University of Helsinki
Department of General Practice and Primary Health Care

THE INFLUENCE OF SCHOOL SMOKING POLICY AND SCHOOL PREVENTION PROGRAMS ON THE SMOKING BEHAVIOUR OF HIGH SCHOOL STUDENTS IN PRINCE EDWARD ISLAND, CANADA

Donna A. Murnaghan

Academic dissertation
To be presented with the permission of the Medical Faculty of the University of Helsinki for public examination in the Auditorium XVI, Unioninkatu 34, on September 4th, 2009, at 12 noon.

Helsinki 2009
ABSTRACT

The aim of the study was to examine the influence of school smoking policy and school smoking prevention programs on the smoking behaviour of students in high schools in Prince Edward Island using the School Health Action Planning Evaluation System (SHAPES).

A total sample included 13,131 observations of students in grades 10-12 in ten high schools in Prince Edward Island over three waves of data collection (1999, 2000, and 2001). Changes in prevalence of smoking and factors influencing smoking behaviour were analyzed using descriptive statistics and Chi-Square tests. Multi-level logistic regression analyses were used to examine how both school and student characteristics were associated with smoking behaviour (I, II, III, IV). Since students were located within schools, a basic 2-level nested structure was used in which individual students (level 1) were nested within schools (level 2).

For grade 12 students, the combination of both school policies and programs was not associated with the risk of smoking and the presence of the new policy was not associated with decreased risk of smoking, unless there were clear rules in place (I).
For the grade 10 study, (II) schools with both policies and programs were not associated with decreased risk of smoking. However, the smoking behaviour of older students (grade 12) at a school was associated with younger students’ (grade 10) smoking behaviour. Students first enrolled in a high school in grade 9, rather than grade 10, were at increased risk of occasional smoking.

For students who transitioned from grade 10 to 12 (III), close friends smoking had a substantial influence on smoking behaviour for both males and females (III). Having one or more close friends who smoke (Odds Ratio (OR) = 37.46; 95% CI = 19.39 to 72.36), one or more smokers in the home (OR = 2.35; 95% CI = 1.67 to 3.30) and seeing teachers and staff smoking on or near school property (OR=1.78; 95% CI = 1.13 to 2.80), were strongly associated with increased risk of smoking for grade 12 students.

Smoking behaviour increased for both junior (Group 1) and senior (Group 2) students (IV). Group 1 students indicated a greater decrease in smoking behaviour and factors influencing smoking behaviour compared to those of Group 2. Students overestimating the percentage of youth their age who smoke was strongly associated with increased likelihood of smoking. Smoking rates showed a decreasing trend (1999, 2000, and 2001). However, policies and programs alone were not successful in influencing smoking behaviour of youth. Rather, factors within the students and schools contextual environment influenced smoking behaviour. Comprehensive approaches are required for school-based tobacco prevention interventions.
Keywords: schools, policy, programs, smoking prevention, adolescents

Subject Terms: school-based programming, public health, health promotion
ACKNOWLEDGEMENTS

This study was carried out in the Department of General Practice and Primary Health Care at the University of Helsinki, Finland.

It is a pleasure to thank the many people who have contributed to this thesis.

First, I want to express my sincere gratitude to Docent Marja Sihvonen, Ph.D., R.N., and Professor Pertti Kekki, M.D., Sc.D. who provided guidance and support throughout this long journey. To Professor Kekki for his suggestions and contribution to this work and for having the foresight to create a University of Helsinki and University of Prince Edward Island partnership which allowed me to study primary health care with high quality scholars across the world. To Marja for her ability to synthesize and guide my thesis development and who challenged me to be more analytical.

I would like to thank my external examiners, Professor Olli-Pekka Ryynänen, M.D., Dr.Med.Sci., and Docent Seppo Y.T. Junnila, M.D., Dr.Med.Sci. who graciously accepted the role of critiquing my thesis and providing guidance for the final version. The comments I received were very helpful and rewarding. I am also very grateful to Professor Arja Rimpelä M.D., Dr. Med Sci, for taking time from her very busy schedule to act as the opponent for my thesis. I want to thank my colleague and friend Dr. Scott Leatherdale who was instrumental in guiding me through data analysis and publications. He gave me the encouragement and guidance that I needed when I did not believe in myself.

I would like to thank my many colleagues at the University of Waterloo particularly Dr. Roy Cameron, Dr. Steve Brown and Dr. Steve Manske. They supported me through funding, data analyses, their expertise in school health
and the many resources within the Centre for Behavioural Research and Program Evaluation and the Health Behaviour Research Group. To my many colleagues and friends at the University of Prince Edward Island, my research staff and my nursing friends, I have benefited from your support, guidance and encouragement. I want to thank my wonderful friends who always listened to me, laughed with me and helped me escape from work when I needed it most.

I especially wish to thank the Eastern and Western School Districts for agreeing to participate in my study and each Principal and teaching staff who welcomed me into their schools and classrooms. A special thank you goes to all the students across Prince Edward Island who participated in my study by completing the student questionnaires.

A very profound thank you goes to my mother Menadora Mac Donald who taught me the value of continued learning and the importance of family. I am very fortunate to have 12 wonderful brothers and sisters who have continued to be a source of phenomenal support throughout this journey. They celebrated each small step along the way and pushed me to continue when the going was difficult. I am very blessed to have such a family.

I want to say a very special thank you to my children Chantelle and Darcy. They grew up with a mother who worked full time and studied part time. They accepted this as normal life and never complained. Through the highs and lows of doctoral studies they have been the reality check for what is truly important. They are beautiful, healthy, happy and exceptional adults who continue to be a source of pride and joy for me. Finally and most importantly, I want to thank my husband Donnie for his unfailing support of me throughout this whole journey. He has walked beside me, carried the responsibilities of the home when needed and ensured that we maintained a strong family life. He is my source of strength and support as my husband, my partner, my friend. His patience and encouragement allowed me to complete this major goal.
DEDICATION

This thesis is dedicated to my husband Donnie and my children Chantelle and Darcy.
# TABLE OF CONTENTS

Abstract .......................................................................................................................... ii
Acknowledgements ........................................................................................................ v
Dedication ....................................................................................................................... vii
Table of Contents ......................................................................................................... viii
List of original articles ................................................................................................. xi
List of Figures ............................................................................................................... xii
List of Tables ............................................................................................................... xiii
Glossary ......................................................................................................................... xiv

1. **INTRODUCTION** .......................................................................................... 1
   1.1 The incidence and prevalence of smoking among adolescents .... 1
   1.2 Background .............................................................................................. 6
   1.3 Literature Review .................................................................................... 9
      1.3.1 Tobacco Control and Youth .......................................................... 10
      1.3.2 Schools and Youth Tobacco Control ........................................ 23
      1.3.3 School environment and smoking policies and programs ......... 25
      1.3.4 Evaluation of School-based tobacco policies and programs ....... 27
   1.4 Summary ............................................................................................... 30
   1.5 Theories and Models ........................................................................... 31
      1.5.1 Health Behaviour Theories ......................................................... 34
      1.5.2 Summary of theoretical approaches ..................................... 44
   1.6 Aims of the study ............................................................................... 45
      1.6.1 Specific objectives: ................................................................. 46

2. **METHODS** ................................................................................................... 47
   2.1 Background to Study: .......................................................................... 47
   2.2 Design ..................................................................................................... 49
   2.3 Recruitment of sample and Data Collection ........................................ 50
      2.3.1 Recruitment ............................................................................... 50
      2.3.2 Questionnaire and Variables ................................................ 51
      2.3.3 Questionnaire Implementation ............................................. 53
   2.4 Participants ............................................................................................ 55
   2.5 Measures ............................................................................................... 56
      2.5.1 Outcome Variables .................................................................. 56
   2.6 Analyses .................................................................................................. 59
   2.7 Ethical Considerations .......................................................................... 63
Appendix 7 Cessation Results 1999 .............................................................. 169
Appendix 8 Cessation Results 2000 .............................................................. 170
Appendix 9 Cessation Results 2001 .............................................................. 171

Original Articles .............................................................................................. 172
LIST OF ORIGINAL ARTICLES

I

II

III
Murnaghan DA, Leatherdale ST, Sihvonen M, Kekki P. School-based tobacco control programming and student smoking behaviour. Chronic Diseases in Canada. Accepted for publication, 18.2.2009.

IV
Murnaghan DA, Sihvonen M, Leatherdale ST, Kekki P. School-based tobacco control efforts and the smoking behaviour of high school students in Prince Edward Island, Canada: Examining and differences. Primary Health Care Research & Development. Accepted for publication 4.3.2009.
LIST OF FIGURES

Figure 1. Percentage of never smokers in high school in PEI by grade and year ................................................................. 66
Figure 2. Percentage of occasional smokers in high schools in PEI by grade and year .............................................................. 67
Figure 3. Percentage of regular smokers in high schools by grade and year ........................................................................ 67
Figure 4. Comparison of group changes in smoking behaviour and school and students characteristics influencing smoking behaviour between 2000 and 2001 ................................................................. 88
LIST OF TABLES

Table 1. Demographic characteristics of participants ........................................ 65
Table 2. Factors influencing smoking behaviour.............................................. 69
Table 3. Changes in smoking behaviour between Board 1 and Board 2 over three waves of data collection ..................................................... 71
Table 4. Smoking behaviour of grade 10-12 students in high schools in PEI (1999) ........................................................................................... 73
Table 5. Smoking behaviour of grade 10-12 students in high schools in PEI (2000) ........................................................................................... 74
Table 6. Smoking behaviour of Grade 10-12 students in high schools in PEI (2001) ........................................................................................... 75
Table 7. Factors influencing smoking behaviour of grade 10-12 high school students in PEI (1999) .............................................................. 78
Table 8. Factors influencing smoking behaviour of grade 10-12 high school students in PEI (2000) .............................................................. 79
Table 9. Factors influencing smoking behaviour of grade 10-12 high school students PEI (2001) ................................................................. 80
**GLOSSARY**

<table>
<thead>
<tr>
<th>Term</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>School smoking policy</td>
<td>Statement describing what the tobacco policy means for the Board/school with accompanying regulations to guide how the policy will be implemented.</td>
</tr>
<tr>
<td>School prevention programs</td>
<td>School approved activities designed to reduce tobacco use. Examples of activities might include curricula, social influences approaches, combined curricula and ecological approaches.</td>
</tr>
<tr>
<td>SHAPES</td>
<td>School Health Action Planning Evaluation System consists of a questionnaire, a quality control scanning protocol and a report delivered back to the school or community.</td>
</tr>
<tr>
<td>Intervention</td>
<td>A policy or program designed to help reduce tobacco use.</td>
</tr>
<tr>
<td>CCS</td>
<td>Canadian Cancer Society</td>
</tr>
<tr>
<td>CDC</td>
<td>Centres Disease Control</td>
</tr>
<tr>
<td>CTUMS</td>
<td>Canadian Tobacco Use Monitoring Survey</td>
</tr>
<tr>
<td>ETS</td>
<td>Environmental Tobacco Smoke</td>
</tr>
<tr>
<td>HBM</td>
<td>Health Belief Model</td>
</tr>
<tr>
<td>ICC</td>
<td>Intra Class Correlation</td>
</tr>
<tr>
<td>Kick the Nic</td>
<td>Smoking cessation program</td>
</tr>
<tr>
<td>PEI</td>
<td>Prince Edward Island</td>
</tr>
<tr>
<td>PETRA</td>
<td>PEI Tobacco Reduction Alliance</td>
</tr>
<tr>
<td>PMT</td>
<td>Protection Motivation Theory</td>
</tr>
<tr>
<td>SCT</td>
<td>Social Cognitive Theory</td>
</tr>
<tr>
<td>SSP</td>
<td>School Smoking profile (precursor to SHAPES)</td>
</tr>
<tr>
<td>Acronym</td>
<td>Description</td>
</tr>
<tr>
<td>---------</td>
<td>-------------</td>
</tr>
<tr>
<td>SWITCH</td>
<td>Students working in tobacco can help. Youth group working to reduce tobacco use in PEI.</td>
</tr>
<tr>
<td>TPB</td>
<td>Theory Planned Behaviour</td>
</tr>
<tr>
<td>TRA</td>
<td>Theory Reasoned Action</td>
</tr>
<tr>
<td>TTI</td>
<td>Theory Triadic Influence</td>
</tr>
<tr>
<td>TTM</td>
<td>Transtheoretical Model</td>
</tr>
<tr>
<td>WHO</td>
<td>World Health Organization</td>
</tr>
<tr>
<td>YSS</td>
<td>Youth Smoking Survey</td>
</tr>
</tbody>
</table>
1. INTRODUCTION

Adolescents continue to initiate cigarette smoking despite extensive prevention programs to warn them of the harmful risks of smoking. However, the processes of initiation and use of cigarettes are very complex and relate to multiple health determinants including physical, social, and cognitive influences. Cigarette smoking typically begins and escalates during the adolescent years, a time when youth are influenced by their social environment (particularly close friends and family) as well as contextual factors within their physical environment (access to tobacco, policies and legislation to control tobacco use).

