DETERMINANTS OF CHILD PROTECTION FROM EXPOSURE TO ENVIRONMENTAL TOBACCO SMOKE IN THE HOME

by

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Abstract

Exposure to environmental tobacco smoke (ETS) has a considerable negative impact on the health of children, and has been causally associated with chronic bronchitis and pneumonia, chronic ear infection due to the build up of fluid in the middle ear and the exacerbation and induction of asthma. The most important source of exposure to ETS for children is the home, and significant reductions in exposure to ETS can result from restricting smoking in the home. Several controlled trials of interventions designed to encourage smokers living with children to adopt smoking restrictions in their households or to stop smoking altogether have been published, but have shown limited success. In the future, interventions involving the entire household unit may be more effective, and an essential foundation on which to build such interventions will include knowledge of the characteristics of households with varying levels of household smoking restriction. The objectives of this study were twofold: 1) to examine the relationship between household socio-demographic variables and the level of smoking restriction in households that include both adult smokers and children under the age of 18 years, and 2) to examine this relationship utilizing ordinal and nominal regression methods to contribute to the understanding of the nature of the progression from a low level of smoking restriction to a high level of smoking restriction in the home. These objectives were met by performing a secondary analysis of data previously collected as part of the ETS in the Home National Survey. The results of this analysis indicated that the odds of having a high level of smoking restriction in the home were significantly lower for families residing in apartments and/or condominiums compared to single detached homes, families residing in Quebec compared to Ontario, and households with older children. The odds for having a high level of household smoking restriction were significantly higher for households residing in British Columbia compared to Ontario. These results were consistent in direction and magnitude with results of similar studies reported previously in the literature.

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List of Abbreviations and Acronyms

CATI	computer assisted telephone interview
CDC	Centers for Disease Control and Prevention
CEPA	California Environmental Protection Agency
CI	confidence interval
CINAHL	Canadian Index of Nursing and Allied Health Literature
CTUMS	Canadian Tobacco Use Monitoring Survey
df	degree(s) of freedom
ETS	environmental tobacco smoke
ISR	Institute of Social Research
NCIC	National Cancer Institute of Canada
NHANES III	Third National Health and Nutrition Examination Survey
NHIS	National Health Interview Survey
NPHS	National Population Health Survey
OR	odds ratio
OTRU	Ontario Tobacco Research Unit
SHS	second-hand smoke
USEPA	United States Environmental Protection Agency

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Chapter 1 : Introduction

Since the early 1950s, when Sir Richard Doll and A. Bradford Hill made the link between cigarette smoking and lung cancer, tobacco use has been recognized by the health care community as a significant health risk (Doll and Hill, 1950, 1952). Today, tobacco use is the leading cause of preventable death in Canada and was responsible for 47,581 deaths in this country in 1998 (Makomaski Illing and Kaiserman, 2004). In 2002, the Canadian Tobacco Use Monitoring Survey (CTUMS) indicated that 21% of Canadians 15 years of age and older chose to put themselves at risk by smoking cigarettes (Health Canada, 2002). Despite this being the lowest level since regular monitoring of smoking prevalence began in 1965 (Health Canada, 2002), it becomes alarming when considering that it is not only these 21% of Canadians that are being put at risk. Non-smokers can also be put at risk through exposure to environmental tobacco smoke (ETS).

ETS, also known as second-hand smoke, has two components: the smoke given off by a cigarette as it burns, and the smoke that is given off when a smoker exhales. Although ETS is more dilute than the mainstream smoke that is inhaled by smokers, it is chemically similar and contains many of the same carcinogens and toxins. As many as 4,000 chemicals have been detected in cigarette smoke, and at least 60 of these have been found to cause cancer in humans (USEPA, 1992). ETS has long been regarded as nothing more than an irritant to non-smokers, however recent research has challenged this notion, and in 1992 the United States Environmental Protection Agency (USEPA) published a landmark report on the respiratory effects of ETS that established it as a significant health risk for both adults and children (USEPA, 1992). For children, the USEPA concluded that exposure to ETS is causally associated with an increased risk of: lower respiratory tract infections such as bronchitis and pneumonia, chronic ear infection caused by the build-up of fluid in the middle ear, and exacerbation of existing

asthmatic symptoms, and is a risk factor for developing asthma in children who have not yet shown symptoms of the disease (USEPA, 1992).

The most important source of ETS exposure for children is the home (Ashley and Ferrence, 1998). In Canada, population-based estimates indicate that as many as 1.6 million children under the age of 18 years are exposed to ETS in their homes (Health Canada, 2000). While no Canadian data is available on the intensity of this exposure, data from the United States estimates that 14.5% of American children who reside in homes with smokers are exposed to the ETS from more than 20 cigarettes per day (Gergen et al., 1998).

To protect the public from exposure to other people's cigarette smoke federal, provincial and municipal governments have moved toward increasing restrictions on where smokers are permitted to light up. These include smoking bans in government buildings and public-use areas such as shopping malls, schools and recreation facilities. As the number of places where smoking is permitted decreases, smokers who wish to indulge in their habit are increasingly forced to do so at home. Private homes remain outside the scope of smoking regulations, and currently there is no legislation in Canada to protect children from ETS in their own homes. Although many laws, such as those prohibiting physical and sexual abuse, exist to protect children, there is much resistance to banning smoking in the home as it is considered to be an invasion of privacy (Ashley and Ferrence, 1998). As a result, it is up to members of households with children to decide how to best protect the children who reside in the home from exposure to ETS. In the absence of legislation to protect children, it is important to have a better understanding of the factors that are associated with household smoking bans, which will provide the foundation for the future development of interventions directed at increasing the number of smoke-free homes.

This study will contribute to that understanding by examining data obtained from the ETS in the Home National Survey to quantitatively examine the relationship between household socio-demographic characteristics and the level of smoking restriction that exists in households that include at least one smoker and at least one child under the age of 18 years. In addition, the nature of the level of smoking restriction in the home as a hierarchy of stages will be explored utilizing various statistical analysis techniques. The results of this analysis will provide valuable information about the determinants of protecting children from exposure to ETS at the household level for different stages in the progression to a smoke-free home.

Chapter 2 : Literature Review

Introduction

This chapter will provide background information to the study and place it within the context of the existing literature. First, the health effects of exposure to ETS in children will be briefly discussed, utilizing data from major reports, systematic reviews and meta-analyses. Following this, data from population-based surveys in Canada and elsewhere will be used to describe current trends in children's exposure to ETS in the home. Attitudes toward reducing and restricting exposure, along with changes and trends in the social climate toward exposure to ETS will also be discussed. Then, interventions to reduce children's exposure to ETS will be discussed along with an evaluation of their effectiveness. This will be followed a comprehensive review of previous studies examining the factors associated with restricting smoking inside the home. This will include a description of the characteristics of the studies such as the methodologies used, populations studied and findings, as well as a synthesis of what is known about the issue and what gaps in knowledge remain. The final section of the chapter will present the study objectives and a conceptual framework for the study.

Health Effects of Exposure to ETS in Children

The health effects of exposure to ETS in children have been studied extensively, both by independent researchers and government agencies interested in formulating policy to protect children. This has resulted in a considerable body of literature on the subject, and numerous reports, systematic reviews and meta-analyses are available.

Landmark reports published by the United States Environmental Protection Agency (USEPA, 1992) and the California Environmental Protection Agency (CEPA, 1997), have

concluded that exposure to ETS is causally associated with substantial morbidity and mortality in children. These conditions include: lower respiratory tract infections such as bronchitis and pneumonia, chronic ear infection caused by the build-up of fluid in the middle ear, exacerbation of existing asthmatic symptoms and the development of asthma in children who have not yet shown symptoms of the disease (USEPA, 1992; CEPA, 1997). Infants and young children up to the age of three years are at the highest risk for developing infections such as bronchitis and pneumonia as a result of exposure to ETS (DiFranza and Lew, 1996; USEPA 1992). Population attributable risk estimates for the United States indicate that ETS exposure is responsible for 150,000 to 300,000 cases of lower respiratory tract infection, resulting in approximately 7,500 to 15,000 hospitalizations and approximately 136 to 212 deaths in infants and toddlers under the age of 18 months (USEPA, 1992; CEPA, 1997). DiFranza and Lew (1996) provide population attributable risk estimates for children up to five years of age; the most conservative of these suggest that 260,000 cases of bronchitis and 115,000 cases of pneumonia can be attributed to ETS exposure in this population. Chronic ear infections due to the build up of fluid in the middle ear are the most common reason for hospitalization of young children for an operation (USEPA, 1992) and children under the age of 18 years in the United States suffer approximately 17 million ear infections per year (DiFranza and Lew, 1996). Approximately 2 to 13% of these can be attributed to exposure to ETS; this equates to 354,000 to 2,200,000 cases per year in the United States (DiFranza and Lew, 1996). Among the 2 to 5 million children who have been previously diagnosed with asthma, symptoms of the disease are exacerbated as a result of exposure to ETS in approximately 20% (USEPA, 1992), and is responsible for 529,000 physician office visits per year in children under 14 years of age in the United States (DiFranza and Lew, 1996).

Clearly, these data show that exposure to ETS has a considerable negative impact on the health of children, and this impact is notable from a public health perspective. This provides a rationale to work toward the goal of eliminating exposure to ETS in children.

Exposure to ETS in the Home

The most important source of exposure to ETS for children is the home (Ashley and Ferrence, 1998). An integral component of a strategy to protect children from the harmful effects of exposure to ETS is to eliminate or reduce sources of ETS exposure in homes where children reside. Evidence from the published scientific literature supports this strategy. Cotinine is a metabolite of nicotine present in bodily fluids such as urine, saliva and blood that is often used by researchers as a biological indicator of ETS exposure. The level of cotinine in biological samples is indicative of the level of exposure to ETS. Higher cotinine levels indicate higher levels of exposure, while lower levels indicate lower levels of exposure. Jarvis and colleagues (1992) discovered a stepwise increase in cotinine levels with a decreasing level of smoking restriction. In a study of children with asthma, cotinine levels were statistically significantly higher in children from homes where exceptions to a total ban on smoking indoors were allowed compared to those for children where no such exceptions were allowed (Wakefield et al., 2000). Al-Delaimy and colleagues (2001) reported that the hair nicotine levels for children who lived with smokers or had visitors who smoked were statistically significantly higher than those for children who did not live with smokers or did not have visitors who smoked. This evidence demonstrates that restricting smoking inside the home can result in reduced exposure to ETS for children, and as such, should be promoted.

There are several population-based surveys of health indicators in the Canadian population. Of these, the National Population Health Survey (NPHS) and the Canadian Tobacco Use Monitoring Survey (CTUMS) include questions regarding exposure to ETS in the home. The NPHS is a biennial, longitudinal, household-based survey conducted by Statistics Canada. The CTUMS is conducted by Health Canada and is an annual survey designed to monitor changes in the smoking behaviour of Canadians. The most recent data available from CTUMS indicates that regular smoking occurs in 21% of Canadian homes with children under the age of 12 years, representing approximately

800,000 children who are regularly exposed to ETS in their homes (Health Canada, 2001). This statistic does not include children between the ages of 12 and 17 years, but data from the 2000 CTUMS suggests that approximately 760,000 children in this age group are regularly exposed to ETS at home (Health Canada, 2000). Combining these figures indicates that 1.56 million Canadian children under the age of 18 years are at risk for adverse health effects as a result of exposure to ETS in their homes.

Examining NPHS data and CTUMS data together allows us to evaluate the trends in exposure to ETS in the home and these trends indicate that exposure to ETS in Canadian homes is declining. In 1996/97, an estimated 33% of Canadian households including children under the age of 12 allowed smoking inside the home. The percentage of households where children were exposed to ETS varied widely by province, with exposure being lowest in British Columbia, Ontario and Alberta, and highest in Newfoundland and Labrador, Prince Edward Island and Quebec (Statistics Canada, 1997). In 2000, the percentage of homes where children under 12 years of age were exposed to ETS dropped to 25%, with a decrease occurring in every province. British Columbia, Ontario and Alberta maintained below average levels of exposure, while Quebec and Newfoundland and Labrador remained at the highest levels of exposure, joined in that year by Saskatchewan (Health Canada, 2000). The 2001 CTUMS saw the percentage of homes where children under 12 were exposed to ETS drop to 21%, again decreasing in every province. In that year, British Columbia, Ontario and Alberta again maintained below average levels of exposure, while exposure was once more highest in Quebec. The greatest declines between 2000 and 2001 occurred in Prince Edward Island, Nova Scotia, and Newfoundland and Labrador (Health Canada, 2001).

Several population-based, random digit dialled studies designed to measure health indicators in the general, non-institutionalized population in the United States have also included questions about smoking behaviours in the home. Data from the Third

National Health and Nutrition Examination Survey (NHANES III), conducted from 1988-1994, indicated that 43% of American children resided with at least one adult smoker. Of these, 14.5% resided in homes where more than 20 cigarettes were smoked per day (Gergen et al., 1998; Hovell et al., 2000). In 1997, the Centers for Disease Control and Prevention (CDC) estimated that approximately 15 million children were exposed to ETS in their homes (CDC, 1997).

Studies in other developed countries also suggest that the number of smoke-free homes is rising. In the United Kingdom, a longitudinal survey of children aged 11 to 15 years indicated that the percentage of children living in non-smoking households rose from 48% in 1988 to 57% in 1994 with a small decline to 55% in 1996 (Jarvis et al., 2000). Results from longitudinal surveys of the population of Victoria, Australia suggest that from 1989 to 1996 the number of smokers who said they do not smoke at all when children were present increased from 14% to 33% (Borland et al., 1999).

Attitudes, Beliefs and Knowledge Regarding Exposure to ETS

An integral component of a strategy to reduce children's exposure to ETS is increasing awareness of the harmful effects of exposure in addition to changing the attitudes and beliefs of parents and caregivers regarding exposure to ETS. In Canada, there have been very few studies examining the knowledge, attitudes and beliefs of household members with children. This section will review the literature regarding knowledge, beliefs and attitudes with regard to ETS with a particular focus on Canadian data.

In 1995, a survey of 3000 parents and extended family members of children aged 12 years and younger was commissioned by Health Canada to examine the knowledge, beliefs and attitudes of respondents with regard to ETS (Health Canada, 1995). To determine the extent of knowledge regarding the health impacts of exposure to ETS, respondents were asked to name, unaided, health impacts due to exposure to second-

hand smoke (SHS, an alternative but equivalent term for ETS). When respondents were questioned in this manner, awareness of specific health consequences was low - lung cancer was the only health impact reported by a majority of respondents. When respondents were presented with a list of illnesses and asked whether SHS is a cause of each, a majority indicated that lung cancer, bronchial problems or bronchitis, asthma in children, emphysema (an illness which has not been associated with exposure to ETS) and heart disease are "definitely caused by" exposure to SHS. With regard to beliefs about ETS, results from this survey indicated that parents and other family members strongly believed that children are at greater risk of health problems due to exposure to ETS than adults; 75% of respondents expressed this view (Health Canada, 1995). In addition, 83% of respondents believed that children do not need to be exposed to ETS for long periods of time before it affects their health. With regard to attitudes toward exposure to ETS in general, 87% of respondents answered "Yes" to the statement "People should have a right to be free from breathing other people's second-hand smoke" and 72% strongly supported banning smoking in all indoor public places.

Population-based telephone surveys in the province of Ontario, conducted in 1992, 1993, 1995 and 1996 support these findings. In addition, because the Ontario surveys were longitudinal in nature, trends in the data can also be identified and examined. Results suggest that attitudes toward parental smoking in the home when children are present shifted significantly over the 5-year period covered by the surveys. The percentage of respondents who indicated that they agreed with the statement "parents spending time with young children should not smoke at all inside the home" increased from 50.6% in 1992 to 69.5% in 1996 among all respondents, and from 16.7% to 42.6% among smoking respondents (Ashley et al., 1998).

While these data show that attitudes regarding exposure to ETS are changing to reflect new knowledge regarding the dangers associated with ETS exposure, the same surveys report that these attitudes are not reflected in the actions that household members take

to protect children. Data from the Health Canada survey indicate that, in 1995, while a large majority (87%) of respondents believed that people have the right not to be exposed to other people's cigarette smoke, only 19% of households participating in the survey were smoke-free (Health Canada, 1995). Similarly, in Ontario in 1996, 19.8% of households with at least one daily smoker and at least one child under the age of 18 years banned smoking inside the home, despite the finding that 42.6% of smoking respondents believed that parents spending time with young children should not smoke at all inside the home (Ashley et al., 1998). These results suggest that, while attitudes toward exposing children to ETS in the home may be shifting, households require assistance in acting on those attitudes and beliefs.

Interventions to Reduce Children's Exposure to ETS

Currently, private homes are not included in government regulations establishing smoke-free spaces. In the absence of legislation to protect children, research has focused on developing interventions to decrease children's exposure to ETS in their own homes by encouraging smokers living with children to adopt restrictions or to stop smoking altogether.

Several controlled trials of interventions involving smoking participants who reside in households with children under the age of 18 years have been published in the time period between 1990 and 2003. A search of PubMed, Medline, PsycINFO and the Canadian Index of Nursing and Allied Health Literature (CINAHL) generated 15 such studies. Of these, 13 were original trials of interventions to reduce exposure to ETS in the home (Chilmonczyk et al., 1992; Emmons et al., 2001; Eriksen, Sorum and Bruusgaard, 1996; Greenberg et al., 1994; Groner et al., 2000; Hovell et al., 1994, 2000, 2002; Irvine et al., 1999; McIntosh, Clark and Howatt, 1994; Wakefield et al., 2002; Wall et al., 1995; Wilson et al., 2001), and two were follow-up reports to previously published studies (Severson et al., 1997 followed Wall et al., 1995; Wahlgren et al., 1997 followed

Hovell et al., 1994). There was significant variation in populations studied, methodologies used and outcome measures reported among the studies.

Five of the studies showed evidence of an intervention effect (Emmons et al., 2001; Hovell et al., 1994, 2000, 2002; Wall et al., 1995). Emmons and colleagues (2001) found a significant decrease in air nicotine levels in households that received a 30-45 minute motivational interviewing session in addition to four follow-up telephone calls when compared to control households that were mailed a smoking cessation manual, passive smoke reduction tip sheet and resource guide. Hovell and colleagues (1994) reported a significant decrease in exposure to ETS (measured by the number of cigarettes smoked per day in the home by the parents on weekdays) in the intervention group receiving behaviour modification counselling sessions, compared to a monitoring control group (who were monitored in the same way as the intervention group, but did not receive counselling sessions) and a usual care control group (who were monitored only at baseline and follow-up and did not receive counselling sessions). This result, however, was not sustained when participants in this study were recontacted in 1996, two years after the intervention was withdrawn. The monitoring and usual care control groups experienced decreased exposure to ETS, while exposure levels in the intervention group remained steady (Wahlgren et al., 1997). Another study by Hovell and colleagues (2000) reported a significant decline in exposure to ETS as measured by the number of cigarettes smoked by parents while in the same room as the child, in the group receiving seven counselling sessions (three in person, four by telephone) over 3 months compared to a control group that received brief advice to quit smoking and to not expose children to ETS. A third study by Hovell and colleagues (2002), building on the success of the previous study, reported a significant decline in asthmatic children's exposure to ETS in an intervention group receiving seven in-home coaching sessions compared to those in the control group, which received only asthma management education. Finally, Wall and colleagues (1995) reported a significant increase in smoking cessation among new mothers who received brochures about the health effects

of exposure to ETS along with brief advice and encouragement at each well baby visit (2 week, 2, 4, and 6 months postpartum) compared to the control group, which received only the brochures.

The studies used a variety of intervention strategies, represented by three major themes: 1) brief advice and self-help materials, 2) tailored feedback and self-help materials, and 3) behavioural counselling. Three studies investigated the effectiveness of brief advice, often provided at well baby/well child or outpatient clinic visits (Eriksen, Sorum and Bruusgaard, 1996; Irvine et al., 1999; Wall et al., 1995). Participants in the intervention group in these studies were advised of the health effects of exposure to ETS in children and strategies to reduce exposure. Advice was accompanied by brochures and self-help manuals designed to encourage participants to follow the advice provided in the intervention. In one study, participants were also provided with stickers and signage to assist them in establishing a smoke free home (Wall et al., 1995). Of the three studies of this type, only one (Wall et al., 1995) reported evidence of reduced exposure to ETS in the intervention group that could be attributed to the intervention.

Tailored feedback and self-help materials were used in three studies (Chilmonczyk et al., 1992; McIntosh, Clark and Howatt, 1994; Wakefield et al., 2002). In these interventions, feedback was provided to participants (who were often the parents of the child) about the level of exposure to ETS detected in the child by biochemical markers of nicotine metabolism. Feedback was provided in a personalized letter signed by the child's physician, advising the parents of the child's exposure level, how this level compared to children who were not exposed to ETS, the harmful effects of exposure to ETS in children, and recommendations for reducing the child's exposure. None of the studies of this type produced significantly lower levels of ETS exposure in the intervention group compared to the control group.

The third major type of intervention compared behavioural counselling sessions to usual care control groups; six of the studies were of this type (Greenberg et al., 1994; Groner et al., 2000; Hovell et al., 1994, 2000, 2002; Wilson et al., 2001). The number of sessions offered to participants ranged from one to seven, and were provided by various persons, including physicians, nurses and trained research assistants. Sessions used behaviour modification strategies such as shaping, goal setting and contingency contracting with the goal of increasing the participants' capacity to change their behaviour. Successful studies in this category were the three studies by Hovell and colleagues (1994, 2000, 2002). The study conducted by Emmons and colleagues (2001) could not be classified into the three major types. It used a motivational interviewing technique, which is focused on building motivation in the participant to change his or her behaviour (Emmons et al., 2001), in contrast to counselling strategies used in other studies, which focus on building skills for behaviour change. This study reported a significant decline in exposure to ETS in the intervention group when compared to the control group.

