this study used comprehensive instruments with known validity and reliability. It could also be argued that the health measures in this study were more comprehensive compared to existing studies since both global health measures and specific health problems were examined. Health consequences such as disability due to physical health problems and pain that interferes with daily activities and health care utilization indicators are important in understanding social and economic as well as health impacts.

In contrast with previous studies, this study reported results separately for men and for women and for younger and older respondents. This study also examined the relationship between childhood abuse and adult health while other common adverse

childhood experiences were taken into account. The relationship between childhood abuse and adverse childhood experiences was also examined. Existing studies have examined the relationship between childhood abuse and health risk behaviors however only one research group has recently tested the mediating effects of health risk behaviors in the relationship between childhood abuse and adult health. This study examined the mediating role of many important health risk behaviors, as well as childhood school difficulties, in the abuse-health relationship.

CHAPTER 5. RESULTS

5.1 Description of Study Variables

The initial step of the analysis was to gain an understanding of how the variables representing childhood abuse, health problems, adverse childhood experiences and demographic characteristics were distributed and how they were interrelated. An array of 22 health indicators was examined. (See Table 4 for frequency of study variables.)

5.11 Demographic Factors

Table 8 shows the weighted distribution of demographic variables in the OHS. The sample has slightly more women than men (51% vs. 49%) and more respondents

Table 8. Demographic Factors of the Ontario Health Survey Sample

Demographic Variables	Number of Respondents†	Percentage†
Gender		
Male	4,836	48.6
Female	5,117	51.4
Age Groups		
15 to 24 yrs	1,825	18.3
25 to 34 yrs	2,262	22.7
35 to 44 yrs	1,909	19.2
45 to 54 yrs	1,355	13.5
55 to 64 yrs	1,157	11.6
65 to 74 yrs	934	9.4
75 to 98 yrs	522	5.2
Educational Attainment		
Primary School	1,190	12.0
Some High School	2,825	28.6
High School	2,291	23.2
Some Post-Secondary	1,321	13.4
Post-Secondary	2,256	22.8
Marital Status		
Married or Common Law	6,530	66.1
Single	2,355	23.8
Widowed	528	5.3
Separated/Divorced	471	4.8

† Weighted number and percentages

under the age of 45 years old. The 15 to 24 year old age group was over sampled to provide adequate sample sizes for analysis (Boyle et al. 1996). Education levels were well represented in this sample. Relatively few respondents reported that they were widowed, separated or divorced, therefore these categories were grouped together (widowed/separated/divorced).

5.12 Childhood Abuse and Other Adverse Childhood Experiences

Table 9 shows prevalence rates of childhood abuse and other adverse childhood experiences in the OHS. High rates of adverse childhood experiences were observed:

Table 9. Prevalence of Childhood Abuse and Other Adverse Childhood Experiences†

	Total Sample†		% by Sex		% by Age Groups		
Adverse Childhood Experiences	%	n	Male	Female	15-30 yrs	31-50 yrs	51-98 yrs
Childhood Abuse							
Childhood Physical Abuse	26.0	2,414	31.2	21.1	24.6	27.4	25.6
Childhood Sexual Abuse	8.6	798	4.3	12.8	7.7	10.1	7.7
Both Types of Abuse	6.1	426	3.4	8.4	5.4	7.7	4.8
Either Type of Abuse	30.4	2,786	33.5	27.5	28.4	32.2	30.4
Other Childhood Experiences							
Low Parental Education	34.4	3,158	35.0	33.9	42.1	28.9	33.3
Parental Psychopathology	32.7	3,112	29.9	34.5	35.5	38.9	21.4
Parental Marital Conflict	22.7	2,224	20.4	24.9	28.7	24.2	14.3
Lack of Close Relationship	16.2	1,594	18.6	14.0	13.1	19.1	15.8
Number of Adverse Experiences							
No Reports of Adversities	28.1	2,759	26.9	29.3	23.8	26.6	34.8
One Adversity	34.2	3,357	35.9	32.6	34.3	32.9	35.8
Two Adversities	21.1	2,064	21.4	20.7	23.0	21.1	18.9
Three Adversities	9.1	919	8.9	9.8	10.8	10.9	5.8
Four Adversities	5.0	493	5.1	4.9	5.3	6.1	3.4
Five Adversities	1.9	188	1.5	2.3	2.4	2.1	1.2
Six Adversities	0.2	24	0.2	0.3	0.3	0.3	0.1

† Weighted number and percentages

childhood physical abuse (26%), childhood sexual abuse (9%), low parental education (34%), parental psychopathology (33%), parental marital conflict (23%) and lack of close relationship (16%). When these adverse childhood experiences were added together

(Number of Adverse Childhood Experiences), 28% of respondents reported no adverse childhood experiences and 16% reported having three or more adversities. Childhood sexual abuse was reported more often by females than males, however, males were more likely to report childhood physical abuse than females. Females reported more parental psychopathology and parental marital conflict than males. Respondents in the 31 to 50 year old age group reported slightly more childhood abuse than those in the other two age groups. Overall the older age group reported slightly lower rates of the other adverse childhood experiences than the younger age groups.

Table 7 illustrates the relationships between adverse childhood experiences. The table indicates that having one adverse childhood experience predicts having another type of adverse childhood experience. For example, 59% of those reporting childhood sexual abuse also reported parental psychopathology while the rate of parental psychopathology among respondents in the total sample was only 34%. The odds of reporting parental psychopathology is three times greater for respondents with childhood sexual abuse than those without the abuse. Low parental education was not as strongly associated with childhood abuse as were the other types of adversity measured in this study. The interrelationships between abuse and other adverse childhood experiences make it difficult to disentangle the effects of childhood abuse on health from the effects of other types of adverse experiences. Their individual influence on health was observed in the models to determine whether or not they were overlapping risk factors.

5.13 Global Health Problems and Health Care Utilization

Rates of occurrence of health problems and health care utilization varied in the sample (Table 10). Significant numbers of respondents (9% to 20%) reported global health

problems which were "multiple health problems", "poor self-rated health", "pain that interferes with activities", "disability due to physical health problems" and high levels of the three health care utilization. These variables were "high GP use" (six or more general practitioner visits per year), "high ER use" (two or more emergency room visits per year) and "high professional use" (25 or more health professional visits per year). Females and older respondents reported higher rates of health problems than males or younger respondents.

Table 10. Prevalence of Global Health Problems and High Health Care Utilization†

	Total Sample		% by Sex		% by Age Groups		
Health Indicators	%	n	Male	Female	15-30 yrs	31-50 yrs	51-98 yrs
Global Health Problems							
Multiple Health Problems	19.9	1,978	16.6	23.0	12.1	16.0	32.6
Poor Self-Rated Health	9.0	735	8.1	9.7	4.6	6.5	16.2
Pain	9.1	735	7.8	10.2	5.3	7.7	14.4
Disability	13.2	1,287	12.9	13.5	4.4	11.5	24.9
Health Care Utilization							
High GP Use	18.8	1,850	15.2	22.1	12.7	14.6	30.1
High ER Use	5.9	582	6.3	5.4	8.2	4.6	5.1
High Professional Use	10.0	995	7.7	12.3	6.9	10.0	13.3

† Weighted number and percentages

5.14 Specific Health Problems

Table 11 indicates that some specific health problems were highly prevalent (allergies, back pain, arthritis and hypertension) while others were considerably less (respiratory problems, circulatory problems, diabetes, stomach ulcers, thyroid problems and eye problems). Of the 15 specific health problems examined, eight were more prevalent among females then males and seven were as common in males as in females. Rates of the health problems increased with age with exceptions of skin diseases, allergies and asthma.

Table 11. Prevalence of Specific Health Problems†

	Total Sample		% by Sex		% by Age Groups		
Specific Health Problems	%	n	Male	Female	15-30 yrs	31-50 yrs	51-98 yrs
Allergies	18.6	1840	16.5	20.5	21.2	21.2	12.7
Arthritis	12.7	1255	9.4	15.7	2.1	8.4	28.7
Hypertension	10.2	1012	9.3	11.1	1.4	6.1	24.3
Skin diseases	8.1	805	6.1	10.0	8.5	8.8	6.9
Back pain	9.2	913	9.6	8.8	5.4	11.2	10.7
Bone problems	4.7	468	4.5	5.0	3.0	5.3	5.8
Digestive problems	4.0	292	3.3	4.5	1.0	4.7	5.9
Asthma	3.9	390	3.2	4.6	4.9	3.4	3.7
Respiratory problems	2.5	249	2.4	2.6	1.3	2.5	3.8
Stomach ulcers	2.6	253	2.3	2.8	1.2	3.2	3.1
Heart disease	4.3	424	4.8	3.8	0.4	1.6	11.5
Eye problems	3.6	361	3.0	4.3	1.1	1.1	9.5
Circulatory problems	2.7	267	2.4	2.9	0.8	1.7	5.9
Diabetes	2.7	268	3.0	2.4	0.5	1.5	6.4
Thyroid problems	3.2	315	1.0	5.3	1.3	2.4	6.1

† Weighted number and percentages

5.15 Health Risk Behaviours and Childhood School Difficulties

Table 12 shows that prevalence rates for health risk behaviours varied between 7% and 71%. Males were more likely than females to have alcohol problems, to have more than one sexual partner and to smoke. Conversely females were more likely than males to report low exercise. In this sample, no gender differences for obesity were found. Health risk behaviours appeared more prevalent in the middle aged group. Having more than one sexual partner dramatically decreased with age and not exercising increased with age. About 26% of respondents reported school difficulties (failing a grade or requiring special education), with more males than females reporting these difficulties.

Table 12. Prevalence of Health Risk Behaviors and Childhood School Difficulties†

	Total sample		% by Sex		% by Age Groups		
Variable	%	n	Male	Female	15-30 yrs	31-50 yrs	51-98 yrs
Health Risk Behaviors							
Smoking	26.7	2129	28.9	24.7	27.6	30.0	21.5
Alcohol Problems	10.7	1045	17.7	4.1	13.3	13.2	4.8
Low Exercise	71.2	5357	65.0	76.8	60.3	76.5	75.2
Obesity	13.3	1003	13.5	13.2	7.1	16.4	15.4
More than One Sexual Partner	7.1	502	10.0	4.5	14.6	5.5	1.2
Childhood School Difficulties	25.9	2516	32.6	19.6	23.3	31.8	21.0

† Weighted number and percentages

5.2 Childhood Abuse and Global Health Problems

5.21 Relationship Between Childhood Abuse and Global Health Problems

Table 13 (first and second columns) indicates that respondents with childhood physical and sexual abuse had higher rates of health problems. Logistic regression analyses were conducted to test the relationship between childhood abuse and global health problems (multiple health problems, poor self-rated health, pain that interferes with activities and disability due to physical health problems). A relationship of moderate strength between childhood abuse and global health problems was observed after controlling for demographic factors (age, sex, marital status and low education). Odds ratios for childhood physical abuse ranged between 1.37 for multiple health problems to 1.64 for pain that interferes with activities. For childhood sexual abuse, they ranged between 1.33 for pain that interferes with activities to 1.73 for disability due to physical health problems. Confidence intervals were wider for childhood sexual abuse due to the smaller number of respondents who reported this type of abuse. Consequently, although the magnitude of odds ratios was comparable to those of the relationships between childhood physical abuse and health, the relationship between childhood sexual abuse and pain did not reach statistical significance.

Table 13. Prevalence Rates of Global Health Problems Among Respondents With and Without Childhood Abuse and Summary of Logistic Regression Models of Childhood Abuse Predicting Global Health Problems†

Global Health Problems	*Without* Abuse		*With* Abuse		Logistic Regression‡	
	%	n	%	n	OR	CI
Childhood Physical Abuse						
Multiple Health Problems	18	1254	22	535	1.38	1.15-1.64
Poor Self-Rated Health	8	428	10	206	1.38	1.05-1.81
Pain	8	434	12	249	1.64	1.27-2.13
Disability	14	771	17	397	1.58	1.28-1.94
Childhood Sexual Abuse						
Multiple Health Problems	19	1575	28	223	1.66	1.29-2.15
Poor Self-Rated Health	8	547	11	72	1.52	1.02-2.27
Pain	9	595	11	74	1.33	0.89-1.98
Disability	12	1032	18	138	1.73	1.27-2.23

† Weighted number and percentages
‡ Controlling for Age, Sex, Low Education and Marital Status

5.22 Childhood Abuse, Other Adverse Childhood Experiences and Global Health Problems

To examine the relationship between childhood abuse, other adverse childhood experiences and global health problems, three models were tested as displayed in Table 14. All three models controlled for demographic factors. The first column shows the odds ratios of adverse childhood experiences predicting global health problems when other childhood experiences were *not* in the model. Many of the relationships between adverse childhood experiences and global health problems were of moderate strength and reached statistical significance. In the second column, once all adverse childhood experiences were entered into the same model, the relationships between health and childhood adversities (including abuse) were attenuated. Entering several adverse childhood adversities in the same model did not generally improve the model, as noted by the χ^2 and Cox and Snell R^2 values (not shown in the table).

Table 14. Logistic Regression Models for Adverse Childhood Experiences (ACE) as Predictors of Global Health Problems

	Separate Models[2]		Same Model[3]		Number of ACE	
Explanatory Variables	OR	CI[1]	OR	CI[1]	OR	CI[1]
Multiple Health Problems						
Childhood Physical Abuse	1.38	1.15-1.64	1.18	0.97-1.42	---	---
Childhood Sexual Abuse	1.65	1.28-2.13	1.32	1.01-1.73	---	---
Parental Marital Conflict	1.53	1.27-1.83	1.23	1.01-1.51	---	---
Parental Psychopathology	1.66	1.40-1.96	1.48	1.24-1.78	---	---
Lack of Close Relationship	1.06	0.86-1.31	0.94	0.76-1.16	---	---
Low Parental Education	1.13	0.96-1.35	1.14	0.96-1.35	---	---
Number of ACE	---	---	---	---	1.22	1.15-1.30[4]
Poor Self-Rated Health						
Childhood Physical Abuse	1.40	1.07-1.81	1.23	0.92-164	---	---
Childhood Sexual Abuse	1.50	1.01-2.24	1.23	0.81-1.88	---	---
Parental Marital Conflict	1.14	0.84-1.53	0.90	0.65-1.25	---	---
Parental Psychopathology	1.36	1.04-1.76	1.32	0.99-1.76	---	---
Lack of Close Relationship	1.48	1.10-2.00	1.35	0.99-1.84	---	---
Low Parental Education	1.32	1.02-1.72	1.28	0.98-1.67	---	---
Number of ACE	---	---	---	---	1.18	1.08-1.29[4]
Pain						
Childhood Physical Abuse	1.67	1.29-2.16	1.51	1.14-1.98	---	---
Childhood Sexual Abuse	1.31	0.88-1.94	0.96	0.63-1.45	---	---
Parental Marital Conflict	1.44	1.09-1.90	1.14	0.84-1.55	---	---
Parental Psychopathology	1.58	1.23-2.04	1.42	1.08-1.87	---	---
Lack of Close Relationship	1.21	0.89-1.65	1.03	0.74-1.42	---	---
Low Parental Education	1.33	1.03-1.72	1.31	1.01-1.71	---	---
Number of ACE	---	---	---	---	1.24	1.14-1.36[4]
Disability						
Childhood Physical Abuse	1.59	1.29-1.96	1.41	1.13-1.76	---	---
Childhood Sexual Abuse	1.74	1.28-2.36	1.34	0.97-1.86	---	---
Parental Marital Conflict	1.43	1.15-1.80	1.13	0.88-1.85	---	---
Parental Psychopathology	1.57	1.28-1.93	1.43	1.15-1.78	---	---
Lack of Close Relationship	1.08	0.85-1.38	0.93	0.72-1.20	---	---
Low Parental Education	1.26	1.03-1.55	1.25	1.02-1.54	---	---
Number of ACE	---	---	---	---	1.24	1.15-1.33[4]

[1] All Adverse Childhood Experiences (ACE) were controlled for age, sex, marital status and low education. Dummy variables for missing variables were included in the analysis to maximize the sample size. They are not shown in the table

[2] Each ACE was entered in a separate model with each health indicators as the outcomes variable.

[3] All ACE were entered in the same model with the health indicator as the outcome variable.

[4] Note that the odds ratio associated with number of adverse childhood experiences indicates the increased risk of health problems for each additional adverse childhood experience.

In the last model (third column), to further explore if adverse childhood experiences may be proxy risk factors for a more global construct such as a stressful home environment, an aggregate measure of all these measures was created by combining the adverse childhood experiences into one variable. The third column shows

that the odds of health problems increased with the number of adverse childhood experiences reported. For example for each additional adverse childhood experience reported, the odds of having multiple health problems increased by 1.22. In other words, compared to respondents with no adverse childhood experiences, the odds of having multiple health problems increased by 22% when respondents reported one adverse experience, 48% when a respondents reported two and to 330% for respondents reporting all six experiences. The predictive value of this model was comparable to the other two models. Confidence intervals were considerably narrower than in previous models.

5.23 Global Health Problems by Age and Gender

Interactions between childhood abuse and age and between childhood abuse and gender were tested and some statistically significant interactions were found in predicting the four global health problems. Being female and having a history of childhood abuse (either physical or sexual) increased the risk of having multiple health problems to a greater extent than the addition of the separate influences of these factors. Also being a younger respondent and having a history of childhood physical abuse increased the risk of reporting pain and disability.