1.1 The incidence and prevalence of smoking among adolescents

Smoking is a very critical problem for youth in Canada. In the early 1990’s, after many years of decline, smoking rates in Canadian youth (daily and occasional) were increasing. Despite the overwhelming evidence on the harmful effects of smoking, such as cancer and cardiovascular disease (CCS 2005; Chen 2003; Ellison et al.1995), youth smoking rates in Canada remain high (Health Canada 2007a, 2008). Approximately 85% of adult smokers began smoking before the age of 18 years (Health Canada 2001) and 70-75% of students try a cigarette prior to the end of high school (Orlando et al. 2004; CDC 2004).
According to the 2004-05 Youth Smoking Survey (YSS), rates of ever smoking increased from 5.8% in grade 5 to 34.3% in grade 9 (age 13-14 years) for both males and females (Health Canada 2007b). In Prince Edward Island, self-reported adolescent smoking (12-19 years old) rates in 2003 were 11.4% with large tobacco usage increases from age 13 (4%) to age 18 (29%) (PEI Department of Health and Social Services 2000). The prevalence of smoking among youth age 15-19 years rose from 21% in 1991 to 30% in 1995 (Statistics Canada, 1996). This is compared to rates for youth from grades 7, 9, 11, and 13 in Ontario which ranged from 21.7% in 1991 to 27.9% in 1995 (Manske et al. 1997). Estimates suggest that in 2007 smoking will have caused 37 000 deaths in Canada where tobacco use is the major modifiable cause of preventable morbidity and mortality (Health Canada CTUMS 2006).

According to the 2002 Youth Smoking Survey Technical Report, there continues to be a rapid rise in smoking for youth as they age particularly around grades 10-12. In 2003, national data indicated that 13% of males and 17% of females aged 15-17 years were current smokers. These rates increased further to 24% of males and 25% of females aged 18-19 years. Similar increases were observed in data from the United States, where smoking rates rose steadily in high school to peak in twelfth grade students at 26% (2002). The 2003 CTUMS data indicate that more than half (56%) of respondents, age 15 and older had their first cigarette by age 15 (Health Canada 1996). Age of onset was consistent across genders.
Between 1994 and 2007 there has been a great decline in smoking rates of youth ages 15-19, particularly in Prince Edward Island where rates decreased from a high of 28% to a low of 13.1%. Although this decreasing trend in adolescent smoking behaviour has been positive, there is concern because of the plateau effect of the past couple years and a slight upward curve in smoking behaviour. The relationship between rising smoking rates and grade in school is well documented in the broader literature, as well as in the PEI Drug Study (PEI Drug Study 1998).

For adolescents, smoking is a common activity, with 27% of twelfth graders (17-18 years), 18% of tenth graders (15-16 years), and 11% of eighth graders (16-17 years), reporting smoking in the past month (Johnston et al. 2002). Many adolescent smokers do not believe there are health risks in “the first few years” (Chassin 2002; Slovic 2000), and may believe that they will stop smoking before damage is done (Arnett, 2000). The research to understand the best practices for addressing youth tobacco control has been fraught with challenges, one of which is the variability in smoking behaviour of adolescents. Baker, Brandon and Chassin (2004), described age related trajectories of smoking behaviour using longitudinal studies (Chassin et al. 2000, Colder et al. 2001; White et al. 2002). The early onset group (age 12-13) is marked by a steep rise to heavy smoking. A late onset group (after age 15) smokes at a moderate level. An experimenter group tries smoking but does not proceed to daily smoking and is developmentally limited to adolescence and a group that quits smoking. Identifying more effective tobacco prevention strategies to stop early
initiation to smoking, to prevent transitions from experimenting to regular smoking and to assist cessation efforts of students who are already addicted to cigarettes speaks to the complexity of the problem. Identifying interventions that address individual and environmental factors that influence adolescent smoking, particularly in schools where students spend a large bulk of their day (~25 hours per week) may provide new insights for future tobacco control.

The school is a primary social environment that can reach a significant proportion of youth (Baker et al. 2003), and acts as a site for prevention and promotion of multiple behaviour interventions (Deschesnes et al. 2003). Schools can play a crucial role in the agenda to improve the health of adolescents and thus the adults they become. For instance, not only do the majority of smokers (~80-90%) start smoking while they are students (Unger & Chen 1999), but considering that the vast majority of youth spend large amounts of time at school, the school environment represents the best possible environmental context for population-level interventions to reduce tobacco use among youth. During the ~25 hours each week students spend in school throughout the school year, they could be continually exposed to programs and policies (interventions) to reduce or prevent tobacco use. Schools are part of all communities where children live, learn, grow and play and are located in communities of every socioeconomic, cultural and ethnic group. Therefore, it is in the best interest of public health professionals to foster school environments for building lifelong healthy behavioural patterns that will reduce the burden of chronic disease. Schools should be viewed as one component of a broader comprehensive approach to
tobacco control for youth. More information is needed on the interaction of school variables with a host of other community, provincial and national factors that influence youth smoking patterns (YSS Technical Report, 2002).

Research and programs to enhance interventions for preventing youth smoking behaviour have met with less success because of their limited reach, and failure to provide long-term impact (Peterson 2000). Further, the great success of tobacco control in developed countries, counterbalanced by the continued uptake of cigarette use by youth, is contributing in the long term to destruction and death caused by tobacco use (Warner 2007). However, recommendations from National and international initiatives such as the Ottawa Charter (Health and Welfare Canada 1986) and the World Health Organization’s guidelines for comprehensive school health (WHO 1991) are still being developed. Integrated, coordinated, and comprehensive school-based programs can provide students with (1) the knowledge and skills to decrease the risks for chronic diseases, (2) proactive approaches to evidence-based education, and (3) an environment that is conducive to both learning and health (WHO 1997; McCall 2003; Stewart-Brown 2006).

Although there are strong recommendations to conduct comprehensive school-based programs, coordinated action and measurements are required at the local, municipal, provincial and national level. Further study is required to enhance lessons learned from implementing school-based programs, particularly within a local context. This study was part of a larger initiative in the province of
Prince Edward Island to reduce tobacco use among youth through school-based initiative that was combined with broader community and policy level work.

1.2 Background

Prince Edward Island (PEI), the smallest province in Canada, has a population of 135,000 people with approximately 10,000 between the ages of 15-19 years. The population is predominately Caucasian with 68% of British ancestry, 21.3% French descent and 11.7% other origins including aboriginal, German, Dutch, Acadian, First Nations. The majority of the population are Roman Catholic (47.4%) or Protestant (42.8%) as well as small populations of other religions such as Anglican, Lutheran, Pentecostal, Baptist, Muslin, Buddhism and Hindu. PEI is a relatively stable community with over 94% of the population having lived in Prince Edward Island for over 5 years or more. Economic measures place PEI residents in the lower end of socioeconomic measures for Canada. The median family income for PEI is approximately $55,000 for a family of five. Only the urban capital of Charlottetown has family income rates that are only slightly higher than other rural areas of the province because of the Government and University employment. PEI is predominantly a rural community with fishing, agriculture and tourism as the major markets for the economy. The public school system has three School Boards - Board 1, Board 2 and a French Board (six schools). Board 1 represents 21 schools with over 6000 students while Board 2 represents 43 schools with over 13000 students. Both
school Boards provide instruction to students from Grade 1 (age 6) to grade 12 (age 17-18).

In 1998, after broad consultation with tobacco related stakeholders from government, schools, voluntary agencies, health professionals and municipal and provincial leaders, a new tobacco policy was introduced banning smoking on all school property. Board 1 Tobacco Policy provided a policy statement with specific regulations for implementation of the policy. Specifically the policy states:

“it shall be the policy to promote a safe, healthy environment for all students, employees, and visitors to our property and facilities. The Board recognizes the danger to health of all users of our Board property through the exposure to the use of tobacco products and prohibits any tobacco product usage in Board 1 facilities or on Board property. Accepted research has indicated that the two key issues in reducing tobacco product usage are the availability of the product and the opportunity to use the product. The Board will promote education and public awareness through the use of signage and authorized educational programs. The Board will follow the principle of the Duty of Care in the implementation of this policy. This means that the Board will demonstrate the following: respect for the rights of all individuals to benefit from a safe and healthy environment; fair procedural treatment; and persistent and diligent effort to encourage successful behaviour.”

The Board further recognizes that tobacco usage is a wide societal issue and will work with other partners in the PEI Tobacco Reduction Alliance to reduce tobacco product usage among people who use our property. The Board will implement this policy with the use of regulations, which will deal with public education, educational programs, prevention activities, cessation programs, and enforcement and compliance.

Board 2 also had a stated policy and accompanying regulations. Specifically the tobacco policy for Board 2 states:
“It shall be the policy to provide a healthy working environment for all students and staff, as well as to provide effective educational programs and positive example to students concerning the use of tobacco. Rationale: The Board believes that it has a responsibility to co-operate in protecting the health and safety of all its students and employees. The Board encourages the administration and staff in its facilities to take steps to increase the awareness of all persons who use school facilities to the dangers of smoking.”

This study was part of a comprehensive tobacco preventive initiative called the Prince Edward Island Tobacco Reduction Alliance (PETRA) that was officially launched in the fall of 1998. Between 1999 and 2001, Prince Edward Island (PEI) introduced a province-wide initiative to implement both school-based policies banning smoking on school grounds and school-based smoking prevention programming, phased in over a three-year period in all schools. During this time PETRA also continued to work towards enforcement of banning smoking in public places such as restaurants, bars, shopping centers and work places, and enhancing tobacco control initiatives across the province. This provided a unique natural environment to explore the individual and combined effects of school characteristics such as policies and programs on youth smoking behaviour.
1.3 Literature Review

This literature review includes a review of the current and seminal studies on tobacco use that addresses youth ages 15-19 years. The literature searches for this review included searches from CINAHL, MEDLINE, Pub Med and Cochrane library databases using the key words tobacco and youth, smoking policies, smoking prevention programs, schools and tobacco, tobacco control and theoretical models. A general search of the literature was conducted for all types of studies addressing tobacco policy and schools. The search was limited to empirical research articles published in English around tobacco policy, programs, and youth in schools between 1989 and 2009. General topics of tobacco, youth and schools generated 2971 abstracts. The search was further refined to identify Cochrane Reviews, systematic reviews, meta-analyses, World Health Organization (WHO) reports and Health Canada documents. Individual articles from studies relevant to tobacco policy, schools and youth were also identified. The final search resulted in 694 abstracts reviewed. Over 300 articles and documents were retrieved including: two Cochrane reviews (Thomas & Perera 2006; Sowden & Arblaster 2001), one Better Practice Review (Dobbins et al. 2007), one WHO report on school health promotion (Stewart-Brown, 2006), 15 reviews, 5 meta-analysis as well as individual articles on youth, smoking policies and programs and schools. Exclusion criteria were tobacco policy studies addressing adults, clinical studies, community based programs and studies addressing other behaviours.
1.3.1 Tobacco Control and Youth

Psychological factors believed to explain the process of adolescent smoking are personal (e.g. smoking-specific beliefs and attitudes, self-esteem), environmental (e.g. modelling and tolerance of tobacco use in the social environment), behavioural (e.g. school factors, lifestyle), and socio-demographic (e.g. gender, ethnicity, family income) (Rutger et al. 1999; Tyas & Pederson 1998). These variables explain much of the variance in smoking behaviour and both cause, and protect, against the uptake of smoking (Engels et al. 1999). Seven motives for smoking described by Lujic, (2005, p.7) include psychological, sensorimotor, indulgent, stimulation, sedation, dependent, and automatic. Psychological smoking occurs during social situations. Sensorimotor smoking occurs for sensations such as the taste of the cigarette or the sense of touch when holding a cigarette. Indulgent smoking is the pleasure of smoking a cigarette at times such as during break. Stimulation smoking sees benefit from the effects of nicotine to increase attention. Sedation smoking uses smoking to cope with negative feelings. Dependent smoking occurs because of the nicotine levels that are required to function. Automatic smoking occurs without being conscious of lighting a cigarette or noticing their smoking behaviour.