The most successful intervention strategy was behavioural counselling, with three studies of this type reporting reduced exposure to ETS (Hovell et al., 1994, 2000, 2002), followed by brief advice and self-help materials with one successful study (Wall et al., 1995) and the motivational interviewing study by Emmons and colleagues (2001). These results suggest that counselling sessions offering participants assistance in developing the skills or motivation needed to change their behaviour may be more effective than simply providing advice. This finding is, however, based on a small number of studies, indicating the relative scarcity of investigation in this area considering the serious consequences of exposure to ETS in children, a finding echoed by other researchers in the field (Emmons et al, 2000) More research is required in this area to: 1) further investigate the effectiveness of various types of intervention strategies, and 2) identify successful intervention strategies.

An intervention strategy that has not been adequately explored in the literature is one that includes all household members in the intervention, whether it is brief advice or behavioural counselling. Many intervention studies chose an "index" or "target" parent, who was the main participant in the intervention activities. This parent was often the mother of the child or another female caregiver. It is expected that, in households where more than one member smokes (particularly in those where smoking members are not a parent to the child), it will be difficult to reduce the child's exposure to ETS if only one smoker in the household is encouraged to change his or her smoking behaviour. Behaviour change researchers have expressed the need for more interventions that extend beyond the individual level and focus on the environment to which the individual belongs, particularly in the area of tobacco use (Ory, Jordan and Bazzarre, 2002). Further research can be profitably conducted in this area to develop interventions that involve all members of the household, allow all members to increase their awareness of the risks of exposure to ETS and build the skills necessary to change their smoking behaviour to protect the children that reside in the household. An essential foundation on which to build such interventions will include knowledge of the characteristics of households with varying levels of household smoking restrictions, so that future interventions can be tailored to the households that need them most.

Factors Associated with Household Smoking Restrictions

The purpose of this section is to review studies previously conducted to determine the factors associated with household smoking restriction, and to identify: 1) factors that have been found to be associated with household smoking bans in at least one previous study, and 2) gaps in knowledge that exist in the literature. Research databases PubMed, Medline and CINAHL as well as the National Clearinghouse on Tobacco and Health and Health Canada websites were searched using the terms "environmental tobacco smoke" or "second-hand smoke", and "children" or "infants" or "adolescents".

No Canadian studies could be located in the peer-reviewed literature; however the 1995 Health Canada study mentioned previously included questions regarding the status of smoking restrictions in the home (Health Canada, 1995). Findings indicated that among smoking parents, those who smoked only outside the home were more likely to be highly educated, have higher incomes, be older, and to come from non-smoking households compared to those who smoked inside the home. Respondents who reported having a partial smoking ban in place (limited smoking to one room of the home, opened windows while smoking) were more likely to be smokers or to live with a smoker and less likely to be bothered by smoke compared to those who smoked only outside the home.

Much of the research that has been performed regarding ETS and smoking restrictions in the home has taken place in the United States, Europe and Australia. In the United States, a national, population-based, cross-sectional telephone survey of self-reported smoking behaviours in American homes suggests that smoking inside the home is less likely in homes: a) with younger children; b) in which at least two adults reside; c) where parents have a higher educational level; d) with higher annual family income and e) located in the Western part of the country as compared to the Southern part of the country (Schuster et al., 2002). Similar findings were obtained from the NHANES III survey, which indicated that the age, race and education level of the respondent adult, the number of rooms in the home and the number of cigarettes smoked in the home to be predictors of cotinine concentrations in the children residing with the respondent (Mannino et al., 2001).

Population-based surveys have also been performed in various states of the United States. The state of California has a comprehensive tobacco control strategy in place, and monitoring efforts associated with the strategy include periodical population-based telephone surveys that include questions regarding smoking behaviour in the home. Results from the 1996 survey suggested that smokers residing in households that did

not include children or non-smoking adults were the least likely to have smoke-free homes. The likelihood of having a smoke-free home increased with the addition of a child, a non-smoking adult, and both a child and a non-smoking adult, respectively (Gilpin et al., 1999). Norman and colleagues (1999) analyzed population-based survey data from the Independent Evaluation of the California Tobacco Control, Prevention and Education Program collected from 1996 to 1997 and found similar results: being a non-smoker, having children in the home and having higher household income were found to be associated with having smoking bans in the home and car. In addition, the results of this survey revealed that the smoking habits of friends were also a factor in establishing rules for smoking in Californian homes. Respondents were more likely to report restricting smoking in their homes if they had "no" or "few" friends who smoked, compared to those who answered that "half" to "most" of their friends smoked. The influence of friends, however, was not as powerful as the influence of children: smokers who lived with children and who reported that "most" of their friends were smokers were more likely than those who reported "most" of their friends were smokers but did not live with children to have complete smoking bans inside the home (Norman et al., 1999).

The presence of children in the home has also been found to be an important factor in establishing rules for smoking in the home in Oregon. Results from a state-wide population-based telephone survey found that complete or partial smoking bans in households that included at least one smoker were associated with the presence of children in the home (Pizacani et al., 2003). An additional study in Massachusetts revealed that the number of hours children were exposed to ETS at home was strongly associated with the number of adult smokers in the household (Biener et al., 1997).

Population-based research in other developed countries lends support to these findings. A representative sample of residents in the city of Espoo, Finland was surveyed regarding smoking behaviour in the home. The results again revealed that the age of

the children residing in the home was associated with the level of smoking restriction in the home. Children exposed to ETS in the home on a regular basis were, on average, 3.9 years older than those who were not exposed, which was a statistically significant difference. Interestingly, the proportion of smoking mothers was significantly higher in the group of children who were regularly exposed to ETS, while no difference existed between the proportion of smoking fathers of children who were and were not exposed to ETS at home, suggesting that the gender of the smoking parent may be an important factor (Jaakkola et al., 1994). A series of population-based surveys in the city of Victoria, Australia examining the trends in home smoking restrictions performed yearly from 1989 to 1997 confirmed that the presence of children in the home is a predictor of the level of smoking restriction in the home. In these surveys, the odds of smoking only outdoors for households including smokers and children were 1.6 times higher than those for households that included smokers but not children (Borland et al., 1999).

A number of studies have attempted to determine the household and individual factors that predict the level of exposure to ETS in children as measured by cotinine concentrations in the urine, saliva and blood. With increasing regulations restricting smoking in public places the greatest source of exposure to ETS for children is the home, and increasing smoking restrictions in the home are reflected in lower cotinine concentrations and other biochemical measurements of exposure to ETS (Al-Delaimy, Crane and Woodward, 2000; Jarvis et al., 1992; Wakefield et al., 2001). Thus, factors associated with cotinine concentrations can also be a reflection of factors associated with household smoking restrictions reported in a questionnaire.

Cook and colleagues (1994) examined the factors associated with cotinine concentrations in schoolchildren aged 5 to 7 years in England. This study revealed that children's cotinine concentrations increased 13.7 fold in households where both parents smoked compared to households where none of the parents smoked, indicating that parental smoking status is an important predictor of children's exposure to ETS in this age group. In addition, cotinine concentrations were 8 to 9 times higher among children

of the lowest social classes compared to the highest social class, suggesting that socio-economic status may be a predictor of exposure to ETS in children. Similar results have been found in two separate investigations in Italy. Dell'Orco and colleagues (1995) found that the most important predictor of urinary cotinine concentration in children was the presence of a parent who smoked, followed by the extent of crowding in the household and the education level of the father. Ronchetti and colleagues (1994) discovered that the smoking habit of the parents and, for older children, the child, were independently associated with cotinine concentrations in the child. Cotinine levels in children studied in Cape Town, South Africa could be predicted most significantly by the smoking status of the child's mother, but also by the number of other smokers in the household, the smoking status of the father, and the prevalence of smoking in the community (Jordaan et al., 1999). Similarly, Preston and colleagues (2001) found that among children aged 2 to 12 years in Puerto Rico, the number of sources of exposure to ETS, along with the child's age and the mother's level of education were independently associated with urinary cotinine concentrations.

Another factor that has been found to predict cotinine concentrations in children is climate. In Italy, Ronchetti and colleagues (1994) found that during the spring season cotinine concentrations were greatly reduced among non-smoking children who lived with smoking parents, indicating that cold weather may deter parents from smoking outside the home, even if children are present. The day of the week on which the cotinine sample was taken was also found to be a predictor of the cotinine level in children in another Italian study (Dell'Orco et al., 1995). Cotinine levels in this study were highest on Monday, suggesting that exposure to ETS in the home is greatest on the weekend when all family members typically spend more time in the home. These results are supported by the work of Jarvis and colleagues (1992), who studied a population of children in Edinburgh, Scotland and discovered a seasonal variation in cotinine levels, along with an effect associated with the day of the week that the sample was taken.

Another focus for research in this area concentrates on specific populations of children, such as those who have existing respiratory ailments such as asthma, or those who are part of a disadvantaged or minority group who may be at higher risk of being exposed to ETS. Asthmatic children have often been studied due to the causal association between ETS exposure and asthma exacerbation and induction, and the belief that parents and caregivers of asthmatic children may take more drastic measures to protect their children from the harmful effects of exposure to ETS as a result of the child's illness.

The age of the child has been found to be an important predictor of ETS exposure in asthmatic children, which is similar to findings for non-asthmatic children. Younger children were found to have higher measurements of cotinine in their bodily fluids than older children, presumably because younger children spend more time inside the home with their parents (Wakefield et al., 2000; Irvine et al., 1997).

Also, the smoking habits of parents and other adults in the household have been found to play a role in asthmatic children's exposure to ETS. For example, data from a sample of asthmatic children aged 2 through 12 years from smoking homes revealed that a number of smoking related variables such as the amount smoked by the parents in the home, the frequency of smoking in same room as child and the amount of contact the child had with other smokers were independently associated with exposure to ETS (Irvine et al., 1997). In addition to these variables, baseline data from a randomized controlled trial designed to reduce exposure to ETS in children with asthma found that parental reporting of smoking restriction and the total number of cigarettes smoked indoors per day predicted cotinine concentrations in study participants (Wong et al., 2002). Also, Wakefield and colleagues (2000) have reported that higher daily levels of cigarette consumption by parents, the presence of smokers other than the parents in the household and fewer restrictions on smoking in the home and car were predictors of increased cotinine levels in asthmatic children. These findings demonstrate that, for

asthmatic children, it is not only the presence or absence of smoking in the home, but how and where this smoking takes place that determines children's level of exposure to ETS. It is possible that these variables are more important in homes with asthmatic children since parents may be more aware of their smoking habit and its effect on their children.

Minority and inner city children have also been the focus of research. Interestingly, research conducted with minority and inner-city children has been one of the only areas in which attitudes and beliefs about smoking in the home and the smoker's readiness to quit have been examined for their association with children's exposure to ETS. In a study of rural, low-income Native American and white families in north-eastern Oklahoma, Kegler and colleagues (2002) found that the belief that ETS harms children and babies and the number of attempts to quit smoking made by the respondent in the past year were associated with having a complete smoking ban in place in the home. In addition, Okah and colleagues (2002), who studied inner city children in the United States, discovered that smokers with children who were in the preparatory stage of quitting smoking were more likely than those in the precontemplation or contemplation stages to report having smoking restrictions in their homes. These findings suggest that low-income or minority smokers who have children can be enticed to restrict smoking in their homes to protect children from ETS if they can be convinced that exposure to ETS may be harming their children, and that enticing this group of smokers to quit may result in a decrease in their children's exposure to ETS.

Summary

In recent years, exposure to ETS has been found to have a negative impact on the health of children, and has been causally associated with chronic bronchitis and pneumonia, chronic ear infections due to the build up of fluid in the middle ear and the induction and exacerbation of asthma. Exposure to ETS is clearly harmful to children, and should be reduced as much as possible, or ideally, eliminated. The most important source of

exposure to ETS for children is the home, and significant reductions in exposure to ETS can result from restricting smoking in the home. Recent Canadian data indicates that while the number of children exposed to ETS on a regular basis in their homes is decreasing, 1.56 million children under the age of 18 years are still exposed to ETS at home. Similar trends with regard to children's exposure to ETS in the home have been found in other developed countries such as the United States, Australia and the United Kingdom. In addition, despite changes in attitudes and beliefs regarding exposure to ETS, many Canadian families are not changing their smoking behaviours to reflect these attitudes and beliefs. Several controlled trials of interventions designed to encourage smokers living with children to adopt smoking restrictions in their households or to stop smoking altogether have been published, but have shown limited success. In the future, interventions involving the entire household unit may be more effective, and an essential foundation on which to build such interventions will include knowledge of the characteristics of households with varying levels of household smoking restriction. A number of studies examining these characteristics have been published. Factors that have been found to be associated with household smoking restriction include: the presence of children in the household, the age of the children residing in the household, the number of adults residing in the household, the socio-economic status of the household (including education and income) and the region of the country and type of housing in which the family resides. This study will contribute to this literature by examining the determinants of the level of household smoking restriction using data from the large, nationally representative ETS in the Home National Survey.

Chapter 3 : Study Objectives and Conceptual Framework

The studies discussed in the previous section used one of two approaches to examine the determinants of exposure to ETS in the home: 1) a dichotomy of self-reported complete household smoking ban versus a less than complete ban (anywhere from a partial ban to no restrictions at all) to classify households in the study sample or 2) an assessment the level of exposure to ETS by measuring the levels of nicotine metabolites, in particular cotinine, in biological samples. While these approaches are useful in determining the factors that predict the absolute level of ETS exposure in children or the presence or absence of a household smoking ban, they may not be compatible with contemporary thought regarding the behaviour change process that is now the basis for many health promotion interventions. A commonality of these theories is that they portray behaviour modification as a step-like progression toward a desired change rather than an "all or nothing" event (Borland, 2003). An example of this is the transtheoretical model of behaviour change, which postulates that individuals move through the distinct stages of precontemplation, contemplation, preparation, action and maintenance as the behaviour is modified (DiClemente et al., 1991). This model has often been applied to smoking cessation as well as a wide range of other health behaviours , and the stages are defined in this context in Table 3.1. According to the transtheoretical model, individuals utilize different processes and have different needs as they progress through each stage of behaviour change, which, in this example, is smoking cessation (Prochaska et al., 1988). While little is known about the process by which households develop and impose smoking restrictions, it is possible that households pass through similar steps or stages as the behaviour change is made.

Table 3.1: Stages of change in smoking behaviour under the transtheoretical model of behaviour change

Stage	Definition
Precontemplation	The period in which smokers are not thinking about quitting within the next 6 months
Contemplation	The period in which smokers are thinking about quitting within the next 6 months
Preparation	The period in which smokers who have tried to quit in the past year seriously think about quitting smoking in the next month
Action	The period of about 0-6 months after smokers have made overt change of stopping smoking
Maintenance	The period beginning 6 months after action has started and continuing until smoking is terminated as a problem

Source: Prochaska et al., 1994

Recently, qualitative research conducted by Poland and colleagues (in press) has suggested that households fall into three categories with regard to the level of smoking restriction in the household: high, moderate and low. The characteristics of these groups were described as follows. Households in the high level of smoking restriction group did not allow any smoking in the home, with only rare exceptions to this rule. In the moderate level of restriction group, there was a variety of smoking arrangements: smoking was allowed, but only in certain areas of the home; smoking was not allowed in the home, but regular exceptions were made; and smoking was allowed in the household under the condition that children were not present. Finally, in households with a low level of smoking restriction no consistent effort was made to restrict

smoking in the household. An important finding in this study was the existence of a moderate level of restriction group. Children residing in households in this group were still at risk of being exposed to ETS, but it was clear that members of the household were aware that smoking inside the home was not acceptable and were making attempts to change their behaviour. This is in contrast to households exhibiting a low level of smoking restriction, where no consistent effort was made to modify smoking behaviour in the home. The variability observed in the households in that study suggested that households progress along a continuum of behaviour change with regard to household smoking restriction, rather than simply changing from one state to another. It also suggests that dichotomizing households may result in a loss of information that can be gained from households that are located in the middle of the spectrum and a that better understanding can be gained by creating an additional category for moderate households.

Objective 1: The first objective of this study is to use data from a large, nationally representative survey to build upon this framework of household smoking restriction. This study will go beyond a simple dichotomy to classify households into three categories of household smoking restriction (based on those described above) to examine the relationship between household socio-demographic variables and the level of smoking restriction.

This type of approach will generate a multinomial variable for the level of smoking restriction, consisting of three categories (high, moderate and low level of restriction) instead of two (full ban versus less than full ban). As a result, logistic regression for binomial outcomes can no longer be used for data analysis and more complex statistical methods must be employed. Until recently, statistical theory and software had not advanced to the point where regression methods for dealing with ordinal variables were widely available to non-statisticians; however, several models along with software now exist (Agresti, 1999, 2002; Ananth and Kleinbaum, 1997; Scott, Goldberg and Mayo,

1997). Due to the lack of appropriate statistical models and software, many previous studies have not conceptualized the level of smoking restriction in this way. To date, only one published study of the determinants of household smoking restrictions has conceptualized the level of smoking restriction as a multinomial variable. Pizacani and colleagues (2003) utilized three categories of home smoking restriction, similar to those found by Poland and colleagues (in submission): full ban, partial ban and no ban, although nominal rather than ordinal regression methods were used in that study.

Based on the review of the literature, it is not clear whether it is appropriate to preserve the ordinality of the level of smoking restriction in statistical analyses because theories describing the nature of the progression to a smoke-free home do not yet exist (Borland, 2003).

Objective 2: The second objective of this study is to contribute to the understanding of the level of smoking restriction by using three different statistical approaches to examine the relationship between household socio-demographic variables and the level of smoking restriction in the home. Logistic regression for binomial outcomes, polytomous logistic regression for nominal multinomial outcomes and proportional odds regression for ordinal multinomial outcomes will be used and the results compared to determine how the choice of regression model affects the relationship between household socio-demographic variables and the level of household smoking restriction.

Chapter 4 : Methods

Introduction

This chapter will describe the methods that were used in the study. The research design of the study involved a secondary multivariate regression analysis of data previously collected as part of the cross-sectional ETS in the Home National Survey. The structure of the chapter is as follows. First, the instrumentation section will describe the characteristics of the ETS in the Home National Survey. The next section will describe the procedure used to select participants for the study. This will include a discussion of the sampling design used for the ETS in the Home National Survey and the method used to select a sub-sample of participants from the larger survey sample. Following this, the characteristics of the dependent and independent variables will be discussed. Finally, the procedures for analyzing and interpreting the data will be presented.

Instrumentation

The ETS in the Home National Survey was a cross-sectional, random-digit dialled telephone survey conducted from June 2001 to January 2002 by the Institute of Social Research (ISR) on behalf of researchers at the Ontario Tobacco Research Unit (OTRU) and funded by the National Cancer Institute of Canada (NCIC). The sample included respondents from all Canadian provinces (excluding the territories) and was distributed according to each province's share of the population. Computer assisted telephone interviews (CATI) were conducted in English and French by trained interviewers at ISR facilities. Participation in the survey was voluntary, and participants were reminded that they could withdraw at any time and that their answers would be kept strictly confidential. Identifying information such as names and addresses were not collected during the interview and telephone numbers were not retained with survey responses. Respondents from 14,613 of 23,568 eligible households completed questionnaires for the

survey, yielding a response rate of 62% (Northrup, 2002). The full survey consisted of numerous items assessing household composition and smoking status of all household members, cessation attempts and relapses, smoking restrictions in workplaces and other public places, attitudes and beliefs regarding exposure to ETS, smoking behaviours of household members, exposure to ETS in various settings for both smokers and non-smokers, rules for smoking inside the home and car, strategies being used to reduce exposure to ETS and the perceived effectiveness of these strategies, knowledge regarding health effects due to ETS exposure, general family health and socio-demographic variables. A full copy of the questionnaire, along with instructions for skip patterns followed by the computer program is presented in Appendix 1.

Participants

A random sample of respondents was selected for the ETS in the Home National Survey using a two-stage stratified sampling design. In the first stage random-digit dialling, which allowed all households to have an equal and known probability of selection into the study sample, was used to select households for participation. This was accomplished by selecting a random sample of telephone numbers from a list of possible phone numbers constructed using compact discs of telephone directories and commercially available telephone lists. In the second stage an adult respondent was selected from those available in the household. Previous research has demonstrated that those who answer the telephone in a household are more likely to be women, elderly or unemployed (Northrup, 2002), and as such selecting only those who answer the telephone will result in a non-random sample. To ensure that the sample remained random, the next birthday method was implemented. This method involves the selection of the adult respondent with the nearest birthday to complete the survey. To maintain representativeness at a national level, the population proportional to size method was employed, resulting in a sample that was distributed among the Canadian provinces in proportion to each province's share of the population.

In addition, the proportion of Canadian homes where children were exposed to ETS in 2001 was 21% (CTUMS, 2001), which, for the purposes of the ETS survey, made an over-sample of smoking households necessary to obtain a sufficient number of smoking households with children in the survey sample. This was accomplished by using two forms of the survey: a short form and a long form. The short form was answered by all respondents to the survey and was made up of three sections. The questions in these sections dealt with the importance of ETS as a health problem as perceived by the respondent, the respondent's smoking status and the composition and smoking status of other members of the household. The long form consisted of the entire survey, including the questions asked in the short form and was administered predominantly to households that included smokers and children. Short form questionnaires were administered to non-smoking households (with or without children) most of the time; 86.2% of short forms and 31.2% of long forms were completed in these households (Northrup, 2002). Long form questionnaires were completed in 68.8% of smoking households in the sample, of which 34.1% were households that included smokers and children (Northrup, 2002).