Table 15 shows the relationship between abuse and global health problems by gender and age groups (under 40 years old and 40 years and older) when controlling for other demographic factors. Variations in odds ratios were observed between age and gender strata. Dividing the sample into levels decreased the sample size, which widened confidence intervals considerably and reduced the power of statistical tests. The relationship between childhood abuse and health indicators appeared stronger among females than males. Stratified analyses suggest that the relationship between childhood

physical abuse and health was stronger among younger respondents but that the relationship between childhood *sexual* abuse and health (with the exception of multiple health problems) was stronger among older respondents.

Table 15. Summary of Logistic Regression for Childhood Abuse as a Predictor of Global Health Problems by Gender and Age†

	Males		Females		Under 40 yrs old		40 yrs old & Over	
Global Health Problems	OR	CI	OR	CI	OR	CI	OR	CI
Childhood Physical Abuse								
Multiple Health Problems	1.11	0.86-1.43	**1.76**	**1.37-2.26**	1.50	1.14-1.97	1.30	1.02-1.64
Poor Self-Rated Health	1.18	0.79-1.75	1.60	1.10-2.33	1.38	0.85-2.22	1.42	1.02-1.98
Pain	1.59	1.09-2.32	1.71	1.20-2.43	**1.79**	**1.15-2.79**	1.57	1.15-2.16
Disability	1.50	1.13-1.99	1.68	1.23-2.28	**1.90**	**1.32-2.74**	1.41	1.09-1.81
Childhood Sexual Abuse								
Multiple Health Problems	1.04	0.59-1.86	**1.94**	**1.45-2.60**	2.09	1.43-3.06	1.40	1.00-1.98
Poor Self-Rated Health	---	---	1.60	1.01-2.55	1.17	0.55-2.49	1.78	1.10-2.88
Pain	---	---	1.43	0.91-2.23	0.93	0.44-1.99	1.54	0.96-2.47
Disability	1.27	0.70-2.34	1.91	1.33-2.74	1.44	0.83-2.51	1.83	1.26-2.66

† Odds Ratio calculated after controlling for Age, Sex, Low Education and Marital Status
--- Insufficient sample size for reliable analysis
Note that statistically significant interactions are in bold print.

5.3 Childhood Abuse and Specific Health Problems

5.31 Relationship Between Childhood Abuse and Specific Health Problems

Tables 16 and 17 suggest that respondents with childhood physical and sexual abuse reported more specific health problems than respondents with no history of abuse. In comparing the first and second columns, higher rates of almost all of specific health problems were found among respondents with childhood abuse. Prevalence rates for

Table 16. Prevalence Rates of Specific Health Problems Among Respondents With and Without Childhood Abuse and Summary of Logistic Regression Models of Childhood Abuse Predicting Specific Health Problems†

	Without Abuse		*With* Abuse		Logistic Regression‡	
Specific Health Problems	%	n	%	n	OR	CI
Childhood Physical Abuse						
Allergies	19	1300	18	428	*0.97*	*0.81-1.16*
Arthritis	12	801	12	294	*1.13*	*0.89-1.42*
Hypertension	9	642	9	218	*0.99*	*0.76-1.28*
Skin Diseases	8	537	9	219	**1.30**	**1.01-1.67**
Back pain	8	513	13	316	**1.88**	**1.51-2.36**
Bone problems	4	258	7	172	**1.95**	**1.44-2.63**
Digestive Problems	4	240	5	113	**1.45**	**1.02-2.06**
Asthma	3	230	5	117	**1.58**	**1.12-2.22**
Respiratory Problems	2	128	4	81	**1.79**	**1.17-2.75**
Stomach Ulcers	2	157	3	71	*1.30*	*0.84-1.99*
Three or more health problems	8	578	11	264	**1.50**	**1.17-1.92**
Four or more health problems	4	243	6	140	**1.81**	**1.29-2.53**
Five or more health problems	2	100	3	64	**2.00**	**1.23-3.27**
Childhood Sexual Abuse						
Allergies	18	1544	23	182	*1.23*	*0.94-1.60*
Arthritis	12	973	16	128	**1.52**	**1.09-2.10**
Hypertension	10	802	7	55	*0.76*	*0.48-1.17*
Skin Diseases	8	664	10	81	*1.20*	*0.83-1.73*
Back pain	9	711	16	124	**2.18**	**1.59-3.00**
Bone problems	5	383	5	43	*1.19*	*0.73-1.95*
Digestive Problems	4	315	6	44	*1.59*	*0.97-2.60*
Asthma	4	302	6	45	*1.47*	*0.90-2.41*
Respiratory Problems	2	184	4	32	**1.95**	**1.09-3.50**
Stomach Ulcers	3	206	3	23	*1.24*	*0.65-2.39*
Three or more health problems	9	739	12	99	**1.67**	**1.17-2.38**
Four or more health problems	4	327	7	56	**2.16**	**1.64-2.84**
Five or more health problems	2	134	4	32	**2.79**	**1.51-5.14**

†Weighted percentages and number of respondents

‡ Controlling for demographic variables which include age, sex, low education and marital status

Note that statistically significant relationships are in bold print.

health problems in Table 17 were very low among younger respondents therefore the analyses were not conducted on respondents younger than 40 years old.

Logistic regression results are presented in the last column. A relationship of moderate strength was apparent between childhood physical abuse and seven of the fifteen specific health problems. Odds ratios of moderate strength were also found between childhood sexual abuse and four out of eleven specific health problems. The small sample size for

childhood sexual abuse may explain why so many of these odds ratios were not statistically significant. Back pain, respiratory problems and thyroid problems were statistically associated with both types of abuse.

In the last row of Table 16 for both childhood physical and sexual abuse, variables were created for respondents with three, four, and five or more specific health problems. The relationship between childhood abuse and specific health problems appears stronger among respondents with a greater number of specific health problems.

Table 17. Prevalence Rates of Specific Health Problems Among Respondents (40 years old or older) With and Without Childhood Abuse and Summary of Logistic Regression Models of Childhood Abuse Predicting Specific Health Problems†

	Without Abuse		*With* Abuse		Logistic Regression‡	
Specific Health Problems	%	n*	%	n*	OR	CI
Childhood Physical Abuse						
Heart Disease	9	292	11	121	*1.08*	*0.73-1.61*
Eye Problems	8	252	6	68	*1.04*	*0.64-1.68*
Circulatory Problems	5	167	8	84	*1.22*	*0.74-2.02*
Diabetes	5	159	6	65	*0.92*	*0.55-1.54*
Thyroid Problems	5	157	4	44	**1.92**	**1.17-3.15**
Childhood Sexual Abuse						
Heart Disease	10	387	8	29	---	---
Circulatory Problems	6	218	8	29	---	---
Eye Problems	8	296	6	24	---	---
Diabetes	5	202	5	19	---	---
Thyroid Problems	5	174	8	31	**2.12**	**1.17-3.84**

†Weighted percentages and number of respondents
‡ Controlling for demographic variables which include age, sex, low education and marital status
Note that statistically significant relationships are in bold print.

5.32 Specific Health Problems by Age and Gender

Table 18 suggests that the relationship between childhood abuse and specific health problems varies to some extent by age and gender. This variation appears most pronounced for childhood *physical* abuse. As shown in the top section of the table, generally a stronger relationship was apparent for females and younger respondents than for males and older respondents.

Table 18. Summary of Logistic Regression for Childhood Abuse as a Predictor of Specific Health Problems by Gender and Age

	Males		Females		Under 40 yrs old		40 yrs old & over	
Specific Health Problems	OR	CI‡	OR	CI‡	OR	CI‡	OR	CI‡
Childhood Physical Abuse								
Allergies	0.79	0.61-1.03	**1.20**	**0.94-1.55**	0.95	0.75-1.20	0.99	0.74-1.32
Arthritis	1.01	0.72-1.42	1.26	0.92-1.74	1.43	0.87-2.34	1.04	0.80-1.35
Hypertension	1.10	0.78-1.56	0.91	0.61-1.35	1.36	0.69-2.69	0.93	0.70-1.23
Skin Diseases	1.20	0.82-1.76	1.40	1.00-1.95	1.47	1.05-2.06	1.13	0.77-1.64
Back pain	1.56	1.14-2.13	**2.36**	**1.70-3.28**	2.39	1.69-3.37	1.54	1.14-2.09
Bone problems	2.35	1.54-3.58	1.68	1.08-2.61	2.29	1.42-3.70	1.78	1.21-2.63
Asthma	1.11	0.66-1.87	**2.11**	**1.35-3.31**	1.68	1.07-2.63	1.57	0.93-2.65
Respiratory Problems	1.65	0.91-3.00	1.94	1.05-3.61	1.61	0.74-3.51	1.85	1.10-3.11
Childhood Sexual Abuse								
Allergies	---	---	1.41	1.05-1.90	0.86	0.56-1.24	1.72	1.19-2.39
Arthritis	---	---	1.86	1.28-2.69	1.58	0.81-3.13	1.44	0.99-2.10
Hypertension	---	---	0.92	0.55-1.53	---	---	0.73	0.46-1.16
Skin Diseases	---	---	1.44	0.98-2.13	1.43	0.87-2.36	0.99	0.57-1.71
Back pain	2.95	1.73-5.05	1.89	1.28-2.80	1.61	0.95-2.75	2.67	1.79-3.98
Bone problems	---	---	1.52	0.88-2.62	1.33	0.59-3.03	---	---
Asthma	---	---	1.38	0.77-2.45	---	---	---	---
Respiratory Problems	---	---	2.14	1.08-4.24	---	---	---	---

‡ Odds Ratio calculated after controlling for age, gender, marital status and low education
--- Insufficient sample size for reliable analysis
Note that statistically significant interactions are in bold print.

The age and gender variation in the relationship between childhood sexual abuse and specific health problems is not as straightforward to summarize. The relationship between back pain and childhood sexual abuse appears to be significantly higher for males than for females. Other comparisons by gender were not possible because of the insufficient sample size for males. The odds ratios for skin diseases and arthritis and childhood sexual abuse were higher among younger individuals and conversely the odds ratios for allergies and back pain were higher among older individuals.

Some statistically significant interactions were found in predicting specific health problems when testing for interactions between childhood abuse and age and gender. Being female and having a history of childhood physical abuse was associated with greater risk of allergies, back pain, asthma and digestive problems than being male and

having a history of childhood physical abuse. The only interaction between childhood sexual abuse and age was for predicting digestive problems. Being a younger respondent and having a history of childhood physical abuse increased the risk of having digestive problems to a greater extent than the addition of the separate influences of these factors.

5.4 Childhood Abuse and Health Care Utilization

5.41 Relationship Between Childhood Abuse and Health Care Utilization

Comparisons of health care utilization rates (Table 19) indicate that they were higher among respondents with childhood abuse than respondents with no abuse. Logistic regression analyses were conducted to test the relationship between childhood abuse and health care utilization (high GP, ER and professional use). A moderate relationship was found between childhood physical and sexual abuse and high ER use and high professional use, but not high GP use.

5.42 Childhood Abuse, Other Adverse Childhood Experiences and Health Care Utilization

Three types of models were tested in Table 20 to examine the relationship between childhood abuse, other adverse childhood experiences and health care utilization. The first column shows odds ratios for relationships between each adverse

Table 19. Prevalence Rates of Health Care Utilization Among Respondents With and Without Childhood Abuse and Summary of Logistic Regression Models of Childhood Abuse Predicting Health Care Utilization

	Without Abuse		*With* Abuse		Logistic Regression‡	
Health Care Utilization	%	n†	%	n†	OR	CI
Childhood Physical Abuse						
High GP Use	18	1223	18	430	1.05	0.87-1.26
High ER Use	5	344	9	213	1.85	1.41-2.42
High Professional Use	9	600	12	295	1.57	1.25-1.97
Childhood Sexual Abuse						
High GP Use	18	1503	19	149	1.02	0.76-1.36
High ER Use	6	481	9	70	1.76	1.18-2.62
High Professional Use	9	773	16	127	1.75	1.28-2.39
Disability						

† Weighted number and percentages
‡ Controlling for Demographic Factors. Demographic Variables include Age, Sex, Low Education and Marital Status

childhood experience and health care utilization when adverse childhood experiences were entered in separate models. Relationships were found between many adverse childhood experiences and health care utilization indicators particularly for high ER and professional use. Once all adverse childhood experiences were entered into the same model (second column), the relationships between health care utilization and adversities (including abuse) were attenuated and fewer of these relationships reached statistical significance. Having all of the adverse childhood adversities in the same model improved the model for predicting high ER use, marginally improved it for predicting high professional use and worsened it for high GP use (χ^2 and Cox and Snell R^2 values not shown in table).

The third column shows that the risk of utilizing health care increased with the number of adverse childhood experiences reported. For example, compared to respondents with no adverse childhood experiences, the odds of high ER use increased by 29% when respondents reported one adverse event, 66% when respondents reported two adversities and to 460% for respondents reporting six adversities.

Table 20. Logistic Regression Models for Adverse Childhood Experiences (ACE) as Predictors of Health Care Utilization

	Separate Models[2]		Same Model[3]		Number of ACE	
Explanatory Variables	OR	CI[1]	OR	CI[1]	OR	CI[1]
High GP Use						
Childhood Physical Abuse	1.05	0.87-1.27	0.96	0.79-1.18	---	---
Childhood Sexual Abuse	1.01	0.85-1.50	0.88	0.65-1.19	---	---
Parental Marital Conflict	1.49	1.24-1.79	1.45	1.18-1.78	---	---
Parental Psychopathology	1.27	1.07-1.51	1.17	0.97-1.41	---	---
Lack of Close Relationship	1.00	0.81-1.24	0.94	0.76-1.17	---	---
Low Parental Education	1.27	1.07-1.51	1.28	1.08-1.52	---	---
Number of ACE	---	---	---	---	1.12	1.05-1.19[4]
High ER Use						
Childhood Physical Abuse	1.84	1.41-2.41	1.66	1.24-2.21	---	---
Childhood Sexual Abuse	1.74	1.17-2.59	1.26	0.82-1.92	---	---
Parental Marital Conflict	1.45	1.09-1.92	1.08	0.79-1.48	---	---
Parental Psychopathology	1.70	1.31-2.20	1.48	1.11-1.97	---	---
Lack of Close Relationship	1.07	0.77-1.50	0.90	0.63-1.27	---	---
Low Parental Education	1.31	1.00-1.71	1.29	0.99-1.70	---	---
Number of ACE	---	---	---	---	1.29	1.17-1.41[4]
High Professional Use						
Childhood Physical Abuse	1.57	1.25-1.96	1.38	1.09-1.76	---	---
Childhood Sexual Abuse	1.35	1.27-2.36	1.39	1.00-1.93	---	---
Parental Marital Conflict	1.44	1.15-1.81	1.24	0.96-1.60	---	---
Parental Psychopathology	1.17	0.95-1.46	1.00	0.79-1.27	---	---
Lack of Close Relationship	1.39	1.08-1.79	1.23	0.95-1.59	---	---
Low Parental Education	1.13	0.90-1.41	1.10	0.88-1.38	---	---
Number of ACE	---	---	---	---	1.19	1.11-1.29[4]

[1] All Adverse Childhood Experiences (ACE) were controlled for age, sex, marital status and low education. Dummy variables for missing variables were included in the analysis to maximize the sample size. They are not shown in the table

[2] Each ACE was entered in a separate model with each health indicators as the outcomes variable.

[3] All ACE were entered in the same model with the health indicator as the outcome variable.

[4] Note that the odds ratio associated with number of adverse childhood experiences indicates the increased risk of health problems for each additional adverse childhood experience.

5.43 Health Care Utilization by Age and Gender

Interactions between childhood abuse and age and between childhood abuse and gender were tested in predicting increased health care utilization. No statistically significant interactions were found between childhood abuse and gender or between childhood *physical* abuse and age. However, the odds of high GP use and high professional use is greater among younger individuals with childhood *sexual* abuse than among older ones.

Table 21 shows results of the analyses stratified by gender and age group (under 40 years old and 40 years old and older) when controlling for other demographic factors. The strength of the relationship between childhood abuse and health care utilization was generally similar for males and females. Some differences in relationships between age strata were noted. For childhood physical abuse, differences in odds ratios varied from one health care utilization indicator to another. The relationship between all health care utilization indicators and childhood sexual abuse appeared to be stronger among younger than older respondents.