Previous reviews and meta-analysis have provided supportive evidence of the positive effect of school-based programs on smoking behaviour (Botvin 2000; Bruvold 1993; Rooney 1996; Tobler 1997; 2000). Although Botvin’s review was categorized as weak by Dobbins et al. (2007), it did provide support for findings
from the strong review conducted by Bruvold (1993). Botvin’s (2000) review of school-based prevention initiatives supported the efficacy of psychosocial factors that address teaching information and skills to increase resistance to social influences and overestimations of smoking. Bruvold used meta-analytical techniques to analyze 94 interventions of school-based programs between the 1970s and 1980s. Findings supported programs using social reinforcement, social norms and developmental approaches. In contrast, Rooney (1996) reviewed 131 school-based smoking prevention programs published between 1974 and 1991. They used a modelling approach to estimate the impact of program if it started in sixth grade as part of a broader health program. They found no evidence that social influences, resistance skills or generic skills had a large effect on smoking outcomes. These findings are consistent with the conflicting reports of social influence approaches to smoking prevention of adolescents.

Tobler (1997) conducted a meta-analysis of 120 experimental or quasi-experimental school-based adolescent drug prevention programs (grades 5 to 12) that evaluated the success of interactive and non-interactive programs to reduce drug use. Findings suggested that consistently the interactive programs were more effective than non-interactive programs. However, the larger studies reported implementation issues that draw attention to the need for rigorous implementation designs. Tobler (2000) conducted a meta-analysis of 207 school-based drug prevention programs including 74 tobacco prevention programs. A large number showed positive program effects suggesting that prevention programs may be effective in reducing or preventing adolescent substance use.
over the long term. Thirty of the programs rated as high quality showed effect sizes of near zero for both the non-interactive programs (OR = 0.13, 95% CI = 0.06 to 0.31) and the interactive programs (OR = 0.17, 95% CI, 0.13 to 0.22). One potential reason for these findings is the majority of studies are not designed to collect adequate information for a long-term analysis or did not have the resources available to conduct such a long term rigorous study.

Systematic reviews conducted by Thomas & Perera (2006), and Dobbins DeCorby, Manske & Goldblatt (2007) and Sowden and Arblaster (2003) have contributed further considerations in advancing the discourse on tobacco control programs in schools and provide a very comprehensive analysis of school-based program interventions. Thomas & Perera conducted a systematic Cochrane review of all randomized controlled trials of behavioural interventions in schools to prevent children and adolescents from starting smoking. Their search included 133 authors resulting in 94 randomized controlled trials that met the criteria of having at least a minimum 6-month follow up. Each study was assessed for quality of design, execution and abstracted outcome data. Of the 94 studies identified, 23 were classified as category one (most valid), 31 as category two (one or more problems in design) and 40 were classified as category 3 (serious problems in design of conduct that precluded drawing conclusions). School programs were classified as (i) information giving, (ii) social competence, (iii) social influence, (iv) combined social competence and social influence, and (v) multimodal programming. Thomas (2006) reviewed twenty three high quality studies on school-based programs (one information giving, two social
competence, 13 social influences, three combined social competence and social influence, one social influence versus information giving, and four multimodal initiatives). The review found that when social influence models are incorporated into school-based programs they can be effective in the short term. However, programs based on information only are not effective in the long term. Their findings suggest that the effect of school-based intervention programs on smoking behaviour of youth has not been positive, thereby challenging recommendations for continuing to offer school-based programs. Two of the 10 information only studies reported significant short-term effect of an intervention on the smoking behaviour of students. In Ausems’ (2004) study, the intervention group (n=1444) showed a decrease in smoking after 3 lessons on knowledge attitudes and social influences, class agreement not to smoke, class competition, and optional video lessons, while control students received the usual anti-smoking programs. Crone’s (2003) study of 26 schools in the Netherlands showed a significant intervention effect (OR = 0.61; 95% CI = 0.41-0.91). Two (Kellem 1998; Storr 2002) of three studies teaching social competence showed a positive pooled effect of long-term effectiveness (OR 0.77; 95% CI 0.48 TO 1.22). This pattern of inconsistency across studies suggests that information only programs are fraught with issues of questionable effectiveness over time. Moreover, factors other than information may be equated with the success of such programs.

Fifty-six social influence studies met the inclusion criteria with 13 of them meeting category one criteria (Thomas & Perera 2006). Nine of the high quality studies
showed some positive effect on smoking prevalence (Botvin 2001; Brown 2002 for males only; Cameron 1999 for high risk schools; Dijkstra 1999; Elder 1993; Ellickson 1990; Hansen 1991; Noland 1998; Walsh 2003). Four studies (Aveyard 1999; Ellickson 1990; Murray 1992; and Peterson 2000) did not have any effect on smoking prevalence. Seven high quality studies (Abernathy 1992; Armstrong 1990; Brown 2002; Flay 1985; Focarile 1994; Hansen 1988; and Vartiainen 1998) showed short-term effects. Only one high quality study reported long-term effects but the results were non-significant in the long term (Peterson 2000). The most well known, high quality study in this social influence category is the Hutchinson Smoking prevention study conducted by Peterson and colleagues (2000). This rigorously designed study ran from 1984 to 1999 using an enhanced influences approach that included key elements of a school-based prevention initiative. It included 65 classroom sessions sustained over eight years with students from grades 3 to 10, as well as follow-up two years post school. The study appeared to have all the qualities of excellence in design and implementation. However, no effect of the intervention on prevalence of smoking was found either at the school level or later at follow-up. Major criticisms of the study centered on the diversity of the social influences interventions and the changes in the school Boards over the study period. Cameron and colleagues (1999) had found positive effects of tobacco reduction in high-risk schools. Well-known prevention researchers including Botvin (2001), Cameron (2001), and Sussman (2001), challenged and tried to explain these findings and suggest that the results of one study should not detract from the larger prevention literature.
where there is convincing evidence of the benefits of school-based program. Further, counter arguments were supported by examples of school-based success stories. Botvin, Baker, Dusenbury et al. (1990; 1995) had found a 25% reduction in pack a day smoking among students until the end of grade 12. In the Towards No Tobacco project, Sussman (1993) saw a 30% reduction in initiation of smoking and 60% reduction in weekly smoking across the transition between junior and senior high school years. Although some studies showed some positive effects for the combination of social influences and social competence models (Spoth 2001) and for multimodal approaches (Elder 1996; Perry 2003; Biglan 2000) the results are conflicting because of the limited data available. Thomas (2006, p11) suggests that future rigorous studies should combine multi modal school programs with community initiatives and combining social influences approaches with social competence approaches. One might suggest that the arguments countering school-based interventions should remain open for new research examining comprehensive studies that address the contexts of the student environments, families, and communities.

A Cochrane review by Sowden and Arblaster (2003) examined the effectiveness of community interventions in preventing the uptake of smoking in young people. Thirteen studies (out of 57) met the inclusion criteria including randomized and non-randomized controlled trials that assessed the effectiveness of multi-component community interventions with young people under age of 25. All studies used a controlled trial design with four using random allocation of schools or communities. Two of the nine studies that compared community
interventions to no intervention controls reported a decrease in smoking prevalence. One of three studies that compared community intervention to school-based programming found differences in smoking prevalence of smoking. A decrease in prevalence was found in a community that received a multi-component intervention. Another study showed a significant difference in smoking prevalence when students received media plus school and homework compared to students who received media component only. The authors concluded that there was some limited support for the effectiveness of community interventions in helping prevent smoking among youth.

Dobbins, DeCorby, Manske, and Goldblatt (2007) conducted a better practice review of the synthesized published literature (1985 to 2007). Different from a Cochrane review, they combined reviews from the published literature including RCTs, quasi-experimental studies, meta-analyses as well as evidence from individual interviews and focus groups from stakeholders from the tobacco prevention community. Published abstracts were screened for relevance and quality using pre-tested standardized tools. Methodological quality of the 31 reviews deemed relevant was determined using ten specific criteria. Out of these 31 relevant studies, nine were strong (Bruvold 1993; Flay 1985, Hwang et al. 2004; Rooney 1992, Rundall & Bruvold 1988; Skara & Sussman 2003, Sowden & Arblaster 2001, Thomas & Perera 2006, Wiehe et al. 2005), three moderate, and nineteen weak.

Three of the most recent strong reviews identified by Dobbins et al. (Skara & Sussman 2003; Wiehe et al. 2005; Hwang et al. 2004) showed positive short-
term results. Skara and Sussman (2003) reviewed 25 long-term adolescent tobacco and other drug-use prevention programs with at least 2-year follow-up using 5 specific criteria. Programs were based on social influence (n=19) and counteracting social influences (n=5) and informational social influences (n=1). Findings showed that school and community based programs were ineffective. However, “the majority (n=14) of the studies used quasi-experimental designs, selected schools as the unit of analysis, analyzed data at the individual level, and showed great variability in the selection and use of substance use outcome measures” (Thomas & Perera 2006 p467). In a systematic review of eight RCT studies on middle and high school students, with interventions ranging from five to 65 sessions of 1-8 years duration, Wiehe et al. (2005) found only one study (Botvin et al. 1995) reporting decreased smoking prevalence. Their Life Skills Program study randomized 56 schools into intervention or control groups. However, there was little or no evidence of long-term effectiveness in smoking prevalence among students at 1-year follow-up. Hwang, Yeagley & Petosa (2004), in a meta-analysis of 65 programs (psychosocial interventions with a cognitive behavioural component, found a statistically significant effect size on tobacco knowledge after one year (0.53); however behavioural effects persisted with an average effect size of 0.19 from one to three years.

Overall findings from the review by Dobbins et al. (2007) suggest strong evidence that comprehensive and multifaceted school-based tobacco use prevention programs are effective at reducing smoking initiation and prevalence in the short term. Interventions found to be effective included school curricula,
social norms and influences training, social reinforcement, refusal skills training, and cognitive skill enhancement. Similar to reviews by Thomas (2006), Backinger et al. (2003) and Wiehe et al. (2005), Dobbins et al. (2007) did not find evidence of effectiveness of interventions in the long term. A major limitation of finding evidence to assess long-term effectiveness has been that few studies have completed long-term rigorous follow-up or have provided ongoing interventions and/or booster programs during the long-term follow-up. Weaknesses of studies reviewed by Dobbins et al. (2007) included weak methods for combining results across studies, inadequate search strategy, quality of study not adequately assessed, and disagreement between reviewers. Five of the reviews were actually meta-analysis.

1.3.1.1 Quitting

Gathering information about quitting and quit attempts is difficult because adolescents, who are at early stages of smoking (i.e. beyond puffing but are not daily smokers) may not perceive cessation questions or programs as being relevant to them. The diversity of these trajectories complicates the processes around cessation planning. Youth who move to heavy smoking are at greater risk of not quitting while those who are still at the experimenting stage or a late onset group may have more success with quit attempts. Quitting is more likely among females compared to males, and among youth who are still experimenting with less than five cigarettes a week (Pletcher 2000). According to Thomas and Perera (2006), reports from a Teenage Attitudes and Practices Survey in the US
(1993) showed that 18% of 10 to 18 year old monthly smokers and 74% of daily smokers said that it would be difficult to quit. Further, heavy smokers have lower success rate with quitting while occasional smokers are more likely than regular smokers are to quit (Sargent et al. 1998; Zhu et al. 1999). Success in quitting is stronger when quit attempts are greater than two weeks (Zhu et al. 1999) and for adolescents who have fewer friends and family members who smoke (Sussman 2002; Ellickson et al. 2001; Paavola et al. 2001). A strong predictor of cessation and reducing the likelihood of smoking for adolescents is price increases and work place restrictions.

According to the YSS Technical report (2002), the likelihood of quitting successfully appears to be related to: (1) anti smoking beliefs (Sussman et al. 2002); (2) attitudes (Engels et al. 1998); (3) intentions not to smoke in the future (Ellickson et al. 2001; Sargent et al. 1998); (4) self efficacy (Engels et al. 1998); (5) school performance (Hu et al. 1998); (6) feeling hopeful about life (Sussman et al. 2002); (7) having an intact nuclear family (Ellickson et al. 2001); and, (9) not having symptoms of depression (Zhu et al. 1999).