For the current study, data from households that included at least one adult smoker and at least one child under the age of 18 years (n=1763) was extracted from the ETS in the Home National Survey database. The data obtained from these participants was generated using the long form of the questionnaire, therefore when population-based estimates were generated household type weights were used to account for the unequal probability of selection into the sample. These weights were calculated by dividing the percentage of the household type in the total sample by the percentage of the household type that completed a long form questionnaire, and were included in the data set.

Variables

Dependent Variable

To investigate the relationship between the level of smoking restriction in the home and household socio-demographic variables, several multivariate regression models were constructed using nominal and ordinal methods. These methods were chosen as a result of the second objective for this study. This objective was to contribute to the understanding of the nature of the dependent variable by determining whether the way the dependent variable was treated in the analysis had an effect on the results of the analysis. The dependent variable, level of smoking restriction in the household, was represented by three categories: high, moderate and low level of restriction, based on those described by Poland and colleagues (in press). The categories, as they pertain to this study, are defined in Table 4.1. The categories were constructed using responses from three survey questions regarding the smoking behaviour of all smoking members of the household. These questions, along with the response choices available to the respondents, are listed in Table 4.2.

Table 4.1: Categories for level of smoking restriction in the home

Level of Smoking Restriction	Definition
High	Households where no member of the household smokes anywhere inside the household
Moderate	Households where at least one member smokes inside the home on a daily or occasional basis, but smoking only occurs at certain times, in certain areas of the home or when children are not present in the home
Low	Households where at least one member smokes inside the home on a daily or occasional basis, and smoking occurs in any area of the home, at any time, with no restriction

The respondent provided information regarding his or her own smoking behaviour (if he or she was a smoker), and information regarding the smoking behaviour of any other smoking members of the household. The classification protocol is presented in Table 4.3. Briefly, households were placed in the high level of restriction category when respondents indicated that no member of the household smokes cigarettes inside the home. Households were placed in the moderate level of restriction category when the respondent indicated that at least one member of the household smokes at least daily or occasionally inside the home *and* each smoker residing in the home does at least one of the following: smokes only in certain areas of the home, smokes only at certain times, or smokes only when children are not present in the home. Households in which the respondent indicated that at least one member smokes inside the home on a daily or occasional basis, but do not restrict their smoking to certain areas, times, or when children are not present were classified as low level of restriction households. The important distinction between the moderate and low levels of restriction is that, while smoking inside the home occurs in both categories, the moderate category includes only households in which all smokers in the household restrict their smoking to certain areas of the home or certain times of the day. Households in which one or more smokers did not follow this practice were classified as low level of restriction households. The purpose of this distinction was to separate households where efforts are made by all smokers to restrict smoking in the home from those where efforts are made only by particular members of the household or are non-existent. This classification tool is unique to the ETS in the Home National Survey, and as such no reliability or validity data is available.

Independent Variables

The independent variables were chosen based on the review of the relevant literature. Variables found to have been associated with the dependent variable in at least one other study, and household socio-demographic variables available for study in this particular survey were used. The variables are listed in Table 4.4.

Table 4.2: Survey questions and response choices used for classification of level of smoking restriction

Question	Response Choices
1. Do you smoke cigarettes INSIDE your home?	a. Daily b. Occasionally c. Not at all d. Respondent volunteers he/she NEVER smoked cigarettes inside household e. Respondent volunteers no one smokes cigarettes inside household f. Respondent volunteers no one smokes ANYTHING inside household g. Don't know h. Refused
2. Do you smoke only in certain areas inside the home, not smoke when children are present, or do you smoke anywhere in the home?	a. Smoke only in certain areas b. Not smoke when children are present c. Smoke anywhere in the home d. Something else (specify)
3. Do you go outside to smoke cigarettes when you are home?	a. Yes b. No c. Don't know d. Refused

Note:

a) Question 2 was asked only of respondents who answered that they smoke inside the home at Question 1.

b) Question 3 was asked only of respondents who answered choices c. through f. in Question 1.

c) The respondent answered Questions 1 through 3 for each smoker in the household.

Table 4.3: Classification procedure for level of smoking restriction

Level of Smoking Restriction	Procedure
High	a) Households (HH) where the respondent has volunteered that no one smokes inside the home b) HH that answer "Yes" to "Do you go outside to smoke cigarettes when you are home?" for all smokers in the HH c) HH that answer "Not at all" to "Do you smoke cigarettes inside your home?" for all smokers in the HH
Moderate	a) HH where respondent answers "Daily" or "Occasionally" to "Do you smoke cigarettes inside your home?" for at least one of the smokers AND b) Each smoker does at least one of the following: smoke only in certain areas, smoke only at certain times, smoke inside only when children absent
Low	a) HH where respondent answers "Daily" or "Occasionally" to "Do you smoke cigarettes inside your home" for at least one smoker AND b) Respondent answers "Smoke anywhere in the home" to "Do you smoke only in certain areas inside the home, not smoke when children are present, or do you smoke anywhere in the home?" OR c) One or more smokers do not restrict their smoking to certain areas, certain times or to when children are not present

Several independent variables that were used in the analysis describe the composition of the household and provide demographic data regarding household members. Currently, the relationship between the number of children living in the household and the level of protection from ETS provided by the household is unclear and was

examined in this research. It was analyzed as a count variable, consisting of the number of individuals under the age of 18 years of age residing in the household. The age of the children living in the household has been shown by previous studies to affect the level of smoking restriction in the home, with smoking inside the home less likely in homes with younger children (Gilpin et al., 1999; Jaakkola et al., 1994; Schuster et al., 2002; Preston et al., 2001). This variable was entered into the analysis as a continuous variable representing the mean age of all children residing in the household.

The effect of household income has been studied extensively, and findings have indicated that increased annual household income is associated with an increase in household smoking restriction (Health Canada, 1995; Norman et al., 1995; Schuster et al., 2002; Kegler & Malcoe, 2002; Cook et al., 1994; Jarvis et al., 1992). It was analyzed as a categorical variable, utilizing the increments provided in the questionnaire response options: less than $20,000 followed by categories increasing in $10,000 increments up to $100,000; $100,000 to $120,000; $120,000 to $150,000 and over $150,000. The number of adults living in the household has also been found to affect the level of household smoking restriction; households that include at least two adults are more likely to impose restrictions on smoking in the household than those with fewer than two adults (Biener et al., 1997; Schuster et al., 2002). The number of adults residing in the home was entered into the analysis as a count variable, consisting of the number of individuals over the age of 18 years living in the household.

The health of household members may also play a role in the development of smoking restrictions in the home. The relationship of the presence or absence of a pregnant woman in the household in the past 12 months to the level of smoking restriction has not been extensively studied, and was examined as a binary variable (1=yes, 0=no) in this analysis. In addition, families including children with an illness related to ETS

Table 4.4: Independent variables used in the analysis

Variable	Type
Number of children in household	Count
Household income	Categorical
Number of other adults in household	Count
Type of housing	Categorical
Presence of pregnant women	Binary
Presence of child with asthma, chronic bronchitis or chronic ear infection	Binary
Region of country	Categorical
Mean age of children	Year
General health of adults in household	Categorical

exposure (asthma, chronic bronchitis or pneumonia, chronic ear infections) may have been advised by a physician to limit the child's exposure to ETS, and may behave differently than families not in that situation. This variable was included in the analysis as a binary variable, with 1 indicating the presence of a child with an ETS-related illness in the household and 0 indicating the absence of such a child. Finally, the general health of adults in the household was also analyzed. It was represented as a score generated by the answers to questions regarding the presence or absence of adults with three types of diseases related to cigarette smoking (heart disease, chronic bronchitis or emphysema and asthma) in the household. For each type of disease, if the respondent indicated that an adult residing in the household had been diagnosed with that illness one point was added to the score, for a possible range of 0 points to 3 points.

Characteristics such as the type of housing in which the family resides and the culture and climate of the region may also affect the level of smoking that occurs inside the household. The type of housing can affect the smoking behaviour of those living in the household, specifically, households with greater access to the outdoors are more likely to place restrictions on the amount of smoking that takes place inside the home (Mannino et al., 2001; Dell'Orco et al., 1995; Jarvis et al., 1992). Type of housing was included as a categorical variable, using the response options provided in the questionnaire. They were as follows: single detached house, semi-detached house (duplex, triplex), townhouse/row house (includes condominiums with this structure), apartment/condominium in apartment-like structure and room or flat in a house. Previous research in the United States has indicated that smoking inside the home is less likely in the Western part of the country compared to other regions, which could be attributable to climate and/or cultural differences between regions (Schuster, Franke and Pham, 2002). It is possible that the same relationship exists in Canada; therefore a categorical variable indicating the geographical regions of Canada was included. The regions were categorized as follows: British Columbia, the Prairies (Alberta, Saskatchewan and Manitoba), Ontario, Quebec and the Maritimes (New Brunswick, Nova Scotia, Newfoundland and Labrador and Prince Edward Island).

Data Analysis

The objectives of this study were met by constructing several multivariate regression models utilizing both nominal and ordinal methods to describe the relationship between the level of smoking restriction in the home and household socio-demographic variables. Each method used will be discussed below.

The procedures used for constructing the multivariate models were equivalent for each type of analysis performed. First, bivariate associations between the level of smoking restriction and each independent variable were examined by fitting separate univariate

models for each independent variable. The statistical significance of the association between each independent variable and the level of smoking restriction was assessed with the p-value, with a set at 0.05. The next steps involved the fitting of a multivariate model. In all cases, variables found to be significantly associated with the level of smoking restriction in bivariate analyses were included in the multivariate model and were retained whether they remained significant in the multivariate model or not. For variables with multiple categories, all categories were entered in instances where one or more categories were significant. The remaining variables were then entered one at a time to determine their effect on the regression estimates for the variables included in the model. Variables that changed the magnitude of the regression estimates by 10% or more and those that affected the p-value of variables included in the model were retained to obtain adjusted effects. Variables that did not affect the magnitude of the estimates for variables included in the model by 10% or more were not retained. Interaction between the variables selected for inclusion into the model was assessed by the inclusion of interaction terms; interaction terms were retained if the interaction term had a p-value of 0.05 or less. All analyses were carried out using the SAS system.

Logistic Regression for Binomial Outcomes

For comparison, the data were first analyzed in a manner similar to previous studies. A pairwise comparison was made between households belonging to the high level of smoking restriction category (similar to the "full ban" category in previous studies) and those belonging to the moderate and low level of smoking restriction categories combined (similar to the "less than full ban" category in previous studies).

Then, the dichotomy was expanded by performing the following pairwise comparisons using logistic regression for binomial outcomes: high level of restriction versus moderate level of restriction, moderate versus low and high versus low. The logistic regression analysis modeled the probability that a household was a member of one category of smoking restriction over the other. For example, in the high versus

moderate level of restriction comparison, logistic regression models the log odds of a household belonging to the high level of restriction category over the moderate level of restriction category. The statistical model is represented by the following equation (Agresti, 2002):

$$\frac{\log \pi x}{1-\pi x} = \alpha + \beta x$$

The measure of association for logistic regression is the odds ratio (OR). The OR for a particular predictor is obtained by exponentiating the regression coefficient ß for that variable, and describes the change in the odds of the outcome for a 1-unit increase in the independent variable (Agresti, 2002). For example, in this study the OR for the mean age of the children residing in the home in the high versus moderate level of restriction comparison describes the change in the odds of belonging to the high level of restriction category over the moderate level of restriction category for every 1 year increase in the mean age of the children residing in the home. In the multivariate model, the odds ratio describes the change in the odds of the outcome for every 1-unit increase in the independent variable while adjusting for all other covariates.

Nominal Regression Analysis: Polytomous Logistic Regression

A drawback of the logistic regression comparisons is that information from only the two of the three categories were analyzed one pair at a time, and as such, the analysis may not be most efficient or appropriate. The probabilities modelled do not include members of the category not being used in the comparison. Polytomous logistic regression extends the logistic model to include a multinomial outcome variable. The model is represented by the following equation (Agresti, 2002):

$$\log \frac{\pi_j(x)}{\pi_J(x)} = \alpha_j + \beta_j' x, j = 1,...J-1$$

As in logistic regression, the measure of association generated by the polytomous logistic model is the OR and it can be obtained by exponentiating the regression coefficient ß. For this model, the OR describes the odds of $(Y = y_j)$ relative to a referent category $(Y = y_J)$, and the ordering of the categories is not preserved in the analysis (Ananth and Kleinbaum, 1997). In this case, j = 1,2,3 so two odds ratios were generated for each independent variable. The referent category is the low level of smoking restriction category so the odds ratios will describe the odds of belonging to the high versus the low level of restriction category and the odds of belonging to the moderate versus low level of restriction category for a 1-unit increase in the independent variable (Agresti, 2002; Ananth and Kleinbaum, 1997). In the multivariate model, the OR describes the change in the odds of the outcome for every 1-unit increase in the independent variable while adjusting for all other covariates. The advantage of polytomous logistic regression over logistic regression is that information from all three categories is used in calculating the probabilities and that estimates can be generated in one model.

Ordinal Regression Analysis: Proportional Odds Model

The proportional odds model uses a cumulative logit link to model the probability of the outcome in relation to the independent variables. The model is represented by the following equation (Ananth and Kleinbaum, 1997):

$$\log\left[\frac{\Pr(Y \le y_j \mid x)}{\Pr(Y > y_j \mid x)}\right] = \alpha_j - x'\beta, j = 1,2,...k$$

The measure of association generated by proportional odds regression is the cumulative OR, which is obtained by exponentiating the regression coefficient ß for each independent variable. The cumulative OR is a summary measure of effect based on the binomial logistic odds ratios calculated for a series of dichotomizations of the outcome variable (Agresti, 2002; Ananth and Kleinbaum, 1997; Scott, Goldberg and Mayo, 1997). For example, the cumulative odds ratios in this study will be based on binomial logistic odds ratios calculated for: 1) high level of restriction versus moderate and low levels of restriction combined and 2) high and moderate levels of restriction combined versus low level of restriction. The cumulative OR is independent of the ordering of the outcome variable (Ananth and Kleinbaum, 1997; Scott, Goldberg and Mayo, 1997). In addition, the cumulative OR is independent of the dichotomy chosen to classify the outcome and is valid across all dichotomizations simultaneously, a property known as the proportional odds assumption. The proportional odds assumption was tested using a $?^2$ Score test, which tests the null hypothesis that the odds ratios for each dichotomization are equal (Agresti, 2002; Ananth and Kleinbaum, 1997; Scott, Goldberg and Mayo, 1997). The interpretation of the cumulative OR is that it represents the change in the odds of the outcome for a 1-unit increase in the independent variable. In the multivariate model, the odds ratio describes the change in the odds of the outcome for every 1-unit increase in the independent variable while adjusting for all other covariates.

Summary

This study involved a secondary analysis of data previously collected for the ETS in the Home National Survey. This cross-sectional telephone survey was conducted from June 2001 to January 2002 and utilized random-digit dialling to select a random sample of the Canadian civilian, non-institutionalized population, from which 14,613 respondents agreed to take part. A sub-sample of 1,763 households that include at least one adult smoker and at least one child under the age of 18 years was selected to examine the

relationship between household socio-demographic characteristics and the level of protection from ETS that is provided to children living in the household. This relationship was examined by constructing logistic regression, polytomous logistic regression and proportional odds regression models.

Chapter 5 : Results

Introduction

This chapter will present the results of the analysis described in the previous chapter. Descriptive statistics regarding the sample will be presented in the first section. Following this, results from the multivariate regression models will be presented. The results will be categorized according to the type of model. For each type of model, bivariate results are presented first, followed by multivariate results.

Descriptive Statistics

A total of 1763 households were included in the sample. The frequency distribution for the level of smoking restriction is presented in Table 5.1. The moderate level of restriction category had the largest proportion of members with 43.7% of the sample. Households included in the sample had an average of 1.9 children under the age of 18 years (95% confidence interval (CI) 1.7-2.0) and 2.5 adults (95% CI 2.5-2.6). The mean age of the children residing in the household was 9.6 years (95% CI 9.4-9.9).

Table 5.1: Frequency distribution for the level of smoking restriction

Level of Smoking Restriction	Frequency (%)
High	35.9
Moderate	43.7
Low	20.3

Table 5.2: Frequency distributions for categorical independent variables

Variable	Frequency (%)
Type of housing	
Single detached home	67.1
Semi-detached home	9.9
Townhouse/row house	7.8
Apartment/condominium	11.5
Room or flat in house	1.4
Other	2.4
Pregnant woman in home	
Yes	12.1
No	87.9
Child with ETS-related illness in home	
Yes	42.4
No	57.6
Region	
Ontario	36.3
Quebec	26.2
Atlantic Provinces	9.8
Prairies	17.8
British Columbia	10.0
Adult health score	
0	76.3
1	18.3
2	4.6
3	0.8

The frequency distributions for the categorical independent variables are presented in Table 5.2. One finding to note from this table is that the majority of the sample (67.1%) lived in single detached homes. The next most common housing type was apartments and/or condominiums; 11.5% of respondents resided in these housing types. For this reason, the single detached home category was chosen as the reference category for this variable. Another noteworthy finding is that 42.4% of respondents reported that at least one of the children under the age of 18 years residing in the home had been diagnosed

with an ETS-related illness (asthma, chronic bronchitis, chronic pneumonia, ear tubes as a result of chronic ear infections). In addition, it was necessary to drop household income as an independent variable in the analysis because over half of the sample refused to provide an answer to the question. Level of education could not be used as a proxy for household income because it was assessed only for the survey respondent and not the remaining members of the household. The unit of analysis for this study was the household and as such level of education could not be used as a proxy for income.

Binary Logistic Regression Analyses

High Level of Restriction vs. Non-high Levels of Restriction

This analysis used a dichotomous outcome variable to model the probability of belonging to the high level of smoking restriction category versus all other categories (moderate and low) combined (the "non-high" levels of restriction). The bivariate results for this analysis are shown in Table 5.3 (variables with significant p-values are highlighted in bold in Tables 5.3 through 5.15). At the bivariate level the type of housing, the region of the country, the number of adults residing in the home and the mean age of the children residing in the household were significantly associated with the level of smoking restriction, as assessed by the p-value.

The final multivariate model included the type of housing, the region of the country, the mean age of the children residing in the home and the number of adults residing in the home. No significant interaction terms were found. The number of adults residing in the home did not contribute significantly to the model; however, according to the procedure outlined in the previous chapter, it was retained to obtain adjusted effects.

Table 5.3: Unadjusted odds ratios for high level of restriction vs. non-high levels of restriction, binary logistic regression analysis

Variable	Unadjusted Odds Ratio (OR)	95% Confidence Interval (CI)	p-value
Type of housing			
Semi-detached	0.73	0.42,1.28	0.27
Townhouse/row house	0.89	0.49,1.63	0.71
Apartment/condominium	**0.43**	**0.23,0.79**	**0.01**
Room or flat in house	0.90	0.24,3.40	0.87
Other	**0.21**	**0.05,0.99**	**0.05**
Single detached (reference)			
Pregnant woman in home			
Yes	1.48	0.92,2.37	0.10
No (reference)			
Child with an ETS-related illness in home			
Yes	0.95	0.69,1.32	0.77
No (reference)			
Region			
Quebec	**0.25**	**0.15,0.40**	**<.0001**
Atlantic Provinces	0.73	0.41,1.32	0.30
Prairies	0.73	0.46,1.15	0.17
British Columbia	**2.02**	**1.20,3.40**	**0.01**
Ontario (reference)			
Adult health score			
1	0.83	0.56,1.25	0.38
2	0.92	0.44,1.91	0.82
3	0.56	0.09,3.57	0.54
0 (reference)			
Number of children	1.17	0.99,1.38	0.07
Number of adults	**1.21**	**1.03,1.42**	**0.02**
Mean age of children	**0.93**	**0.90,0.96**	**<.0001**

Adjusted odds ratios for these variables are presented in Table 5.4. Examining the table indicates that the odds of belonging to the high level of restriction category compared to the non-high levels of restriction category were significantly lower for residents of Quebec compared to residents of Ontario, households that reside in apartments or

condominiums compared to those that reside in single detached homes and households with older children. The odds of belonging to the high level of restriction category compared to the non-high levels of restriction category were significantly higher for residents of British Columbia compared to residents of Ontario.

Table 5.4: Adjusted odds ratios for high level of restriction vs. non-high levels of restriction, binary logistic regression

Variable	Adjusted Odds Ratio (OR)	95% Confidence Interval (CI)	p-value
Type of housing			
Semi-detached	0.82	0.45,1.50	0.52
Townhouse/row house	0.70	0.36,1.34	0.28
Apartment/condominium	**0.47**	**0.24,0.91**	**0.03**
Room or flat in house	0.40	0.08,2.04	0.27
Other	**0.19**	**0.04,0.92**	**0.04**
Single detached (reference)			
Region			
Quebec	**0.25**	**0.15,0.42**	**<.0001**
Atlantic Provinces	0.74	0.40,1.38	0.34
Prairies	0.73	0.45,1.19	0.20
British Columbia	**2.00**	**1.15,3.48**	**0.01**
Ontario (reference)			
Number of adults	1.15	0.96,1.38	0.14
Mean age of children	**0.92**	**0.89,0.96**	**<.0001**

High Level of Restriction vs. Moderate Level of Restriction

This analysis used a dichotomous outcome variable to model the probability of belonging to the high level of restriction category over the moderate level of restriction category. Unadjusted odds ratios for the independent variables are presented in Table 5.5. At the bivariate level the type of housing, the region of the country, the number of adults residing in the home and the mean age of the children residing in the household

were significantly associated with the level of smoking restriction, as assessed by the p-value.