Table 21. Summary of Logistic Regression for Childhood Abuse and Number of Adverse Childhood Experiences as Predictors of Health Care Utilization by Gender and Age

	Males		Females		Under 40 yrs old		40 yrs old & Over	
Health Care Utilization	OR	CI‡	OR	CI‡	OR	CI‡	OR	CI‡
Childhood Physical Abuse								
High GP Use	1.07	0.81-1.41	0.97	0.75-1.26	1.06	0.75-1.36	1.05	0.82-1.34
High ER Use	1.81	1.26-2.59	1.90	1.27-2.84	1.69	1.19-2.42	2.26	1.49-3.44
High Professional Use	1.61	1.14-2.27	1.49	1.10-2.01	1.92	1.38-2.67	1.29	0.95-1.77
Childhood Sexual Abuse								
High GP Use	0.90	0.48-1.68	0.99	0.72-1.37	**1.23**	**0.82-1.85**	0.88	0.59-1.32
High ER Use	---	---	1.99	1.25-3.17	1.99	1.17-3.38	1.65	0.89-3.07
High Professional Use	---	---	1.71	1.21-2.43	**2.74**	**1.80-4.17**	1.11	0.69-1.78

‡ Odds Ratio calculated after controlling for Age, Sex, Low Education and Marital Status
--- Insufficient sample size for reliable analysis
Note that statistically significant interactions in bold print

5.5 Cohort Effects

Table 22 shows relationships between childhood abuse, adverse childhood experiences and health indicators across three age cohorts. Overall, the relationship between childhood physical abuse, childhood sexual abuse and adverse childhood experience and health indicators does not appear to be as strong for the cohort born prior to 1940 as the cohort born in 1940 or later. Interactions between childhood abuse and age cohort were

tested and many statistically significant interactions were found in predicting the four global health problems and health care utilization. These interactions are found in bold print in Table 22. Being younger and reporting childhood physical abuse increased the risk of reporting pain that interferes with activities and disability due to physical health problems. Being younger and reporting childhood sexual abuse increased the risk of reporting multiple health problems, high GP use and high professional use. It was not possible to determine if these differences were attributable to a cohort effect, an age effect or a recall bias due to the cross-sectional design of the study.

Table 22. Summary of Logistic Regression with Childhood Abuse, Adverse Childhood Experiences Predicting Health Indictors Stratified by Age Cohorts

	Born between 1960 and 1975 (15 to 30 Years Old)		Born between 1940 and 1960 (31 to 50 Years Old)		Born prior to 1940 (51 Years Old or Older)	
Health Indicators	OR	CI ‡	OR	CI ‡	OR	CI ‡
Childhood Physical Abuse						
Multiple Health Problems	1.27	0.88-1.84	1.55	1.17-2.06	1.31	0.98-1.75
Poor Self-Rated Health	1.73	0.93-3.23	1.56	0.96-2.44	1.16	0.78-1.74
Pain	**2.43**	**1.36-4.35**	1.87	1.24-2.83	1.22	0.81-1.83
Disability	**2.06**	**1.17-3.61**	1.97	1.43-2.70	1.14	0.83-1.57
High GP Use	1.10	0.75-1.62	0.89	0.65-1.23	1.12	0.83-1.57
High ER Use	1.39	0.91-2.14	2.73	1.72-4.34	1.94	1.12-3.35
High Professional Use	2.03	1.29-3.18	1.27	0.88-1.82	1.55	1.06-2.29
Childhood Sexual Abuse						
Multiple Health Problems	1.52	0.87-2.63	**2.16**	**1.48-3.15**	1.29	0.82-2.02
Poor Self-Rated Health	1.68	0.69-4.11	1.63	0.87-3.07	1.29	0.68-2.46
Pain	0.94	0.34- 2.63	1.40	0.77-2.53	1.42	0.75-2.68
Disability	2.14	0.95 - 4.81	1.67	1.06-2.63	1.61	0.99-2.61
High GP Use	**1.24**	**0.73-2.11**	1.03	0.66-1.61	0.76	0.45-1.30
High ER Use	2.18	1.17-4.08	2.01	1.06-3.83	1.03	0.39-2.69
High Professional Use	**3.11**	**1.77-5.44**	1.14	0.68-1.90	1.67	0.95-2.94

‡ Odds Ratio calculated after controlling for Age, Sex, Low Education and Marital Status

5.6 Health Risk Behaviours and Childhood School Difficulties as Mediators of the Relationship Between Childhood Abuse and Health

5.61 Testing for Mediation

The purpose of the following analyses was to examine the hypothesis that the relationship between childhood abuse and health is mediated by health risk behaviours and childhood school difficulties. According to Baron and Kenny (1986), a variable is said to function as a mediator when the following conditions hold:

1) the predictor variable (abuse) must account for variation in the outcome variable (health);

2) the predictor variable (abuse) must account for variation in the presumed mediator (health risk behaviour, school difficulties);

3) the mediator must account for variation in the outcome variable while the predictor variable is in the equation and a previously significant relationship between the predictor variable and the outcome variable must be significantly decreased.

Baron and Kenny (1986) state that perfect mediation holds if the predictor variable has no effect on the outcome variable when controlled for the mediator variable. Since there are many factors affecting health, a more realistic goal in evaluating a mediator, is that the mediator significantly attenuates the relationship (partial mediation). Since these authors do not quantify what a significant decrease might be, a 10% decrease or more in the odds ratio of childhood abuse and health was considered a substantial decrease in this study.

The first step which consists of evaluating the relationship between abuse and health has been described previously (See Tables 13 and 19). Results reported in previous

sections found evidence of a relationship of moderate strength between childhood abuse and many health and health care utilization indicators, after controlling for demographic characteristics. However, no relationship was found between childhood *sexual* abuse and pain or between physical or sexual abuse and high GP use. Consequently mediation analyses were not carried out on these relationships.

5.62 Relationship between Childhood Abuse and Health Risk Behaviours and Childhood School Difficulties

For the second step, the relationship between childhood abuse and health risk behaviours and childhood school difficulties was examined by comparing rates and conducting logistic regression analyses. Table 23 (first and second column) shows that rates of health risk behaviours and school difficulties, with the exception of low exercise, were higher among respondents with childhood abuse than respondents without childhood abuse. The rates of low exercise as defined in this study were generally high which is consistent with American rates (Estabrooks et al., 2003). The odds ratios (last column) suggest that relationships exist between childhood abuse and health risk behaviours and school difficulties. The relationship between childhood *physical* abuse and obesity did not reach statistical significance. No evidence was found of relationships between childhood physical and sexual abuse and low exercise.

Table 23. Rates of Health Risk Behaviors and School Difficulties Among Respondents With and Without Childhood Abuse and Summary of Logistic Regression Models of Childhood Abuse Predicting Health Risk Behaviors and School Difficulties†

	Without Abuse		*With* Abuse		Logistic Regression‡	
Health Risk Behaviors	%	n		n	OR	CI
Childhood Physical Abuse						
Smoking	24.9	1382	32.0	633	1.40	1.18-1.66
Alcohol Problems	8.9	607	17.1	410	1.90	1.54-2.34
Low Exercise	70.5	3727	70.8	1319	1.04	0.87-1.24
Obesity	12.6	660	15.0	282	1.16	0.93-1.46
More than One Sexual Partner	6.6	327	8.6	150	1.55	1.10-2.17
School Difficulties	23.6	1611	33.0	783	1.44	1.23-1.68
Childhood Sexual Abuse						
Smoking	26.2	1792	33.7	224	1.49	1.15-1.94
Alcohol Problems	10.6	890	14.8	117	2.63	1.88-3.69
Low Exercise	70.3	4557	73.1	467	0.98	0.74-1.29
Obesity	12.4	804	17.5	112	1.55	1.12-2.17
More than One Sexual Partner	6.8	415	10.5	64	2.54	1.52-3.97
School Difficulties	25.6	2142	30.3	239	1.49	1.15-1.94

† Weighted number and percentages
‡ Controlling for Demographic Factors. Demographic Variables include Age, Sex, Low Education and Marital Status

Interactions between childhood abuse and age and childhood abuse and gender were tested and some statistically significant interactions were found in predicting the health risk behaviours and school difficulties. These interactions are found in bold print in Table 24. Being female and reporting childhood physical abuse increased the risk of reporting alcohol problems. Being younger and reporting childhood physical abuse increased the risk of reporting school difficulties. Being younger and reporting childhood sexual abuse increased the risk of reporting being a smoker.

Table 24. Summary of Logistic Regression Models of Childhood Abuse Predicting Health Risk Behaviors and School Difficulties Stratified By Gender and Age‡

	Male		Female		Under 40 Years Old		40 Years Old & Older	
Health Risk Behaviors	OR	CI	OR	CI	OR	CI	OR	CI
Childhood Physical Abuse								
Smoking	1.37	1.08-1.73	1.45	1.12-1.86	1.46	1.15-1.85	1.26	0.98-1.63
Alcohol Problems	*1.64*	*1.29-2.08*	**3.06**	**1.98-4.74**	1.60	1.23-2.09	2.35	1.63-3.37
Low Exercise	1.13	0.89-1.43	0.91	0.70-1.20	0.97	0.76-1.23	1.05	0.80-1.38
Obesity	1.22	0.89-1.67	1.12	0.80-1.56	1.15	0.80-1.65	1.12	0.83-1.51
More than One Sexual Partner	1.66	1.10-2.80	1.20	0.66-2.19	1.33	0.92-1.93	1.80	0.76-4.28
School Difficulties	1.44	1.17-1.76	1.40	1.13-1.87	**1.54**	**1.23-1.92**	*1.27*	*1.01-1.60*
Childhood Sexual Abuse								
Smoking	1.53	0.93-2.53	1.49	1.09-2.02	**1.81**	**1.26-2.59**	*1.10*	*0.74-1.63*
Alcohol Problems	2.48	1.54-3.99	2.77	1.71-4.51	1.94	1.23-3.04	3.97	2.33-6.77
Low Exercise	1.28	0.74-2.22	0.88	0.63-1.22	0.74	0.51-1.08	0.27	0.80-2.01
Obesity	---	---	1.53	1.04-2.27	1.18	0.67-2.07	1.73	1.14-2.63
More than One Sexual Partner	---	---	2.85	1.55-5.22	2.32	1.35-4.01	---	---
School Difficulties	1.20	0.75-1.90	1.77	1.32-2.38	1.63	1.13-2.35	1.28	0.90-1.82

‡ Odds Ratio and Confidence Intervals calculated after controlling for Age, Sex, Low Education and Marital Status
--- Insufficient sample size for reliable analysis

5.63 Smoking Effects

Table 25 shows the final step in testing the mediating effects of smoking for the relationship between childhood abuse and health. Overall, the analyses suggest that smoking partially mediates the effect of childhood abuse on health for three of four adverse health indicators and none of the health care utilization indicators. The odds ratios for the relationship between childhood abuse and health were compared when smoking was *not* included in the model (Model #1) and when smoking was included in the model (Model #2). Both models controlled for demographic factors.

Table 25. Summary of Logistic Regression Analysis for Smoking as a Mediator between Childhood Abuse and Global Health Problems and Health Care Utilization

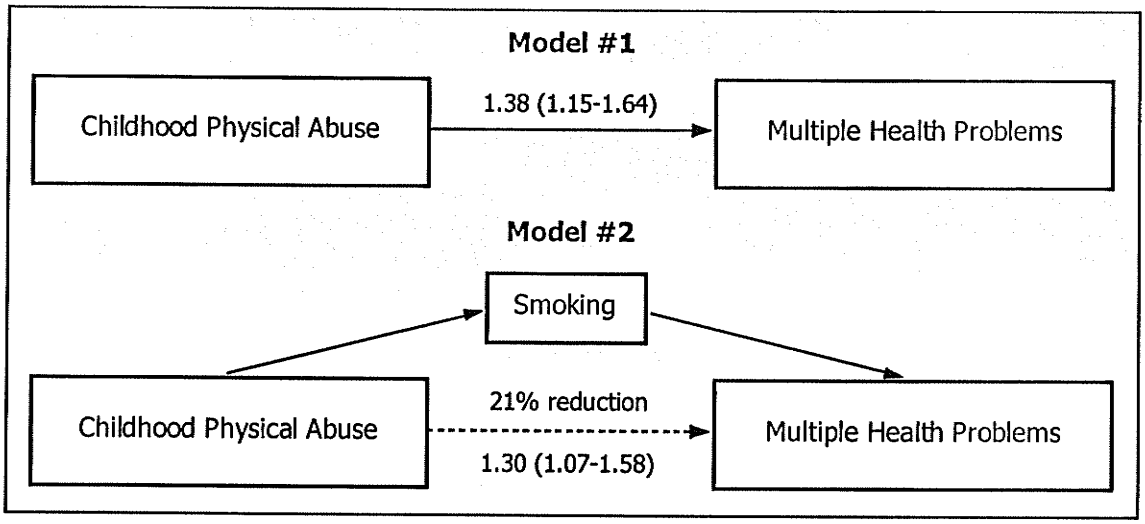
	Model #1		Model#2		% Change**
Predictor Variables	OR	CI*	OR	CI*	
Multiple Health Problems					
Childhood Physical Abuse	1.38	1.15-1.64	1.30	1.07-1.58	- 21
Smoking			1.31	1.08-1.60	
Childhood Sexual Abuse	1.66	1.29-2.15	1.48	1.12-1.96	- 27
Smoking			1.29	1.06-1.56	
Poor Self-Rated Health					
Childhood Physical Abuse	1.38	1.05-1.81	1.29	0.97-1.71	- 24
Smoking			1.51	1.14-2.00	
Childhood Sexual Abuse	1.52	1.02-2.27	1.32	0.87-2.02	- 38
Smoking			1.64	1.24-2.16	
Pain					
Childhood Physical Abuse	1.64	1.27-2.13	1.57	1.21-2.04	- 11
Smoking			1.64	1.26-2.14	
Disability					
Childhood Physical Abuse	1.58	1.28-1.94	1.74	1.39-2.19	+ 28
Smoking			1.20	0.95-1.53	
Childhood Sexual Abuse	1.73	1.27-2.23	1.81	1.30-2.51	+ 11
Smoking			1.13	0.89-1.44	
High ER Use					
Childhood Physical Abuse	1.85	1.41-2.42	1.80	1.33-2.42	- 6
Smoking			1.42	1.05-1.93	
Childhood Sexual Abuse	1.76	1.18-2.62	1.76	1.15-2.70	0
Smoking			1.48	1.09-2.01	
High Professional Use					
Childhood Physical Abuse	1.57	1.25-1.97	1.66	1.30-2.14	+ 16
Smoking			1.01	0.78-1.32	
Childhood Sexual Abuse	1.75	1.28-2.39	1.83	1.31-2.57	+ 11
Smoking			1.02	0.78-1.33	

* Also included in the Model were age, sex, marital status and low education.
** To calculate how much the odds ratio for abuse changed,: (OR(Model #1) – OR (Model #2)/OR (Model#1) -1.00) x100%

The diagrams in Figure 5 illustrate how childhood physical abuse may affect multiple health problems via its relationship with smoking. Model #1 shows that respondents with childhood physical abuse are 1.37 times more likely to report multiple health problems compared to respondents with no childhood physical abuse. In Model #2 when smoking

is added to the model, the odds ratio decreases from 1.38 to 1.30 (21% reduction). Smoking accounts for variation in the model (OR: 1.31) in multiple health problems when childhood physical abuse is in the model.

Figure 5. Mediating Effects of Smoking for the Relationship between Childhood Abuse and Health



The mediation analyses were also conducted by gender and age. Table 26 shows that smoking is partially mediating the relationship between abuse and health for females in more instances than for males. In examining the mediation effects of smoking by age groups, these appear to vary by age group and by health indicator.

Smoking may be playing other roles than mediating in influencing the relationship between abuse and health. In Tables 25 and 26, for some models predicting health, the odds ratios for childhood abuse increased when smoking was entered into the model. Further analyses (not shown in tables) found that the odds ratio for the relationship between childhood abuse and disability due to physical health problems was higher among smokers (physical OR: 1.78; sexual OR: 2.39) than non-smokers (physical OR: 1.68; sexual OR: 1.55), and that the relationship between childhood sexual abuse and

high professional use was higher among smokers (physical OR 1.79; sexual OR: 2.51) than non-smokers (physical OR: 1.61; sexual OR: 1.53). No statistically significant interaction effects were found.

Table 26. Summary of Logistic Regression Analysis for Smoking as a Mediator Between Childhood Abuse and Global Health Indicators and Health Care Utilization by Gender and Age

Percentage of Change between Model #1 and Model #2**				
Predictor Variables	Males*	Females*	Younger* (Under 40)	Older* (40 or older)
Multiple Health Problems				
Childhood Physical Abuse	NS	- 12%	- 30%	***
Childhood Sexual Abuse	NS	- 11%	- 21%	***
Self-Rated Health				
Childhood Physical Abuse	NS	- 30%	NS	- 19%
Childhood Sexual Abuse	---	- 43%	NS	- 23%
Pain				
Childhood Physical Abuse	- 17%	- 6%	- 13%	- 5%
Disability				
Childhood Physical Abuse	+ 38%	+ 16%	+ 10%	+ 44%
Childhood Sexual Abuse	---	- 2%	NS	+ 24%
High ER Use				
Childhood Physical Abuse	+ 6%	- 21%	+ 26%	- 35%
Childhood Sexual Abuse	---	- 6%	- 24%	NS
High Professional Use				
Childhood Physical Abuse	+ 23%	+ 8%	+ 23%	NS
Childhood Sexual Abuse	---	+ 8%	- 1%	NS

* Also included in the Model were age, sex, marital status and low education.
** To calculate how much the odds ratio for abuse was attenuated,: (OR(Model #1) – OR (Model #2)/OR (Model#1) -1.00) x100%
*** The odds ratio is attenuated but no evidence between childhood abuse and the health risk behavior is found.
--- Insufficient sample size for reliable analysis
NS - Insufficient evidence of relationship between abuse and health in strata.