1.3.1.2 Smoking as a prevalence-driven behaviour

Thomas and Perera, (2006) described adolescent smoking behaviour as a prevalence driven behaviour because of the relationship of adolescent smoking to social interactions with significant others within their environment and to their risk factor for smoking. Tyas and Peterson (1998) identified parents, siblings and close friends as being significant influences on youth smoking behaviour.
Further, youth who engage in other high-risk behaviour such as drugs, sexual activity, and not wearing seatbelt were also associated with smoking behaviour. The transitions through adolescence with developmental and social changes are marked with increased uptake of risk behaviour including tobacco use. The increasing use of statistical modelling techniques that are able to account for nesting of students within classes, within schools and within community and that can explore contextual, as well as individual, influences on smoking behaviour will be essential to advance our understanding of tobacco control for youth.

1.3.1.3 School-based interventions

Thomas and Perera (2006) identified five categories of theoretically derived school-based intervention programming including: (1) information giving curricula; (2) social competence curricula; (3) social influences approaches; (4) combination of social competence and social influence; and (5) multimodal program that combine curricula with broader ecological approaches. The information-based curricula present the philosophy that if you provide youth with information about smoking, its prevalence and risks, changes in smoking behaviour will occur (Bangert-Drowns 1988). Bandura’s Social Cognitive Theory is the foundation of social competence training whereby youth learn positive preventive behaviour by modelling, imitation and reinforcement by role models in their environment that will lead to personal and social skills to resist smoking. McGuire’s (1968) persuasive communication theory and Evan’s (1976) theory of psychological inoculation are the basis of enhancing youth’s anti-tobacco refusal
skills, correcting overestimation of tobacco use by youth their age and, participating in public campaigns to help market anti smoking norms. The fourth intervention program draws on the lessons from both social competence and social influences. Multi-modal programs expand the antismoking initiatives by addressing contextual, as well as, individual student and school influences and broader contextual influences within the community. Such programs extend beyond the individual and school environment to the home and community at large and may reach to the broader policy level arena such as taxation and adoption of policy such as the International Framework Convention for Tobacco Control (WHO 2005).

Unfortunately, evidence of the effectiveness of some school-based interventions has been moderate and conflicting (Dooris 2006; Kolbe et al. 2004). One explanation might be that the same intervention approach (i.e., structure, content, & delivery) changed all the targeted behaviours (National Institutes of Health 2003) when different approaches were needed. Disappointingly, most school-based programs to date have been fraught with failures especially beyond the short-term effect. The Hutchinson Smoking Prevention Project, the longest school-based intervention trial in the United States (Peterson 2000), followed students from grades 3 to 10 with an intervention program that was sustained for eight years. Intervention students received 65 sessions that included skills to identify marketing and peer influences to smoke, resistance skills, corrections to overestimation of smoking behaviour, motivation to be smoke free, enhanced self-esteem, confidence skills and garnering positive family influences. Results
showed no effect of the intervention on prevalence of smoking at time of school leaving or two years later. Similarly, Wiehe (2005) found little or no effectiveness in eight school-based programs that followed students to age 18 or the 12th grade.

However, examples of three successful intervention programs include the Coordinated Approach to Child Health (CATCH) (Nader et al. 1999), Planet Health (Wiecha et al. 2004), and Not-On-Tobacco (NOT) (Horn et al. 2005). Some common success elements across these three programs are inclusion of multiple stakeholders, familiarity with the culture of the school, flexibility for local adaptation, building effective partnerships, and use of theory (Franks et al. 2007).

Furthermore, interventions that target behaviours through multiple mechanisms (i.e., curriculum, policies, role modelling) simultaneously (Deschesnes et al. 2003) may provide schools with a comprehensive and coordinated approach to school health. Schools are the most common setting for tobacco prevention programs; however, continued efforts to enhance the efficacy and effectiveness of those programs are needed. Future, school-based programs need to recognize that the context of the school matters, tobacco prevention programs should be interactive, should correct misperceptions, and teach skills to help youth refuse tobacco (Botvin, 2007). However, continued evaluation and testing of the most promising programs are required, particularly in the long-term.
1.3.2 Schools and Youth Tobacco Control

School-based tobacco control efforts can include both policy and program level activities to help reduce tobacco use in their schools. Policy can be either written or oral statements of the rules about smoking on or near school property with accompanying regulation or guidelines about how the rules are enforced and consequences if the rules are broken. Tobacco prevention programs refer to official and unofficial curricular or other activities carried out in schools during or after class time to support tobacco reduction in schools. Policy and programs are designed to protect students and staffs from harms of smoking while on school property, help adolescents to abstain from starting to experiment with tobacco, help adolescents who are experimenting with tobacco stop smoking immediately and offer cessation programs for those adolescents who are unable to stop on their own.

Interventions or school specific activities to support efforts to reduce tobacco use and uptake in schools should be comprehensive, including students, teachers, and staff and have reach into the community. Typical interventions or school-based efforts to address tobacco use include: (1) school policy and regulations on tobacco use; (2) information on the negative physiological and social consequences of tobacco use; (3) curricula (in class or out of class) education sessions on tobacco use, health risks of tobacco, social influences on tobacco use, peer norms and refusal skills; (4) training for teachers, allied health professionals and community leaders in tobacco control, (5) parent and family support programs; (6) cessation programs for students and staff; and (7) regular
evaluation of tobacco control efforts. Thomas and Perera (2007, p3) categorized the literature on school-based interventions into five types each with their particular theoretical foundation. They included information giving curricula; social competence curricula; social influence approaches; combined methods and multi-modal programs. Information giving curricula are based on providing information about smoking, its physiological characteristics, the prevalence and incidence of smoking and the health risks of smoking. Supporters of information curricula believed that if you provide accurate information about tobacco then that will lead to health behaviour changes (Bangert-Drowns 1988). Social competence curricula are often based on Bandura’s Social Cognitive/Learning Theory (Bandura 1977). Such tobacco control programs would use cognitive-behavioural skills such as personal and social skills, problem solving, decision making, refusal skills, coping skills and enhanced self-esteem skills. Social influence approaches are based on Mc Guire’s persuasive communication theory (McGuire 1968), and Evans theory of psychological inoculation (Evans 1976) to teach students how to interpret estimates of smoking behaviour accurately, how to analyzes deceptive media campaigns, practicing refusal skills and making public commitments to anti-tobacco use. Multi modal programs combine curricular approaches with broader contextual domains of the environment and community. These would include legislation and regulation changes, programs for parents and peers, schools and communities. The Theory of Triadic Influence with its emphasis on combined methods and variety of theoretical approaches could provide guidelines for this type of initiative.
1.3.3 School environment and smoking policies and programs

The school environment represents a broader contextual factor that is associated with youth smoking (Flay et al. 1999; Tyas & Pederson 1998; Aveyard et al. 2004; Leatherdale & Manske 2005; Leatherdale et al. 2005a); yet it is not clear how these school characteristics directly or indirectly influence smoking behaviour. Schools are recognized as social environments that contribute to the health of the students (Flay 2000). They provide students with behavioural models, opportunities to bond with people who have differing expectations about substance use and access to substances (Catford 2001; Bond et al. 2001 [in Evans–Whipp 2004]). Health promoting schools, a framework endorsed by the WHO (WHO 1996) and supported widely in Europe and Australia, supports schools as settings for supporting healthy child development and learning.

School policies are important components of school-based health promotion; however, the development, implementation and evaluation of school drug policies have received much less empirical evidence than drug education curricula and programs (White & Pitts 1998; Flay 2000). According to Goodstadt (1989), policies influence the social environment of the school and therefore play an important role in student behaviour. Strongly enforced school policies, that prevent students from smoking on school property, are linked to lower rates of student smoking (Wakefield et al. 2000). However, Leatherdale and colleagues (2005) identified that sub-populations of students were at increased risk for being susceptible to smoking where susceptibility is a precursor to trying smoking
(Pierce et al. 1996) at schools where students smoked off school property because the smoking policy banned smoking on school property.

A meta-analysis by Rooney and Murray (1996), showed smoking prevention programs result in a reduction in smoking of at least 5% and at most 30% for very comprehensive programs. However, the effects of the programs are often short term. Studies by both Bruvold (1993) and Lynagh et al. (1997) posit that prevention programming can postpone, but not prevent, smoking initiation. Other studies suggest that school-based programs and policies can have a positive impact on reducing youth smoking uptake (Kumar et al. 2005; Distefan et al. 2000; Reitsma & Manske 2004; Pentz et al. 1989; Leatherdale et al. 2005b; Trinidad et al. 2005; Wakefield et al. 2000; Moore et al. 2001; Maes & Lievens 2003), especially when targeted to sub-populations of high-risk youth (Thomas & Perera 2006; Cameron et al. 2008), or when tailored to the needs of smoking youth (Brown et al. 2002; Sussman 2001).

Previous studies that have shown that school-based interventions may increase knowledge about health impacts of tobacco (Schofield 2003), have had limited impact on tobacco control efforts with youth (Schofield 2003; Biglan, 2000; Orleans & Cummings 1999; Cameron et al. 1999). Moreover, school-based prevention programs can be improved, when they are combined with intensive community based interventions and with home supports such as parental supervision (Tyas & Pederson 1998; Chassin et al. 1998; 2000; Wilkinson & Abraham 2004). School level tobacco control policies (Clark, 1996; Tyas & Pederson 1998; Currie et al. 2004; Wiium & Wold 2006) may contribute
to youths’ decisions not to smoke (Unger & Chen 1999). For example, Flynn et al. (1994) showed school-based smoking prevention programs that are combined with a mass media campaign can result in longer lasting effect.

The challenge for school health is the controversy of the evidence to support school-based programs. The Cochrane systematic review of school-based smoking interventions (Thomas & Perera 2006) suggests school-based programs and policies are not effective at sustaining smoking reduction beyond short-term. However, a systematic review by Dobbins et al. (2007) provides strong support for continuing school-based prevention interventions. Both of these recent reviews raise concern about methodology for implementing and evaluating school-based interventions and address the inadequacy of evidence for long-term impact. A challenge not addressed is how to access the appropriate resources to implement rigorous programs.

1.3.4 Evaluation of School-based tobacco policies and programs

According to Flay (1999) school-based programs can work if they are theory based, include teaching and social skills, and include changing social normative beliefs (in addition to knowledge and decision making) [page S1140]. In a comprehensive review of school substance use policies, over 95% of schools in developed countries have some substance use policies; however, there was a great variation in the comprehensiveness, enforcement and orientation of these policies (Evans-Whipp et al. 2004). Among the studies that
were reviewed, all used cross sectional data; there were no studies in secondary schools that used longitudinal data. Tobacco policies in schools for younger students were more comprehensive than were policies for older students. More comprehensive and better-enforced school polices were associated with less smoking among secondary school students. However, many school-based tobacco policies allowed students to smoke in designated smoking areas on school property (Bowen et al. 1995; Denman et al. 1995).

Studies that researched the impact of school policies on youth smoking behaviour have been limited (Willemsen & De Zwert 1999; Flay 2000). Schools with more restrictive smoking policies (Porter 1982) and schools that had written tobacco policies (Griesbach et al. 2002) were less likely to report higher rates of smoking behaviour. In an Australian study, Clark and colleagues (1994) reported that simply having a smoking policy was not related to general smoking. However, Reid et al. (1995) and Reeder & Glasgow (2000) suggest having formal tobacco policies establishes non-smoking norms within the school. A national represented study of grade 9-12 students in US schools (Wakefield 2000) found smoking bans were associated with reductions in teenage smoking with higher proportions of students in early stages of smoking uptake but only when enforcement of the ban was strong. In a national study of secondary school students in Wales, Moore et al. (2001) found more comprehensive smoking policies were associated with less daily smoking among students. Previously, similar results were reported by Charlton and White (1994) in a survey of 16-19 year olds in schools and colleges in England and Wales; students tended to
smoke more cigarettes per day in schools where smoking was allowed. Schools with comprehensive tobacco policies had lower prevalence rates of student reported smoking in a study of 5,000 seventh graders in California (Pentz et al. 1989). Clarke’s (1994) study of secondary students in Australia found that having a staff and visitor smoking policy in addition to student smoking policy was unrelated to prevalence rates of student reported smoking in the past week. An important consideration for tobacco control planners is knowledge that comprehensive policies may result in students smoking fewer cigarettes; but they do not necessarily prevent students from smoking at all (Evans-Whitt 2004). Further, new anti-smoking policies banning smoking on school property have resulted in students moving to smoking in public places off school property (Northrup et al. 1998).