Table 5.5: Unadjusted odds ratios for high level of restriction vs. moderate level of restriction, binary logistic regression

Variable	Unadjusted Odds Ratio (OR)	95% Confidence Interval (CI)	p-value
Type of housing			
Semi-detached	0.70	0.39,1.28	0.25
Townhouse/row house	0.87	0.45,1.67	0.67
Apartment/condominium	**0.44**	**0.23,0.84**	**0.01**
Room or flat in house	0.97	0.22,4.24	0.97
Other	0.24	0.05,1.21	0.08
Single detached (reference)			
Pregnant woman in home			
Yes	0.75	0.45,1.24	0.26
No (reference)			
Child with ETS-related illness in home			
Yes	0.92	0.65,1.30	0.63
No (reference)			
Region			
Quebec	**0.29**	**0.17,0.48**	**<.0001**
Atlantic Provinces	0.79	0.42,1.50	0.46
Prairies	0.80	0.48,1.32	0.38
British Columbia	**1.79**	**1.03,3.13**	**0.04**
Ontario (reference)			
Adult health score			
1	0.79	0.51,1.22	0.29
2	1.19	0.52,2.76	0.68
3	0.53	0.08,3.71	0.53
0 (reference)			
Number of children	1.15	0.96,1.39	0.13
Number of adults	**1.19**	**1.00,1.42**	**0.05**
Mean age of children	**0.95**	**0.92,0.98**	**0.00**

Adjusted odds ratios for variables included in the final model are presented in Table5.6. While the number of adults residing in the home and the presence of a pregnant

woman in the home do not contribute significantly to the model, according to the procedure outlined in the previous chapter, they were retained to obtain adjusted effects. No significant interaction terms were found. These results suggest that the odds of a household belonging to the high level of restriction category compared to the moderate level of restriction category are significantly lower for residents of Quebec compared to residents of Ontario, households that reside in apartments or condominiums compared to those that reside in single detached homes and households with older children. For residents of British Columbia, the odds of belonging to the high level of restriction category compared to the moderate level of restriction category were higher compared to residents of Ontario; however these results did not reach statistical significance at the 0.05 level.

Table 5.6: Adjusted odds ratios for high level of restriction vs. moderate level of restriction, binary logistic regression

Variable	Adjusted Odds Ratio (OR)	95% Confidence Interval (CI)	p-value
Type of housing			
Semi-detached	0.78	0.41,1.47	0.44
Townhouse/row house	0.70	0.35,1.40	0.32
Apartment/condominium	**0.48**	**0.24,0.96**	**0.04**
Room or flat in house	0.49	0.08,2.83	0.42
Other	0.22	0.04,1.18	0.25
Single detached (reference)			
Region			
Quebec	**0.29**	**0.17,0.50**	**<.0001**
Atlantic Provinces	0.78	0.40,1.52	0.46
Prairies	0.79	0.47,1.35	0.39
British Columbia	**1.76**	**0.98,3.15**	**0.06**
Ontario (reference)			
Mean age of children	**0.94**	**0.91,0.98**	**0.01**
Number of adults	1.12	0.92,1.36	0.21
Pregnant woman in the home	1.15	0.62,2.11	0.66

Moderate Level of Restriction vs. Low Level of Restriction

This analysis used a dichotomous outcome variable to model the probability of belonging to the moderate level of restriction category over the low level of restriction category. Unadjusted odds ratios are presented in Table 5.7. Examining the table reveals that, unlike the previous comparison between the high category and the moderate category, only one variable, the mean age of the children residing in the household, had a significant effect on the outcome at the 0.05 level as assessed by p-values.

The final model was the bivariate model for the mean age of children residing in the home. None of the remaining variables had a significant effect on the regression estimates for this variable and were dropped from the model. The OR of 0.94 (95% CI 0.90,0.98) suggests that the odds of belonging to the moderate level of restriction category over the low level of restriction category are significantly lower for households with older children.

High Level of Restriction vs. Low Level of Restriction

This analysis used a dichotomous outcome variable to model the probability of belonging to the high level of restriction category over the low level of restriction category. Unadjusted odds ratios, along with confidence intervals and p-values, are presented in Table 5.8.

Examining the table indicates that the type of housing, the region of the country and the mean age of the children residing in the home have a significant effect on the outcome, as assessed by p-values.

Table 5.7: Unadjusted odds ratios for moderate level of restriction vs. low level of restriction, binary logistic regression

Variable	Unadjusted Odds Ratio (OR)	95% Confidence Interval (CI)	p-value
Type of housing			
Semi-detached	1.13	0.55,2.34	0.74
Townhouse/row house	1.09	0.48,2.50	0.83
Apartment/condominium	0.91	0.48,1.75	0.79
Room or flat in house	0.79	0.14,4.44	0.79
Other	0.69	0.22,2.20	0.53
Single detached (reference)			
Pregnant woman in home			
Yes	0.70	0.34,1.45	0.34
No (reference)			
Child with ETS-related illness in home			
Yes	1.13	0.74,1.74	0.58
No (reference)			
Region			
Quebec	0.64	0.38,1.06	0.08
Atlantic Provinces	0.78	0.35,1.71	0.53
Prairies	0.73	0.40,1.36	0.33
British Columbia	1.69	0.62,4.62	0.31
Ontario (reference)			
Adult health score			
1	1.20	0.70,2.06	0.51
2	0.51	0.21,1.26	0.15
3	1.20	0.14,10.15	0.87
0 (reference)			
Number of children	1.06	0.83,1.34	0.66
Number of adults	1.04	0.82,1.31	0.77
Mean age of children	**0.94**	**0.90,0.98**	**0.01**

Table 5.8: Unadjusted odds ratios for high level of restriction vs. low level of restriction, binary logistic regression

Variable	Unadjusted Odds Ratio (OR)	95% Confidence Interval (CI)	p-value
Type of housing			
Semi-detached	0.80	0.37,1.70	0.55
Townhouse/row house	0.95	0.41,2.20	0.90
Apartment/condominium	**0.40**	**0.19,0.85**	**0.02**
Room or flat in house	0.77	0.14,4.31	0.76
Other	**0.17**	**0.03,0.91**	**0.04**
Single detached (reference)			
Pregnant woman in home			
Yes	0.52	0.26,1.07	0.08
No (reference)			
Child with ETS-related illness in home			
Yes	1.04	0.67,1.61	0.87
No (reference)			
Region			
Quebec	**0.18**	**0.10,0.33**	**<.0001**
Atlantic Provinces	0.61	0.28,1.36	0.23
Prairies	0.59	0.31,1.10	0.09
British Columbia	**3.03**	**1.16,7.93**	**0.02**
Ontario (reference)			
Adult health score			
1	0.95	0.54,1.66	0.85
2	0.61	0.26,1.47	0.27
3	0.64	0.06,7.11	0.72
0 (reference)			
Number of children	1.20	0.95,1.51	0.13
Number of adults	1.23	0.98,1.54	0.07
Mean age of children	**0.89**	**0.85,0.94**	**<.0001**

Adjusted odds ratios are presented in Table 5.9. These results are similar to those obtained when comparing the high level of restriction category with the moderate level of restriction category in that the type of housing, the region of the country and the mean age of the children were retained in the final model. No additional variables were retained in the model and no significant interaction terms were found. The results

suggest that the odds of belonging to the high level of restriction category over the low level of restriction category are significantly lower for residents of Quebec compared to residents of Ontario, households that reside in apartments or condominiums compared to those that reside in single detached homes and households with older children. The odds of belonging to the high level of restriction category versus the low level of restriction category were significantly higher for households residing in British Columbia compared to those residing in Ontario.

Table 5.9: Adjusted odds ratios for high level of restriction vs. low level of restriction, binary logistic regression

Variable	Adjusted Odds Ratio (OR)	95% Confidence Interval (CI)	p-value
Type of housing			
Semi-detached	0.95	0.38,2.31	0.90
Townhouse/row house	0.64	0.24,1.70	0.37
Apartment/condominium	**0.40**	**0.16,0.96**	**0.04**
Room or flat in house	0.20	0.02,1.69	0.14
Other	**0.10**	**0.02,0.67**	**0.02**
Single detached (reference)			
Region			
Quebec	**0.16**	**0.09,0.32**	**<.0001**
Atlantic Provinces	0.63	0.26,1.50	0.29
Prairies	0.55	0.27,1.09	0.09
British Columbia	**3.13**	**1.12,8.79**	**0.03**
Ontario (reference)			
Mean age of children	**0.88**	**0.84,0.93**	**<.0001**

Summary of Binary Logistic Regression Analyses

The results of the binary logistic regression analyses indicate that expanding the dichotomy of categories to include a moderate level of restriction did not significantly alter the relationships found between the dependent and independent variables. The results obtained with both categorizations were very similar in the variables that were

significant and the magnitude and direction of the odds ratios. These findings can be attributed to the lack of significant difference between the moderate and low levels of restriction.

In summary, the logistic regression analyses provided the following results. The odds of belonging to the high level of restriction category versus the moderate level of restriction category were significantly lower for households located in Quebec, households residing in apartments or condominiums and households with older children. The odds were significantly higher for households located in British Columbia. Similar results were found when the high level of restriction category was compared with the low level of restriction category. In contrast, the odds of belonging to the moderate level of restriction category versus the low level of restriction category were significantly lower only for those households with older children.

Nominal Regression Analyses: Polytomous Logistic Model

The purpose of this analysis was to examine the relationship between the level of smoking restriction in the home and the independent variables using methods for logistic regression for multinomial dependent variables. Unadjusted odds ratios for the level of smoking restriction are presented in Tables 5.10 and 5.11. (The results were obtained from a single model, however each dichotomization is presented separately as space did not allow for them to be presented together.)

Examining the two tables demonstrates that the results obtained from the polytomous model are equivalent to those obtained using logistic regression for binomial outcomes. Similar to the binary logistic regression analyses, the region of the country, the type of housing and the mean age of the children residing in the household were significantly associated with the outcome in the high versus low level of restriction comparison,

while the mean age of the children residing in the household was the only significant predictor in the moderate versus low level of restriction comparison.

Table 5.10: Unadjusted odds ratios for high level of restriction vs. low level of restriction, polytomous logistic regression

Variable	Unadjusted Odds Ratio (OR)	95% Confidence Interval (CI)	p-value
Type of housing			
Single detached	**1.72**	**1.04,2.84**	**0.03**
Semi-detached	1.37	0.65,2.87	0.41
Townhouse/row house	1.63	0.74,3.61	0.23
Apartment/condominium	0.69	0.33,1.44	0.32
Other	0.29	0.07,1.21	0.09
Room or flat in house (reference)			
Pregnant woman in home			
Yes	0.72	0.51,1.04	0.08
No (reference)			
Child with an ETS-related illness in home			
Yes	0.98	0.79,1.22	0.87
No (reference)			
Region			
Ontario	1.38	0.94,2.05	0.10
Quebec	**0.25**	**0.16,0.40**	**<.0001**
Atlantic Provinces	0.85	0.46,1.57	0.60
Prairies	0.81	0.50,1.32	0.40
British Columbia (reference)			
Adult health score			
0	1.28	0.65,2.51	0.47
1	1.21	0.58,2.54	0.61
2	0.79	0.33,1.90	0.59
3 (reference)			
Number of children	1.21	0.96,1.53	0.12
Number of adults	1.24	0.99,1.55	0.07
Mean age of children	**0.89**	**0.85,0.94**	**<.0001**

Table 5.11: Unadjusted odds ratios for moderate level of restriction vs. low level of restriction, polytomous logistic regression

Variable	Unadjusted Odds Ratio (OR)	95% Confidence Interval (CI)	p-value
Type of housing			
Single detached	1.08	0.69,1.70	0.73
Semi-detached	1.23	0.62,2.43	0.56
Townhouse/row house	1.19	0.56,2.52	0.66
Apartment/condominium	0.99	0.53,1.86	0.98
Other	0.75	0.27,2.04	0.57
Room or flat in house (reference)			
Pregnant woman in home			
Yes	0.84	0.58,1.20	0.34
No (reference)			
Child with an ETS-related illness in home			
Yes	0.94	0.76,1.17	0.58
No (reference)			
Region			
Ontario	1.10	0.75,1.63	0.63
Quebec	0.70	0.48,1.03	0.07
Atlantic Provinces	0.86	0.47,1.57	0.62
Prairies	0.81	0.50,1.30	0.38
British Columbia (reference)			
Adult health score			
0	1.08	0.58,1.99	0.81
1	1.29	0.66,2.55	0.46
2	0.56	0.24,1.29	0.17
3 (reference)			
Number of children	1.05	0.83,1.34	0.66
Number of adults	1.03	0.82,1.30	0.78
Mean age of children	**0.94**	**0.90,0.98**	**0.01**

Adjusted odds ratios for the level of smoking restriction are presented in Tables 5.12 and 5.13. Again, the results for each dichotomization were obtained from the same

model but are presented separately due to space considerations. The final model includes the type of housing, the region of the country and the mean age of the children residing in the household. No significant interaction terms were found. Although the reference categories have changed, the results are similar to those obtained using logistic regression.

Table 5.12: Adjusted odds ratios for high level of restriction vs. low level of restriction, polytomous logistic regression

Variable	Adjusted Odds Ratio (OR)	95% Confidence Interval (CI)	p-value
Type of housing			
Single detached	**2.25**	**1.28,3.95**	**0.00**
Semi-detached	2.05	0.91,4.67	0.09
Townhouse/row house	1.46	0.61,3.50	0.39
Apartment/condominium	0.91	0.40,2.06	0.82
Other	0.30	0.06,1.39	0.12
Room or flat in house (reference)			
Region			
Ontario	1.42	0.94,2.16	0.10
Quebec	**0.24**	**0.15,0.40**	**<.0001**
Atlantic Provinces	0.87	0.45,1.68	0.68
Prairies	0.78	0.47,1.31	0.35
British Columbia (reference)			
Mean age of children	**0.89**	**0.84,0.93**	**<.0001**

For the high level of restriction versus low level of restriction comparison, the odds of belonging to the high category were significantly lower for residents of Quebec compared to residents of British Columbia and for households with older children. The odds were significantly higher for households that reside in single detached homes compared to those that reside in a room or flat within a house. For the moderate level of restriction versus low level of restriction comparison, the results are again similar in

direction and magnitude to those obtained by binary logistic regression. The odds of belonging to the moderate category were significantly lower for households with older children.

Table 5.13: Adjusted odds ratios for moderate level of restriction vs. low level of restriction, polytomous logistic regression

Variable	Adjusted Odds Ratio (OR)	95% Confidence Interval (CI)	p-value
Type of housing			
Single detached	1.18	0.74,1.89	0.49
Semi-detached	1.41	0.69,2.89	0.35
Townhouse/row house	1.11	0.50,2.45	0.80
Apartment/condominium	1.05	0.54,2.04	0.90
Other	0.79	0.27,2.31	0.67
Room or flat in house (reference)			
Region			
Ontario	1.10	0.73,1.66	0.64
Quebec	0.68	0.45,1.02	0.06
Atlantic Provinces	0.87	0.46,1.64	0.68
Prairies	0.79	0.49,1.30	0.36
British Columbia (reference)			
Mean age of children	**0.94**	**0.90,0.98**	**0.01**

Ordinal Regression Analyses: Proportional Odds Model

Unadjusted cumulative odds ratios for the level of smoking restriction are presented in Table 5.14. For all variables, the data met the proportional odds assumption as assessed by $?^2$ Score test; all p-values were non-significant with 1 degree of freedom (df) and the null hypothesis of equality of odds ratios across dichotomizations was not rejected. The results of the bivariate analyses are similar to those obtained in the binary logistic regression analyses. The type of housing, the region of the country, the number of adults residing in the home and the mean age of the children residing in the home had a significant effect on the level of protection from ETS. In contrast to the binary logistic

regression analyses, several variables approached statistical significance. The presence or absence of a pregnant woman residing in the home and the number of children living in the home did not reach statistical significance at the 0.05 level, however their p-values are less than 0.10, indicating that they may have had an effect on the level of smoking restriction.

Table 5.14: Unadjusted cumulative odds ratios for level of smoking restriction, proportional odds regression

Variable	Unadjusted Odds Ratio (OR)	95% Confidence Interval (CI)	p-value
Type of housing			
Semi-detached	0.80	0.49,1.32	0.38
Townhouse/row house	0.93	0.53,1.61	0.79
Apartment/condominium	**0.52**	**0.32,0.85**	**0.01**
Room or flat in house	0.85	0.25,2.85	0.79
Other	**0.33**	**0.12,0.89**	**0.03**
Single detached (reference)			
Pregnant woman in home			
Yes	0.66	0.42,1.03	0.06
No (reference)			
Child with ETS-related illness in home			
Yes	1.00	0.75,1.34	0.98
No (reference)			
Region			
Quebec	**0.32**	**0.22,0.47**	**<.0001**
Atlantic Provinces	0.71	0.41,1.21	0.21
Prairies	0.69	0.45,1.05	0.09
British Columbia	**2.09**	**1.26,3.47**	**0.00**
Ontario (reference)			
Adult health score			
1	0.91	0.63,1.31	0.61
2	0.74	0.39,1.43	0.37
3	0.70	0.15,3.20	0.65
0 (reference)			
Number of children	1.16	0.99,1.35	0.06
Number of adults	**1.19**	**1.02,1.38**	**0.03**
Mean age of children	**0.93**	**0.90,0.96**	**<.0001**

Despite these differences, the multivariate model provides results very similar to those obtained using binary logistic regression. Adjusted cumulative odds ratios are shown in Table 5.15. The multivariate model satisfied the proportional odds assumption, with a p-value of 0.85 with 11 df; the null hypothesis of equality of odds ratios across dichotomizations was not rejected. Variables retained in the final model consisted of the type of housing, the region of the country, the number of adults residing in the home and the mean age of the children residing in the home. The inclusion of additional variables, such as the presence or absence of a pregnant woman in the home and the number of children residing in the home did not significantly alter the estimates for the variables forced into the model and according to the procedure outlined in the previous chapter, these variables were not retained in the final model. No significant interaction terms were found. While the number of adults residing in the home does not contribute significantly to the model, according to the procedure outlined in the previous chapter, it was retained to obtain adjusted effects.

The cumulative odds ratios presented in Table 5.15 suggest that the cumulative odds of belonging to a higher level of restriction category over a lower level of restriction category were significantly lower for residents of Quebec compared to residents of Ontario, households that reside in apartments or condominiums compared to those that reside in single detached homes and households with older children. The cumulative odds were significantly higher for residents of British Columbia compared residents of Ontario. These results were similar to those obtained using logistic regression, and the odds ratios were also similar in magnitude.

Table 5.15: Adjusted cumulative odds ratios for level of smoking restriction, proportional odds regression

Variable	Adjusted Odds Ratio (OR)	95% Confidence Interval (CI)	*p*-value
Type of housing			
Semi-detached	0.90	0.53,1.51	0.68
Townhouse / row house	0.74	0.42,1.33	0.32
Apartment / condominium	**0.58**	**0.34,0.98**	**0.04**
Room or flat in house	0.43	0.11,1.63	0.21
Other	**0.32**	**0.11,0.90**	**0.03**
Single detached (reference)			
Region			
Quebec	**0.33**	**0.22,0.49**	**<.0001**
Atlantic Provinces	0.72	0.41,1.27	0.26
Prairies	0.70	0.45,1.08	0.11
British Columbia	**2.05**	**1.21,3.49**	**0.01**
Ontario (reference)			
Number of adults	1.15	0.97,1.36	0.10
Mean age of children	**0.92**	**0.89,0.95**	**<.0001**

Summary

The results of this study were strikingly consistent across the three types of modelling strategies used. One of the objectives of this research was to determine if the use of nominal and ordinal regression methods had an effect on the results. The analyses have shown that both the nominal and ordinal models provided very similar results. In the absence of a significant difference between the models in terms of the relationship between the dependent and independent variables, the choice of the most appropriate model must be made using both statistical and theoretical considerations (Agresti, 2002). In statistical terms, the most appropriate model will be the one that best fits the data. The statistical test used to evaluate model fit is the log-likelihood ratio test. The log-likelihood values for the nominal and ordinal models, respectively, were 1232.5 and 1238.2 and were not found to be significantly different from one another ($p > 0.10$, 1 df),

indicating that both models fit the data equally well. This finding places an increased importance on theoretical considerations, which, in the case of restricting smoking in the home, makes the choice of the appropriate model difficult. No model yet exists to describe this process, and as such, the process cannot be definitively described as an ordinal one. What is known from theories of change in other behaviours, such as smoking cessation, suggest that change, while it may be an iterative process, does proceed in an ordinal fashion. It is likely that the process of restricting smoking in the home, or the change in smoking behaviour from inside the home to outside the home, also occurs in an ordinal fashion. Therefore, the results and interpretations presented from this point onward will be in reference to the ordinal model.

According to the ordinal proportional odds model, the results of this study indicate that the odds of belonging to a higher level of household smoking restriction category for households that included at least one smoker and at least one child under the age of 18 years are significantly lower for families residing in apartments and/or condominiums compared to single detached homes, families residing in Quebec compared to Ontario, and households with older children. The odds for belonging to a higher level of household smoking restriction category were significantly higher for households residing in British Columbia compared to Ontario.