5.64 Alcohol Problem Effects

The same analyses described in the previous section were conducted in testing for mediation by alcohol problems of the relationship between childhood abuse and health indicators. While the reductions in the odds ratios for alcohol problems (see Table 27)

were less then the reductions observed for smoking, there was some evidence to suggest the mediating effects of alcohol problems in the relationship between childhood

Table 27. Summary of Logistic Regression Analysis for Alcohol Problems as a Mediator Between Childhood Abuse and Global Health Problems and Health Care Utilization

	Model #1		Model#2		% Change**
Predictor Variables	OR	CI*	OR	CI*	
Multiple Health Problems					
Childhood Physical Abuse	1.38	1.15-1.64	1.34	1.12-1.60	- 11
Alcohol Problems			1.61	1.25-2.09	
Childhood Sexual Abuse	1.66	1.29-2.15	1.61	1.24-2.08	- 8
Alcohol Problems			1.62	1.25-2.09	
Poor Self-Rated Health					
Childhood Physical Abuse	1.38	1.05-1.81	1.35	1.03-1.78	- 8
Alcohol Problems			1.39	0.92-2.10	
Childhood Sexual Abuse	1.52	1.02-2.27	1.44	0.96-2.16	- 15
Alcohol Problems			1.51	1.00-2.27	
Pain					
Childhood Physical Abuse	1.64	1.27-2.13	1.65	1.27-2.14	+ 2
Alcohol Problems			0.95	0.62-1.47	
Disability					
Childhood Physical Abuse	1.58	1.28-1.94	1.51	1.22-1.86	- 12
Alcohol Problems			1.71	1.26-2.32	
Childhood Sexual Abuse	1.73	1.27-2.23	1.61	1.18-2.20	- 16
Alcohol Problems			1.71	1.26-2.32	
High ER Use					
Childhood Physical Abuse	1.85	1.41-2.42	1.83	1.39-2.39	- 2
Alcohol Problems			1.20	0.82-1.74	
Childhood Sexual Abuse	1.76	1.18-2.62	1.72	1.15-2.57	- 5
Alcohol Problems			1.26	0.86-1.84	
High Professional Use					
Childhood Physical Abuse	1.57	1.25-1.97	1.54	1.23-1.94	- 5
Alcohol Problems			1.26	0.88-1.78	
Childhood Sexual Abuse	1.75	1.28-2.39	1.71	1.25-2.34	- 5
Alcohol Problems			1.23	0.86-1.75	

* Also included in the Model were age, sex, marital status and low education.
** To calculate how much the odds ratio for abuse was attenuated,: (OR(Model #1) – OR (Model #2)/OR (Model#1) -1.00) x100%

Table 28. Summary of Logistic Regression Analysis for Alcohol Problems as a Mediator Between Childhood Abuse and Global Health Indicators and Health Care Utilization by Gender and Age

Percentage of Change between Model #1 and Model #2**				
Predictor Variables	Males*	Females*	Younger* (Under 40)	Older* (40 or older)
Multiple Health Problems				
Childhood Physical Abuse	NS	- 4%	- 10%	- 7%
Childhood Sexual Abuse	NS	- 5%	- 6%	- 10%
Self-Rated Health				
Childhood Physical Abuse	NS	- 0%	NS	- 7%
Childhood Sexual Abuse	---	- 10%	NS	- 18%
Pain				
Childhood Physical Abuse	- 2%	+ 3%	+ 4%	0%
Disability				
Childhood Physical Abuse	- 16%	- 10%	- 20%	- 5%
Childhood Sexual Abuse	---	- 11%	NS	- 4%
High ER Use				
Childhood Physical Abuse	- 5%	0%	- 4%	+ 1%
Childhood Sexual Abuse	---	- 2%	- 7%	NS
High Professional Use				
Childhood Physical Abuse	- 13%	+ 2%	- 4%	NS
Childhood Sexual Abuse	---	- 1%	- 1%	NS

* Also included in the Model were age, sex, marital status and low education.
** To calculate how much the odds ratio for abuse was attenuated,: (OR(Model #1) – OR (Model #2)/OR (Model#1) -1.00) x100%
--- Insufficient sample size for reliable analysis
NS - Insufficient evidence of relationship between abuse and health in strata

abuse and adverse health. Insufficient evidence was found to suggest that alcohol problems mediate the relationship between abuse and health care utilization.

In the analysis stratified by gender in Table 28, some differences were noted. For females, alcohol problems appeared to mediate the relationship between childhood *sexual* abuse and poor self-rated health and disability due to physical health problems and for males, between childhood *physical* abuse and disability due to physical health problems and high professional use. For younger respondents only, alcohol problems appear to be partially mediating the relationship between childhood *physical* abuse and some of the

global health indicators and for older respondents between childhood *sexual* abuse and some of the global health indicators.

5.65 Obesity Effects

Table 29 shows the final step in testing the mediating effects of obesity for the relationship between childhood *sexual* abuse and health. These analyses were not conducted for the relationship between childhood physical abuse and health because childhood physical abuse did not account for variation in obesity. The analyses suggest that obesity partially mediates the relationship between childhood sexual abuse and multiple health problems and self-rated health but not the relationship between childhood sexual abuse and other health indicators. Table 30 indicates stronger mediating effects for the relationship between childhood sexual abuse and multiple health problems in older respondents than in younger respondents. Since the sample size for males was too small, it is not possible to compare mediation effect of obesity by gender.

As was noted for smoking, obesity may be playing other roles than mediating in influencing the relationship between abuse and health. In Tables 29 and 30, for models predicting health care utilization, the odds ratios for childhood abuse increased when obesity was entered into the model. Further analyses (not shown in tables) found that among obese respondents, the relationship between childhood sexual abuse and high professional use (odds ratio: 0.84) is weaker than among respondents of normal weight (odds ratio: 2.20). This interaction was statistically significant. Differences in odds ratios were also found across strata for childhood sexual abuse and high ER use, but these differences were not statistically significant.

Table 29. Summary of Logistic Regression Analysis for Obesity as a Mediator Between Childhood Abuse and Global Health Problems and Health Care Utilization

	Model #1		Model#2		% Change**
Predictor Variables	OR	CI*	OR	CI*	
Multiple Health Problems					
Childhood Sexual Abuse	1.66	1.29-2.15	1.47	1.10-1.96	- 29%
Obesity			1.66	1.31-2.12	
Poor Self-Rated Health					
Childhood Sexual Abuse	1.52	1.02-2.27	1.46	0.96-2.23	- 12%
Obesity			2.58	1.89-3.53	
Disability					
Childhood Sexual Abuse	1.73	1.27-2.35	1.69	1.20-2.39	- 5%
Obesity			1.82	1.37-2.40	
High ER Use					
Childhood Sexual Abuse	1.57	1.25-1.97	1.86	1.20-2.88	+ 15%
Obesity			1.16	0.76-1.77	
High Professional Use					
Childhood Sexual Abuse	1.75	1.28-2.39	1.90	1.35-2.68	+ 20%
Obesity			1.03	0.73-1.45	

* Also included in the Model were age, sex, marital status and low education.
** To calculate how much the odds ratio for abuse was attenuated,: (OR(Model #1) – OR (Model #2)/OR (Model#1) -1.00) x100%

Table 30. Summary of Logistic Regression Analysis for Obesity as a Mediator between Childhood Abuse and Global Health Indicators and Health Care Utilization By Gender and Age

Percentage of Change between Model #1 and Model #2**				
Predictor Variables	Males*	Females*	Younger* (Under 40)	Older* (40 or older)
Multiple Health Problems				
Childhood Sexual Abuse	NS	- 14%	- 13%	- 58%
Self-Rated Health				
Childhood Sexual Abuse	---	- 8%	NS	+ 1%
Disability				
Childhood Sexual Abuse	---	+ 1%	NS	+ 2%
High ER Use				
Childhood Sexual Abuse	---	+ 9%	- 2%	NS
High Professional Use				
Childhood Sexual Abuse	---	+ 17%	- 1%	NS

* Also included in the Model were age, sex, marital status and low education.
** To calculate how much the odds ratio for abuse was attenuated,: (OR(Model #1) – OR (Model #2)/OR (Model#1) -1.00) x100%
--- Insufficient sample size for reliable analysis
NS - Insufficient evidence of relationship between abuse and health in strata

5.66 Effects of Having More Than One Sexual Partner

As indicated in Table 31, some evidence was observed of partial mediation by the variable 'more than one sexual partner' for the relationship between childhood abuse and multiple health problems and high professional use but not of the relationship between

Table 31. Summary of Logistic Regression Analysis for More than One Sexual Partner as a Mediator Between Childhood Abuse and Global Health Problems and Health Care Utilization

	Model #1		Model#2		% Change**
Predictor Variables	OR	CI*	OR	CI*	
Multiple Health Problems					
Childhood Physical Abuse	1.38	1.15-1.64	1.21	0.99-1.50	- 45%
More than One Sexual Partner			1.46	0.98-2.17	
Childhood Sexual Abuse	1.66	1.29-2.15	1.43	1.06-1.92	- 35%
More than One Sexual Partner			1.41	0.95-2.10	
Poor Self-Rated Health					
Childhood Physical Abuse	1.38	1.05-1.81	1.26	0.93-1.72	***
More than One Sexual Partner			0.88	0.44-1.77	
Childhood Sexual Abuse	1.52	1.02-2.27	1.54	0.99-2.38	+ 4%
More than One Sexual Partner			0.85	0.43-1.71	
Pain					
Childhood Physical Abuse	1.64	1.27-2.13	1.70	1.28-2.45	+ 9%
More than One Sexual Partner			1.32	0.73-2.38	
Disability					
Childhood Physical Abuse	1.58	1.28-1.94	1.81	1.42-2.30	+ 40%
More than One Sexual Partner			0.95	0.53-1.71	
Childhood Sexual Abuse	1.73	1.27-2.23	1.65	1.16-2.37	***
More than One Sexual Partner			0.96	0.54-1.72	
High ER Use					
Childhood Physical Abuse	1.85	1.41-2.42	1.94	1.42-2.65	+ 11%
More than One Sexual Partner			1.40	0.83-2.35	
Childhood Sexual Abuse	1.76	1.18-2.62	1.79	1.15-2.80	+ 4%
More than One Sexual Partner			1.43	0.85-2.41	
High Professional Use					
Childhood Physical Abuse	1.57	1.25-1.97	1.51	1.16-1.99	- 11%
More than One Sexual Partner			2.15	1.33-3.47	
Childhood Sexual Abuse	1.75	1.28-2.39	1.69	1.18-2.42	- 8%
More than One Sexual Partner			2.09	1.29-3.37	

* Also included in the Model were age, sex, marital status and low education.
** To calculate how much the odds ratio for abuse was attenuated,: {OR(Model #1) – OR (Model #2)/OR (Model#1) -1.00) x100%
*** The odds ratio is attenuated but no evidence between childhood abuse and the health risk behavior is found.

childhood abuse and other health indicators. These effects appear slightly stronger for the relationship between childhood *physical* abuse and multiple health problems than the relationship between childhood *sexual* abuse and multiple health problems.

Table 32 indicates that the mediation effects may differ by gender and age. For males only, having more than one sexual partner may be partially mediating the relationship between childhood physical abuse and high professional use. For females, some evidence of the mediating effects of having more than more sexual partner were

Table 32. Summary of Logistic Regression Analysis for More than One Sexual Partner as a Mediator Between Childhood Abuse and Global Health Indicators and Health Care Utilization by Gender and Age

Percentage of Change between Model #1 and Model #2**				
Predictor Variables	Males*	Females*	Younger* (Under 40)	Older* (40 or older)
Multiple Health Problems				
Childhood Physical Abuse	NS	- 9%	- 38%	- 55%
Childhood Sexual Abuse	NS	- 29%	- 22%	- 63%
Self-Rated Health				
Childhood Physical Abuse	NS	***	NS	***
Childhood Sexual Abuse	---	***	NS	+ 10%
Pain				
Childhood Physical Abuse	+ 29%	+ 1%	+ 5%	+ 7%
Disability				
Childhood Physical Abuse	+ 56%	+ 19%	+ 14%	+ 59%
Childhood Sexual Abuse	---	***	NS	- 7%
High ER Use				
Childhood Physical Abuse	+ 31%	- 10%	+ 52%	- 27%
Childhood Sexual Abuse	---	- 6%	- 20%	NS
High Professional Use				
Childhood Physical Abuse	- 29%	+ 6%	+ 20%	NS
Childhood Sexual Abuse	---	- 8%	- 6%	NS

* Also included in the Model were age, sex, marital status and low education.
** To calculate how much the odds ratio for abuse was attenuated,: (OR(Model #1) – OR (Model #2)/OR (Model#1) -1.00) x100%
--- Insufficient sample size for reliable analysis
NS - Insufficient evidence of relationship between abuse and health in strata

found for the relationship between childhood sexual abuse and multiple health problems and the relationship between childhood physical abuse and high ER use. The mediating effects of having more than one sexual partner for the relationship between childhood physical and sexual abuse and multiple health problems were higher for older than younger respondents. Among younger respondents, having more than one sexual partner mediates the relationship between childhood *sexual* abuse and high ER use, and among older respondents, it mediates the relationship between childhood *physical* abuse and high ER use.

In Tables 31 and 32, for some models predicting health care utilization, the odds ratios for childhood abuse increased when more than one sexual partner was entered into the model. Further analysis (not shown in tables) found that generally the odds ratio was weaker among respondents with more than one sexual partner than respondents with one or less sexual partners. Interactions between child abuse and more than one sexual partner were tested and one statistically significant interaction was found. Among respondents with more than one sexual partner, the relationship between childhood physical abuse and pain (odds ratio: 0.60) was weaker than among respondents with one or less sexual partners (odds ratio: 1.82).

5.67 Childhood School Difficulties Effects

Tables 33 and 34 shows the final step in testing the mediating effects of school difficulties for the relationship between childhood abuse and health. Some evidence was found to suggest that childhood school difficulties partially mediate the relationship between childhood sexual abuse and poor self-rated health and high ER use. The partial mediation of school difficulties also appeared between childhood physical abuse and high

professional use. These mediation effects appear to be more pronounced for females and for younger respondents.

Table 33.Summary of Logistic Regression Analysis for School Difficulties as a Mediator Between Childhood Abuse and Global Health Problems and Health Care Utilization

	Model #1		Model#2		% Change**
Predictor Variables	OR	CI*	OR	CI*	
Multiple Health Problems					
Childhood Physical Abuse	1.38	1.15-1.64	1.37	1.14-1.63	- 3%
School Difficulties			1.11	0.93-1.34	
Childhood Sexual Abuse	1.66	1.29-2.15	1.65	1.28-2.13	- 2%
School Difficulties			1.14	0.95-1.37	
Poor Self-Rated Health					
Childhood Physical Abuse	1.38	1.05-1.81	1.39	1.06-1.83	+ 3%
School Difficulties			1.23	0.92-1.62	
Childhood Sexual Abuse	1.52	1.02-2.27	1.46	0.98-2.19	- 12%
School Difficulties			1.32	1.00-1.75	
Pain					
Childhood Physical Abuse	1.64	1.27-2.13	1.65	1.28-2.14	+ 2%
School Difficulties			1.14	0.86-1.49	
Disability					
Childhood Physical Abuse	1.58	1.28-1.94	1.57	1.28-1.94	- 2%
School Difficulties			1.34	1.08-1.67	
Childhood Sexual Abuse	1.73	1.27-2.23	1.69	1.24-2.29	- 5%
School Difficulties			1.36	1.10-1.69	
High ER Use					
Childhood Physical Abuse	1.85	1.41-2.42	1.81	1.38-2.38	- 5%
School Difficulties			1.32	1.00-1.75	
Childhood Sexual Abuse	1.76	1.18-2.62	1.70	1.14-2.55	- 8%
School Difficulties			1.38	1.04-1.83	
High Professional Use					
Childhood Physical Abuse	1.57	1.25-1.97	1.55	1.23-1.94	- 4%
School Difficulties			1.14	0.89-1.45	
Childhood Sexual Abuse	1.75	1.28-2.39	1.72	1.26-2.35	- 4%
School Difficulties			1.20	0.95-1.53	

* Also included in the Model were age, sex, marital status and low education.
** To calculate how much the odds ratio for abuse was attenuated,: (OR(Model #1) – OR (Model #2)/OR (Model#1) -1.00) x100%

Table 34. Summary of Logistic Regression Analysis for School Difficulties as a Mediator Between Childhood Abuse and Global Health Indicators and Health Care Utilization by Gender and Age

Predictor Variables	Percentage of Change between Model #1 and Model #2**			
	Males*	Females*	Younger* (Under 40)	Older* (40 or older)
Multiple Health Problems				
Childhood Physical Abuse	NS	- 1%	***	***
Childhood Sexual Abuse	NS	- 3%	***	0%
Self-Rated Health				
Childhood Physical Abuse	NS	- 4%	NS	+ 8%
Childhood Sexual Abuse	---	- 15%	NS	- 7%
Pain				
Childhood Physical Abuse	- 3%	+ 1%	- 5%	+ 3%
Disability				
Childhood Physical Abuse	- 3%	- 3%	- 2%	0%
Childhood Sexual Abuse	---	- 4%	NS	- 4%
High ER Use				
Childhood Physical Abuse	- 8%	- 3%	- 9%	- 2%
Childhood Sexual Abuse	---	- 8%	- 10%	NS
High Professional Use				
Childhood Physical Abuse	0%	- 10%	- 10%	NS
Childhood Sexual Abuse	---	- 3%	- 1%	NS

* Also included in the Model were age, sex, marital status and low education.
** To calculate how much the odds ratio for abuse was attenuated,: (OR(Model #1) – OR (Model #2)/OR (Model#1) -1.00) x100%
— Insufficient sample size for reliable analysis
NS - Insufficient evidence of relationship between abuse and health in strata

CHAPTER 6. DISCUSSION

6.1 Overview of Study Findings

Based on this representative sample of Ontario residents, results show that childhood physical and sexual abuse are associated with a number of factors as illustrated in Figure 2. The three main findings of the study are: 1) Childhood physical and sexual abuse are associated with adult physical health problems and higher health care utilization. The strongest effects are found among women and younger respondents. 2) Higher rates of other adverse childhood experiences (parental psychopathology, parental marital conflict, lack of a close relationship with a parent or adult, and low parental education) were reported among respondents with childhood abuse compared to those without abuse. When an aggregate measure of adverse childhood experiences was created, the analyses indicated a dose-response relationship where the likelihood of health problems and higher health care utilization increased with the number of adverse childhood experiences. 3) Respondents with childhood abuse reported more health risk behaviors and school difficulties than respondents with no childhood abuse. The analyses also suggested that smoking, alcohol problems, obesity, multiple sexual partners and childhood school difficulties are partial mediators of the relationship between childhood abuse and many health problems. These findings will be discussed in light of other pertinent research. The implications of these findings will then be addressed as will be the strengths and limitations of this study.