Studies that looked at the relationship of home smoking policies on smoking behaviour showed that adolescents who live in smoke free households were 74% as likely to be smokers as adolescents living in homes with no smoking restrictions (Farkas et al. 2000). Further, restrictive home smoking policies were associated with lower likelihood of trying smoking but were not associated with current smoking in either middle or high school students (Proescholdbell et al. 2000).
1.4 Summary

The literature on the effectiveness of school-based tobacco policies remains conflicted. Whereas many studies support the role of policy and programs in reducing tobacco use among youth, there are equally as many studies that suggest the association is not clear. Several researchers suggest that school-based programs and policies are not effective at preventing smoking uptake (Manske et al. 1997; Wiehe et al. 2005; Thomas & Perera 2006). These findings are contrary to some empirical and theoretical evidence which has demonstrated that school-based programs can be effective (i.e., Wakefield et al. 2000; Cameron et al. 1999; Pentz et al. 1989; 1997; Moore et al. 2001). The two major systematic reviews (Thomas & Perera 2006 and Dobbins et al. 2007) have supported the effectiveness of school-based programs in the short term. They were not able to support school-based programs in the long term. They posit that additional research is required to evaluate the effectiveness of long-term programs. The continued arguments suggest that research has not fully addressed school-based interventions for tobacco reduction. At the heart of the problem is the design and implementation of school-based smoking prevention programs. Often the study design is weak, recruitment procedures are not rigorous, the protocol and documentation of the implementation is not clear, training of research and/or project staff is limited, there is no evaluation, duration of the intervention is not adequate for good measurement, and resources for completing a highly effective program are not available for community led initiatives. Understanding how different social and school influences may either
support or inhibit tobacco use may contribute to a better understanding of the roles of schools in tobacco control.

### 1.5 Theories and Models

Theory has been defined as “a set of interrelated concepts, definitions and propositions that presents a systematic view of events or situations by specifying relations among variables in order to explain and predict events or situations” (Glantz et al. 1997, p21). Therefore, theory tells us what variables are important and how the variables relate or interact, explains differences across context, and provides a guide for developing and evaluating interventions. Theoretical models that have addressed tobacco use are discussed and the rationale for choice of models for this study. A comprehensive review conducted by Noar and Zimmerman (2005) identified 2901 articles that used the major health behaviour theories (Health Belief Model (HBM), Theory Reasoned Action/Theory Planned Behaviour (TPB), Transtheoretical Model (TTM) and Social Cognitive Theory (SCT)). Additionally the Theory of Triadic Influence (TTI), a comprehensive theory that combines constructs from all previous theories, was developed specifically for studying tobacco related behaviour.

Numerous theories/frameworks help understand social and contextual influences on health risk behaviour such as smoking. However, there has been a paucity of research that has explored the pros and cons of these theories for use in practice. In a meta-analysis of 27 prospective studies of the onset of cigarette
smoking, Conrad, Flay & Hill (1992) found only one study that tested competing theoretical models, and few used any model or theory of relationships between predictors and smoking onset. Many well-known Health Behaviour Theories (HBM, TRA/TPB, SCT, TTM, TTI) share similar concepts that were articulated by Noar and Zimmerman (2005, p 278-279). Similarities in the theories included (a) attitudinal beliefs, the positive and negative aspects of the behaviour (b) self efficacy, belief that a person can perform the behaviour and (c) normative and norm related beliefs and activities, the belief that significant others would want you to engage in the behaviour. Intention, planning or making a commitment to perform the behaviour was evident in all five health behaviour theories, except the Health Belief Model. Response to one’s behaviour that increases or decreases the likelihood of engaging in the behaviour was present in all but the Theory Planned Behaviour. Perception of others engaging in the behaviour is present in Social Cognitive Theory, Trans Theoretical Model, and Theory Triadic Influence while risk related beliefs and responses were components of the Health Belief Model, Social Cognitive Theory, Trans-theoretical Model and Theory Triadic Influence.

The HBM focuses on health related beliefs and attitudes, while SCT addresses social influences and how these behaviours can be acquired through relationships with others, and observation and imitation and social reinforcement. Ajzen’s TRA/TPB focus on variables that are proximal to the individual in their attitudes toward the behaviour, perceptions of significant others influence on the individuals participation in the behaviour, and perceptions of their health related
self-efficacy. In contrast, SCT and TTI focus on more distal contextual variables in the environment that influence the behaviour.

There is a large body of research on micro level theories of smoking that were developed to reduce tobacco use among adolescents. Interventions to reduce tobacco use (derived from these theories) are said to be more successful if they teach adolescents about (1) the adverse effects of cigarettes; (2) overestimation errors in percentages of youth smoking; (3) subtle advertising pressures; (4) peer pressure tactics and if they help students; (5) develop stronger self esteem skills; (6) enhance social skills; and (7) practice refusal skills (Flay & Petraitis 1994, p20).

Baranowski et al. (1998) and Sharma (2006) suggest that using a theoretical framework for school-based programming helps determine which constructs work and to what extent. Comprehensive reviews have identified individual-based motivational theories that address correlates of smoking among youth including the Health Belief Model (HBM; Jantz 1984), Protection Motivation Theory (PMT; Rogers 1983), Social Cognitive Theory (SCT; Bandura 19860, Theory of Reasoned Action (TRA; Ajzen 1975, Ajzen, 1985), and Theory of Planned Behavior (TPB; Ajzen 1985). The motivational models specify variables that are supposed to determine whether an individual will view a health protective action as more attractive than current behaviour. Motivation for self protection is assumed to occur when: (1) one anticipates a negative health outcome, and the desire to avoid this outcome or reduce its impact; (2) the motivation to act depends on beliefs about the likelihood that this outcome will occur, and that
action can reduce the likelihood or severity of harm; (3) that the expected benefits of action must be weighed against expected costs and they predict the relative likelihood of individual action (Weinstein, 1993). Variables discussed in these theories represent some of the most consistent proximal predictors of smoking initiation and smoking cessation (Conrad et al. 1992; Sussman 2002; Tyas & Pederson 1998).

1.5.1 Health Behaviour Theories

Theories of health behaviour may address proximal cognitive predictors of behaviour, expectancy-value formulations, social support and bonding processes, social learning processes, and personality and intrapersonal processes. The most well known motivational models focus on motivational factors that influence an individual’s decision to perform or not perform behaviour. All of these models are based on subjective expected utility\(^1\) and the expectancy-value\(^2\) tradition, which assume that individuals seek to maximize their utility or level of satisfaction. These theories are categorized as cognitive or rational models; they emphasize individual cognitions, which estimate the costs and benefits of behaviour.

---

\(^1\) Subjective expected utility is a combination of the expected value of an outcome and the expected probability of it occurring. It was originally put forward by L. J. Savage in 1954.

\(^2\) Martin Fishbein developed this theory in the early to mid-1970s, in order to explain and predict individual attitudes toward objects and actions.
1.5.1.1 Health Belief Model

Health Belief Model (HBM) developed by Hochbaum (1956), and Rosenstock (1966; 1974) focuses on the attitudes and beliefs of individuals to explain and predict health behaviours. Over time, this model has been expanded from four to six factors predicting the likelihood that a person adopts a specific preventive health strategy (Glantz et al. 1997; 2002; Becker 1974). Six main constructs in the model include: (1) perceived susceptibility, that is a person’s belief of the chances of getting the condition; (2) perceived severity, the person’s belief of how serious his/her condition and its consequences are; (3) perceived benefits, refers to a person’s belief in the efficacy of the advised action to reduce risk or the seriousness of impact; (4) perceived barriers, one’s belief in the tangible and psychological costs of the advised behaviour; (5) “cues to action”, the strategies to activate “readiness”; and (6) self-efficacy, confidence in one’s ability to take action (Becker 1974; Becker et al. 1977). Therefore, if interventions are to be effective the HBM argues that interventions should increase perceptions that current behaviours pose severe health threats, people are personally susceptible to these threats and alternative behaviour can reduce the likelihood of the health threats (Flay & Petratis 1994, p21). The Health Belief Model has been used to study group decision making to reduce adolescent girls smoking behaviour (Peterson & Clark 1986). Five constructs of the Health Belief model were used to evaluate the California’s Tobacco Control, Prevention and Education Program (Li et al. 2003) and was a key feature of the curriculum guiding the Project ALERT drug prevention program in South Dakota (Ellickson et al. 2003).
Between 1996 and 1997, Li et al. (2003) studied 6902 grade 10 students from 65 schools in 18 California counties. Structured equation modelling was used to examine the associations of five constructs of the health belief model and one construct of the perceived social pressure susceptibility with Environmental Tobacco Smoke (ETS) exposure among smokers and non-smokers. Results supported students adopting three of the predictors of adopting a specific health strategy. High-perceived susceptibility to diseases was associated with lower levels of ETS for both smokers and non-smokers and high social pressure to smoke was associated with higher exposure to ETS. Perceived barriers predicted lower exposure to ETS for non-smokers but higher exposure for smokers.

The Health Belief Model (Ellickson et al. 2003) was used in a study called Project ALERT where 4276 eight-grade students from 55 middle schools were randomly assigned to treatment and control schools. The treatment schools received 11 lessons in drug prevention with 7th grade and 3 lessons in 8th grade (11-13 years). Eighteen months post baseline reductions were reported in cigarette and marijuana initiation, current and regular cigarette use, and alcohol misuse.

Guided by the Health Belief Model, Hahn et al. (1996) conducted focus groups with parents and school personnel to identify strategies for promoting parent involvement with their children's substance abuse education. Results showed that low-income parents and school personnel identified cues to action and requirements such as childcare, transportation, and incentives. A core cue for parent involvement was children's enthusiasm about parent involvement.
1.5.1.2 The Trans-theoretical Model

The trans-theoretical model (TTM; Prochaska & DiClemente 1983) is a stage theory of behaviour change that matches interventions to the stage of readiness of the individual. This process occurs in a cyclical manner which may be repeated a number of times. Five distinct motivational stages of change prescribed by the TTM are: (1) pre contemplation (individual is not intending to change in the foreseeable future, i.e. 6 months); (2) contemplation (individual is not prepared to take action at present but is intending to within the next 6 months); (3) preparation (individual is actively considering changing his or her behaviour in the immediate future (i.e. within the next month); (4) action (when the individual has actually made an overt behavioural change in the recent past but changes are not well established (i.e. for 6 months or less); and (5) maintenance (when the individual has changed his or her behaviour for > 6 months and is working to sustain overt change. The TTM change occurs along several distinct steps, is not determined by a single decision or at a single point in time, and is most effective when personalized for each individual and their level of commitment to the change (Elder et al. 2007; Weinstein 1993).

Data from the 369 non-smokers in the last grades of high school (15-19 years old) from 12 randomly selected schools participated in the study (Anatchkova et al. 2007). A two-factor model for decisional balance (CFI = .94) and a hierarchical three-factor model for temptations (CFI = .90) demonstrated the best fit. The predicted crossover pattern for decisional balance and
decreasing trend for temptations across the stages of change was verified and supported the cross-cultural validity of these Trans-theoretical Model (TTM) constructs and indicated that they can be used as a basis for development of smoking prevention interventions.

A randomized control trial by Armitage (2008) used volitional help sheets to encourage smokers to link temptations to smoke with appropriate behavioural responses derived from the Trans-theoretical Model (Prochaska & Di Clemente 1983). Findings revealed significant decreases in nicotine dependence, number of cigarettes smoked, and increases in quitting in the volitional help sheet condition, relative to the control conditions.