Chapter 6 : Discussion

Introduction

The objectives of this study were twofold: 1) to examine the relationship between household socio-demographic variables and the level of smoking restriction in households that include both adult smokers and children under the age of 18 years, and 2) to examine this relationship utilizing ordinal and nominal regression methods to contribute to the understanding of the nature of the progression from a low level of smoking restriction to a high level of smoking restriction in the home.

This chapter will discuss the results of the analyses in terms of these objectives, and will discuss the degree to which they have met the objectives. The discussion will begin with a presentation of selected results that were noteworthy or unexpected. Following this, the results of the study will also be interpreted in terms of the existing literature in the field. In addition, the limitations faced during the conduct of this research will be presented and discussed. Finally, the chapter will conclude with recommendations for further research regarding the protection of children from exposure to ETS in the home and practical implications of the study results with regard to policy and intervention.

Noteworthy Results

The frequency distributions presented in Table 4.2 indicated that 42.4% of households reported that at least one child residing in the home had been diagnosed with an ETS-related illness (asthma, chronic bronchitis/pneumonia or chronic ear infections). This proportion was unexpectedly high and may indicate the presence of a reporting bias. According to Health Canada data, the prevalence of asthma among children aged 4 to 11 was 15.2% and 12.5% among youth aged 12-19 in 1998/99 (Health Canada, 2001).

Data are not available for the prevalence of chronic bronchitis or pneumonia or chronic ear infection, however even if they were as prevalent as asthma in this age group, it does not account for the high prevalence of these illness found in this population. It is likely, however, that ETS-related illnesses would be more prevalent in this population compared to the general population, due to the presence of only smoking households in the sample. In addition, it was expected that this variable would be found to be significantly associated with the level of smoking restriction in the home; however, no significant relationship was found.

The presence of a pregnant woman in the home in the past 12 months was also expected to be significantly associated with the level of home smoking restriction, but the results revealed that no such relationship existed. A possible explanation for this result can be found in the frequency distribution presented in Table 4.2. This reveals that the large majority of households, 87.9%, reported that none of the women residing in the household had been pregnant in the past 12 months. Considering the modest sample size analyzed in this study, it is not likely that a significant relationship would be detected when such a low proportion of households reported the presence of a pregnant woman in the home.

Results Relative to Previous Studies

The results of this study indicate that the odds of belonging to a higher level of household smoking restriction category for households that included at least one smoker and at least one child under the age of 18 years are significantly lower for: families residing in apartments and/or condominiums compared to single detached homes, families residing in Quebec compared to Ontario, and households with older children. The odds of belonging to a higher level of household smoking restriction category are significantly higher for households residing in British Columbia compared

to Ontario. These findings are supported by the results of previously reported studies, which will be discussed below.

Age

In the present study, the odds of belonging to a higher level of restriction group decreased significantly with increasing mean age of the children residing in the household. Results comparable in direction and magnitude to those presented in the current study can be found similar studies utilizing questionnaire data reported in the literature. A study of children residing with smokers in Finland found that older children were significantly more likely to be exposed to ETS in the home than younger children (Jaakkola, Ruotsalainen and Jaakkola, 1994). A large, nationally representative, population-based survey of households with children conducted in the United States found that regular smoking was more likely to occur in homes as the age of the youngest child increased (Schuster, Franke and Pham, 2002). Another population-based survey in the state of California confirmed these results, finding that the odds of having a full ban on smoking inside the home increased significantly as the age of the youngest child decreased (Gilpin et al., 1999).

In contrast, however, are the findings of studies examining the relationship between socio-demographic factors and actual ETS exposure, as measured by the concentration of cotinine in the saliva, blood or urine of children. Studies of this nature that have examined the relationship between the age of the child and the level of exposure to ETS in the home have consistently reported that younger children have significantly higher levels of cotinine than older children (Bakoula et al., 1997; Mannino et al., 2001; Preston et al., 2001). These results suggest that younger children are exposed to more ETS in the home than older children, which appears to contradict the results of studies that use self-reported home smoking behaviour to classify children as being exposed or non-exposed to ETS.

There are several possible explanations for this contradiction. One possibility is that the classification of children as exposed or non-exposed using self-reported smoking behaviour in the home is vulnerable to social desirability bias, and cotinine is a more appropriate measure of exposure to ETS in the home. While there is reason to believe that self-reported home smoking restriction may be influenced by social desirability bias, studies examining the agreement between self-report data and cotinine data have not provided evidence that this occurs with regard to ETS exposure in the home. Results from these studies have shown a high correlation between questionnaire assessment of smoking behaviour in the home and cotinine concentration in children (Al-Delaimy, Crane and Woodward, 2000; Peterson, Johnson and Ownby, 1997; Scherer et al., 1999; Seifert, Ross and Norris, 2002;), particularly when qualitative ("no smoking is allowed in the home") rather than quantitative (number of cigarettes per day smoked inside the home or number of hours exposed to ETS) exposure was reported (Coultas, Peake and Samet 1989; Coultas et al., 1990). In addition, several studies found that agreement between cotinine measurement and self-report was greatly improved when additional sources of exposure outside the home were considered (Coultas et al., 1990; Peterson, Johnson and Ownby, 1997; Scherer et al., 1999; Seifert, Ross and Norris, 2002). Children exposed to ETS in a number of settings outside the home will have increased cotinine levels even if smoking is restricted inside the home, as is possible with very young children who may not be able to escape environments where they may be exposed to ETS. These findings suggest that it is unlikely that the disparity in results is due to a misclassification bias. Another possibility is that younger children spend more time inside the home than older children, resulting in higher cotinine values, even in households where smoking restrictions are in place. For example, in a household where smoking occurs only in a certain room (classified as a moderate level of restriction in the present study) very young children who do not attend school and remain in the home during the day will be exposed to higher levels of ETS and have higher cotinine levels than older children who spend the majority of the day in a smoke-free school environment. An additional possibility is that cotinine becomes more highly

concentrated in younger children's bodies, due to their smaller size. Given the current evidence, the reason for these differences are unclear, and further work is required to determine whether a true discrepancy exists, as in the case of misclassification due to social desirability bias, or if the contradictory results are due to differing activity patterns among younger and older children rather than differing household smoking behaviour.

Previous studies have also used various methods to incorporate the age variable in the analysis. For the current study, the household was the unit of analysis and it was desirable that the ages of all children residing in the household be incorporated into one variable. For this reason, the mean of the ages of all the children residing in the household was included in the analysis. In previous studies, methods such as the age of the youngest child and the individual ages of the children residing in the household (for studies using the individual as the unit of analysis) were used to represent the age variable in the analyses. Given that the mean is sensitive to outliers in the dataset (which may occur when the children within a household are far apart in age), a different method of representing the age variable may have altered the results of the current study. The age of the youngest child and the median age of the children residing in the home would have been appropriate for the unit of analysis and may have provided more accurate results due to their increased resistance to outliers in the dataset when compared to the mean.

Region of the Country

In the present study, respondents residing in Quebec had significantly lower odds of belonging to a higher level of smoking restriction category, while respondents from British Columbia had significantly higher odds of belonging to a higher level of smoking restriction category compared to respondents in the reference group who resided in Ontario. These results reflect trends in smoking prevalence in Canada. In 2003, British Columbia reported the lowest smoking prevalence in the country at 16%

among individuals aged 15 and over, while Quebec reported the highest at 23% (Health Canada, 2004). Based on previous results reported in the literature, it was expected that the relationship between region and level of smoking restriction would be significant. In the United States, Schuster, Franke and Pham found that smoking inside the home was less likely to occur in households located in the Western United States compared to the Southern United States, which also reflects differences in smoking prevalence among regions in the United States (Schuster, Franke and Pham, 2002).

In addition, climatic conditions vary widely across the regions used in this study. Many areas of British Columbia, such as the Lower Mainland and Vancouver Island, have much more temperate climates than other areas of Canada, which may contribute to the higher odds of smokers in British Columbian homes smoking only outside the home. It is likely that the effect of region observed in this study is due to a combination of the acceptability and prevalence of smoking and climatic factors in particular regions, and suggests that denormalizing tobacco use through smoke-free spaces legislation and reducing the overall prevalence of smoking can reduce children's exposure to ETS in the home.

Type of Housing

The results of this study indicated that, for families residing in apartments or condominiums, the odds of belonging to a higher level of smoking restriction category were significantly lower than those for families residing in single detached homes. This finding can be attributed to the decreased access to the outdoors experienced by those who live in apartment or condominium housing, and has been found in previously reported studies. Significantly higher cotinine concentrations have been found in children living in crowded conditions, which are likely to occur in apartment-style housing (Dell'Orco et al., 1995; Jarvis, Strachan and Feyerabend, 1992; Mannino et al., 2001). Bakoula and colleagues (1997) reported that cotinine concentrations in children in their study decreased as the floor surface area of the home increased, which is

consistent with the finding that families residing in apartments or condominiums are less likely to have high levels of smoking restriction than those residing in larger single detached homes.

Dichotomous vs. Multinomial Dependent Variable

It was expected that the addition of a moderate level of smoking restriction category would produce results different from those obtained in previous studies when a dichotomy of restrictions (full ban versus less than full ban) was used, that is, that the moderate level of restriction category would be distinct from the high and low categories. The results of this study suggest otherwise, particularly those generated by the binary logistic and polytomous logistic models where an odds ratio was generated for each pairwise comparison. The purpose of including the moderate category was to separate the "less than full ban" category into households where partial arrangements were in place regarding smoking (the moderate households) and those where no arrangements were in place (the low households) so that any significant differences between the two groups could be determined. The results of the analyses, however, showed that the two groups were not significantly different with regard to the relationship between the level of smoking restriction and the independent variables included in the analysis. The only significant difference that was found between the moderate and low level of restriction categories in this study was the mean age of the children residing in the household. The similarity of the moderate and low categories rendered the three-category system of classifying households redundant in this study; the results of the analyses were equivalent whether the dichotomous or multinomial classification was used.

This unexpected result raises questions regarding the utility and validity of using a multinomial variable to represent the level of smoking restriction in a household. Was this result due to a true lack of difference between the moderate and low categories, or

was it due to an aspect of this particular study that did not allow any differences that did exist to be detected? The analyses presented here were secondary analyses of data previously collected as part of the ETS in the Home Survey, which was not designed specifically to address the questions in this study. A classification scheme was developed by choosing existing questions from the survey that most closely represented the construct to be measured, namely, the level of smoking restriction in the household. Despite efforts to develop the most reliable and valid classification tool given the data available, the tool that resulted was less than ideal. For example, the three questions chosen to classify households enquired about the smoking behaviour of members of the household (eg. "Do you go outside to smoke when you are at home?"), but not directly about any rules that had been established regarding smoking in the home. Therefore, rules or arrangements for smoking in the home were inferred from the behaviours reported by the respondents. In addition, the format of the questions resulted in a dichotomous distinction between the households with regard to smoking behaviour inside the home. The distinction made was between households where smoking did not occur inside the home and those where smoking did occur inside the home. In this study, the first category became the high level of restriction category, while the second was split into the moderate and low level of restriction categories on the basis of whether smoking was restricted to certain areas of the home or certain times of the day. It is possible that this criterion was not appropriate to distinguish between moderate and low households and that true moderate households may have been classified as low and vice versa. This would serve to mask any distinction between the categories, making them appear similar.

Another possible explanation for the apparent lack of difference between the moderate and low level of restriction categories is that, even if the classification was correct, the independent variables included in the analyses were not associated with the multinomial (and perhaps ordinal) nature of the dependent variable. This means that the three categories used in this study may have been distinct; however they were not

significantly different with regard to the independent variables included in the analyses. For example, socio-demographic variables such as the ones used in this study may be useful in discriminating between highly distinct categories, but may not be able to detect more subtle differences between closely related categories. Perhaps more detailed variables such as the knowledge, beliefs and attitudes of the household toward smoking in the home may be more sensitive to subtle changes. In the ETS in the Home National Survey, data on such variables were collected only from the respondent and not for the household as a unit. The household was the unit of analysis for the present study, and as such, only variables collected for the household as a unit were included.

These limitations make it possible that the lack of difference between the dichotomous and multinomial categorizations of the dependent variable found in the current study may not be indicative of homogeneity between the moderate and low level of restriction categories. The existence of a moderate level of restriction/partial smoking ban category has been recognized by previous qualitative and quantitative research (Pizacani et al., 2003; Poland et al., in press) and should not be discounted on the basis of one negative result. It is essential that further research be carried out in this domain to determine the true nature of the level of smoking restriction in the home. Longitudinal datasets will be particularly important in researching this question, as studying the process of home smoking restriction may produce more detailed results.

Smoking Restriction in the Context of Behaviour Change and Family Decision-Making

The second objective of this study was to examine how the relationship between household socio-demographic variables and the level of smoking restriction is affected by the choice of regression model. In this case, it was not clear from the literature whether the dependent variable, level of smoking restriction, should be represented as an ordinal variable (ie. a progression from a low level of restriction to a moderate level

of restriction to a high level of restriction, with the ordering preserved in the analysis) or as a nominal variable (ordering not preserved in the analysis). Therefore, the analysis was carried out using ordinal (proportional odds regression) and nominal (logistic and polytomous logistic regression) methodologies. As shown in Chapter 5, the results varied little among the various methodologies used and both nominal and ordinal methods fit the data equally well. These findings are difficult to interpret, as no method was clearly more appropriate over another. This is particularly true in the case of household smoking restriction, where theories describing the process by which households make and implement the decision to become smoke-free do not yet exist (Borland, 2003).

The dynamics of family relationships and decision-making make the study of these processes particularly complex. Families are dynamic social systems influenced by environmental, psychosocial, developmental and cognitive factors (Potvin et al., 2001); in short, the family is much more than the sum of its individual parts. Often, rules set for behaviour within the home are the result of negotiation among some or all of the individuals in the household, each with their own agenda and level of power or influence over the other members of the household. The resulting rules can be less than ideal; compromises may be required to maintain peace within the family. In the case of restricting smoking inside the home, the decision-making and implementation process may require various members of the family to take on the roles of arbitrator, decision-maker, enforcer and informer, while continuing to share living space with other household members who may have conflicting roles or opinions. In addition, relationships with individuals outside of the family unit, such as grandparents, other relatives or friends can also have an impact on the decision-making process in the family as well as the roles each member must play. For smoking households, the process is even more complex, as each individual smoker enters the process carrying the burden of his or her own dependence on nicotine, as well as his or her own attitudes

and beliefs regarding the dangers of smoking and ETS and readiness (or reluctance) to undertake behaviour change.

Borland (2003) has recently reviewed current behaviour change theories in relation to reducing exposure to ETS in the home. It becomes apparent in the review that while the theories differ with regard to the presence or absence of defined stages of change and the primary motivating factors that drive behaviour change, there is consensus that change does not happen at once, but rather as a series of steps which eventually lead to the desired change (Borland, 2003). This similarity lends support to the conceptualization of the level of smoking restriction in the home, which can be seen to represent the progress of the household along the continuum of change, as an ordinal variable and to retain the ordinal nature of the variable in statistical analyses. Further support can be found in the qualitative work of Poland and colleagues (in press), who interviewed respondents from households that included at least one smoker and at least one child under the age of 18 years. Findings suggested that a continuum of ETS reduction measures were used in these households, spanning the spectrum from a low level of smoking restriction (masking the smell of smoke, using fans or air purifiers) to a very high level of smoking restriction (no smoking allowed inside the home, or in some cases smoking was not allowed anywhere on the property).

A small body of literature exists regarding family decision-making and problem solving behaviour; however, much of this work is found in the market research literature and focuses on factors that influence purchasing behaviour within families and very little is known about the process by which families make and implement decisions (Rettig, 1993). While the problem solving/decision-making process in families is undoubtedly more complex than that for individuals, theories discussed by Tallman (1993) and Rettig (1993) suggest that it can be broken down into a sequential process consisting of three to four basic steps. The first three, common to both theories involve perceiving a situation as a problem, deciding on a course of action to solve the problem and acting

on that decision. Tallman suggests a fourth step involving an evaluation of the effectiveness of the actions taken and deciding whether to terminate or continue the process. These findings provide additional support for the conceptualization of the level of smoking restriction as an ordinal variable.

In addition to the stage-like nature of the process of behaviour change, Borland (2003) has identified five factors that have been postulated to play a role in behaviour change that are shared among theories:

1. attitudes and beliefs about the behaviours or the outcomes of change,
2. beliefs about self-efficacy or perceived ability to enact and/or maintain the desired behaviour change,
3. the role of contextual factors either directly and/or mediated through people's beliefs,
4. previous experience with the behaviour either directly or indirectly through the processes of modelling, and
5. priority for action.

These factors provide a point of reference for postulating how variables such as the age of the children that reside in the home and the region of the country and type of housing in which the family lives can affect membership in one category of smoking restriction over another. For example, one possible explanation for the finding that households with older children were less likely to have a high level of smoking restriction may be linked to the attitudes and beliefs of families regarding the dangers of exposure to ETS in children. The perception of the danger ETS exposure poses to children, and in turn, the urgency to take action, may be greater in households that include infants and toddlers as opposed to a household where the children are teenagers. This may be particularly important in the moderate and low level of restriction groups, where, in logistic regression analyses, the age of the children living in the household was the only significant difference between the two groups.

Household level data regarding attitudes and beliefs about exposure to ETS were not collected in the ETS in the Home National Survey, and it was not possible to examine the relationship between attitudes and beliefs and the level of smoking restriction in the present study.

The relationship between the region of the country and the level of smoking restriction in the home may be a result of contextual factors such as social norms regarding smoking in public and private places having an effect on the level of smoking restriction in the home. In British Columbia, where the prevalence of smoking is low, smoking inside the home, particularly homes where children reside, may be seen as less socially acceptable than in Quebec, where smoking prevalence is the highest of the ten provinces. More permissive social norms regarding smoking and exposure to ETS can hinder progress to a smoke-free home by influencing beliefs regarding the dangers of exposure to ETS, particularly among those who are motivated to make a change but feel that accomplishing that change will be unlikely or will negatively affect their relationships with household members, family and friends.

The type of housing in which the family lives may also influence self-efficacy. Families living in apartment or condominium-style housing may feel that smoking only outside is not possible, particularly those living in multi-storey and high-rise buildings where residents can only access the outdoors through a balcony or must leave their unit to exit the building. It is important to note, however, that further work, particularly longitudinal studies that include both quantitative and qualitative components, is required to fully understand these relationships and to formulate a theory of behaviour change to describe the transition to a smoke-free home, as well as the factors that promote movement through the continuum of change.

Limitations

As mentioned above, there are limitations inherent to the study that have the potential to limit the generalizability of the findings, in addition to potential sources of bias.

Misclassification Bias

As mentioned earlier, the level of smoking restriction within the home was inferred from behaviours reported by the respondents in response to three questions regarding smoking behaviour inside the home. The wording of the questions, however, (presented in Table 3.2) does not allow us to determine whether these behaviours are always performed or are only performed some of the time. For example, the question "Do you go outside to smoke when you are at home?" does not inquire whether the respondent always goes outside to smoke when he or she is home, allowing respondents who only occasionally go outside to smoke to answer "Yes". This can result in misclassification bias in households where all smokers answered "Yes" to the question "Do you go outside to smoke when you are home?" but do not always go outside to smoke. As a result, households with a moderate or low level of smoking restriction may be erroneously classified as households with a high level of smoking restriction. This would artificially inflate the number of households in the high level of restriction category and, if it is occurring with equal frequency in both the moderate and low level of restriction categories, would bias the odds ratios for the moderate versus low comparisons toward the null. The finding that the moderate and low level of restriction categories were not significantly different from each other may be due to misclassification bias.

To avoid erroneously classifying households as high level of restriction households, any households where discrepancies occurred with regard to smoking inside and outside the home were classified in the lower level of restriction category. For example, if a respondent answered "Not at all" to the question "Do you smoke cigarettes inside your

home?", but answered "No" to the question "Do you go outside to smoke when you are home?", the household was classified as a moderate level of restriction household rather than a high level of restriction household. In addition, the question regarding going outside to smoke was only asked of respondents who indicated in earlier questions that smoking did not occur inside the home, reducing the possibility that households where smoking is allowed inside the home will be asked if they go outside to smoke when they are at home. Despite these efforts, misclassification bias still may have occurred, and may be responsible for the similarity found between the moderate and low level of restriction categories.

Small Sample Size

The sample selected for the current study (n=1763) was only a small sub-sample of the larger survey sample. With a smaller sample, the power of the analysis is reduced, particularly for weaker relationships between dependent and independent variables. In addition, regression estimates for model parameters will be less precise with smaller samples, resulting in larger standard errors and wider confidence intervals (Agresti, 2002). Several variables, such as the presence of a pregnant woman in the home and the presence of a child with an ETS-related illness in the home were not significant but had wide confidence intervals and small p-values, indicating that the model may not have had sufficient power to detect relationships between these variables and the level of smoking restriction in the home with this sample (Agresti, 2002).

Cross-Sectional Data

One major limitation of this study, particularly considering the discussion above, is the cross-sectional nature of the survey. In this case, cross-sectional data provides only a "snapshot" of smoking behaviour in households at a given point in time, which does not allow conclusions to be made regarding changes in household smoking behaviour over time. Instead, we can only determine what factors are associated with belonging to a particular category of behaviour at a specified point in time. This means that while the

children's age has been shown to have an effect on which level of smoking restriction a household belongs to (which may reflect the perception of the risks of ETS exposure among household members) we cannot conclude, from the results of this study, that the age of the children plays a role in the movement from lower levels of restriction to higher levels of restriction. It must be emphasized that theories of behaviour change and family decision-making and problem solving have been used here to illustrate how the variables found to affect the level of smoking restriction in this study may relate to these theories with regard to where along the sequence of change a household is located at a particular point in time, not how households move from one location to another.