6.2 Childhood Abuse, Health Problems and Health Care Utilization

To clarify the evidence linking childhood physical and sexual abuse to adult health and health care utilization, the present findings and relevant literature will be evaluated using epidemiologic criteria of causal association formulated by a British medical epidemiologist A.B. Hill (Hill, 1965). These criteria should be considered when discerning between causal and noncausal association (Rothman & Greenland, 1998). These criteria include:

- Consistency - Is the association consistent when results are replicated in studies using different settings and different methods?
- Strength - What is the size of the risk as measured by statistical tests?
- Specificity - Does a single cause produce a specific problem?
- Dose-response relationship - Do increasing levels of exposure increase the risk?
- Temporal relationship - Does the exposure precede the problem?
- Biological plausibility / coherence - Is the association compatible with existing theory and knowledge and currently accepted pathobiological processes?
- Experiment - Are there some experiments that demonstrate the association?

6.21 Consistency

Is the association consistent when results are replicated in studies using different settings and different methods? Previous research has found associations between childhood abuse, maltreatment or adversity and adult health problems and increased health care utilization. A direct comparison to other studies is difficult since childhood abuse and health outcomes were assessed in different ways. For example, some studies asked about irritable bowel syndrome, dyspepsia and heartburn and the present study

asked about digestive problems. Also some studies examined the broader construct of childhood maltreatment and adverse childhood experiences, while this study focused on childhood physical and sexual abuse. Research, which has considered global health indicators, will be examined first, followed by research with specific health problems and then finally research with health care utilization indicators.

The association found in this study between childhood abuse and global health problems (multiple health problems, poor self-rated health, pain that interferes with activities and disability due to physical health problems) is consistent with previous research which was based on different samples. Most recently, Sachs-Ericsson et al. (2005), using a population-based sample in the United States, reported an association between childhood abuse and having at least one medical problem. Based on a health maintenance organization (HMO) sample, Felitti and colleagues (1998) found a relationship between adverse childhood experiences (which included childhood abuse) and poor self-rated health. Similarly, a relationship between childhood sexual abuse and poor perceived health was shown by Thompson et al. (2002). Davis, Luecken and Zautra (2005), in a meta-analysis from clinical and community samples, found that individuals with childhood abuse reported more pain symptoms than those with no childhood abuse. In a study of women from a HMO, Walker, Gerland et al. (1999) reported higher rates of physician-coded health problems (infectious diseases, pain disorders and other diseases) as well as greater levels of functional disability among those with childhood abuse compared to those with no childhood abuse.

With regard to the relationship between childhood abuse and specific health problems or medical conditions, the results of the present study are almost all consistent

with other studies reviewed. The studies reporting consistent findings will be examined first, followed by a study with conflicting findings. Associations of moderate strength were found between childhood abuse and irritable bowel syndrome, dyspepsia and heartburn (Longstreth & Wolde-Tsadik, 1993; Talley et al. 1994). This finding is similar to the present study which found an association between childhood abuse and digestive problems. In the present study, when the specific health problems were combined, childhood abuse appeared to increase the risk of having three, four, five or more health problems. This is similar to the finding by Walker, Gerland et al (1999), where childhood maltreatment was associated with an increased number of physician-coded diagnoses. Thompson and colleagues reported no association between childhood abuse and hypertension and asthma. The present study found no association between childhood sexual abuse and these chronic health problems, but did find an association between childhood physical abuse and asthma.

A study by Felitti et al. (1998) reported some findings similar to the present study, but also some that were conflicting. The authors reported a relationship between adverse childhood experiences (including abuse) and ischemic heart disease, cancer, stroke, chronic bronchitis or emphysema, diabetes, skeletal fracture and hepatitis or jaundice. The present study found an association between childhood abuse and respiratory problems, but not heart disease and diabetes. The other specific health problems were not examined in the present study. The type of population studied may account for the differences. Population-based samples such as the present study and Thompson and colleagues' study were less likely to find associations between childhood abuse and some specific health problems. Clinical samples, unlike population samples, are prone to

Berkson's selection bias, where people with more difficulties (more abuse, more health problems) may be more likely to seek help than people with fewer difficulties (Last, 1995). The effect of this bias would be to find differences where none actually existed. Another reason for not finding associations between childhood abuse and some specific health problems is that population-based studies have relatively low numbers of respondents with specific health problems. This is particularly true among younger respondents where the magnitude of the abuse-health relationship appears to be strongest. The cell sizes for childhood sexual abuse and health problems were smaller than those for childhood physical abuse. This results in statistical comparisons with limited power. Ideally, it would be useful to have population-based studies with sufficient numbers of respondents with particular health problems. This can be accomplished through the use of a disease registry for example.

The present study results confirms previous findings that respondents with a history of childhood abuse seek health services more frequently than those with no childhood abuse with the exception of visits to family physicians. Although there were methodological weaknesses in other studies of health care utilization and abuse, such as clinically based samples and inadequate control of confounders, some have found an association between childhood abuse and the frequency of physician visits (Arnow et al, 2000; Felitti, 1991; Finestrone et al., 2000; Newman et al., 2000), hospitalizations (Finestrone et al., 2000; Moeller, 1993; Salmon & Calderbank, 1996) and emergency room visits (Arnow et al., 2000). On the other hand, McCauley and colleagues (1997) reported no association between childhood abuse and hospitalization, miscarriages, and medication use.

The present study results did not support previous findings that respondents with childhood abuse had higher rates of general practitioners (GP) visits. These negative results remained when the analyses were conducted using a higher frequency of use (10 or more GP visits year instead of six or more GP visits a year). Paradoxically, in the present study higher use of health professionals including nurses, dentists, psychologists and medical specialists was found among the respondents reporting a history of abuse. It may be that respondents with childhood abuse are seeking these professional services or turning to the emergency room (ER) instead of consulting their general practitioners. Individuals with unstable lifestyles are least likely to have maintained a relationship with a family physician and may be using the ER for their medical needs. Frequent ER use may indicate that respondents with childhood abuse seek medical attention when urgent help is needed or postpone seeking help until the health problems become severe. Data were not available on the reasons for ER visits in this sample. For example, it was not known if the visits were due to an injury or to existing medical conditions. High utilization of the ER may be reflecting injury treatment for current abuse. Previous research has found that women with histories of abuse continue to be revictimized in adulthood (Coid, Petruckevitch, Feder, Chung, Richardson & Moorey, 2001; McNutt, Carlson, Persaud & Postmus, 2002).

6.22 Strength of Association

What is the size of the risk as measured by statistical tests? The strength of the relationship between childhood abuse and adult physical health in the present study as assessed by odds ratios (in the range of 1.3 to 2.2) was generally similar to those reported in many previous studies (in the range of 1.2 to 2.2). Associations ranged from odds

ratios of 1.2 (Felitti et al., 1998) for poor or fair self-rated health to 2.2 for back pain (McCauley et al., 1997). Variations in the magnitudes of the relationships between studies may depend on how childhood maltreatment was defined, how health problems were assessed, how well the study was controlled for confounders and what type of population was included. It is important to remember that the most likely bias operating in these studies is that the strength of the relationship is actually higher than estimated. since childhood abuse is typically underreported making it likely that some respondents in the "no abuse" group may have experienced abuse.

The similarity between studies in the strength of association is striking given the differences in settings, age and gender of respondents and instruments used. Studies in this area have used different measures of physical abuse including the Conflict Tactics Scale (used in the present study, Felitti et al., 1998, Thompson et al. 2002) and the Childhood Trauma Questionnaire (used in Walker, Gerland et al., 1999) and measures of sexual abuse including the National Population Survey of Canada questions for childhood sexual abuse (used in the present study, Talley et al., 1994) and Wyatt's Sexual History Questionnaire (used in Felitti et al., 1998) and have provided similar strengths of association.

However, the strength of association between childhood abuse and physical health reported in the current study was lower than that found between childhood abuse and mental health. Using the same Ontario Health Survey data as the current study, MacMillan and colleagues (2001) found odds ratios that ranged from 1.9 for the relationship between childhood physical abuse and anxiety disorders and 3.4 for childhood sexual abuse and major depressive disorder. Similar and higher rates were

found in other studies examining the relationship between abuse and mental health (Fergusson et al., 1996; Kessler et al, 1997; Widom, 1999). A possible explanation for the stronger relationship between abuse and psychopathology is that mental health problems are more prevalent among younger respondents (Kessler, McGonagle, Shanyang, Nelson, Hughes, Ehleman et al., 1994) whereas physical health problems are more prevalent among older respondents.

For health care utilization in this study, the odds ratios for childhood physical and sexual abuse were respectively 1.85 and 1.76 for high Emergency Room use and 1.57 and 1.75 for high health professional use. Comparing the strength of association found in this study with the results of previous investigations was not possible due to the different statistical and reporting methods used. In addition these other studies used clinical samples and only three adequately controlled for confounders. In the first study with adequate control for confounders by McCauley and colleagues (1997) no association between childhood abuse and health care utilization was shown. In the second, Walker, Ulzer and colleagues (1999) found that women with childhood sexual abuse had higher health care costs, but they did not include the utilization frequencies in their report to facilitate comparisons. In the third study, Newman and colleagues (2000) found that the association differed by the type of clinic. No differences were found in the mean number of annual gynecological visits (abused: 3.36, non abused: 3.78) while significant differences were reported in internal medicine clinics (abused: 7.19, non abused: 4.49).

6.23 Specificity

Does a single cause produce a specific problem? In reviewing the present findings, no support was found for the notion that abuse affects certain body systems

more than others. This is consistent with previous work where researchers have not demonstrated that childhood abuse is associated with a specific health problem and not others. All types of childhood abuse and other childhood adversities are associated with a broad spectrum of negative health outcomes (Edwards et al., 2004). For example, McCauley and colleagues (1997) found that childhood abuse was associated with nightmares, back pain, headaches, pelvic, genital or private area pain, binging and vomiting, frequent tiredness, problems sleeping, abdominal or stomach pain, vaginal discharge, breast pain, choking sensation, loss of appetite, problems urinating, diarrhea, constipation, chest pain, face pain, frequent or serious bruises, and shortness of breath. It was also associated with anxiety, depression and hospitalization for an emotional problem.

The observations are consistent with a growing body of knowledge on the effects of stress. In her review of neurobiological responses to childhood maltreatment, Glaser (2000) concluded that no post-maltreatment syndrome is apparent. Predicting how individuals will be affected by similar experiences is difficult because the neurobiological processes may vary depending on factors such as the nature and the duration of the abuse or neglect, and the social environment of the child. McEwen and Seeman (1999) explain that genetic factors and adverse childhood experiences can predispose the individual to overreact physiologically and behaviorally to stressful stimuli. Over time, overexposure to neural, endocrine and immune stress mediators can lead to the development of disease. They write,

> "In general, the health effects of trauma and other childhood adversities are very broad and do not appear to be specific for any one type of psychiatric or other

disorder, the breadth and strength of the effects of such trauma is reminiscent of the broad systemic effects of alterations of the responsiveness of physiological mediators that is embodied in the concept of allostatic load." (McEwen & Seeman 1999, p.42).

6.24 Dose-Response Relationship

Does increasing levels of exposure increase the risk? This study found that the risk of adverse health increased with the number of adverse childhood experiences (including childhood physical and sexual abuse). For example, compared to respondents with no adverse childhood experiences, the odds of having multiple health problems was 1.2 times higher for respondents with one adverse childhood experience, 1.5 for respondents with two adverse childhood experiences and 3.3 for respondents with five or six adverse child hood experiences. Other studies describe similar evidence of a dose-response relationship between abuse or adverse childhood experiences and health. Felliti and colleagues (1998) found that a higher number of adversities was associated with a greater likelihood of reporting health problems. Women reporting multiple types of child maltreatment (physical, sexual, emotional, physical and emotional neglect) were more likely to report problems than women reporting one type of abuse (Walker, Gerland et al, 1999).

This study also found a dose response relationship between the number of adverse childhood experiences and higher general practitioner, emergency room and health professional use. Similarly, Moeller and colleagues (1993) reported that the number of types of childhood maltreatment a women experiences will influence the number of hospitalizations and physical and psychological problems. Arnow and colleagues (2000)

reported that emergency room and nonpsychiatric outpatient use was higher in respondents with both childhood physical and sexual abuse than respondents with only childhood sexual abuse. Also, women with multiple types of abuse incurred higher costs for health care utilization compared to women with one type of abuse (Walker, Unutzer et al., 1999).

6.25 Temporal Relationship

Does the exposure precede the problem? The present study and previous studies were cross-sectional and retrospective reports of childhood abuse and current reports of adult health were collected at one time. Information on health status prior to the abuse is generally not available in these studies. However, many of the health problems assessed are unlikely to be present in childhood. While there is a high probability that abuse preceded the health problems, this cannot be ascertained with certainty in a cross-sectional design.

6.28 Biological Plausibility / Coherence

Is the association compatible with existing theory and knowledge and currently accepted pathobiological processes? As shown in Figure 1, researchers have suggested that the childhood environment can influence health through biological and psychosocial pathways (Hertzman et al., 2001; Kuh et al., 1997; Rutter, 1989). Research suggests that childhood abuse negatively influences biological resources and affects health capital, or future health. Latent factors, pathway factors and cumulative effects are possible mechanisms which link childhood factors to adulthood (Hertzman et al., 2001). Latent factors adversely affect health independently of other intervening factors and pathway

factors influence health by altering the life trajectories which in turn affect health. Cumulative effects are the increased risk of adverse health with the increase in intensity and duration of a risk factor.

As Hertzman and colleagues (2001) remarked, it is difficult to distinguish between latent, pathway factors and cumulative effects. All three mechanisms may be operating in most cases of childhood abuse. The posited neurobiological effects of abuse could be classified as a latent factor because physiological studies have shown that high stress brought about by abuse or neglect can adversely affect body tissues and organs (McEwen & Seeman, 1999). The details of the physiological effects of adverse environments before adulthood have been studied most thoroughly in animal models where a high degree of experimental control is possible. There is no reason to believe that these physiological mechanisms would work differently in humans. Childhood abuse could be considered a pathway factor due to its negative effects on health risk behaviors and academic achievement which in turn lead to negative health outcomes. In considering the putative negative effects of prolonged childhood abuse, a case could be made for the cumulative effects of childhood abuse.

6.27 Experiment

Are there some experiments that demonstrate the association? No human experiments have been conducted showing that childhood abuse leads to adverse adult health. The ethical issues related to random assignment of children to an abuse group and a non-abuse group speak for themselves. A natural experiment was provided by Romanian orphanages where parents left their children due to socioeconomic hardships. Conditions in these orphanages included inadequate care giving, malnutrition, low

stimulation and physical abuse. Higher cortisol levels were found in the Romanian children who had spent more than four months in the orphanages (at age seven) compared to Romanian children who spent less than four months in the orphanages and Canadian children raised in nurturing homes (Gunnar, 2000). A number of animal experiments provide strong evidence for the association between abuse and neglect in early life and long term biological consequences that influence physiological functioning and future behaviour (Coplan et al. 1998; Heim et al., 1997; Plotsky & Meaney, 1993).

6.28 Summary of Evidence for a Causal Relationship

Evidence from this study and previous research satisfy to a high degree four of the seven of Hill's criteria. The studies consistently point to a relationship of moderate strength between childhood abuse and adult health. They also provide evidence for a dose-response relationship. A growing body of evidence shows how child abuse can negatively impact biological systems, particularly neurodevelopment as well as psychosocial factors which lead to poor health.

However, less evidence exists to support the specificity, temporality and experiment criteria. No evidence was found that childhood abuse leads to specific health problems. Rothman and Greenland (1998) question the validity of the specificity criterion and argue it should not be used to refute a causal relationship. The well-known causal relationship between smoking and health outcomes provides a good example of a cause leading to effects on a wide variety of biological systems. The evidence for temporality is reasonable given that it is likely that health problems occurred after the childhood abuse. While no human experiments have been conducted to test the long-term effects of abuse on health, the naturally occurring experiments of Romanian orphanages provide

convincing data. Results from animal studies also provide findings consistent with this relationship.