1.5.1.3 Social Cognitive Theory

Social Cognitive Theory (SCT) (Social Learning Theory), a well-known motivational model, assumes that anticipation of a negative health outcome, and the desire to avoid this outcome or reduce its impact, creates motivation for self-protection and that action can reduce the likelihood or severity of harm. SCT posits that the environment, both social (e.g., smoking friends) and physical (e.g., smoking programs and policies), influences behaviour through observational learning and vicarious experience (Bandura 1986). Moreover, Social Cognitive Theory assumes that people learn by observing the behaviours of others and the outcomes of those behaviours; that learning can occur without change in the behaviour; that cognition (i.e. awareness and expectations of future reinforcements or punishments) plays a role in learning; and encompasses
attention, memory and motivation. Studies of cognitive models of adolescent smoking have supported the influence of beliefs and attitudes, and have been important for antismoking interventions and public policy. However, there are limitations to the capacity of cognitive models. According to Loewenstein (2001), limitations of cognitive models relate to their reliance on explicit measures of attitudes, failure to address attitudinal ambivalence and not accounting for the role of affect at the time of decision-making.

Bandura (1986) suggests the positive or negative reinforcements that the person receives by observing another person’s actions, helps the observer form rules of behaviour, which serve as a guide for their action in future situations. For example, youth are more likely to begin smoking if they have friends or family members who smoke (Leatherdale et al. 2005; de Vries et al. 2006; Merken et al. 2007). Conversely, students appear less apt to smoke if they attend schools with low smoking rates among senior students (Leatherdale et al. 2005), if smoking is made to appear undesirable and difficult (Wiium & Wold 2006; Currie et al. 2008) and if there are consistent restrictions on smoking in the home (Proescholdbell et al. 2000; Szabo et al. 2006). SCT was used as a framework to measure predictors of lapses and relapses in a smoking cessation among 135 daily smoking adolescents (Van Zundert et al. 2009). Base line predictors were pros of smoking, pros of quitting, self-efficacy, and intensity of smoking. Follow up monitoring revealed that perceiving many pros of smoking, reporting a low self-efficacy to quit, and high levels of baseline smoking were predictive of relapses within 3 weeks after quitting.
SCT was used as one theoretical framework for development of a theory driven tobacco prevention program for family tobacco cessation in conjunction with a state wide toll-free Quit Line (Tingen et al. 2006). Data were collected from 1,024 6th grade children and their parents/guardians over a 10-week period. Results from pre and post scores showed significant improvements in drug knowledge, refusal skills, attitudes, normative expectations, assertiveness, and anxiety reduction techniques.

1.5.1.4 The Theory of Planned Behaviour

The Theory of Planned Behaviour (TPB), was derived from an earlier theoretical framework, the Theory of Reasoned Action (TRA) (Ajzen & Fishbein, 1980; Fishbein & Ajzen 1975). The TPB measures willingness to perform, or not perform a behaviour and perceived behavioural control (PBC), a person’s perception of being able to control production of the behaviour (Ajzen 1991). Therefore, the easier a behaviour is to perform, the more likely it is that one will intend to perform it. The TPB identifies behavioural intention as the most proximal and important cognitive antecedent of behaviour. Intention refers to a person’s decision to act and reflects the effort he or she will exert toward the achievement of that behaviour. Therefore, the goal of the TPB is not only to predict human behaviour, but also to explain it. Whereas people can hold numerous beliefs about a particular behaviour at any one time, only salient beliefs (or information) in three categories will help explain behaviour. The first category is the behavioural beliefs, which influence attitudes toward the
behaviour; these reflect the positive or negative consequences of performing the behaviour. The second category is normative beliefs, which reflect the sources of social pressures relevant to the behaviour and the nature of that pressure. The third category is control beliefs that reflect salient factors that support or impede performance of the target behaviour.

To date, research has shown that attitudes and PBC are key predictors of smoking-related intentions, which in turn, are key predictors of smoking behaviour in adolescents (Kam et al. 2009; Bricker et al. 2007; Smith et al. 2007; Van en Eijnden et al. 2006; Wiiun et al. 2006; Smith et al. 2006; McMillan et al. 2005; Harakeh et al. 2004; Mc Millan & Connor 2003; Higgins & Conner 2003). In an analysis of these studies, attitudes and PBC were the dominant predictors of smoking related intentions and explained a significant percentage of variation in smoking intentions. In Prince Edward Island, Murnaghan et al. (2008) used the TPB to predict and explain variation in smoke free intentions and behaviour over a one-month period in a sample of adolescents (12-15 years). Findings suggest that attitudes and PBC significantly predict smoke free intentions, which in turn significantly predicted smoke free behaviour. Whereas smoke free behaviour was determined by PBC, the intention/smoke free relationship was non-significant due to the moderately large overriding effect of PBC on being smoke free. PBC appears to be the dominant variable to guide a smoke free adolescent intervention.
1.5.1.5 **Theory triadic influence**

The Theory of Triadic Influence (TTI), a comprehensive theory that combines constructs from all previous theories, provides a unified and parsimonious integration of correlates of youth tobacco use; sociological and psychological theoretical explanations of youth tobacco use, and various tested approaches to addressing factors that influence youth initiation of tobacco use (Flay 1999). The TTI is based on the premise that behavioural choices are influenced by complex systems of factors and all behaviour choices are influenced by genetic and environmental factors that act through three streams of influence – intrapersonal/psychological, interpersonal/social and sociocultural/attitudinal. Each of the three (triadic) streams of influence flow from tiers or causes of behaviour that ranges from very proximal, to distal, to ultimate. These influences can be positive or negative resulting in positive or negative behaviour. In addition to the direct influences of these streams, there are important interactions between streams that can increase or reduce both the risks and/or protector factors. Thus, a continuous cycle occurs whereby each behaviour changes the cause and the changed cause leads to the same, similar or different behaviour over time. The reactions to certain behaviour feed back to influence the causes of related behaviour (i.e. smoking).

The Theory of Triadic Influence addressed the contextual domain of influence for youth tobacco uptake through three domains that influence youth tobacco behaviour. The first domain encompasses intrapersonal factors that are intrinsic to the individual (e.g., personality traits or self-esteem). The second
domain encompasses socio-environmental factors that shape the attitudes, knowledge and beliefs of the individual (e.g., friends and family members). The third domain encompasses broader contextual factors that represent the environment and social context within which an individual is situated (e.g., school environment). This theory provides a framework to better understand the underlying complex nuances of how characteristics within the school environment (smoking prevention policies and programs within schools) might be related to student smoking behaviour. This theory supports targeting multiple intervening variables at multiple levels of a young person’s personal, social and environmental context to prevent or reduce tobacco use. Contextual interactions are important because they can show us how a school-level characteristic does not always have the same effect on all students, and provide guidance on how we may learn how to tailor and target future programs to the needs of different student populations.

The TTI has been used to guide studies on predicting multiple influences on the use of tobacco by adolescents (Grenard et al. 2006) and youth culture and smoking behaviour (Schofield et al. 2003). The TTI provides the theoretical underpinnings for considering underlying complex nuances of how characteristics within the school environment (smoking prevention policies and programs within schools) are related to student smoking behaviour. Contextual interactions may show how school-level characteristics do not always have the same effect on all students, and provide guidance on how to tailor and target future programs to the needs of different student populations.
Schofield et al. (2003) conducted a study whereby an extension of the TTI provided the best fit for predicting future smoking. Identification with peer group had the strongest effect on peer group norm. Grenard et al. (2006) examined multiple influences on use of tobacco among adolescents in China. Using the TTI three constructs were selected from baseline data to predict adolescent smoking one year later. Significant risk factors within each category were identified including: interpersonal influences (parental monitoring, close friends smoking, and peer smoking), attitudinal/cultural influences (academic school ranking; meaning of smoking), and intrapersonal influences (susceptibility to smoking, low self-confidence to quit).

1.5.2 Summary of theoretical approaches

Each of the discussed theories provides a framework for understanding tobacco related behaviours of adolescents in schools. Meta-analyses and reviews of health behaviour theories suggest that no one model explains all health behaviour (Armitage & Conner 2000; Glanz et al. 1997; Petraitis et al.1995). In fact, diversity in choice of theoretical models may be necessary because of the complexity of health behaviour studies. For example, the health belief model (HBM) may be the most appropriate theory for studies where illness avoidance and perceived threat are the key issues. The theory of planned behaviour (TPB) may better explain behaviours where the intention-behaviour link is strong and the trans-theoretical model (TTM) may be most applicable to studies of behaviour change particularly useful for individual change processes.
The TPB is a very useful and validated theory for the prediction of intentions and behaviour for a wide variety of behaviours and a robust predictor of health behaviours in a variety of domains including tobacco as well as multiple behaviours (Murnaghan et al. 2009).

A broader theory, such as the Theory of Triadic Influence, may be needed when contextual factors such as environment and community play a role in health behaviour. Integrating several motivational models or combining variables from motivational and stage models may explain health behaviour better than any single existing model (Armitage & Conner 2000; Hoffman et al. 2006; Petraitis et al. 1995; Rosen 2000). For example, the Theory of Triadic Influence integrates constructs from all previous theories including correlates of youth tobacco use, sociological and psychological theoretical explanations of youth tobacco use, and various tested approaches to addressing factors that influence youth initiation of tobacco use (Flay 1999). In the TTI model the three streams of influence and multiple levels or tiers of influence challenges policy and program stakeholders to provide interventions that address all three streams and multiple layers of influence if they want to have a successful intervention.

1.6 Aims of the study
The overall aim of the study was to examine the influence of school smoking policy and smoking prevention programs on the smoking behaviour of
students in high schools in Prince Edward Island using the School Health Action Planning Evaluation System (SHAPES).

1.6.1 Specific objectives:

1) To examine how the presence of school smoking policies, school prevention programs, and individual student characteristics might interact to influence occasional and regular smoking behaviour among grade 12 students in PEI (I).

2) To examine how school smoking policies and prevention programs are associated with occasional and regular smoking among grade 10 (age 15-16) students and compare these findings to existing research with an older student population (II).

3) To determine the factors that most influence whether or not a school-based tobacco control program influences the smoking behaviour of the students during their transition from grade 10 to grade 12 (III).

4) To examine the factors related to whether or not school-based tobacco control efforts were associated with the smoking behaviour of high school students and to determine if two groups of students (junior, Group 1; and senior Group 2) experienced the implementation of a new tobacco control policy differently between 2000 and 2001 (IV).
2. METHODS

2.1 Background to Study:

Prior to 1998, the Council for a Smoke Free Prince Edward Island, an advocacy group of health professionals and voluntary organizations, were advocating for policies and programs to decrease the burden of cigarettes. There were no provincial policies banning smoking in Island schools, nor were there smoking policies regulating visitors using school property after school hours or on weekends or holidays. Both school boards permitted smoking outside on designated areas on school property. These designated smoking areas varied from a back door area of the school, to a smoking hut built specifically to protect students who chose to smoke from cold and wet weather.

In 1998, Prince Edward Island introduced a tobacco control strategy by the PEI Tobacco Reduction Alliance (PETRA). This official support for tobacco control provided the catalyst for a series of initiatives to reduce the burden of tobacco use in the province. PETRA, a community based volunteer organization included health promotion coordinators from the PEI government, volunteer organizations joined together to develop and implement a province wide provincial tobacco reduction strategy. One of their major targets was to address tobacco use among youth. As a part of that strategy, the departments of Health and Education and the two major school boards worked with the committee to develop new smoking policies banning smoking on school property and decided
on prevention programs that they would support in their schools. There were no smoking policies regarding smoking behaviour of people using school property after school hours or on weekends or holidays.

A key element of the PETRA initiative was an agreement with the School Boards to implement a school-based ban on smoking on all school property. The departments of Health and Education and the two major school Boards worked with PETRA to develop a new school-based policy banning smoking on school property and smoking prevention programming to address tobacco use and prevention. Over a two-year period, the two school boards staggered the introduction of the program. This situation presented a unique, natural experiment to examine the associations that potentially can determine what works and where.

Concurrently, stakeholders from PETRA had built a relationship with the University of Waterloo using SHAPES (Cameron et al. 2007) a school-based data collection system, which allowed researchers to contribute to a large national tobacco database, while taking advantage of and building capacity to study natural experiments such as what occurred in Prince Edward Island. Of particular interest to the PEI Tobacco Reduction Alliance (PETRA) was the ability of SHAPES system to monitor tobacco use among all high school students and provide feedback reports at the Provincial, Board and local school levels to monitor the progress of tobacco use among youth in the high school system.
2.2 Design

For this study, a cross-sectional design used three waves of data (1999, 2000, 2001) collected from annual smoking behaviour data from all 10 English speaking secondary schools in the province of PEI (Canada) over three years (1999, 2000, 2001). Data were collected using the Tobacco Module of the School Health Action, Planning and Evaluation System (SHAPES); additional details about SHAPES and the Tobacco Module measures and psychometric properties are available in print (Cameron et al., 2007) and online www.shapes.uwaterloo.ca (Appendix 1).