Selection Bias

Due to the voluntary and lengthy nature of the survey, selection bias may have occurred if those who declined to participate in the survey were significantly different from those who chose to participate with respect to variables chosen for analysis in this study. Selection bias is a systematic error in selecting one or more of the groups that will be compared in the study and can result in spurious associations if the response rate is higher in one group of individuals over another (Gordis, 2000). In survey research, a low response rate (or high refusal rate) can be indicative of a chance for selection bias to occur. Telephone surveys have been experiencing declines in response rates in recent years and the ETS in the Home National Survey, with a response rate of 62%, was no exception (Northrup, 2002). In efforts to recruit as many respondents as possible, a minimum of 14 calls were made to each telephone number at day and evening times on both weekdays and weekends, and interviewers attempted to re-contact refusals to encourage them to complete a survey. The pursuit of households who refused to participate was worth the effort: 19% of completed surveys were obtained on the first contact following the initial refusal and 15% of completed surveys were obtained on the second or subsequent contact following the initial refusal (Northrup, 2002). While it is likely that converting some refusals into completed surveys may reduce the possibility for selection bias to occur, it does not remove it

entirely. No data was collected from refusals that were not converted, so comparisons to determine if any significant differences in socio-demographic variables or level of smoking restriction existed between the three groups (respondents who agreed to complete the survey at initial contact, refusals who were converted at subsequent contact and refusals that could not be converted) were not possible. Therefore, a role for selection bias cannot be ruled out in this study; however, the findings are supported by results from previous studies using different populations, indicating that it is not likely that selection bias has affected the results.

Another indicator of a possible selection bias is the large proportion, 67.9%, of respondents reporting residing in single detached homes compared to a relatively small proportion, 11.5%, reporting residing in apartments and condominiums. A selection bias is possible if these proportions differ from the true proportions of Canadians residing in single detached homes and apartments or condominiums, as families that reside in single detached homes may be more likely to be of higher socio-economic status than those that reside in apartments or condominiums. Census data from 2001 indicates that 57.2% of Canadians resided in single detached homes and 27.2% resided in apartments or condominiums (Statistics Canada, 2002), suggesting that a selection bias may have been present in the sample used for this study. Due to the insufficient response for the household income variable, it was not possible to compare the distribution of incomes in this sample to those contained in census data and selection bias in relation to socio-economic status cannot be ruled out. A bias such as this may have resulted in fewer households being classified as moderate and low level of restriction households given that previous studies have demonstrated that households of higher socio-economic status are more likely to restrict smoking in their homes.

Social Desirability Bias

Social desirability bias can be defined as the tendency of individuals to respond to questions in a manner that conforms to societal norms and beliefs, and to present

themselves in a positive light to an interviewer (Hebert et al., 1997). It can be considered a form of information bias, which occurs when the estimate of the effect of the variable under study is distorted by a systematic error in the measurement or classification of exposure and outcome variables (Choi and Noseworthy, 1992). In survey research, social desirability bias is most likely to occur when respondents are asked to provide information about attitudes or behaviours that run contrary to dominant social norms or the respondents' perceptions of the views of the interviewer (Gregson et al., 2002).

There is an increasing social stigma associated with cigarette smoking, and the consequences of exposure to ETS in children and adults are becoming better known. This may provide the ideal conditions for social desirability bias to occur, and situations where bias in self-reported smoking behaviour is suspected have been reported in the literature. In a study examining the association between maternal smoking and low birth weight, questionnaire data indicating self-reported smoking status had high sensitivity but low specificity when compared to cotinine data, indicating that many of those who reported being non-smokers were, according to their cotinine levels, active smokers (Jedrychowski et al., 1998). A possible case of misclassification of households according to level of smoking restriction has also been reported by Dell'Orco and colleagues (1995). They found a group of households where reports of smoking behaviour inside the home conflicted between parents and children, with parents reporting that no smoking occurred inside the home and the children reporting that smoking did occur inside the home. In these homes, children had significantly higher cotinine concentrations than those in homes where there was agreement between the reports given by parents and children, suggesting that some parents in the study may have been modifying their answers to present themselves in a more positive light. These examples demonstrate that social desirability bias may occur in studies where parents or caregivers of children when they are asked to report behaviours that are considered harmful to children, such as exposing children to ETS by smoking inside the home. Due to the nature of the bias, precautions must be taken in the data collection

stage of a study to reduce the risk that it may occur. In the ETS in the Home survey the issue was addressed by assuring respondents that their answers would be kept strictly confidential. Conducting the questionnaire over the telephone allows the respondents a degree of anonymity not available to those completing a face-to-face questionnaire, which may decrease the tendency of the respondent to falsify their answers (Kissinger et al., 1999). In addition, the wording of the questions (eg. "Do you smoke cigarettes inside your home?") did not directly associate smoking inside the home with exposing children to ETS, which may have reduced the tendency among respondents to answer falsely. While it is not possible to rule out the presence of social desirability bias entirely, the precautions taken and the corroboration of the results from previously published studies suggest that it did not have a large influence on the results.

Generalizability

This study examined data from households that included at least one smoker and at least one child under the age of 18 years. As such, data from households where children are exposed to ETS from visitors, such as family members or friends who smoke but do not live in the household was not included. Thus, the findings will only be generalizable to the population of households that include smokers and children. In addition, the low response rate may signal that segments of the target population may not be represented in the study sample and may decrease the generalizability of the findings.

Recommendations for Research and Policy

While a body of literature is developing that examines the factors associated with the level of smoking restriction in the household based on cross-sectional data, no published studies report results based on longitudinal data. Given the limitations associated with cross-sectional data, there is an urgent need to collect longitudinal data from families who are in the process of establishing a smoke-free home to determine the factors associated with movement from one level of restriction to another. In light of the

difficulty in quantitatively differentiating between households with moderate and low levels of smoking restriction, studies of this nature should include both quantitative and qualitative components to ensure that differences between households with various levels of smoking restriction can be fully explored. Results from such studies can contribute greatly to the understanding of smoking restriction in the home that has begun with cross-sectional research.

In addition, this research has highlighted the need for a standard classification tool for the level of smoking restriction in the household. A crucial first step in this process would be to determine the relationship between rules for smoking in the home and actual smoking behaviour in the home, constructs that are often used interchangeably or inferred from one another (as in the present study), but may not be equivalent. This could be accomplished through focus groups or interviews with families to gain an understanding of whether rules for smoking behaviour in the home are always followed (which may vary depending on the level of restriction the rule imposes) and how each member of the household interprets the rules with regard to their own behaviour. This understanding will contribute greatly to the design of an instrument to measure the level of smoking restriction in the home.

In terms of policy, this study has demonstrated that exposure to ETS in the home is an important issue that must be addressed. In this sample, 64% of households that include smokers and children were classified as having a moderate or low level of smoking restriction, indicating that children residing in these households are at risk of exposure to ETS and the harmful effects that can result from this exposure. This is particularly important as smoking restrictions increase in public spaces and force smokers into the privacy of their own homes.

In addition, the results of this study suggest that tobacco control policy can play a key role in determining smoking behaviour both in public and at home. Households

located in provinces with comprehensive tobacco control programs, such as Ontario and British Columbia, were more likely to restrict smoking compared to those located in provinces without comprehensive tobacco control programs. Policies that encourage and enforce smoke-free spaces have the potential to influence social norms regarding smoking behaviour as well as the perception of the risks smokers place on non-smokers as a result of their behaviour. These policies can also indirectly affect smoking behaviour in areas outside of their jurisdiction and should be strongly encouraged and enforced. The results of this study can also inform intervention efforts by Health Canada and other government agencies working to reduce exposure to ETS. The regional differences found in the current study suggest that targeting interventions to particular regions of the country may be more effective than "one size fits all" interventions. It may also be beneficial to target interventions toward particular household types, in light of the finding that smoking restrictions are less likely to be established in apartments and condominiums.

References

Agresti A. Modelling ordered categorical data: recent advances and future challenges. *Statistics in Medicine* 1999; 18: 2191-2207.

Agresti A. Categorical Data Analysis. Indianapolis, IN: Wiley, 2002.

Al-Delaimy WK, Crane J, Woodward A. Passive smoking in children: effect of avoidance strategies at home as measured by hair nicotine levels. *Archives of Environmental Health* 2001; 56: 117-122.

Ananth CV, Kleinbaum DG. Regression models for ordinal responses: a review of methods and applications. *International Journal of Epidemiology* 1997; 26: 1323-1333.

Ashley MJ, Cohen J, Ferrence R, Bull S, Bondy S, Poland B, Pederson L. Smoking in the home: changing attitudes and current practices. *American Journal of Public Health* 1998; 88: 797-800.

Ashley MJ, Ferrence R. Reducing children's exposure to environmental tobacco smoke in homes: issues and strategies. *Tobacco Control* 1998; 7: 61-65.

Biener L, Cullen D, Xiao Di Z, Hammond SK. Household smoking restrictions and adolescents' exposure to environmental tobacco smoke. *Preventive Medicine* 1997; 26: 358-363.

Borland R, Mullins R, Trotter L, White V. Trends in environmental tobacco smoke restrictions in the home in Victoria, Australia. *Tobacco Control* 1999; 8: 266-271.

Centers for Disease Control and Prevention. State-specific prevalence of cigarette smoking among adults, and children's and adolescents' exposure to environmental tobacco smoke - United States, 1996. *Morbidity and Mortality Weekly Report* 1997; 46: 1038-1043.

Chilmonczyk BA, Palomaki GE, Knight GJ, Williams J, Haddow JE. An unsuccessful cotinine-assisted intervention strategy to reduce environmental tobacco smoke exposure during infancy. *American Journal of Diseases of Children* 1992; 146: 357-360.

Choi BCK, Noseworthy AL. Classification, direction, and prevention of bias in epidemiologic research. *Journal of Occupational Medicine* 1992; 34: 265-71.

Cook GD, Whincup PH, Jarvis MJ, Strachan DP, Papacosta O, Bryant A. Passive exposure to tobacco smoke in children aged 5-7 years: individual, family, and community factors. *British Medical Journal* 1994; 308: 384-389.

Dell'Orco V, Forastiere F, Agabiti N, et al. Household and community determinants of exposure to involuntary smoking: a study of urinary cotinine in children and adolescents. *American Journal of Epidemiology* 1995; 142: 419-427.

DiClemente CC, Prochaska JO, Fairhurst SK, Velicer WF, Velasquez MM, Rossi JS. The process of smoking cessation: an analysis of precontemplation, contemplation, and preparation stages of change. *Journal of Consulting and Clinical Psychology* 1991; 59: 295-304.

DiFranza JR, Lew RA. Morbidity and mortality in children associated with the use of tobacco products by other people. *Pediatrics* 1996; 97: 560-568.

Doll R, Hill AB. Smoking and carcinoma of the lung. *British Medical Journal* 1950; 4682: 739-748.

Doll R, Hill AB. A study of the aetiology of carcinoma of the lung. *British Medical Journal* 1952; 4797: 1271-1286.

Emmons KM, Hammond SK, Fava JL, Velicer WF, Evans JL, Monroe AD. A randomized trial to reduce passive smoke exposure in low-income households with young children. *Pediatrics* 2001; 108: 18-24.

Eriksen W, Sorum K, Bruusgaard D. Effects of information on smoking behaviour in families with preschool children. *Acta Paediatrica* 1996; 85: 209-212.

Gergen PJ, Fowler JA, Maurer KR, Davis WW, Overpeck MD. The burden of environmental tobacco smoke exposure on the respiratory health of children 2 months through 5 years of age in the United States: Third National Health and Nutrition Examination Survey, 1988 to 1994. *Pediatrics* 1998; 101: e8-e13.

Gilpin EA, White MM, Farkas AJ, Pierce JP. Home smoking restrictions: which smokers have them and how they are associated with smoking behavior. *Nicotine & Tobacco Research* 1999; 1: 153-162.

Gordis L. Epidemiology. Philadelphia: W.B. Saunders Company, 2000.

Greenberg RA, Strecher VJ, Bauman KE, et al. Evaluation of a home-based intervention program to reduce infant passive smoking and lower respiratory illness. *Journal of Behavioral Medicine* 1994; 17: 273-290.

Gregson S, Zhuwau T, Ndlovu J, et al. Methods to reduce social desirability bias in sex surveys in low-development settings: experience in Zimbabwe. *Sexually Transmitted Diseases* 2002; 29: 568-75.

Groner JA, Ahijevych K, Grossman LK, Rich LN. The impact of a brief intervention on maternal smoking behavior. *Pediatrics* 2000; 105: 267-271.

Health Canada. Canadian Tobacco Use Monitoring Survey: Annual Results, 2000. Available at http://www.hc-sc.gc.ca/hecs-sesc/tobacco/ctums/ETS_factsheet_2000_eng.html. Accessed 22 September 2003.

Health Canada. Canadian Tobacco Use Monitoring Survey: Annual Results, 2001. Available at http://www.hc-sc.gc.ca/hecs-sesc/tobacco/research/ctums/2001/2001ets.html. Accessed 22 September 2003.

Health Canada. Canadian Tobacco Use Monitoring Survey: Annual Results, 2002. Avaiable at http://www.hc-sc.gc.ca/hecs-sesc/tobacco/research/ctums/2002/annual_summary.html. Accessed 31 May 2004.

Health Canada. Environmental tobacco smoke: knowledge, attitudes and actions of parents, children and child care providers, 1995.

Health Canada. National Population Health Survey Highlights 1997. Available at http://www.hc-sc.gc.ca/pphp-dgspsp/ccdpc-cpcmc/cancer/publications/nphs-sboc/nphs111e.html. Accessed 22 September 2003.

Health Canada. Respiratory Disease in Canada. Population and Public Health Branch, 2001. Available at http://www.hc-sc.gc.ca/pphb-dgspsp/publicat/rdc-mrc01/index.html. Accessed 20 July 2004.

Hebert JR, Ma Y, Clemow L, et al. Gender differences in social desirability and social approval bias in dietary self-report. *American Journal of Epidemiology* 1997; 146: 1046-55.

Hovell MF, Meltzer SB, Wahlgren DR, Matt GE, Hofstetter CR, Jones JA, Meltzer EO, Bernert JT, Pirkle JL. Asthma management and environmental tobacco smoke exposure reduction in Latino children: a controlled trial. *Pediatrics* 2002; 110: 946-956.

Hovell MF, Meltzer SB, Zakarian JM, et al. Reduction of environmental tobacco smoke exposure among asthmatic children: a controlled trial. *Chest* 1994; 106: 440-446.

Hovell MF, Zakarian JM, Matt GE, Hofstetter CR, Bernert JT, Pirkle J. Effect of counselling mothers on their children's exposure to environmental tobacco smoke: randomised controlled trial. *British Medical Journal* 2000; 321: 337-342.

Hovell MF, Zakarian JM, Wahlgren DR, Matt GE. Reducing children's exposure to environmental tobacco smoke: the empirical evidence and directions for future research. *Tobacco Control* 2000; 9(Suppl II): ii40-ii47.

Irvine L, Crombie IK, Clark RA, Slane PW, Feyerabend C, Goodman KE, Cater JI. Advising parents of asthmatic children on passive smoking: randomised controlled trial. *British Medical Journal* 1999; 318: 1456-1459.

Irvine L, Crombie IK, Clark RA, Slane PW, Goodman KE, Feyerabend C, Cater JI. What determines levels of passive smoking in children with asthma? *Thorax* 1997; 52: 766-769.

Jaakkola N, Ruotsalainen R, Jaakkola JJK. What are the determinants of children's exposure to environmental tobacco smoke at home? *Scandinavian Journal of Social Medicine* 1994; 22: 107-112.

Jarvis MJ, Goddard E, Higgins V, Feyerabend C, Bryant A, Cook DG. Children's exposure to passive smoking in England since the 1980s: cotinine evidence from population surveys. *British Medical Journal* 2000; 321: 343-345.

Jarvis MJ, Strachan DP, Feyerabend C. Determinants of passive smoking in children in Edinburgh, Scotland. *American Journal of Public Health* 1992; 82: 1225-1229.

Jordaan ER, Ehrlich RL, Potter P. Environmental tobacco smoke exposure in children: household and community determinants. *Archives of Environmental Health* 1999; 54: 319-327.

Kegler MC, Malcoe LH. Smoking restrictions in the home and car among rural native American and white families with young children. *Preventive Medicine* 2002; 35: 334-342.

Mannino DM, Caraballo R, Benowitz N, Repace J. Predictors of cotinine levels in US children: data from the third national health and nutrition examination survey. *Chest* 2001; 120: 718-724.

Makomaski Illing EM, Kaiserman MJ. Mortality attributable to tobacco use in Canada and its regions, 1998. *Canadian Journal of Public Health* 2004; 95: 38-44.

McIntosh NA, Clark NM, Howatt WF. Reducing tobacco smoke in the environment of the child with asthma: a cotinine-assisted, minimal-contact intervention. *Journal of Asthma* 1994; 31: 453-462.

Norman GJ, Ribisl KM, Howard-Pitney B, Howard KA. Smoking bans in the home and car: do those who really need them have them? *Preventive Medicine* 1999; 29: 582-589.

Northrup DA. Environmental Tobacco Smoke in the Home: A National Survey - Technical Documentation. Institute for Social Research, York University, 2002.

Okah FA, Choi WS, Okuyemi KS, Ahluwalia JS. Effect of children on home smoking restriction by inner-city smokers. *Pediatrics* 2002; 109: 244-249.

Ory MG, Jordan PJ, Bazzarre T. The Behavior Change Consortium: setting the stage for a new century of health behavior-change research. *Health Education Research* 2002; 17: 500-511.

Phillips DL, Clancy KJ. Some effects of "social desirability" in survey studies. *American Journal of Sociology* 1972; 77: 921-40.

Pizacani BA, Martin DP, Stark MJ, Koepsell TD, Thompson B, Diehr P. Household smoking bans: which households have them and do they work? *Preventive Medicine* 2003; 36: 99-107.

Poland B, Gastaldo D, Pancham A, Ferrence R. The interpersonal management of environmental tobacco smoke in the home - a qualitative study. *Applied Environmental Science and Public Health* (in press).

Preston AM, Rodriguez C, Rivera CE, Sahai H. Determinants of environmental tobacco smoke in a population of Puerto Rican children. *Nicotine & Tobacco Research* 2001; 3: 61-70.

Prochaska JO, Velicer WF, DiClemete CC, Fava J. Measuring processes of change: applications to the cessation of smoking. *Journal of Consulting and Clinical Psychology* 1988; 56: 520-528.

Prochaska JO, Velicer WF, Rossi JS et al. Stages of change and decisional balance for 12 problem behaviors. *Health Psychology* 1994; 13: 39-46.

Rettig KD. Problem-solving and decision-making as central processes in family life: an ecological framework for family relations and family resource management. *Marriage & Family Review* 1993; 18: 187-222.

Ronchetti R, Bonci E, de Castro G, Signoretti F, Macri F, Ciofetta GC, Villa MP, Indinnimeo L, Martinez FD. Relationship between cotinine levels, household and

personal smoking habit and season in 9-14 year old children. *European Respiratory Journal* 1994; 7: 472-476.

Schuster MA, Franke T, Pham CB. Smoking patterns of household members and visitors in homes with children in the United States. *Archives of Pediatric and Adolescent Medicine* 2002; 156: 1094-1100.

Scott SC, Goldberg MS, Mayo NE. Statistical assessment of ordinal outcomes in comparative studies. *Journal of Clinical Epidemiology* 1997; 50: 45-55.

Severson HH, Andrews JA, Lichtenstein E, Wall M, Akers L. Reducing maternal smoking and relapse: long-term evaluation of a pediatric intervention. *Preventive Medicine* 1997; 26: 120-130.

Silverthorn NA, Gekoski WL. Social desirability effects on measures of adjustment to university, independence from parents, and self-efficacy. *Journal of Clinical Psychology* 1995; 51: 244-51.

Statistics Canada. Household Size (9) and Structural Type of Dwelling (9) for Occupied Private Dwellings, for Canada, Provinces, Territories, Census Metropolitan Areas and Census Agglomerations, 2001 Census - 100% Data. Ottawa, October 22, 2002. 2001 Census of Canada. Catalogue number 95F0327XCB01004.

Tallman I. Theoretical issues in researching problem solving in families. *Marriage & Family Review* 1993; 18: 155-186.

United States Environmental Protection Agency. Respiratory Health Effects of Passive Smoking: Lung Cancer and Other Disorders. Washington, DC, 1992.

Wahlgren DR, Hovell MF, Meltzer SB, Hofstetter CR, Zakarian JM. Reduction of environmental tobacco smoke exposure in asthmatic children: a 2-year follow-up. *Chest* 1997; 111: 81-88.

Wakefield M, Banham D, Martin J, Ruffin R, McCaul K, Badcock N. Restrictions on smoking at home and urinary cotinine levels among children with asthma. *American Journal of Preventive Medicine* 2000; 19: 188-192.

Wakefield M, Banham D, McCaul K, Martin J, Ruffin R, Badcock N, Roberts L. Effect of feedback regarding urinary cotinine and brief tailored advice on home smoking restrictions among low-income parents of children with asthma: a controlled trial. *Preventive Medicine* 2002; 34: 58-65.