6.3 Relationship Between Childhood Abuse and Health by Gender and Age

Few studies have explored whether the association between childhood abuse and health was different by gender and age. The present study suggests that while an association between childhood abuse and health was found for males and females and for younger and older respondents, there were some differences across strata. The physical health status of women may be more adversely affected by childhood abuse than it is for men. For example, the relationship between childhood physical abuse and multiple health problems was higher in women (OR: 1.77) than men (OR:1.09). Similarly, Thompson, Kingree and Desai (2004) using a nationally representative American sample, found that the relationship between childhood abuse and perceived physical health and mental health was stronger for women than for men. The present study did not find, however, that abuse had a differential relationship with health care utilization between males and females. The abuse-health relationship is stronger among younger than older respondents. For example, the relationship between childhood physical abuse and disability due to physical health problems was significantly higher for younger respondents (OR: 1.90) than older respondents (OR: 1.41).

A variety of explanations for the gender differences may be advanced. Childhood sexual abuse may be a more damaging trauma than other types of abuse. In this sample, 30% of women with childhood physical abuse also reported childhood sexual abuse, and only 9% of men also reported childhood sexual abuse. The odds ratios reported in the study tend to be higher for sexual abuse than physical abuse. The limited number of

respondents with both types of abuse restricted analysis to test this possibility. Some authors have reported that women with a history of childhood abuse were more likely to be revictimized as adults (Coid et al., 2001; McNutt et al., 2002). The compounded effects of abuse in childhood and adulthood may lead to a greater risk of adverse health effects (McCauley et al. 1997). Other researchers suggest that women react differently to abuse than men. Haataunen, Tanskanen, Kylma, Honkalampi, Koivumaa-Honkanen, Hintikka et al. (2003) found an association between adverse childhood experiences and adult hopelessness for women but not for men. A study by Hovdestad (2001) indicates that females may be more sensitive to disruptions in attachment with their primary caregiver. These early relationships with the primary caregiver are crucial to the infant's survival, forming expectations about relationships and views of themselves and others. Hovdestad found that attachment problems in infancy and coping strategies used to deal with abuse mediated the effects of childhood abuse and health and that these mediation effects were stronger in women.

Gender differences were also noted in the relationship between childhood abuse and health risk behaviors. Being female and reporting childhood physical abuse increased the risk of reporting alcohol problems. Being male and reporting childhood physical abuse appeared to increase the risk of having multiple sexual partners. These results suggest that men and women may be affected in different ways by childhood abuse. Some researchers posit that childhood physical abuse may lead to externalizing disorder in males but not females (Malinosky-Rummel & Hansen, 1993). Holmes and Sammel (2005) found, in a sample from a socio-economically deprived urban area, that

males with a history of childhood abuse had higher rates legal troubles, incarceration and more lifetime sexual partners than those with no childhood abuse.

One reason that the relationship between abuse and health is stronger among younger respondents may be that the assessment is closer in time to the period when the abuse occurred. With the passage of time, other life events are likely contributing to health status such as exposure to social, behavioral and environmental risks as well as exposure to factors that strengthen health. Kessler et al. (1997) examined the association between adverse childhood experiences and psychopathology in adulthood and found that the associations were stronger in early-onset mental disorders than late-onset disorders. These authors referred to a decay in effects due to the passage of time. Nevertheless, results of this study indicate a relationship between childhood abuse and health in older individuals and as Rysberg (2004) emphasizes, older individuals can benefit from treatment as well.

6.4 Childhood Abuse, Other Adverse Childhood Experiences and Health Indicators

This study also found an association between other adverse childhood experiences (parental marital conflict, parental psychopathology, low parental education and lack of close relationship with a parent or adult) and poor adult health and high health care utilization. The results suggest that childhood abuse and other adverse childhood experiences are overlapping risk factors. This overlap made it difficult to distinguish the unique influences on health outcomes of each adverse childhood experience (Briere, 1988). This study found that the relationships between adverse childhood experiences (including childhood abuse) and health were attenuated, when all six adverse experiences were in the same model.

In examining the odds ratios in the separate models, childhood physical and sexual abuse tended to have a stronger influence than other types of adverse childhood experiences. Only parental psychopathology had odds ratios of comparable magnitudes. The odds ratios for childhood abuse were decreased with the addition of other adverse childhood experiences in the model but the odds ratios remained significant for most of the health outcomes. This suggests that childhood abuse may have a unique adverse influence on the development of poor adult health. The attenuated odds ratios do not mean that childhood abuse is less important in the presence of other adverse childhood experiences, but rather that the other adverse childhood experiences also influence long-term health and that they often co-occur with childhood abuse. What appears to be most harmful to long-term health is the accumulation of these adversities.

The six adverse childhood experiences explored in this study could be viewed as proxy risk factors for a global risk factor such as a stressful home environment, parents who are not functioning well in their roles or dysfunctional parent-child relationships. A family stressor was identified in 73% of the child maltreatment cases reported in the Canadian Incidence Study of Reported Child Abuse and Neglect. These stressors included mental health issues, spousal violence, lack of social support and substance abuse (Trocmé et al., 2001). Belsky (1993) remarks that the balance between stressors and supports determines whether or not maltreatment will take place.

It is therefore important when assessing a child's environment, to be aware of the many adverse and supportive conditions affecting the child's health and development. Previous research indicates, as this study has, that numerous adverse childhood experiences are in themselves risk factors in predicting adverse outcomes (Cummings,

1997; Dickstein et al., 1998; National Research Council Institute of Medicine, 2000; Willms, 2000). In practice, childhood abuse is often difficult to identify as families tend to keep it hidden and reported cases represent a small percentage of the actual cases. Assessments and interventions which focus on socio-economic status, marital discord, parental psychopathology and parent-child relationships may also be less threatening for families than assessing only their experiences with abuse and neglect. This approach may be helpful in identifying a group of children at risk for negative outcomes.

6.5 Mediating Effects in the Relationship Between Abuse and Health

6.51 Mediating Effects of Health Risk Behaviors

The study confirms the association between childhood abuse and most health risk behaviors which differed by age and gender. Smoking, alcohol problems, obesity, and having more than one sexual partner were partial mediators of the relationship between childhood abuse and some health indicators. Reduction in the strength of the abuse-health relationship ranged from negligible to 43% when the model was adjusted for these health risk behaviors. Finding partial mediation versus complete mediation indicates that these important health risk behaviors are not the sole mechanism linking abuse and health but rather are likely one link in one of the causal chains.

Consistent with this study, a number of studies have reported that individuals with childhood abuse engage in more health risk behaviors than individuals with no childhood abuse. Comparing the strengths of these associations with much of the prior research is not possible because of the type of health risk behaviors studied. Comparable studies were generally consistent in finding an association of moderate strength. Nelson et al.

(1994) found that students with sexual abuse were about three times as likely to smoke and two times as likely to have used alcohol compared to students with no sexual abuse. Similar to this, the present study found that younger respondents with childhood abuse were almost twice as likely to smoke and have alcohol problems than younger respondents with no childhood abuse. Bensley and colleagues (2000) reported that the odds ratio for the relationship between childhood physical abuse and heavy drinking for males was 3.2 and not significant for females. The relationship between childhood sexual abuse and heavy drinking was 2.0 for males and not significant for females. In the present study, the odds ratio for alcohol problems in males was 1.6 for childhood physical abuse and 2.5 for childhood sexual abuse and in females was 3.1 for childhood physical abuse and 2.8 for childhood sexual abuse. The marked differences in the odds ratios for females between Bensley's study and this study may be because there were very few females in Bensley's sample who reported heavy drinking making this estimate less reliable. Young and Katz (1998) did not calculate odds ratios, but their prevalence tables indicated that women with sexual abuse were about three times more likely to have multiple sexual partners than women with no sexual abuse which is similar to an odds ratio of 2.9 found in this study.

Fewer studies have explored whether or not health risk behaviors mediate the relationship between abuse and health. Researchers from the Adverse Childhood Experiences Study recently found evidence that health risk behaviours mediated the relationship between adverse childhood experiences and ischemic heart disease (Dong, Giles et al., 2004) and liver disease (Dong, Dube et al., 2003). Both of these studies

included all of the health risk behaviours in one model which yielded higher reductions in the odds ratios than reductions found in this study.

Given that changing health habits is difficult (Davis, Combs-Lane & Smith, 2004), it is important to understand how these habits develop and are maintained. In explaining the relationship between childhood abuse and smoking, Anda and colleagues (1999) suggest that nicotine's psychoactive effects are used to cope with negative emotional, neurobiological and social effects of adverse experiences. They also note that individuals who have experienced adverse childhood experiences suffer from problems with affect, socialization and self-esteem. These problems may increase their susceptibility to peer pressure and tobacco marketing. McKay (1999) in his review found that negative emotional states, cravings, cognitive factors, interpersonal problems and lack of coping effort prior to relapse played a role in relapse to alcohol, drug and nicotine use. The cognitive factors included decreased commitment to abstinence, lower self-efficacy and urge to give up. These factors are more common among individuals with a history of childhood abuse making it difficult for them to manage these health risk behaviors.

Wells, Horwood and Fergusson (2004) found that childhood physical and sexual abuse and interparental violence predicted alcohol use at 16. Drinking at age 16 was in turn associated with smoking, sex before 16 and suicidal ideation and predicted adult outcomes such as negative drinking patterns, increased sexual partners and exposure to increased violence. The dysfunction which exists in families where abuse occurs may be contributing to the development of health risk behaviors. Bensley and colleagues (2000) posited that women with a history of childhood abuse engaged in health risk behaviors as

maladaptive coping strategies or as learned behaviors. These women were less likely to resist unwanted sexual activities. Alcohol may be affording physiological stress relief.

6.52 Mediating Effects of Childhood School Difficulties

The study also found an association between childhood abuse and school difficulties. For females and younger respondents only, these school difficulties appear to be partially mediating the relationship between childhood abuse and self-rated health and health care utilization. Previous research has found that abused or neglected children experience school difficulties (Ciccetti & Toth, 1995; Kaplan et al., 1999; Whiting, 2001). Low levels of educational attainment have been linked to poor health (Ross & Wu, 1995; Shkolnikov et al., 1998).

Childhood abuse may lead to school difficulties through its biological and psychosocial effects. High levels of glucocorticoid (one of the many bodily responses to stress) have been associated with memory impairment. Abuse or neglect could disrupt the maturation of the frontal lobes, making it difficult for children to learn control their emotions (Glaser, 2000). Memory impairment and difficulty with self-regulation render learning more challenging. In terms of psycho-social effects, researchers have found that socio-economic status is associated with educational outcomes (Brownell et al., 2003). Families where abuse is present may not provide a supportive environment for success in education. The mediating effects of school difficulties found in this study were not strong (ranging from negligible to 15%) suggesting that they may play a minor role in the causal chain.

6.6 Policy Implications

6.61 Child Abuse as a Public Health Concern

Following asthma and allergies, childhood abuse can be considered the third most common public health concern for children (Paluci, 2003). A recent report from the Canadian Incidence Study of Reported Child Abuse and Neglect (CIS) indicates that the number of reported child abuse cases in Canada (except child sexual abuse) has increased (Trocmé, Fallon, MacLaurin, Daciuk, Felstiner, Black et al., 2005). An estimated 217, 319 child investigations were conducted in Canada (excluding the province of Quebec) of which nearly half were substantiated. Prevalence rates of child abuse from retrospective studies indicate that reported cases represent a small proportion of the actual number of children experiencing abuse in Canada. MacMillan and colleagues (1997) using data from the Ontario Health Survey (OHS) indicate that 15.9% of females and 13.2% of males reported childhood histories of severe physical or sexual abuse.

Not withstanding the traumatic experiences of children, the economic impact to society is substantial. A recent study commissioned by the Law Society of Canada found that the costs of child abuse are fifteen billion dollars annually (Bowlus, McKenna, Day & Wright, 2003). Calculations were based on judicial, social services, education and health costs, as well as lost income and out of pocket personal costs. Given these calculations, an argument can be made for investing in child protection and healthy child development. Nobel Laureate in Economics, James Heckman (1998), has studied the economic impact of early childhood interventions. He writes,

> "Economic theory demonstrates that the returns to human capital investments are greatest for the young. This is for two reasons: (i) younger persons have a longer

horizon over which to recoup the fruits of their investments, and (ii) skill begets skill. Early learning facilitates later learning. At the same level of ability, it pays to invest in the young." (Heckman, pp. 117)

6.62 Considerations in Child Abuse Prevention

Given the mounting evidence for the short and long-term effects of childhood abuse, greater efforts are clearly required to prevent abuse and the secondary effects of abuse. Prevention of child maltreatment is not easily achieved and will certainly require fundamental changes to our society. Some researchers suggest that child abuse and other social problems must be considered within an ecological context (Finkelhor, 1982; Fryer, 1993; Tesh, 1981; Wandersman & Nation, 1998). Werkele and Wolfe (1996) suggest that at its most basic level, child maltreatment is a parenting failure. Under this premise, improved supports for children and families would decrease child abuse rates.

Corporal or physical punishment of children is still accepted and is lawful in Canada (Criminal Code of Canada, 1985). These laws have been challenged on the grounds that the distinction between abuse and punishment is not easily made and that child abuse often occurs during disciplinary action (Bernstein, 2005; Ateah & Durrant, 2005). Romania, Ukraine, Iceland, Israel, Germany, Latvia, Croatia, Cyprus, Austria, Finland, Denmark, Norway and Sweden now have laws banning physical punishment (Durrant, 2005). Child abuse rates have decreased dramatically in Sweden and could be attributed to the Swedish approach to this problem. The Swedish model has several components including laws banning corporal punishment, educating the public about parenting issues and supporting parents and families through comprehensive programs (Ateah, Durrant & Mirwaldt, 2004).

The model used in this study (Figure 2) suggests that childhood abuse, as well as other adverse childhood experiences, are risk factors in the development of poor health outcomes. Given that the adverse effects of childhood abuse may be latent, pathway or cumulative, policies and interventions, which improve health outcomes, can conceivably target multiple points in the life course. These could include: early in life before abuse occurs, after abuse has taken place in childhood, adolescence or adulthood, before secondary problems occur such as school difficulties or the adoption of health risk behaviors or after these secondary problems have occurred.

Treatment Programs

Treatment programs for children and adults who have experienced abuse aim at reducing the adverse effects of abuse. Offering services to decrease cognitive, behavioral, psychological effects may lead to improved health outcomes. The results of this study highlight opportunities for developing and providing more effective services to these individuals. Interventions for children will be discussed first followed by those for adults.

Most abused children do not receive treatment and those who do, are often not receiving appropriate treatment (Friedrich, 2002). Available treatment modalities for children are derived from attachment, dysregulation and self-perception theories and some have been shown to be helpful in the short-term (Friedrich, 2002). Finkelhor and Berliner (1995) reviewed 29 studies evaluating the effectiveness of treatments for sexually abused children. All showed that there was improvement but only five studies demonstrated that the improvement was due to the treatment. In a recent meta-analysis, Showron and Reinemann (2005) examined 21 studies testing the effectiveness of psychological interventions for child maltreatment. These interventions, aimed at abused

children or their parents (abusing and non-abusing), had medium effect sizes. Treated participants were better off than 71% of the comparison participants. Improvements were reported in child cognitive processes, self-esteem, anxiety or depression and behavior as well as parenting attitudes and behaviors and abuse-specific attitudes and behaviors.

The health status of individuals who have been abused could be improved by preventing health risk behaviors. The present study results showed that respondents with childhood abuse reported higher rates of health risk behaviors and that the combined effects of abuse and health risk behaviors (interaction effects) increased the risk of some adverse health outcomes. Children, adolescents and adults with many health risk behaviors should be assessed for a history of childhood abuse and this history should be considered in caring for them. While it may be difficult to target large scale health promotion efforts to individuals who have been abused, the efforts could be targeted to populations with increased risk of abuse and other factors putting them at risk of developing poor health habits (e.g. economically disadvantaged families).

Targeting high risk families has been shown to be effective in decreasing health risk behaviors in adolescents in a randomized trial (Olds, Henderson, Cole, Eckenrode, Kitzman, Luckey et al., 1998). Olds and colleagues compared adolescents born to mothers who had participated in a nurse home visitation program to adolescents in a control group. This intervention consisted of weekly home visits, beginning prenatally to the child's second birthday, to unmarried and socioeconomically disadvantaged women. When these adolescents were interviewed at 15 years old, those born to mothers from the intervention group reported fewer cigarettes smoked each day, fewer days of having consumed alcohol in the last six months, and fewer lifetime sexual partners than the

adolescents from the control group. While this study does not show directly that preventing child abuse decreased health risk behaviors, this nurse home visitation intervention has also shown its efficacy at decreasing rates of childhood abuse in the intervention families (Olds, Eckenrode, Henderson, Kitzman, Powers, Cole et al., 1997) and decreasing health risk behaviors (Olds et al., 1998).