In Wave 1 (1999), none of the schools had policies banning smoking on school property, or were participating in provincially directed school-based smoking prevention programs (e.g., Students Working in Tobacco Can Help - SWITCH and Kick the Nic) (Table I). In Year 2 (2000), (a) four of the schools (Board 1) had introduced a policy banning smoking on school property, and (b) the remaining six schools (Board 2) had implemented provincially directed school-based smoking prevention programs (SWITCH and Kick the Nic). In Year 3 (2001), all 10 schools had (a) introduced a policy banning smoking on school property, and (b) implemented the provincially directed school-based smoking prevention programs (SWITCH and Kick the Nic).

Although there was no pure control or experimental group, new insights were gained from this study design by examining how the presence or absence of a school smoking policy and/or prevention program at different points in time
were associated with the smoking behaviour of a particular group of students, in each school, during each wave of data collection.

2.3 Recruitment of sample and Data Collection

2.3.1 Recruitment

The two public school Boards in the province of Prince Edward Island were included in the study. The one French school Board and small private schools were not included because of the small numbers of students, the inability to guarantee confidentiality and the SHAPES questionnaires were not available in French at the time of this study. Both School Boards approved the study for their schools at a meeting to discuss the study. After those meetings, individual letters of invitation were sent to each School Principal (Appendix 2). Once consent to participate was received from the principal, information letters about the study and a consent form were mailed directly to parents requesting that their child/children participate in the study. Parent information letters described the study and informed parents that they may withdraw their son/daughter from the study by calling the school contact or project staff at a toll free number (Appendix 3). Parent information letters were provided to the school in postage paid envelopes. Parents were asked to either return a signed copy of the postage paid refusal letter or call a toll-free number (accessible 24 hours a day) if they refused their child’s participation. Student information letters described the study, made clear that participation was voluntary and participants could withdraw at any time.
and asked for the participants’ assent to be involved (Appendix 4). Student information letters were provided to students on the day of survey implementation.

2.3.2 Questionnaire and Variables

The tobacco module of SHAPES System (precursor School Smoking Profile) was developed to support planning, evaluation and research related to youth tobacco programs and policies. The system consists of three components: (1) a scannable questionnaire, (2) a quality controlled scanning protocol to ensure accurate data files, and (3) a computer generated report that is delivered back to the school or community. Items cover several domains: demographics, smoking behaviour, circumstances of smoking (places, time, people), social influences, smoking cessation, obtaining cigarettes, reasons for smoking (or not smoking), perceptions of peer smoking, school environment, and school connectedness. Items were developed in consultation with 25 practitioners (e.g., public health and education sectors) and 9 surveillance experts to ensure item relevance, utility, face validity, and alignment with other surveillance protocols. The tobacco module consisted of 36 multiple choice questions presented in a booklet. Smoking behaviour definitions for regular, occasional and (current) non-smoker or never smoker used for the study were based on the work of Biglan et al. (1984) and Flay (1993). There were no skip patterns throughout the questionnaire (this was to ensure smokers and non-smokers could not be identified based on time to completion).
Trained staff collected data in classrooms, using standard instructions which informed students that the questionnaire would be administered again in one week. In 109 (93 percent) of the classrooms, the questionnaire was administered on two occasions: mean interval between administrations was 8 days (range, 7 - 10 days). A self-generated student code enabled anonymous questionnaire linkage (i.e., a participant’s code was generated based on items of personal information). A total of 2249 students (86 percent of enrolled students) and 2171 (83 percent of enrolled students) completed the first and second administrations, respectively. A third session was held in six schools for students who had missed one test session, in which 125 students participated. The final sample consisted of 1462 students (56 percent of enrolled students) who completed the questionnaire on both occasions. Students were lost due to refusal to participate, failure to complete two administrations, or the inability to link the questionnaires. A total of 915 of the 1058 students (87 percent) enrolled in the classes selected for CO testing completed both the questionnaire and provided a breath sample.

Test-retest reliability for all variables had mean kappa score of 0.69 (ranging from 0.35 to 0.99) and 0.68 when the demographic variables were excluded. Kappa coefficients for most items (77.7 percent) were>0.61 suggesting substantial agreement (Landis & Koch, 1977). Another 20.0 percent of the items had kappa coefficients in the moderate range (e.g., kappa coefficient between 0.41 and 0.60). The remaining two items (2.4 percent) had kappa coefficients in the fair range (e.g. kappa coefficient between 0.21 – 0.40). The core smoking
items by sex and grade showed a high level of test-retest reliability (e.g. substantial agreement) among all sub groups on the core items (kappa coefficients ranged from 0.66 to 0.98).

Additionally, random carbon monoxide testing results showed a validity of 96% of participants had Carbon Monoxide (CO) value less than 6ppm indicating truthful reporting while 4% of self reported non smokers were classified as smokers by their CO values.

2.3.3 Questionnaire Implementation

Active information with passive consent was used to reduce demands on schools and to increase student participation rates. This process included an information letter about the study and a consent form mailed directly to parents. In addition, a notice about the study was posted in the local newspaper. These procedures helped ensure parents received the information about the study. A pre-stamped envelope was provided so that parents could mail a refusal to allow their child to participate in the study. Parents could also telephone the school or the research team if they wanted to refuse their child’s participation. If parents were willing to allow their child to participate in the study, no action was required.

On the day of the data collection teachers participated in a short training session to review the protocol for administering the survey and distributed the surveys to the students during class time using an exam like protocol. All data
materials were prepared by the research team and collected from the school at the end of the survey implementation.

Student surveys were completed during a classroom period following a specific protocol across all classrooms. Participants did not receive compensation and could decline participation at any time, including during survey administration. In accordance with requirements stipulated by ethics, anonymous data collection was required on all surveys so individual student smoking behaviour could not be tracked over time.

Students who chose not to complete the surveys or who had not received parental consent to participate were given an optional exercise by the teachers. When students completed their surveys they put them into a sealed envelope and then put the envelope into a large classroom folder. The research team facilitated survey implementation and was present in the school to answer any questions. Random carbon monoxide testing was used as a bogus test for enhancing accuracy in reporting.

Feedback reports of locally relevant data were returned to schools each year (provided there were sufficient sample to protect anonymity), Provincial Departments of Education and Health and the two participating School Boards (Appendix 5, Sample Smoking at School Anywhere Feedback Report). The feedback reports were developed through a partnership with the University of Waterloo. The feedback report provided locally relevant data and recommendations to take action.
2.4 Participants

A provincial census sample of 13,131 students (grades 10 to 12; ages 15-18) attending all 10 English speaking secondary schools in the province of PEI, Canada, participated in the three waves of data collection (n = 4114 in 1999; n = 4427 in 2000; n = 4590 in 2001). The sample data for study I were grade 12 students (17-18 years, n=3,965) from each study year (n=1,179 in 1999, n=1,361 in 2000, n=1,425 in 2001). The sample data for study II were grade 10 students (15-16 years, n = 4,732) from each study year (n = 1534 in 1999; n = 1537 in 2000; n = 1661 in 2001). For study III, data were collected from a group of students who were eligible to be followed over all three waves of data collection [grade 10 students in 1999 (n=1,537), grade 11 students in 2000 (n=1,514), grade 12 students in 2001 (n=1,429)]. Without having longitudinally linked data, these observations are the most accurate representation of the potential students who may have participated in all three years of the study. For study IV data were collected from two groups of students who would have been followed over two waves of data collection; Group 1 (n = 3,022; 15-17 years of age; grade 10 in 2000 and grade 11 in 2001) and Group 2 (n = 2,943; 16-19 years of age; grade 11 in 2000 and grade 12 in 2001). These two groups of students had the potential to be attending one of the 10 schools over all three waves of data collection (i.e., students who were in grade 9 or 10 in 1999).
2.5 Measures

2.5.1 Outcome Variables

All four studies (I, II, III, IV) used demographic variables including age, grade, and gender. Gender was measured by asking students if they were male or female ((I, II, III, IV). Outcome variables for smoking behaviours included: Never smokers were defined as students who reported that they had never smoked or had only tried smoking once; occasional smokers reported that they smoke less than weekly; and regular smokers reported that they smoked every week. Because the definition of never smoker included students who may have tried smoking once but quit, Articles I, III and IV used the definition of non-smoker or current non-smoker rather than never smoker. In article II clarification of the meaning of regular smoker was made by including students who reported smoking every week or most days of the week. For all four articles (I, II, III, IV) study years were identified as variables called either Year (1999; 2000; 2001) or Wave1 (1999), Wave 2 (2000) or Wave 3 (2001). For study IV two new variables were derived to study differences between two groups of students who would have experienced the implementation of the policy between 1999 and 2000. Group 1 were students who would have been in grade 10 in 2000 and grade 11 in 2001 and Group 2 were students who would have been in grade 11 in 2000 and grade 12 in 2001.
2.5.1.1 School Characteristics

For all four articles (I, II, III, IV), the measure for school smoking programs and policy was based on whether or not the school was participating in the school-based prevention programming and/or if the school had implemented the school smoking policy at the time of data collection. School location was a measure of the location of the school (urban/rural).

For article II, a variable called senior student (17-18 > years) smoking rate was derived to look at the influence of senior student smoking on the smoking behaviour of junior students (15-16 years) in the same school. Another variable called year of enrolment looked at the influence of enrolment grade (9 or 10) when students first enter the school as new students on predicting smoking behaviour.

For article III, school and environment characteristics were derived into dichotomous variables: see students smoking near school (yes, no); see teachers/staff smoking near school property (yes, no); clear policy rules are in place in this school (yes, no); students get in trouble if they break the smoking rules (yes; no); students smoke in this school where they are not allowed (yes, no); and students are asked their age when buying cigarettes (yes; no). Social influences included: the number of smokers in your home (0; 1 or more) and number of close friends who smoke (0; 1 or more).

Senior student smoking rate was defined as the prevalence of occasional or regular smoking among the grade 12 students at a school. The enrolment...
grade (9 or 10) represents the grade when students first enter the school as new students (I).

2.5.1.2 Student Characteristics

Students' beliefs about school smoking policies were derived into dichotomous variables: in your school there are clear rules about smoking for students to follow (true/false); and if a student is caught breaking the smoking rules at your school they get into trouble (true/false) (I,II). Friend smoking behaviour was measured by asking students if they have one or more friends who smoke (none/one or more smoking friends). Gender was measured by asking students if they were male or female. For article III, student characteristics included planning to quit (yes within 1 year, no plans to quit). Misperceptions about smoking behaviour of other youth your age (>30%, <30 %) (II, III, IV). Students were asked to mark on a percentage scale from 0-100 the percentage of students their age that smoke. This item was collapsed into responses of below or greater than 30% of the youth their age smoke (>30%, <30 %) (II, III, IV).

Student level predictors were derived into dichotomous variables which included misperceptions (overestimate >30% or underestimate <30%) about smoking behaviour of other youth their age; whether or not they see students smoking near school (yes = 1, no = 0); whether or not they see teachers/staff smoking near school property (yes = 1, no = 0); knowledge that clear policy rules
are in place in their school (yes = 1, no = 0); perceptions that students get in trouble if they break the smoking rules (yes = 1 no = 0); that students smoke in their school where they are not allowed (yes = 1, no = 0; Board (Board 1 = 1, Board 2 = 0) and gender (female = 1, male = 0) (IV).

2.6 Analyses

Frequency and percentage distributions were used to describe socio demographic variables, gender, and smoking behaviour. Changes in descriptive data and smoking behaviour and factors influencing smoking behaviour were analyzed using Chi-square tests. A p-value of 0.05 was considered statistically significant.

Multi-level logistic regression analyses were used to examine how both school and student characteristics were associated with student smoking behaviour (Raudenbush & Bryk 1992) (I, II). Since students were located within schools, a basic 2-level nested structure was used in which individual students (level-1) were nested within schools (level-2). The first model examined how school and student characteristics were able to differentiate occasional smokers (1) from never-smokers/current non-smokers (0). The second model examined how school and student characteristics were able to differentiate regular smokers (1) from occasional smokers (0). All analyses controlled for the wave of data collection to adjust for potential differences in the grade 12 students over time and potential differences in between-school variability of the 30 different groups.
of grade 10 students over the three waves of data collection. Intraclass correlation coefficients (ICC) were calculated to measure the proportion of the total variance in smoking behaviour that were due to school-level differences across each of the 30 groups of students (i.e., school program and/or policy environment during data collection). Contextual interactions between the student characteristics and school characteristics were examined. Statistical analyses were conducted using MLwiN Version 1.1 (Rasbash et al. 2001) (I, II).