Wall MA, Severson HH, Andrews JA, Lichtenstein E, Zoref L. Pediatric office-based smoking intervention: impact on maternal smoking and relapse. *Pediatrics* 1995; 96: 622-628.

Wilson SR, Yamada EG, Sudhakar R, Roberto L, Mannino D, Mejia C, Huss N. A controlled trial of an environmental tobacco smoke reduction intervention in low-income children with asthma. *Chest* 2001; 120: 1709-1722.

Wong GC, Berman BA, Hoang T, Bernaards C, Jones C, Bernert JT. Children's exposure to environmental tobacco smoke in the home: comparison of urine cotinine and parental reports. *Archives of Environmental Health* 2002; 57: 584-590.

Appendix I: ETS in the Home National Survey

Below is the text of the ETS in the Home National Survey. The questions and response choices are presented, along with notes indicating the skip patterns followed by the computer program.

Context

There are many things that affect people's health. For each of the following, please tell me if you think it is a very important, somewhat important, or not an important health problem in Canada today.

<c1> What about not being physically active?

1 very important
3 somewhat important
5 not important
8 don't know
9 refused

<c2> What about smoking?

1 very important
3 somewhat important
5 not important
8 don't know
9 refused

<c3> What about poor eating habits?

1 very important
3 somewhat important
5 not important
8 don't know
9 refused

<c4> What about second hand smoke?

1 very important
3 somewhat important
5 not important
8 don't know
9 refused

<c5> What about air pollution?

1 very important
3 somewhat important
5 not important
8 don't know
9 refused

<c6> *(only asked if two or more of c1 to c5 rated very important)* You mentioned that (items rated very important) are very important problems in Canada today; of these which would you say is most important?

1 not being physically active
2 smoking
3 poor eating habits
4 second hand smoke
5 air pollution
8 don't know
9 refused

<hp2> Now a question about healthy lifestyles. Do you think the government should have a major role in promoting healthy lifestyles, or should this mostly be the responsibility of individuals?

1 government
5 individual
7 respondent (R) volunteers both
8 R volunteers other response (specify)
98 don't know
99 refused

Respondent's Smoking Status & Behaviour Inside Household

<ss1> Have you smoked at least 100 cigarettes in your life?

1 yes
5 no
9 refused

<ss2> What about pipes, cigars or cigarillos, have you smoked at least 50 of these in your life?

1 yes
5 no
8 don't know
9 refused

<ss3> *(if no at ss1 then skip to ss8)* At the present time do you smoke cigarettes:

1 daily
3 occasionally
5 not at all
9 refused

<ss3_occ> *(only if occasionally at ss3)* In a typical week, on how many days do you have one or more cigarettes?

0 smokes less than once a week
1-7 enter number of days
97 varies
98 don't know
99 refused

<ss4a> *(only if not at all in ss3, but skip if 7 days at ss3_occ)* Have you ever smoked cigarettes daily?

1 yes
5 no
8 don't know
9 refused

<ss4b> *(only if ever a daily smoker, yes at ss3 or ss4a)* How old were you when you first started to smoke on a daily basis?

8 eight years of age or younger
9-96 enter age when started to smoke daily
98 don't know
99 refused

<ss5a> *(only if former smoker, yes at ss4a but not at all at ss3)* How many years ago did you quit smoking?

0 less than one month
1-11 enter number of months
98 don't know
99 refused

<ss6> *(daily smokers only, ss3=1)* How many cigarettes do you usually smoke each day?

1-300 enter number of cigarettes smoked
998 don't know
999 refused

<ss7> *(daily & occasional smokers, ss3=1 or 3)* How soon after you first wake up do you smoke your first cigarette: would you say

1 less than six minutes after you wake up

3 between 6 and 30 minutes
5 between 31 and 60 minutes
7 more than 60 minutes
8 don't know
9 refused

<ss8> *(skip to next section if less than 50 at ss2)* At the present time do you smoke pipes, cigars or cigarillos:

1 daily
3 occasionally
5 not at all
8 don't know
9 refused

<ss9> *(only if smoke cigars daily or occasionally)* How many pipes, cigars or cigarillos do you usually smoke each day?

1-30 enter number of pipes, cigars, cigarillos
97 varies, some days smoke, some days do not
98 don't know
99 refused

Household Composition & Smoking Status of Other Household Members

<hc1> I want to ask some questions about other people who live with you. First, including yourself, how many people live in your home, be sure to include all children, grandparents, and any other people who live with you in your home.

1 R is only person in the household
2-20 enter number of people
98 don't know
99 refused

(Note: don't know and refused at hc1 treated as one person households)

<hc2> *(not asked if one person household)* Including yourself, how many of these people are 18 years of age or older?

1 R is only person in the household 18 years or older
2-20 enter number of people over 18
98 don't know
99 refused

<hc3> *(not asked if one person household)* Including yourself, how many of the people 18 years of age and older in your home smoke cigarettes?

0 none/no one smokes
1-20 enter number of people over 18 who smoke cigarettes
98 don't know
99 refused

<hc4> *(not asked if all in household accounted for)* How many people in your household are between 12 and 17 years of age?

0-20 enter number of people between 12 and 17
98 don't know
99 refused

<hc5a> *(if only one person in household 12 or older)* Does this person smoke cigarettes?

1 yes
5 no
8 don't know
9 refused

<hc5b> *(if two or more persons 12 or older in household)* How many of the people 12 to 17 years of age smoke cigarettes?

0-20 enter number of people between 12 and 17
98 don't know
99 refused

<hc6> *(only asked if smokers in household)* Do you/do any/do you or any of the other smokers in your home smoke cigarettes inside your home?

1 yes
5 no
8 don't know
9 refused

<Household_Type> *(determined by answers thus far)*

type=1 non smoking household, no kids
type=2 non smoking household, kids
type=3 smoking household (some adults smoke), no kids
type=4 smoking household (some adults smoke), kids
type=5 smoking household (all adults smoke), no kids
type=6 smoking household (all adults smoke), kids

END OF SHORT FORM

Stages of Change

<sc1a> *(only asked of current smokers)* Now some additional questions about your smoking. Have you ever made a serious attempt to quit smoking that lasted for at least 24 hours?

1 yes
5 no
8 don't know
9 refused

<sc1b> *(only if made a serious attempt at sc1a)* How many serious attempts to quit have you ever made?

1-95 enter number
96 more than 95 times
98 don't know
99 refused

<sc2a> *(only asked of former smokers, but skip if quit 10 or more ago)* Before successfully quitting, did you ever make a serious attempt to quit smoking but then smoked again?

1 yes
5 no
8 don't know
9 refused

<sc2b> *(only if yes at sc2a)* How many serious attempts to quit have you ever made?

1-95 enter number
96 more than 95 times
98 don't know
99 refused

<sc3> *(asked of daily and occasional smokers)* In the past year, have you made a serious attempt to quit smoking, that lasted at least 24 hours?

1 yes
5 no
8 don't know
9 refused

<sc4> *(asked of daily and occasional smokers)* Are you seriously considering quitting in the next 6 months?

1 yes
5 no
8 don't know
9 refused

<sc5> *(only if considering quitting, yes at sc4)* Do you plan on quitting in the next 30 days?

1 yes
5 no
8 don't know
9 refused

Reasons for Quitting and Relapse

<rq1> *(former smokers except those who quit more than ten years ago)* For each of the following, please tell me if it was a MAJOR reason, a MINOR reason, or NOT a reason why YOU quit smoking. You were worried about health problems caused by smoking.

1 major reason
3 minor reason
5 not a reason
8 don't know
9 refused

<rq2> *(former cigarette smokers except those who quit more than ten years ago)* It was getting difficult to find places to smoke?

1 major reason
3 minor reason
5 not a reason
8 don't know
9 refused

<rq3> *(former cigarette smokers except those who quit = ten years ago)* You did not want to expose your family and friends to second hand smoke from your smoking.

1 major reason
3 minor reason
5 not a reason
8 don't know
9 refused

<rq4> *(only asked of current smokers who tried to quit)* I am going to read you a list of reasons why some people start to smoke again after quitting. For each, please think about the last time you tried to quit. Was having strong urges or cravings to smoke a MAJOR reason, a MINOR reason, or NOT a reason why you started smoking again?

1 major reason
3 minor reason
5 not a reason
8 don't know

9 refused

<rq5> *(only asked of current smokers who tried to quit)* It was hard to quit because other people around you were smoking?

1 major reason
3 minor reason
5 not a reason
8 don't know
9 refused

<rq6> *(only asked of current smokers who tried to quit)* You were drinking alcohol?

1 major reason
3 minor reason
5 not a reason
8 don't know
9 refused

<rq7> *(only asked of current smokers who tried to quit)* When you started to smoke again were you:

1 at home
2 at a friend's home
3 at work
4 at a bar
5 at a restaurant
0 some other place (specify)
8 don't know/don't remember
9 refused

Workplace Restrictions

<wp1> *(asked of all respondents)* Now some questions about work, first, do you currently work for pay?

1 yes
5 no
8 don't know
9 refused

(those who do not work or answered don't know or refused skip to next section)

<wp2> *(only if working for pay)* Do you mainly work from your home or do you work somewhere else?

1 work mainly at home *(skip to next section)*
5 works somewhere else (office, outside, building, school, etc)
7 works both at home and somewhere else
8 don't know *(skip to next section)*
9 refused *(skip to next section)*

<wp_inst> *(only if work at home and somewhere else)* For the next questions please think about the time when you work away from home.

<wp3> Which of the following best describes where you work MOST often:
1 inside a building like a factory, a store or an office
2 in a vehicle
3 outside
8 don't know
9 refused

<wp4> *(only if main place of work was a vehicle)* Does your workplace have restrictions on smoking in the vehicle that you use most often for your job?
1 yes
5 no
8 don't know
9 refused

<wp5> *(for respondents working in an office, building, etc.)* Does your workplace have restrictions on smoking?
1 yes
5 no
6 work in many situations no common rules
7 mostly work outside/no enclosed areas
8 don't know
9 refused
(all responses but yes skip to wp10)

<wp6> *(if restrictions at work)* What are the restrictions:
1 not allowed at all
3 allowed outside only
5 allowed in certain areas inside
8 don't know
9 refused

<wp7> *(if restrictions at work)* Do most smokers in your workplace go along with the rules:

1 all of the time
3 most of the time
5 some of the time
7 not at all
8 don't know
9 refused

<wp10> *(not asked if smoking not allowed & rule followed all of the time)* In the last week AT WORK, did anyone smoke around you for five or more minutes?

1 yes
5 no
6 R volunteers NEVER exposed
8 don't know
9 refused

<wp12> *(only if a smoker with restrictions at work)* Because of restrictions AT WORK, has THE TOTAL AMOUNT of tobacco you smoke IN ALL PLACES:

1 gone up
3 gone down
5 stayed about the same
8 don't know
9 refused

<wp13> *(only if a smoker with restrictions at work)* What about AT HOME, because of restrictions AT WORK has the amount of tobacco you smoke AT HOME

1 gone up
3 gone down
5 stayed about the same
8 don't know
9 refused

Restrictions on Smoking in Public Places

<pp1> *(all respondents asked this section)* Now some questions about smoking in other places. Which of the following comes closest to how you feel about smoking in restaurants, should smoking:

1 NOT BE ALLOWED in any section of a restaurant
2 allowed only in enclosed sections separately ventilated to the outdoors
3 be allowed only in a smoking section of a restaurant
4 be allowed in all sections of a restaurant
8 don't know

9 refused

<pp2> What about bars and taverns?

1 NOT BE ALLOWED in any section of a bar
2 allowed only in enclosed sections separately ventilated to the outdoors
3 be allowed only in a smoking section of a bar
4 be allowed in all sections of a bar
8 don't know
9 refused

<pp3> What about in workplaces, should smoking...

1 NOT BE ALLOWED
2 allowed only in enclosed sections separately ventilated to the outdoors
3 be allowed only in smoking sections
4 be allowed in all places
8 don't know
9 refused

<pp4> What about in outdoor places where people are close together, such as on restaurant or bar patios or in lineup, do you think smoking should be allowed in these places?

1 yes
5 no
8 don't know
9 refused

<pp5> What about in PUBLIC places such as sidewalks, beaches, and parks?

1 yes
5 no
8 don't know
9 refused

Attitudes

<a1> *(all respondents asked this section)* Please tell me if you strongly agree, somewhat agree, somewhat disagree, or strongly disagree with the following statements. First: restrictions have gone too far, and smokers need to start standing up for their rights.

1 strongly agree
3 somewhat agree
5 somewhat disagree
7 strongly disagree

8 don't know
9 refused

<a2> Nonsmokers have the right to a smoke free environment?
1 strongly agree
3 somewhat agree
5 somewhat disagree
7 strongly disagree
8 don't know
9 refused

<a3> Family doctors should advise parents not to smoke around children?
1 strongly agree
3 somewhat agree
5 somewhat disagree
7 strongly disagree
8 don't know
9 refused

<a4> Smoking habits of parents should be taken into account when deciding child custody cases?
1 strongly agree
3 somewhat agree
5 somewhat disagree
7 strongly disagree
8 don't know
9 refused

<a5> Parents have the right to decide for themselves whether OR NOT they smoke around their children?
1 strongly agree
3 somewhat agree
5 somewhat disagree
7 strongly disagree
8 don't know
9 refused

<a6> There should be a law that says parents can't smoke INSIDE their homes if children are living there?
1 strongly agree
3 somewhat agree
5 somewhat disagree
7 strongly disagree

8 don't know
9 refused

<a7> There should be a law that says parents can't smoke inside their car if children are present?

1 strongly agree
3 somewhat agree
5 somewhat disagree
7 strongly disagree
8 don't know
9 refused

<a9> Children get sick more often when people smoke regularly around them?

1 strongly agree
3 somewhat agree
5 somewhat disagree
7 strongly disagree
8 don't know
9 refused

Smoking in the Household: Respondent

(This section only asked of smokers, nonsmokers skip to next section. When respondent volunteers answer that provides a response for subsequent questions, then these questions are skipped. If respondent volunteers that no one ever smokes inside the household then we do not ask if other smokers smoke inside the household.)

<rs_hh1> Now some more questions about your smoking. Do you smoke cigarettes INSIDE your home:

1 daily
3 occasionally
5 not at all
6 R volunteers he/she never smoked cigarettes inside household
7 R volunteers no one smokes cigarettes inside household
0 R volunteers no one smokes anything inside household
8 don't know
9 refused

<rs1_where1> *(only if smoke inside the household at rs_hh1)* Do you smoke only in certain areas inside the home, not smoke when children are present, or do you smoke anywhere in the home?

1 smoke only in certain areas
3 not smoke when children are present
5 smoke anywhere in the home
7 somewhere else (specify)
8 don't know
9 refused

<rs1_where2> *(only if not at all or 6 ,7 or 0 at rs_hh1)* Do you go outside to smoke cigarettes when you are home?

1 yes
5 no
8 don't know
9 refused

<rs1_where3> *(if possible that R used to smoke inside household, 0,5 or 7 at hs_hh1)* When you go outside do you usually smoke on a:

1 balcony
2 deck/porch/garage
3 in the yard, just outside the door, on the stoop, etc
4 leave the property
96 more than one place, depends on smoker, weather, etc
97 other (specify)
98 don't know
99 refused

<rs_hh2> *(if currently does not smoke inside the home at rs_hh1)* IN THE PAST, DID you smoke cigarettes INSIDE your home:

1 daily
3 occasionally
5 never
7 R volunteers no one ever smoked cigarettes inside household
0 R volunteers no one ever smoked anything inside household
8 don't know
9 refused

<rs_hh3> *(only if used to smoke cigarettes inside the household)* How many years or months has it been since you stopped smoking cigarettes INSIDE your home?

97 R says they NEVER smoked cigarettes inside their home
0 less than one year ago
1-95 enter number of years
96 ninety six or more years ago
98 don't know
99 refused

<rs_hh4> *(only if quit smoking inside household less than one year ago)* How many months ago did you stop?

0	less than one month ago
1-11	enter number of months
98	don't know
99	refused

<rs_hh5> *(if smokes inside house occasionally at rs_hh1)* In the last week have you smoked any cigarettes INSIDE your home?

1	yes
5	no (includes never smoked cigarettes inside household)
7	R volunteers no one ever smoked cigarettes inside household
0	R volunteers no one ever smoked anything inside household
8	don't know
9	refused

<rs_hh6> *(only if smoked inside household in the last week at rs_hh5)* On how many days did you smoke cigarettes INSIDE your home in the last week?

1-7	enter number of days
8	don't know
9	refused

<rs_hh7> *(only if 1 to 7 days in last week at rs_hh6)* On the last day you smoked cigarettes inside your home, how many cigarettes did you smoke?

1-50	enter number of cigarettes smoked
51	fifty one or more
98	don't know
99	refused

<rs_hh8> *(only if don't know at rs_hh7)* We do not need the exact number, would you say:

1	one or two
3	three to five
6	six to ten
11	eleven to fifteen
16	sixteen to twenty
21	twenty-one to thirty
31	more than thirty
98	don't know
99	refused

<rs_hh9> *(skip if not a cigar smoker/not smoke inside house at ss8 or ss13)* Do you currently smoke pipes, cigars or cigarillos INSIDE your home:

1 daily
3 occasionally
5 not at all
7 R volunteers no one smokes cigars, etc. inside household
0 R volunteers no one smokes anything inside household
8 don't know
9 refused

<rs_hh10> *(only if not at all or code 7 at hs_hh9)* IN THE PAST DID you smoke pipes, cigars or cigarillos INSIDE your home:

1 daily
3 occasionally
5 never
7 R volunteers no one smokes cigars, etc. inside household
0 R volunteers no one smokes anything inside household
8 don't know
9 refused

<rs_hh11a> *(if used to smoke cigars inside home or rs_hh10)* How many years or months has it been since you stopped smoking pipes, cigars or cigarillos INSIDE your home?

97 R says they never smoked these inside their homes
0 less than one year ago
1-95 enter number of years
96 ninety six or more years ago
98 don't know
99 refused

<rs_hh11b> *(if stopped smoking cigars, etc in household less than 1 year ago)* How many months ago did you stop?

0 less than one month ago
1-11 enter number of months
98 don't know
99 refused

<rs_hh12> *(if smoke cigars, etc inside household occasionally at rs_hh9)* In the last week, have you smoked cigars, cigarillos or pipes INSIDE your home?

1 yes
5 no
7 R says they never smoke cigars, etc inside home
8 don't know
9 refused

<rs_hh13> *(if smoked cigars, etc inside household in last week)* On how many days did you smoke cigars, cigarillos or pipes INSIDE your home in the last week?

0-7 enter number of days
8 don't know
9 refused

<rs_hh14> *(if smoked cigars, etc inside household in last week)* On the last day you smoked cigars, cigarillos and pipes inside your home, how many did you have?

Enter number
8 don't know
9 refused

<rs_hh15> *(if don't know at rs_hh15)* We do not need the exact number, would you say you smoked:

1 one or two
3 three to five
6 six to ten
11 eleven to fifteen
16 sixteen to twenty
21 twenty-one to thirty
31 more than thirty
98 don't know
99 refused

(if R is only smoker in household, skip to next section)

This section was repeated for all smokers in the household. The respondent answered all questions on behalf of each smoker in the household.

Exposure for Smokers

<ep3a> In the last week, has anyone (else) smoked cigarettes INSIDE your home?

1 yes
5 no
7 R says no one ever smokes inside home
8 don't know
9 refused

<ep3b> *(if yes at ep3a)* On how many days has this happened in the last week?

1-7 enter number of days
8 don't know

9 refused

<ep3c> *(if smoked inside household 1 to 7 days in last week)* (Not including yourself), On the last day anyone smoked cigarettes INSIDE your home, how many cigarettes in total were smoked?

1-97 enter number of cigarettes smoked
98 don't know
99 refused

<ep3d> *(only if don't know for number of cigarettes)* We do not need the exact number would you say:

1 one or two
3 three to five
6 six to ten
11 eleven to fifteen
16 sixteen to twenty
21 twenty-one to thirty
31 more than thirty
98 don't know
99 refused

<ep4a> What about cigars, cigarillos or pipes, in the last week, has anyone (other than you) smoked any of these INSIDE your home?

1 yes
5 no
7 no one smokes anything inside home
8 don't know
9 refused

<ep4b> *(if yes at ep4a)* On how many days has this happened in the last week?

1-7 enter number of days
8 don't know
9 refused

<ep4c> (Not including yourself) on the last day someone smoked cigars, cigarillos or pipes INSIDE your home, how many in total were smoked?

Enter number
8 don't know
9 refused

<ep4d> *(only if don't know for number of cigars, etc)* We do not need the exact number, would you say they smoked:

1 one or two

3 three to five
6 six to ten
11 eleven to fifteen
16 sixteen to twenty
21 twenty-one to thirty
31 more than thirty
98 don't know
99 refused

<ex7> How long ago was it that someone OTHER THAN YOU smoked a cigarette INSIDE your home?

Answers in years, months, weeks
97 no one ever smoked in my house
98 don't know
99 refused

Exposure for Nonsmokers

(This section only asked of nonsmokers, smokers skip to next section. If respondent volunteers an answer that provides a response for subsequent questions, then these questions are skipped)

<ex1a> The next few questions are about your exposure to other people's tobacco smoke. In the last week, has anyone smoked cigarettes INSIDE your home?

1 yes
5 no
7 R volunteers no one smokes inside home
8 don't know
9 refused

<ex1b> *(if yes at ex1a)* On how many days has this happened in the last week?