The increased health risk for adults with childhood abuse indicate that special considerations should be made in treating these individuals. Some studies indicate that interventions aimed at adults which focus on the psychological aspect of childhood abuse may have positive effects on physical health (Smyth, 1999). Bremner argues that since traumatic experiences influence both psychological and physiological functions, practitioners should consider these health aspects in treatment. Bremner writes

> "If the effects of traumatic stress are thought of as a unitary disorder, there are implications for how we view approaches to the effects of traumatic stress. Such a perspective takes us away from thinking in exclusive terms of psychiatry, cardiology or neurology, and toward a more unitary approach in which all aspects of physical health must be considered. It also implies that doctors should be cross-trained in areas such as psychiatry and neurology, or psychiatry and cardiology, and that cardiologists should think about the effects of mental processes on heart function, while psychiatrists should consider the effects of heart disease on mental processes and behavior. This is a new framework in which cardiologists are expected to talk to psychiatrists and social workers and vice versa." (Bremner, 2002, pp. 276)

This approach is echoed by Kendall-Tackett (2004), who recommends that the gap between physical and mental health professionals be narrowed (Kendall-Tackett, 2004). Mental health professionals should be asking about physical health symptoms and communicating with the general health care system and vice versa. Research indicates that primary health professionals are generally not comfortable asking about abuse histories, claiming that it disrupts the flow of their intervention (Kendall-Tackett, 2004). There is considerable promise in a primary health care model which supports a team approach, improved access to health care, better co-ordination of health information and a focus on the determinants of health (Health Canada, 2005).

Strategies to Prevent Further Abuse

Secondary prevention or early intervention programs attempt to find prompt, caring, and efficient ways of preventing abuse or minimizing its impact. Crucial issues are cooperation and communication between disciplines (education, justice, social services, health), determining the most effective way of healing the victim and the family, and dealing with the abuser (Bagley, 1991). Waldfogel (1998) calls for a community-based system of child protection services (CPS). CPS cannot be the sole agency responsible for the protection of children. The public health, mental health, and informal support systems must be responsive to families' needs. Reviews of CPS in the United States and Britain found that lack of coordination and communication was partly to blame for failures to protect children (Waldfogel, 1998).

A meta-analytic study of early childhood intervention programs found that programs for families after the abuse has occurred are generally less effective than programs for families where abuse has not yet occurred (MacLeod & Nelson, 2000).

MacMillan, Thomas, Jamieson, Walsh, Boyle, Shannon et al. (2005) found that families receiving an intervention program of home visitation by nurses as well as child protection services (CPS) showed similar rates of child physical abuse recurrence as families who received the standard CPS. The authors suggest that when intervening with families after abuse has taken place, there is "high recurrence when children remain the home and up to now there is no intervention proven to reduce the risk "(pp. 1792, MacMillan et al., 2005).

Strategies to Prevent Childhood Abuse

Primary prevention programs are universal in their scope and are aimed at the general population or at whole communities. They target factors leading to abuse such as family problems, structural conditions and values that adversely affect children (Bagley, 1991). According to Daro and Donnelly (2002), an effective child abuse prevention strategy should be nested within a broadly defined network of social services. A coherent system of support should be established where all parents are encouraged to seek assistance in caring for their children. This system would be comprehensive rather than narrowly focused and would provide for the varying levels of assistance needed by parents and families. The support could involve good housing, supporting positive parent-child relationships, promoting knowledge about child growth and development, enhancing mental health services for families, and supporting parents through education, meaningful work, social support, and safe neighborhoods. Programs must take into account limited resources and delivery system difficulties as well as being consistent with the needs and values of the community in which they are offered (Felner, Felner & Silverman, 2000; Levine, 1998). The effectiveness of these strategies would have to be

tracked. A national surveillance system such as the Canadian Incidence Study of Reported Child Abuse and Neglect (CIS) is an exemplary first step (Trocmé et al., 2005).

A number of programs have been designed to improve parent-child relationships which would ultimately decrease child abuse rates. Home visiting programs which consist of regular visits by a nurse or trained paraprofessional have been shown to be effective in decreasing child abuse and improving child outcomes (McLeod & Nelson, 2000). The most effective home visiting programs were two or three years in duration, built on the family's strengths, provided teaching on healthy child development and parenting, and increased the family's support systems. The Triple P Program (Positive Parenting Program) which provides a multilevel program focused on supporting parents in their role through various types of education has demonstrated improvements in child outcomes (Sanders, Markie-Dadds, Turner & Ralph, 2004). The goals of the program are to promote; the skills and knowledge of parents, a nurturing and safe environment for children, and child development through positive parenting practices.

The Manitoba government has been striving towards a universal system where all parents can access different levels of service according to their needs. For the past five years, all children in the province are being screened for risk factors known to be associated with poor child outcomes and childhood abuse. The needs of at-risk families are identified by a public health nurse and the family and supports are recommended such as the home visiting Families First program or weekly meetings for new parents called the Healthy Baby program. Prenatal financial benefits are also offered to low income expectant mothers. The Positive Parenting Program is currently being planned throughout the province and will be available for all Manitoba parents.

Child sexual abuse reports suggest that the rate of this type of abuse may be decreasing. Similar trends are noted in self-report data from community studies but the decrease is not as pronounced. (Jones & Finkelhor, 2003; Trocmé et al., 2005). Jones and Finkelhor (2003) posit that public awareness campaigns, prevention programs, and criminal justice interventions may be responsible for the substantial decline. Preventive efforts aimed specifically at reducing rates of child sexual abuse have been primarily school-based programs for children (Sutherland, 2001; McMillan, 2000; DeLuca and Grayston, 2001). While these strategies have been criticized for placing the burden of protection on the children, the decreasing trends in child sexual abuse may be an encouraging indication of its effectiveness.

In reviewing the possible strategies, it appears that those aimed at treatment are not as effective as those aimed at primary prevention. In practical terms, most cases of child abuse are never reported making it impossible to intervene. Universal early childhood interventions decrease child abuse rates and have the additional advantage of improving multiple parent and child outcomes (Olds et al. 1997, 1998). However, given the prevalence of individuals reporting childhood abuse and the promising treatment results aimed at children and adults with a history of abuse, these should also be made available as well to prevent potential adverse health outcomes.

6.7 Study Strengths and Limitations

The Ontario Health Survey (OHS) data provided a unique opportunity to explore the research questions. Data on both childhood abuse and physical health in the same population-based survey are rarely available. This is important since most studies have examined the relationship between childhood abuse and health using clinical samples.

While there have been some concerns regarding the accuracy of self report data, previous research has been reassuring about the usefulness of type of data. As an example, Moller et al. (1996) found that self-rated health predicted the development of coronary heart disease and death.

The Mental Health Supplement of the OHS surveyed a subset of 9,953 respondents about mental health problems, childhood abuse and other adverse childhood experiences. The questionnaire used to assess childhood abuse was based on abridged versions on well-known instruments. The questions regarding childhood abuse were clear and specific which yielded valid and reliable responses. These child abuse questions were self-administered and returned to the interviewer in a sealed envelope. People generally are more willing to answer sensitive questions if anonymity can be ensured (Bowling, 2005). A limitation of the childhood abuse measure is that the duration of the abuse was not evaluated for both childhood physical and sexual abuse and the frequency was not evaluated for childhood sexual abuse. The consequences of abuse are known to be influenced by duration and frequency (Peters et al., 1990) and would have allowed us to examine the cumulative effects of childhood abuse.

Since much of the research linking abuse and health has been based on American data, the OHS provides an opportunity to study a Canadian population. This study is likely to be more relevant to Canadian policy makers. The OHS sample also has data on both genders and a wide age range. To date, few studies have examined childhood abuse in males. It should be noted that a number of Ontarians were excluded from the study: foreign service personnel, homeless people, people living in institutions (for example, hospitals, prisons), First Nations people living on reserves and residents of extremely

remote locations (Boyle et al., 1996). Had these individuals been included in the study, the nature and strengths of the relationships are likely to be only slightly varied due to their relatively small numbers.

The OHS is a cross-sectional survey which has advantages and disadvantages. Cross-sectional studies are commonly used in studying childhood abuse where exposure and disorder are measured at one point in time. Cross-sectional studies are very practical as they may be conducted over a short period of time. This greatly reduces costs and provides information on pressing research questions sooner rather than later. However due to the cross-sectional design of the study, no definite conclusions can be made about the causal effect of childhood abuse on physical health in adulthood. Exposure is measured retrospectively and may be subject to recall bias. Hardt and Rutter (2004) concluded in their review that retrospective recall of the occurrence childhood adversities is sufficiently valid to be used for research purposes. Their review points to underreporting of childhood abuse which would attenuate the relationship between childhood abuse and health. Also, the review found weak but possible indication that respondents experiencing more problems with their health might be most likely to report childhood abuse. This could accentuate the abuse-health relationship.

While longitudinal designs have advantages in clarifying temporal and causal relationships, there are few examples of longitudinal designs in child abuse research. Practical and ethical barriers have limited the study of children who have experienced abuse. In most jurisdictions, it is not possible legally to identify abuse in young children without reporting it to authorities. Reporting triggers a series of interventions that introduces a bias to the study design. A serious and challenging difficulty with

longitudinal data is attrition. For example, recent examination of the later phases of the NLSCY (National Longitudinal Study of Children and Youth) showed that children from lower SES are more likely to be lost to follow-up than children from higher SES groups (Jones, 2005). Since lower SES and abuse are related, children of interest may be lost in the sample over time.

In regards to statistical methods, this study used multiple regression techniques that allowed many factors to be considered at once. According to Kelsey, Whittemore, Evans, and Thompson (1996) regression is the method of choice for analyzing multiple variables. However it is important to note that multiple comparisons were made in the course of analyzing the data. Using a significance level of $p<0.05$, we would expect that the true value of two of these 40 comparisons would fall outside the constructed confidence intervals. We found 11 out of 14 statistically significant associations between abuse and global health indicators and 11 out of 26 statistically significant associations between abuse and specific health indicators. If two of these associations were not truly statistically significant, this would not greatly alter our conclusions.

6.8 Future Research

Numerous questions remain in our understanding of the relationship between childhood abuse and adult health. While many of Hill's criteria could be satisfied with the present study and previous studies, more could be learned about causality using alternative research designs. Future research could include adding a physical health component in adulthood or questions about childhood abuse at age 18, to longitudinal studies of children. For example, the National Longitudinal Study of Children and Youth (NLSCY) surveys children and their families every two years and currently addresses

some basic questions about health and health limitations. Respondents at age 18 could be asked about childhood abuse and through survey methods or linking to administrative databases, their health could be tracked over time. Including questions on the intensity and duration of abuse would shed light on the cumulative effects of abuse.

Intervention studies could improve our understanding of link between childhood abuse and health. For example, current studies evaluating home visitation programs aimed at preventing childhood abuse could be explored further, since these studies have tracked child abuse as carefully as possible (Olds et al., 1997). The health status of adults with documented child abuse could be compared to adults with no child abuse. If these documented reports are sparse, adults whose families had early childhood interventions could be compared to those with no intervention.

From a population health perspective, more research is needed in understanding the risk factors associated with abuse. Knowing which combinations of factors predict which families are at highest risk for child abuse would be helpful in targeting interventions most appropriately. It would also be important to know if addressing these concomitant risk factors decreases child abuse rates.

Gaining a greater understanding of the mechanisms linking abuse and health would be helpful in developing effective interventions. Why have most respondents with childhood abuse reported good health outcomes? It would be crucial to know more about which protective factors are at play in developing resilience in children at risk of abuse. What are the factors that influence the course of abuse-related problems? Many intermediate factors could be explored preferably using longitudinal designs. For example, research suggests that childhood abuse leads to poor child cognitive, behavioral

and emotional outcomes (MacMillan, 2000). Do factors such as early intervention programs, high quality child care, schools and neighborhoods positively affect the health of individuals with childhood abuse?

The research agenda for child abuse has recently entered a new phase of evaluating the effectiveness of programs and professional practices. Authors of the National Research Council Institute of Medicine (2000) advise that

> There is a pressing need to integrate basic research aimed at developmental processes with intervention research that assesses efforts to influence developmental outcomes. Such collaborative initiatives hold the promise of advancing both understanding the environmental effects on development and improving the effectiveness of the nation's early intervention strategies (pp.13, National Research Council Institute of Medicine, 2000).

Some promising research suggests that decreasing psychological distress associated with childhood abuse improves physiological functioning in adults (Smyth, 1999). In his review, Smyth found that brief writing interventions assisted participants in expressing and organizing their traumatic memories. It would be important to confirm these findings and further develop interventions focused on improving health outcomes of these individuals.

Most existing intervention studies have evaluated programs in ideal and controlled settings. Furthermore, these evaluations examine one intervention at a time. However, one program is not likely to be sufficient for many families at risk of abusing their children. Integrating targeted interventions, community and family supports, child care and health systems are required may assist families to balance their stressors and

supports more effectively. A challenging but essential research plan would be to examine which combinations of intervention programs and supports are most effective at preventing child abuse.

6. 9 Concluding Remarks

Based on this representative sample of Ontario residents, the study findings confirm the existing research that both childhood physical and sexual abuse are associated with adult physical health problems and increased health care utilization. While this relationship was present across genders and age groups, the strongest associations were among women and younger respondents. These results also suggest a cumulative effect of adverse childhood experiences whereby the risk of adverse health increases with the reported number of adverse childhood experiences (including abuse).

The findings lend support to the life course model whereby early life events are linked to outcomes later in life. There are likely many causal chains, and each chain likely has multiple links. The present study found evidence that health risk behaviors and school difficulties may be partially mediating the effects between childhood abuse and adult health. In light of this study and previous research, it is clear that behavioral, social and environmental factors work together in the development of long-term health outcomes. These should be considered when developing population health strategies.

Given the growing evidence of the long-term effects of childhood abuse, greater efforts are clearly required to develop strategies for the prevention and treatment of child abuse. The life course approach suggests that these strategies can be directed at multiple points of the life span. However, neuroscience and human development research favor interventions aimed at early childhood because of the rapid brain and behavioral

development occurring from birth to age 5 (Perry, 2002). An effective child abuse prevention strategy should be part of a larger comprehensive plan at improving multiple dimensions of health and well-being. There should be a coherent system of support where all parents can obtain assistance in caring for their children. Interventions aimed at supporting families with young children have shown important gains in decreasing child abuse, improving the well being of parents, decreasing the development of health risk behaviors and decreasing the prevalence of antisocial behaviors. Long-term health outcomes can be improved by effective interventions that change the balance between risk factors and protective factors in the early childhood environment.

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APPENDIX A: STUDY VARIABLE DESCRIPTION SUMMARY

Health Indicators	Rate*	Rate* Males	Rate* Females	Description of Variable Distributions
Skin Diseases *Do you have skin allergies or diseases*	8%	6%	10%	No discernable trend in the data was found by age. For men, there is a noticeable drop in this condition between 45 and 54 years old and for women, two age groups have a higher prevalence, between 15 and 24 years old and between 45 and 54 years old. The analysis will be conducted on both males and females. A continuous variable (by 10 year blocks) will be used to control variations due to age.
Allergies *Do you have hay fever or other allergies?*	19%	17%	21%	Overall, the rates of hay fever or other allergies decrease with age. This decrease occurs earlier for men. For men, a drop in rate occurs after 45 years old, and another occurs after 65 years old. For women, the decrease is not noticeable until after 55 and it gradually decreases with age after this point. Stratifying by age and sex is preferable. A dichotomous variables (under 55 and 55 and over) will be used to control variations due to age.
Back pain *Do you have back pain?*	9%	10%	9%	The percentage of males with back pain increases until age 39. It remains stable between ages 40 and 69. After age 70, it decreases steadily. The percentage of females with back pain increases until age 29. It remains stable between ages 30 and 44. It increases slightly again after age 45 where it remains at about 11% of females. In examining the relationship between abuse and back pain, analysis for males and females will be conducted separately. A dichotomous variable (under 40 and 40 and over) can be used to control variations due to age.
Arthritis *Do you have arthritis or rheumatism?*	13%	9%	16%	Overall, the rates for this condition increase dramatically with age. For men, if gradually increases until age 65 and then increases dramatically. For women, it remains low until age 45, at which point there is a dramatic increase and another increase at age 65. A continuous variable will be used to control variations due to age.
Bone Problems *Do you have serious joint or bone problems*	5%	4%	5%	These conditions have a slight tendency to increase with age. For men, a peak in prevalence rates is noted between age 55 and 65 years old. For women, this peak occurs earlier between age 45 and 65 years old. A variable grouped into intervals of five years will be used to control variations due to age.
Asthma *Do you have asthma?*	4%	3%	5%	The rates tend to decrease with age until age 45 (for women) and age 65 (for men) and then returns to rates found in early twenties. A dichotomous variable will be used to control variations due to age.

* These rates are weighted to more closely represent the actual population rate.