1-7 enter number of days
8 don't know
9 refused

<ex1c> *(if smoking inside household 1 to 7 days in last week)* On the last day anyone smoked cigarettes INSIDE your home, how many cigarettes in total were smoked?

1-97 enter number of cigarettes
98 don't know
99 refused

<ex1d> *(only if don't know number of cigarettes)* We do not need the exact number, would you say:

1 one or two
3 three to five
6 six to ten
11 eleven to fifteen
16 sixteen to twenty
21 twenty-one to thirty
31 more than thirty
98 don't know
99 refused

<ex2a> What about cigars, cigarillos or pipes, in the last week, has anyone smoked any of these INSIDE your home?

1 yes
5 no
7 R volunteers no one smokes inside home
8 don't know
9 refused

<ex2b> *(if yes at ex2a)* On how many days has this happened in the last week?

1-7 enter number of days
8 don't know
9 refused

<ex2c> *(if cigars smoked inside household 1 to 7 days in last week)* On the last day someone smoked cigars, cigarillos or pipes INSIDE your home, how many were smoked?

enter number
8 don't know
9 refused

<ex2d> We do not need the exact number, would you say they smoked:

1 one or two
3 three to five
6 six to ten
11 eleven to fifteen
16 sixteen to twenty
21 twenty-one to thirty
31 more than thirty
98 don't know
99 refused

<ex5> How long ago was it that anyone smoked cigarettes, pipes, cigars or cigarillos INSIDE your home?

Answer in years/months/weeks

97 no one ever smoked in my house
98 don't know
99 refused

<ex6a> In the last week, have you been in a car, truck, van, taxi or other vehicle while anyone was smoking?

1 yes
5 no
6 never travel in vehicles
7 R says never exposed to tobacco smoke
8 don't know
9 refused

<ex6b> *(if yes at ex6a)* How many times during the last week were you in a vehicle when anyone was smoking?

0 none
1-97 enter number of times
98 don't know
99 refused

<ex7a> In the last week have you visited someone else's home?

1 yes
5 no
7 R says that they do not visit
8 don't know
9 refused

<ex7b> *(if yes at ex7a)* Did anyone smoke while you were there?

1 yes
5 no
8 don't know
9 refused

<ex7c> *(if yes at ex7b)* On how many days, in the last week, have you visited someone else's home when anyone was smoking?

1-7 enter number of days
8 don't know
9 refused

<ex8a> In the last week have you been in a restaurant, coffee shop, or food court when anyone was smoking?

1 yes
5 no
6 didn't go to restaurants/coffee shops/food court/last week/ever
7 R says never exposed to tobacco smoke
8 don't know
9 refused

<ex8b> *(if yes at ex8a)* On how many days has this happened in the last week?

1-7 enter number of days
8 don't know
9 refused

<ex9a> In the last week have you been in a bar or night club when anyone was smoking?

1 yes
5 no
6 didn't go to bar or night club last week
7 R says never exposed to tobacco smoke
8 don't know
9 refused

<ex9b> *(if yes at ex9a)* On how many days has this happened in the last week?

1-7 enter number of days
8 don't know
9 refused

<ex10> In the last week have you been in a casino, bingo, or pool hall when anyone was smoking?

1 yes
5 no
6 didn't go to casinos, bingo or pool halls
7 R says never exposed to tobacco smoke
8 don't know
9 refused

<ex11> *(if yes at ex10)* On how many days has this happened in the last week?

1-7 enter number of days
8 don't know
9 refused

<ex12> In the last week have you been in any other INDOOR places when anyone was smoking?

1 yes
5 no
6 didn't go to any other indoor place
7 R says never exposed to tobacco smoke
8 don't know
9 refused

<ex13> *(if yes at ex12)* On how many days has this happened in the last week?

1-7 enter number of days
8 don't know
9 refused

<ex14> Some people find that tobacco smoke comes into their home through vents or windows, or through hallways they share with other households. Has any tobacco smoke come into your home this way in the last week?

1 yes
5 no
7 R says never exposed to tobacco smoke
8 don't know
9 refused

<ex15> *(if yes at ex14)* On how many days has this happened in the last week?

1-7 enter number of days
8 don't know
9 refused

Compliance with Restrictions

<cr3> *(smokers only)* Which statement best describes how your smoking at work, in public places, and at other places has been affected by restrictions on smoking. Have you:

1 cut down on how much you smoke
2 made a serious attempt to quit smoking
3 not been affected by these restrictions
5 R volunteers both one and two
8 don't know
9 refused

<cr5> *(smokers only)* Which of the following best describes how you feel about smoking around non-smokers you:

1 usually avoid smoking
2 ask if it's okay to smoke
3 feel that they do not like your smoke they can go elsewhere
8 don't know
9 refused

Influences on the Implementation of Rules

<r8> What about people who visit, do they usually go outside to smoke or do they smoke inside the house?

0 do not have visitors/do not have visitors who smoke
1 usually/always go outside
5 they smoke inside the house
7 R volunteers it depends on the visitor, weather, time of year, etc
8 don't know
9 refused

<IN_i2a> Some people stop smoking in their homes gradually or for non-specific reasons. Other people stop smoking in their home because of something that happens. Can you tell me if each of these was a major reason, a minor reason, or not a reason why people stopped smoking in your home.

<i2a>
First, what about moving to a new home, doing renovations, or buying new furniture?

1 major reason
3 minor reason
5 not a reason
7 stopped gradually/non-specific reason
0 R says no one ever smoked inside the home
8 don't know
9 refused

<i2b> Someone was pregnant or a new baby or child came into your home.

1 major reason
3 minor reason
5 not a reason
7 stopped gradually/non-specific reason
0 R says no one ever smoked inside the home
8 don't know

9 refused

<i2c> Someone in your home was ill or had a health problem

1 major reason
3 minor reason
5 not a reason
7 stopped gradually/non-specific reason
0 R says no one ever smoked inside the home
8 don't know
9 refused

<i2d> No one in your home smoked anymore.

1 major reason
3 minor reason
5 not a reason
7 stopped gradually/non-specific reason
0 R says no one ever smoked inside the home
8 don't know
9 refused

<IN_i4> *(not read if smoking allowed in household)* People do not allow smoking/do not smoke in their home for a number of reasons. Please tell me how important each of the following is for not allowing smoking INSIDE your home.

<i4> *(not asked if smoking allowed in household)* Concern about the impact of second hand smoke on the health of others in the household?

1 very important
3 somewhat important
5 fairly important
7 not a reason
0 R says people do smoke/are allowed to smoke inside the home
97 R says does not know why smoking not allowed
98 don't know
99 refused

(if R gives 0, 97, don't know or refused here or next two questions skip to next section)

<i5> *(not asked if smoking allowed in household or if no children)* So that children won't think it is ok to smoke because they see others smoking?

1 very important
3 somewhat important
5 fairly important
7 not a reason
0 R says people do smoke/are allowed to smoke inside the home

97 R says does not know why smoking not allowed
98 don't know
99 refused

<i6> *(not asked if smoking allowed in household)* The smell and stains caused by cigarette smoke?

1 very important
3 somewhat important
5 fairly important
7 not a reason
0 R says people do smoke/are allowed to smoke inside the home
97 R says does not know why smoking not allowed
98 don't know
99 refused

<i7> *(not asked if smoking allowed in household or if no one smokes in household)* To help you or someone else cut down or quit smoking?

1 very important
3 somewhat important
5 fairly important
7 not a reason
0 R says people do smoke/are allowed to smoke inside the home
97 R says does not know why smoking not allowed
98 don't know
99 refused

Behaviours to Reduce ETS in the Home

<b1> *(skips households where we have been told no one smokes inside)* Is there anything done/you personally do to try to reduce or eliminate second hand smoke in your home?

1 yes
5 no (includes why should I/we everyone smokes)
7 R says they are not in a position to do anything
0 no need to/no one smokes in the home
8 don't know
9 refused

(Yes continues to b2 all others go to next section)

<b2> *(only asked of smokers, nonsmokers skip to b13)* Can you tell me whether you personally do any of the following to try to reduce second hand smoke in your home. First what about smoking outside when someone else is in the home, do you do this all of the time, most of the time, some of the time, or not at all?

1 all of the time
3 most of the time
5 some of the time
7 not at all
0 no need to/no one smokes in home
8 don't know
9 refused

<b3> *(asked of smokers who try to reduce/eliminate ETS)* What about not smoking, or going outdoors to smoke, when children are in the home?

1 all of the time
3 most of the time
5 some of the time
7 not at all
0 no need to/no one smokes in home
8 don't know
9 refused

<b4> *(asked of smokers who try to reduce/eliminate ETS)* Not smoking when children are in the same room?

1 all of the time
3 most of the time
5 some of the time
7 not at all
0 no need to/no one smokes in home
8 don't know
9 refused

<b5> *(asked of smokers who try to reduce/eliminate ETS)* Restricting your smoking to a room or certain part of the home?

1 all of the time
3 most of the time
5 some of the time
7 not at all
0 no need to/no one smokes in home
8 don't know
9 refused

<b6> *(asked of smokers who try to reduce/eliminate ETS)* Opening windows or doors?

1 all of the time
3 most of the time
5 some of the time
7 not at all
0 no need to/no one smokes in home
8 don't know
9 refused

<b7> *(asked of smokers who try to reduce/eliminate ETS)* Blowing smoke directly out a window or door?

1 all of the time
3 most of the time
5 some of the time
7 not at all
0 no need to/no one smokes in home
8 don't know
9 refused

<b8> *(asked of smokers who try to reduce/eliminate ETS)* Using fans?

1 all of the time
3 most of the time
5 some of the time
7 not at all
0 no need to/no one smokes in home
8 don't know
9 refused

<b9> *(asked of smokers who try to reduce/eliminate ETS)* Using air purifiers?

1 all of the time
3 most of the time
5 some of the time
7 not at all
0 no need to/no one smokes in home
8 don't know
9 refused

<b10> *(asked of smokers who try to reduce/eliminate ETS)* Is there anything else you personally do to reduce second hand smoke in your home?

1 yes
5 no
8 don't know
9 refused

<b11> What do you do?

1 enter text
98 don't know
99 refused

<b12> And do you do this:

1 all of the time
2 most of the time
3 some of the time
4 not very often
9 refused

<b13> *(nonsmokers only, smokers skip to next section)* Can you tell me whether any of the following things are done in your home to try to reduce second hand smoke. First, do smokers go outside to smoke when someone else is in the home?

1 all of the time
3 most of the time
5 some of the time
7 not very often
0 no one smokes in home/no visitors who smoke
8 don't know
9 refused

(answers of 0 for b13 to b21 skip to next section)

<b14> *(nonsmokers only)* What about smokers not smoking, or going outside to smoke, when children are in the home?

1 all of the time
3 most of the time
5 some of the time
7 not very often
0 no one smokes in home
8 don't know
9 refused

<b15> *(nonsmokers only)* What about smokers not smoking when children are in the same room?

1 all of the time
3 most of the time
5 some of the time
7 not very often
0 no one smokes in home
8 don't know
9 refused

<b16> *(nonsmokers only)* What about smoking only in one room or only smoking in a certain part of the home?

1 all of the time
3 most of the time
5 some of the time
7 not very often
0 no one smokes in home
8 don't know
9 refused

<b17> *(nonsmokers only)* Opening windows or doors?

1 all of the time
3 most of the time
5 some of the time
7 not very often
0 no one smokes in home
8 don't know
9 refused

<b18> *(nonsmokers only)* Blowing smoke directly out a window or door?

1 all of the time
3 most of the time
5 some of the time
7 not very often
0 no one smokes in home
8 don't know
9 refused

<b19> *(nonsmokers only)* Removing ashtrays from sight?

1 all of the time
3 most of the time
5 some of the time
7 not very often
0 no one smokes in home
8 don't know
9 refused

<b20> *(nonsmokers only)* Using fans?

1 all of the time
3 most of the time
5 some of the time
7 not very often

0 no one smokes in home
8 don't know
9 refused

<b21> *(nonsmokers only)* Using air purifiers?
1 all of the time
3 most of the time
5 some of the time
7 not very often
0 no one smokes in home
8 don't know
9 refused

<b22> *(nonsmokers only)* Is there anything else that you have done to reduce your exposure to second hand smoke?
1 yes
5 no
8 don't know
9 refused

<b23> What is it?
1 enter text
98 don't know
99 refused

<b24> Is this done:
1 all of the time
3 most of the time
5 some of the time
7 not very often
8 don't know
9 refused

<b25> *(nonsmokers only)* What about you, do you go to another room when someone smokes in the home?
1 all of the time
3 most of the time
5 some of the time
7 not very often
8 don't know
9 refused

Effectiveness of Strategies Used to Reduce ETS

<ef1> Please tell me how effective you think the following methods are at reducing the amount of second hand smoke in the home. First, what about smoking only in a certain room or part of the home? Do you think this reduces second hand smoke a lot, reduces it a little, or makes no difference in the amount of second hand smoke that others in the home are exposed to?

1 reduces a lot
3 reduces a little
5 makes no difference
0 depends/other (specify)
8 don't know
9 refused

<ef2> Opening windows or doors?

1 reduces a lot
3 reduces a little
5 makes no difference
0 depends/other (specify)
8 don't know
9 refused

<ef3> What about blowing smoke directly out a window or door?

1 reduces a lot
3 reduces a little
5 makes no difference
0 depends/other (specify)
8 don't know
9 refused

<ef4> What about waiting for one hour before using a room that someone has been smoking in?

1 reduces a lot
3 reduces a little
5 makes no difference
0 depends/other (specify)
8 don't know
9 refused

<ef5> Using a fan?

1 reduces a lot
3 reduces a little
5 makes no difference

0 depends/other (specify)
8 don't know
9 refused

Effectiveness of Strategies Used to Reduce ETS

<v1> Do you drive a personal or family vehicle at least once a week?

1 yes
5 no (includes people who ride but are not the driver)
7 doesn't own a vehicle
8 don't know
9 refused

<v2> *(only if drives once a week)* Which of the following best describes the smoking behaviour of people in the vehicle you drive the most:

1 no one ever smokes
2 people smoke occasionally
3 people smoke regularly
4 people smoke except when young children are present
8 don't know
9 refused

<v3> *(only if smoking in vehicle at v2)* When you are driving the vehicle, and someone is smoking do you open a window:

1 all of the time
3 some of the time
5 not at all
7 depends on weather/who is in car
0 never allow anyone to smoke in the car
8 don't know
9 refused

<v4> *(only if smoking in vehicle at v2, but skip if 0, don't know or refused at v3)* What about using the car fan when someone is smoking, do you do this:

1 all of the time
3 some of the time
5 not at all
7 depends on weather/who is in car
0 never allow anyone to smoke in the car
8 don't know

9 refused

Health Risks Resulting from ETS

<hr1> I am going to read you a list of health problems. For each, please tell me if you think other people's smoking is one cause, may be a cause, or is not a cause of the problem. First, lung cancer in nonsmokers. Do you think other people's smoking is:

1 is one cause
3 may be a cause
5 is not a cause
8 don't know
9 refused

<hr2> What about heart attacks in nonsmokers?

1 is one cause
3 may be a cause
5 is not a cause
8 don't know
9 refused

<hr3> What about breast cancer in nonsmokers?

1 is one cause
3 may be a cause
5 is not a cause
8 don't know
9 refused

<hr4> And what about chest problems in children?

1 is one cause
3 may be a cause
5 is not a cause
8 don't know
9 refused

<hr5> Problems in children's ears?

1 is one cause
3 may be a cause
5 is not a cause
8 don't know
9 refused

<hr6> Crib death or sudden infant death syndrome (SIDS)?

1 is one cause
3 may be a cause
5 is not a cause
8 don't know
9 refused

<hr7a> Do you have a family doctor, or a doctor you see on a regular basis?
1 yes
5 no
8 don't know
9 refused

<hr7b> Have you seen a doctor for a check up or other non-emergency reason in the last 12 months?
1 yes
5 no
8 don't know
9 refused

<hr8a> *(asked if R has seen a doctor and is a smoker)* Did the doctor talk/Has this doctor ever talked to you about your smoking?
1 yes
5 no
8 don't know
9 refused

<hr8b> Was this in the last 12 months?
1 yes
5 no
8 don't know
9 refused

<hr9a> *(if doctor has talked to R about smoking and 2 or more persons in household)* Did the doctor talk/Has this doctor ever talked to you about not smoking inside your household?
1 yes
5 no
8 don't know
9 refused

<hr9b> *(if doctor talked to R)* Was this in the last 12 months?
1 yes
5 no

8 don't know
9 refused

<hr10a> *(only asked if a smoking household and R not a smoker)* Has this doctor ever talked to you about making sure that there is no smoking in your household?

1 yes
5 no
8 don't know
9 refused

<hr10b> *(if doctor talked to R about smoking inside household in last 12 months)* Was this in the last 12 months?

1 yes
5 no
8 don't know
9 refused

General Family Health

Now I'd like to ask about any long-term health conditions that people in your household may have. "Long term conditions" refer to conditions that have lasted or are expected to last six months or longer. Do you have any of the following long-term conditions that have been diagnosed by a health professional. *(Depending on household composition, wording is you or you and other adults)*

<fh1> First, what about heart disease, do you have heart disease?

1 yes
5 no
8 don't know
9 refused

<fh2> Chronic bronchitis or emphysema?

1 yes
5 no
8 don't know
9 refused

<fh3> Asthma?

1 yes
5 no
8 don't know

9 refused

<fh4> *(only if children under 18 in household)* Of the people in your household who are younger than 18 years of age, have any of them been diagnosed with asthma by a health professional?

1 yes
5 no
7 no one less than 18 in household
8 don't know
9 refused

<fh5> And of those under 18 years of age, have they ever seen a doctor for bronchitis or pneumonia?

1 yes
5 no
7 no one less than 18 in household
8 don't know
9 refused

<fh6> Have any of those under 18 years of age ever had tubes put in their ears as a result of chronic ear infections?

1 yes
5 no
7 no one less than 18 in household
8 don't know
9 refused

<fh7> Has anyone who lives in your household been pregnant in the last 12 months?

1 yes
5 no
8 don't know
9 refused

Legal Protection

<lp1> I want to ask about a situation where a child's asthma is made worse because the parents smoke around the child. In this case the parents have been told by doctors and child care authorities that their smoking is harming their child. In this type of situation, do you think the court should order the parents not to smoke in their home?

1 yes
5 no

7 R volunteers other response (specify)
8 don't know
9 refused

<lp2> Do you feel very strongly or somewhat strongly about this?
1 very strongly
5 somewhat strongly
8 don't know
9 refused

Sociodemographics

<age> Finally, these last questions are for classification purposes only. First in what years were you born?
1900-1983 enter year
9998 don't know
9999 refused

<edu> What is the highest level of education you have completed?
1 no schooling
2 some elementary school
3 completed elementary school
4 some high school/junior high
5 completed high school
6 some community college (College Classique, CEGEP)
7 some technical school
8 completed community college
9 completed technical school
10 some University
11 completed Bachelor's degree
12 post graduate training: MA, MSc, MLS, MSW, MBA, etc
13 post graduate training: PhD
14 professional degree (law, medicine, dentistry)
98 don't know
99 refused

<mar1> At the present are you:
1 married (includes remarriages)
2 living with a partner
3 widowed
4 divorced

5 separated
6 never married (single)
8 don't know
9 refused

<children> How many people under 18 years of age live in your household?
0 none
1-12 enter number
13 thirteen or more children
99 refused

<AGE> Could you tell me how old that child is/Could you give us the ages of the children who live with you, from oldest to youngest
Enter ages

<home_type> Which of the following best describes your home, is it a
1 single detached home
2 semi-detached (includes duplex, triplex, fourplex)
3 townhouse/row house (includes condos with this structure)
4 apartment/condominium with apartment-like building structure
5 room or flat in house
0 other (specify)
98 don't know
99 refused

<language1> What is the language you first learned to speak and still understand?
1 English
2 French
3 R answers English and French
4 Chinese
5 Greek
6 Italian
7 Portuguese
0 Other (specify)
98 don't know
99 refused

<language2> And what language do you speak most often at home?
Same codes as language1

<ethnicity> To what ethnic or cultural group do you belong?
Enter group

<employment> What is your present job status:

0	self employed
1	employed full-time (30 or more hours per week)
2	employed part-time (less than 30 hours per week)
3	unemployed
4	student - employed part-time or full-time
5	student - not employed
6	retired
7	homemaker
97	other (specify)
98	don't know
99	refused

<inc1> Could you please tell me how much income you and other members of your household received in the year ending December 31, 2000, before taxes? Please include income from all sources such as savings, pensions, rent and unemployment insurance as well as wages to the nearest thousand dollars.

Enter full amount

999998	don't know
999999	refused

<inc2> We don't need the exact amount; could you tell me which of these broad categories it falls into

1	less than $20,000
2	between $20,000-$30,000
3	between $30,000-$40,000
4	between $40,000-$50,000
5	between $50,000-$60,000
6	between $60,000-$70,000
7	between $70,000-$80,000
8	between $80,000-$90,000
9	between $90,000-$100,000
10	between $100,000-$120,000
11	between $120,000-$150,000
12	more than $150,000
98	don't know
99	refused

<inc3> What about you personally, how much income did you receive in the year ending December 31, 2000, before taxes? Please include income from all sources such as savings, pensions, rent, and employment insurance as well as wages, to the nearest thousand dollars.

Enter amount

999998	don't know
999999	refused

<FSA> collect postal code

Appendix II: Ethics Approval

This study was approved by the Behavioural Research Ethics Board, University of British Columbia, certificate number B03-0830