Health Indicators	Rate*	Rate* Males	Rate* Females	Description of Variable Distributions
Respiratory Problems *Do you have emphysema, chronic bronchitis or cough?*	3%	2%	3%	Rates for these respiratory illnesses increase with age. The increase occurs earlier for women (age 45) but rates do not become as high in old age as it does for men. In men, the increase occurs at age 65 where the rates become dramatically elevated. The prevalence rates for respiratory problems in this sample are low which limits the extent of stratification.
Hypertension *Do you have high blood pressure or hypertension?*	10%	9%	11%	Rates of hypertension vary by age and gender. The percentage of males with hypertension remains low between 15 and 39 years old. Between 40 and 70 years old, the prevalence of hypertension increases steadily where it decreases slightly and levels off at a high level after age 65. The percentage of females with hypertension remains very low between 15 and 39 years old. Between 40 and 64 years old, the prevalence of hypertension increases steadily and quickly – from almost 0 to 40% - where it levels off at this high level after age 70. Analysis for males and females are best conducted separately. Due to the low rate of hypertension in the group under 40, the analysis is likely to be unreliable and will not be done. Age as a continuous variable will be used.
Circulatory problems *Do you have circulatory problem?*	3%	2%	3%	These problems are rare before age 45 in women and age 55 in men. After these ages the prevalence rates range between 5% to 12%. Analysis should not be carried out on respondents younger than 40 as their numbers are very low. Age can be controlled by using continuous age variable squared.
Heart Disease *Do you have heart disease?*	4%	5%	4%	Prevalence is very low before age 45 at which point it increases dramatically reaching prevalence rates of 20% in older men and 15% in older women. Analysis should not be carried out on respondents younger than 40 as their numbers are very low.
Diabetes *Do you have diabetes?*	3%	3%	2%	The rates of diabetes increase with age. It is relatively uncommon in respondents under 45 and than increases dramatically. Because so few respondents have diabetes in the younger than 40 group, they will be excluded from the analysis. Prevalence rates for both genders follow similar patterns with age. Age variable will be a dichotomous variable where 45 to 64 and 64 to 98 will be used.
Stomach Ulcers *Do you have stomach ulcers?*	3%	2%	3%	Stomach ulcers increase with age. After 65, the increase is more pronounced. There are likely too few respondents for stratification. Age will be controlled with a continuous age variable.
Digestive Problems *Do you have digestive problems?*	4%	3%	5%	Digestive problems increases with age. The prevalence is relatively low until age 35. For women, there is a dramatic increase at age 35 after which it continues to increase. For men, there is an increase at 35, then a decrease and a gradual increase afterwards. Age will be controlled with a continuous age variable. No stratification analysis is possible due to low sample size.

Health Indicators	Rate*	Rate* Males	Rate* Females	Description of Variable Distributions
Thyroid Problems *Do you have goiter or thyroid problems?*	3%	1%	5%	The prevalence for men reaches a peak between 65 and 74 years old at 2.3%. There are too few men with this problem for a separate gender analysis. The condition clearly increases with age for both genders. After age 50, the prevalence of goiter or thyroid trouble increases dramatically for women. Age will be controlled with a continuous age variable.
Eye problems *Do you have eye problems?*	5%	3%	4%	Eye problems increase gradually with age. It becomes a significant problem after age 45 for women and age 55 for men. About 25% of respondents between ages 75 to 98 report eye problems. Age will be controlled with a continuous age variable squared.
Multiple Health Problems *Respondents who have identified more than two health problems in response to open-ended questions.*	20%	17%	23%	The percentage of males with multiple health problems (more than two health problems) remains low between 15 and 54 years old. After 55 years old, it increases steadily with age so that by ages 85 to 98 years old, 58% of males have multiple health problems. The percentage of females with multiple health problems remains low between 15 and 44 years old. Between 45 and 64 years old, it increases relative to before 45 years old and it increases again after 65 years old and remains high where 61% of females between 85 and 98 have multiple health problems. In examining the relationship between abuse and multiple health problems, analysis for males and females will be conducted separately.
Poor Self-Rated Health *...would you say your health is ... excellent, very good, good, fair or poor?*	9%	8%	10%	Self-Rated Health had 5 categories. A reasonable category was to divide those reporting poorer or fair health and those reporting excellent, very good or good health. Fair or poor self-rated health increases with age for males and females. Few young males rated their health as poor or fair but this increases slowly and steadily with age. At age 55, a sharper increase in fair or poor self-rated health is noted. In general, females report slow and steady increases in rates of poor or fair self-rated health until age 55, where there is a sharper increase. In examining the relationship between abuse and self-rated health, analysis for males and females will be conducted separately.
Pain (preventing some or most activities) *Which of the following sentences best describes the effect of pain or discomfort you usually experience?*	9%	8%	10%	Effects of Pain on Activities had 5 categories ranging from free of pain to pain that prevents most activities. This variable was dichotomized as those having relatively low levels of activity restriction due to pain and those reporting that pain was interfering with their activity level. (1 = Pain prevents some or most of activities; 0 = free of pain and discomfort or pain prevents little activity). Older respondents are more likely to report that pain prevents some or most of their activities than younger respondents. The prevalence of pain steadily increases over time for men. For women, a sharper increase occurs after age 45. This variable can be examined by gender and by ages younger than 40 and 40 and older.

Health Indicators	Rate*	Rate* Males	Rate* Females	Description of Variable Distributions
Disability (due to physical health)	13%	13%	14%	This variable provides a summary measure of a person's decreased ability to function on a daily basis due to a physical health problem. The variable is based on a series of 44 questions inquiring about the degree of disability the respondents were currently experiencing, including limitations in work, school, home, or leisure activities. Women experience a more dramatic increase in disability after age 55. For men, this dramatic increase is after age 65.
High GP Use *Six visits or more to a general practitioner*	19%	15%	22%	Respondents were asked, "How many times did you go to see a general practitioner about your health during the past 12 months?" The majority (79%) of respondents tended to visit less than 6 times a year. The data clearly are skewed to the left. As discussed previously, this violates an assumption for the statistical technique utilized. A commonly used method is to make the boundary at a certain percentile. In the "number of visits to GP" variable, 19% of respondents have six or more appointments with their GP. This variable will then be coded 1= 6 or more visits to GP and 0= less than 6 visits to the GP in the last 12 months. The gender difference in prevalence rates is more pronounced in the younger respondents. After age 55, both genders have similar rates of frequent visits. The tendency to have six or more visits to a general practitioner increases steadily with age. This variable will be analyzed by gender and by age groups (younger than 55 and 55 and older).
High ER Use *two or more visits to the emergency room*	6%	6%	6%	This variable is based on the question, "During the past 12 months, did you use an emergency room at a hospital? How many times? Visiting the emergency room more than once a year is a relatively uncommon experience. Most respondents (92%) report no visits or only one emergency department per year. The data clearly are skewed to the left which violates assumptions for the statistical analysis methods. High emergency room use will be defined as two or more visits to the emergency department. Emergency room use decreases with age for men. For women, it has a U-shaped distribution, where it decreases until age 65 and than increases. Age can be controlled with a continuous age variable.
High Professional Use *25 or more visits to a health professional*	10%	8%	12%	This variable, considered in a 12 month time frame, was the frequency and type of visits to health care professionals. The majority of people (85%) see health professionals between 0 and 25 times a year. The data clearly are skewed to the left which violates assumption for statistical analysis methods. High professional use will be defined as seeing a health professional more than 25 times a year. Utilization of health professional's services increase with age with a plateau between ages 25 to 65 years old for men and ages 25 to 75 years old for women. Separate analyses could be done for men and women.
Demographic Factors				
Sex		49%	51%	Men in this sample tend to be younger than women.

Health Indicators	Rate*	Rate* Males	Rate* Females	Description of Variable Distributions
Age				Younger people are overrepresented in this sample. 52% of the sample is between the ages of 15 to 40 years old and 48% between the ages of 41 to 98 years old.
Marital Status				Most respondents in the sample are currently married (60%), followed by being single (23%). The smallest group is made up of respondents reporting divorce, separation or being widowed (17%). This variable was categorized into 3 groups, 'Married' was the reference group, 'Single' and 'Divorced, Separated or Widowed' were the two other groups. Men are overrepresented in the married or single group and underrepresented in the divorced, separated or widowed groups. In the married group, the middle aged group (31 to 50 years old) is over-represented and in the single group, the younger group is over-represented.
Low Education	30%	30%	30%	The majority of respondents have completed high school. The response for this socio-economic indicator was reasonably complete. Older age groups are over represented in the lower education levels. Having some secondary schooling was considered to be adequately educated in the middle of the 20th century and was probably analogous to a current high school education. Since education is an indicator of socioeconomic status, this reality will be considered in coding the education variable. This variable was coded taking age into account.
Adverse Childhood Experiences				
Low Parental Education	34%	35%	34%	This variable was coded taking the respondent's age into account. Older respondents (31 years old and older) who reported that their parents had some primary school or less were included in the low parental education category. Younger respondents (30 years old or younger) who reported that their parents had some high school or less were included in the low parental education category.
Parental Marital Conflict	23%	20%	25%	Older respondents were less likely to report having had parents with marital conflict.
Lack of close relationship (with parent or adult)	16%	19%	14%	16% of respondents reported lacking a close relationship with a parent or an adult as a child. This variable is fairly evenly distributed among the three age groups.
Parental Psychopathology	33%	30%	35%	Reporting parental psychopathology decreases dramatically with age. Younger respondents (15 to 30 years old) are most likely to report this adversity than middle-aged and older respondents.

Health Indicators	Rate*	Rate* Males	Rate* Females	Description of Variable Distributions
Childhood Abuse	30%	34%	28%	25% reported childhood physical abuse, 9% reported childhood sexual abuse, and 5 % reported both types of abuse. In this sample, childhood sexual abuse is more common in females than males. In general, the three age groups appear to have the same degree of abuse. There appears to be higher number of reports of childhood abuse, especially sexual abuse, in the cohort of individuals born between 1940 and 1959.
School Difficulties	26%	33%	20%	Less respondents in the 65 and older age groups (17%) than in the younger age groups (29%) experienced school difficulties.
Health Risk Behaviors				
Smoking	27%	29%	25%	Smoking is less prevalent among older respondents. This variable has a significant amount of missing data that seems distributed evenly by age and gender. Some recoding was done to retrieve some of those missing values.
Alcohol Problems	11%	18%	4%	Reports of alcohol abuse and dependence decrease with age.
Low Exercise	71%	65%	77%	Estabrooks, Glasgow & Dsewltowski (2003) cite the Surgeon General, the CDC and the American College of Sports Medicine as recommending 30 minutes of moderate activity on most – preferably all days. Respondents with less than 900 minutes (30 minutes per day x 30 days) of exercise per month were classified as being physically inactive. As expected, physical inactivity increases with age. Males are less physically inactive than females.
Obesity	13%	14%	13%	The cut-off score was chosen because a BMI of 30 and over is associated with an increased risk of developing health problems (WHO, 1997). This variable has a significant amount of missing data that seems distributed evenly by age and gender. Middle aged respondents (31 to 50 years old) have higher scores than younger or older respondents. Analysis may be limited with this variable because of the sample size. To increase the cell size, respondents with a score of 29.5 or higher were included as a high score.
More than One Sexual Partner	7%	10%	5%	18% of younger respondents (15-24 yrs), 8% of middle-aged respondents (25-45yrs old) and 1.5% of respondents over 45 report have more than one partner in the last year.

APPENDIX B: CHILDHOOD ABUSE QUESTIONNAIRE IN THE ONTARIO HEALTH SURVEY

The next few questions are about things which may have happened to you as a child. Please mark the circle opposite the appropriate answer, like this ⊗ .

A93a. When you were growing up, how often did any adult do any of the things on this list to you - often, sometimes, rarely, or never?

	Often	Sometimes	Rarely	Never
i) Pushed, grabbed or shoved you	01 ○	02 ○	03 ○	04 ○
ii) Threw something at you	05 ○	06 ○	07 ○	08 ○
iii) Slapped or spanked you	09 ○	10 ○	11 ○	12 ○

A93b. What about this next list? When you were growing up, how often did any adult do any of the things on this list to you - often, sometimes, rarely or never?

	Often	Sometimes	Rarely	Never
i) Kicked, bit or punched you	13 ○	14 ○	15 ○	16 ○
ii) Hit you with something	17 ○	18 ○	19 ○	20 ○
iii) Choked, burned or scalded you	21 ○	22 ○	23 ○	24 ○
iv) Physically attacked you in in some other way	25 ○	26 ○	27 ○	28 ○

If any of the things listed in Question A93b did happen to you, please answer the next two questions. Otherwise, go to Question A93e (on page 3).

A93e. When you were growing up, did any adult ever do <u>any</u> of these things to you against your will?

	Yes	No
i) Exposed themselves to you more than once?	1 ○	2 ○
ii) Threatened to have sex with you?	3 ○	4 ○
iii) Touched the sex parts of your body?	5 ○	6 ○
iv) Tried to have sex with you or sexually attacked you?	7 ○	8 ○

If any of the things listed in Question A93e did happen to you, please answer the next two questions.

APPENDIX C: DESCRIPTION OF LOGISTIC REGRESSION STATISTICAL TECHNIQUE

While logistic regression is very similar to linear regression, it does have some important differences. With a dichotomous outcome variable, we are less interested in predicting the value of a dichotomous outcome (since there are only 2 possible outcomes), then the probability that the outcome will occur. It is useful to think of the goal of analysis as predicting the probability that a case will be categorized into one outcome or the other (Maynard, 1995). If we calculate these probabilities using linear regression, the probability sometimes exceeds 1 or is less than 0. To force the outcome variable to be between 0 and 1, the equation is transformed to the natural log of the outcome variable. Essentially, the logistic regression model predicts the natural log odds of the outcome variable occurring or not. This log can be converted to directly predict the probability of the outcome under study.

The logistic regression parameters include the log odds ratio and the intercept. The intercept measures the log odds of the outcome when all of the explanatory variables in the equation are "0". If the log odds ratio is positive, it measures the increase in odds of the outcome to one unit increase in the value of the explanatory variable If the log odds ratio is negative, it measures the decrease in odds of the outcome to one unit increase in the value of the explanatory variable If log odds ratio is 0, the odds ratio is "1", it means that the explanatory variable has no influence on the outcome variable (Hassard, 1997)

Transforming the outcome variable to the natural log prevents violations of assumptions. Maynard (1995) explains that when the outcome variable is dichotomous in a linear regression, a number of assumptions underlying linear regression are violated. These are heteroscedasticity (error variance not being constant over all cases), the distribution of error terms do not follow a normal distribution, and there are often systemic patterns in the error terms depending on the value of the independent variable. These assumption violations can be dealt with a dependent variable that is the natural log of the odds of Y occurring or not.

Another difference between linear and logistic regression is that in logistic regression, maximum likelihood techniques are used to find the best set of parameters to give the

best log-likelihood function. Likelihood techniques are iterative processes, where a set of parameters is fit to the model, and compared to another set of parameters. This process is repeated until the solution has converged, when changing the parameters bring negligible improvements to the likelihood function. In linear regression, a set of formulas is calculated using the data (Maynard, 1995).

Evaluating a logistic regression has similarities with evaluating a linear regression model (Maynard, 1995). The linear model is based on the sum of squares whereas the logistic regression model is based on the log-likelihood function (Maynard, 1995). This log-likelihood function indicates how likely it is to observe the values of Y given the values of the independent variables and the parameters. In statistical models, the log-likelihood is multiplied by –2 so that is follows a distribution similar to that of the Chi squared distribution. The intercept or initial –2 log-likelihood (denoted at Do) is a value calculated by statistical packages and represents the prediction of the model if there were no independent variables. It is analogous to the total sum of squares in the linear regression model. The deviation of the chi squared (denoted as Dm) is similar to the error sum of squares where large values represent worse prediction. It therefore indicates how poorly the model predicts outcomes. The statistic that is tested is the model Chi squared which is the difference between Do and Dm. If the model chi squared is statistically significant then the null hypothesis is rejected (Maynard, 1995).

Model success is determined by the size of the model error and by changes in the model error. These are expressed by Chi squared values. If it is a good model, then it will indicate a high probability for cases that have the outcome and a low probability for cases that do not have the outcome. For a model to be deemed as a good one, Chi squared values should be low (Hassard, 1997). Another way of evaluating the model is by noting the R squared which represents "a proportional reduction in chi squared or a proportional reduction in the absolute value of the log-likelihood measure" (p.22 , Maynard, 1995). It is analogous to the R square in linear regression where a larger R square indicates a better model.

It is important to check that the assumptions of the logistic regression are not violated as this could result in biased coefficients, inefficient estimates or invalid statistical inferences (Maynard, 1995). Regression diagnostics will be conducted to check for nonlinearity, nonadditivity, collinearity and outliers.

APPENDIX D: EFFECT OF ANALYTIC METHOD ON MULTIVARIATE LOGISTIC REGRESSION (GOEL, 1993)

Variable[1]	Method	OR	95% CI
Language	No Weights	0.26	(0.20, 0,34)
	Analytic Weight	0.19	(0.15, 0.24)
	Analytic Weights & DEFF	0.19	(0.12, 0.32)
	SUDAAN	0.20	(0.14, 0.30)
Education	No Weights	1.65	(1.40, 1.94)
	Analytic Weights	1.84	(1.57, 2.16)
	Analytic Weights & DEFF	1.84	(1.28, 2.63)
	SUDAAN	1.86	(1.47, 2.36)
Sexual Activity	No Weights	18.17	(14.78, 22.34)
	Analytic Weights	18.00	(14.88, 21.77)
	Analytic Weights & DEFF	18.00	(12.99, 24.93)
	SUDAAN	17.61	(12.90, 24.05)

[1] Model includes age, health professional contacts, immigration, work status, income, smoking, drinking and child bearing as well as other variables in table.