**Article I.** Data from the 4732 students in grade 10 during each wave of data collection were used (n = 1534 in 1999; n = 1537 in 2000; n = 1661 in 2001) (I) to examine how school smoking policies and school smoking prevention programs are associated with occasional and regular smoking among grade 12 students. Since the student-level data were not longitudinal, only using data from students in grade 10 from each wave of data collection helps to ensure that we are not predicting the behaviour of the same student at different points in time. Moreover, since the group of grade 10 students entering the school each year would be new, we are limiting the potential confounding effect of students already being acculturated to the smoking behaviour norms within their school context (I).

**Article II.** Data from the 3965 students in grade 12 during each wave of data collection were used (II). Since students were located within schools, a basic 2-level nested structure was used in which individual students (level-1) were nested within schools (level-2). As such, multi-level logistic regression analyses were used to examine how both school and student characteristics were associated with student smoking behaviour (Raudenbush & Byrk 1992).
The first model examined how school and student characteristics were able to differentiate occasional smokers (1) from never smokers (0). The second model examined how school and student characteristics were able to differentiate regular smokers (1) from occasional smokers (0). All analyses controlled for the wave of data collection to adjust for potential differences in the grade 12 students over time. Contextual interactions between the student characteristics and school characteristics were examined; however, only significant interactions are presented in the final models. Statistical analyses were conducted with MLwiN Version 1.1 (Rasbash et al. 2001) (II).

**Article III.** Data were collected from the grade level group of students who were followed over all three waves of data collection [grade 10 students in 1999 (n=1,537), grade 11 students in 2000 (n=1,514), grade 12 students in 2001 (n=1,429)].

Descriptive statistics and Chi-Square analyses were conducted with the group of students who may have participated in all three years of this study: grade 10 (1999), grade 11 (2000), and grade 12 (2001). The grade by year approach provided the best opportunity to examine changes in the prevalence of smoking and related characteristics over time. Three logistic regression models were used to differentiate current non-smokers from occasional smokers, occasional smokers from regular smokers, and current non-smokers from regular smokers. These analyses were also done separately by gender. SPSS 15.0 was used to conduct the analyses (III).
Article IV. This study examined the factors related to whether or not school-based tobacco control efforts were associated with student smoking behaviour among two groups of students: Group 1 (15-17 years; grade 10 in 2000 and grade 11 in 2001) and Group 2 (16-19 years; grade 11 in 2000 and grade 12 in 2001). These two groups of students had the potential to be attending one of the 10 schools over all three waves of data collection (i.e., students who were in grade 9 or 10 in 1999) (IV).

Analyses were conducted separately to examine between group differences: one set of analyses focused on Group 1 by year and the other analyses focused on Group 2 by year. Twelve logistic regression analyses were run with all variables included. Within our logistic regression models, school was used as a class statement in order to control for the effect of clustering of smoking behaviour within schools. Each logistic regression model compared students’ perceptions of characteristics in the school that influence smoking behaviours, as well as board and gender influence on smoking behaviour. Model 1 was used to differentiate occasional versus non-smokers; Model 2 differentiated regular smokers versus non-smokers, and Model 3 differentiated regular smokers versus occasional smokers. SPSS for Windows, version 15.0 was used for all analyses (SPSS Inc. Chicago, IL, USA).
2.7 Ethical Considerations

This study was approved for ethical consideration by the University of Prince Edward Island Research Ethics Board (Appendix 6). The consent procedures used were an informed consent and assent procedures. Information notices about the study were posted in the local newspaper and in the school newsletters. Informed active consent was used to obtain approval from the School Boards and the School Principals. Information letters about the purpose and aims of the study were mailed directly to them. Additionally, oral presentations to review the study and answer any questions were conducted individually or in small groups. Active information, passive consent procedure was used with parents and/or guardians. Information letters were mailed directly to the child’s parent/guardian address. Stamped return consent letters were included in the mail out. Parents were to return the consent letter only if they did not want their child to participate in the study. Parents could also choose to telephone (toll free) their response directly to the research team if they did not want their child to participate in the study. If parents agreed to allow their child to participate there was no action needed. On the day of the study implementation students were provided with an information letter informing them about the purpose and aims of the study, that participation was voluntary and they could withdraw at any time during the study. Any student could choose to not participate in the study at any time. Students, whose parents had refused their participation, could not complete the study. They were given a separate activity to do while other students completed the survey.
3. RESULTS

3.1 Description of Results

The results of a three-year tobacco reduction, policy study with ten high schools in Prince Edward Island are presented (Table 1). Prince Edward Island is the smallest province in Canada with just over 138,000 people. The response rate for the sample was approximately 69-70% for each year with 13,131 observations from students in grades 10-12, in ten high schools across the province. Data was available for only students who completed the survey on the day of data collection. Therefore, we did not have data to compare those who completed surveys compared to students who did not. However, anecdotally, the loss of participants for most schools resulted from their absence because of school events such as school trip or special events. The number of participants was consistent across all three waves of data collection and across grade levels. In each wave of data collection students ranged in age from 14 to 19 years with the majority between 15-18 years of age. The gender distribution was similar across all three waves of data collection with slightly fewer males (i.e. 51.2% females, 48.8% males). Students were predominantly from rural (n=9,344) compared to urban (n=3,797) schools and the majority of students were located in Board 1 (n=8,743) compared to Board 2 (n=4,388) schools (I, II, III, IV).


Table 1. Demographic characteristics of participants

<table>
<thead>
<tr>
<th></th>
<th>1999 a</th>
<th></th>
<th>2000 a</th>
<th></th>
<th>2001 a</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n a</td>
<td>%</td>
<td>n a</td>
<td>%</td>
<td>n a</td>
<td>%</td>
</tr>
<tr>
<td>Participants</td>
<td>4114</td>
<td>31.1</td>
<td>4427</td>
<td>33.7</td>
<td>4590</td>
<td>34.9</td>
</tr>
<tr>
<td>Grade 10</td>
<td>1537</td>
<td>37.4</td>
<td>1384</td>
<td>33.6</td>
<td>1183</td>
<td>28.8</td>
</tr>
<tr>
<td>Grade 11</td>
<td>1538</td>
<td>34.7</td>
<td>1514</td>
<td>34.2</td>
<td>1365</td>
<td>30.8</td>
</tr>
<tr>
<td>Grade 12</td>
<td>1666</td>
<td>36.3</td>
<td>1484</td>
<td>32.3</td>
<td>1429</td>
<td>31.1</td>
</tr>
<tr>
<td>Age 15-19</td>
<td>4056</td>
<td>96.5</td>
<td>4287</td>
<td>96.9</td>
<td>4449</td>
<td>96.9</td>
</tr>
<tr>
<td>Female</td>
<td>2093</td>
<td>51.2</td>
<td>2264</td>
<td>51.4</td>
<td>2312</td>
<td>50.5</td>
</tr>
<tr>
<td>Male</td>
<td>1992</td>
<td>48.8</td>
<td>2141</td>
<td>48.6</td>
<td>2263</td>
<td>49.5</td>
</tr>
<tr>
<td>Smoking Status</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tried Cigarette (one puff)</td>
<td>2967</td>
<td>72.1</td>
<td>3101</td>
<td>70.0</td>
<td>3030</td>
<td>66.0</td>
</tr>
<tr>
<td>Smoked since first time</td>
<td>2541</td>
<td>59.6</td>
<td>2494</td>
<td>56.5</td>
<td>2420</td>
<td>52.9</td>
</tr>
<tr>
<td>Smoked whole cigarette</td>
<td>2180</td>
<td>53.1</td>
<td>2249</td>
<td>51.0</td>
<td>2142</td>
<td>46.9</td>
</tr>
<tr>
<td>Smoked 100 cigarettes in lifetime</td>
<td>1074</td>
<td>33.5</td>
<td>1147</td>
<td>26.0</td>
<td>1041</td>
<td>22.7</td>
</tr>
<tr>
<td>Smoke every week</td>
<td>1016</td>
<td>24.7</td>
<td>1037</td>
<td>23.5</td>
<td>919</td>
<td>20.1</td>
</tr>
<tr>
<td>Smoke every day</td>
<td>848</td>
<td>20.6</td>
<td>858</td>
<td>19.4</td>
<td>779</td>
<td>17.0</td>
</tr>
<tr>
<td>Smoke occasionally</td>
<td>818</td>
<td>19.9</td>
<td>755</td>
<td>17.1</td>
<td>742</td>
<td>16.2</td>
</tr>
<tr>
<td>Smoked today</td>
<td>841</td>
<td>20.5</td>
<td>842</td>
<td>19.2</td>
<td>747</td>
<td>16.5</td>
</tr>
<tr>
<td>Smoked in last 30 days</td>
<td>720</td>
<td>17.5</td>
<td>726</td>
<td>16.4</td>
<td>647</td>
<td>14.1</td>
</tr>
<tr>
<td>Overestimation of % youth smoking (&gt;30%)</td>
<td>3174</td>
<td>77.8</td>
<td>2937</td>
<td>67.2</td>
<td>2790</td>
<td>61.7</td>
</tr>
<tr>
<td>School Location</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rural</td>
<td>2889</td>
<td>70.2</td>
<td>3154</td>
<td>71.2</td>
<td>3291</td>
<td>71.7</td>
</tr>
<tr>
<td>Urban</td>
<td>1225</td>
<td>29.8</td>
<td>1273</td>
<td>28.8</td>
<td>1299</td>
<td>28.3</td>
</tr>
<tr>
<td>School Boards</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Board 1</td>
<td>2772</td>
<td>67.4</td>
<td>2949</td>
<td>66.6</td>
<td>3022</td>
<td>65.8</td>
</tr>
<tr>
<td>Board 2</td>
<td>1342</td>
<td>32.6</td>
<td>1478</td>
<td>33.4</td>
<td>1568</td>
<td>34.2</td>
</tr>
</tbody>
</table>

a Numbers may not add to total because of missing values
3.2 Smoking Behaviour

Over the three waves of data collection (Figures 1-3) there appears to be fewer percentage of students reporting regular/weekly smoking (24.7% in 1999, 23.5% in 2000, and 20.1% in 2001), daily smoking (20.6% in 1999, 19.4% in 2000, 17% in 2001) and occasional smoking (19.9% in 1999, 17.1% in 2000, 16.2% in 2001). In 2001 slightly fewer students reported smoking the day of data collection (16.5%) compared to students in 1999 (20.5%) and 2000 (19.2%). Figures 1, 2 and 3 provide a graphical presentation of the percentage of regular, occasional and never smokers for the three waves of data collection (1999-2000-2001) by grade and year.

Figure 1. Percentage of never smokers in high school in PEI by grade and year
Figure 2. Percentage of occasional smokers in high schools in PEI by grade and year

Figure 3. Percentage of regular smokers in high schools by grade and year
3.3 Factors influencing smoking behaviour

Factors influencing student smoking behaviour are presented in Table 2. For all three waves of data collection, over 94% of students reported seeing students smoking near their school property. By 2001, there was a 15% decrease in reports of seeing teachers and staff smoking near school property. Further, the percentage of students who overestimated the percentage of youth their age who smoke decreased (77.8% in 1999, 67.2% in 2000 and 61.7% in 2001). However, the strongest social influences on youth smoking behaviour, that of family and friends, continued to be high. In 2000 over 40% of students indicated that they had one or more close friends who smoke, compared to 2001 when 45.6% of students indicated that they had one or more friends who smoke.

Knowledge about the rules and enforcement of those rules increased over the three waves of data collection. By 2001 close to 95% of respondents reported that there were clear rules about smoking in their schools. Moreover, by 2001 more students reported that if students break the rules in their school they get into trouble (75%, 77%, and 85%). There was little change in enforcement of underage purchase of cigarettes as indicated by only 1.6% to 2.7% of students reporting that they were asked their age when buying cigarettes. A greater number of students believed that they would definitely not smoke in the future and the percentage changed from 60.5% of students in 2001 believing this compared to 51.4% in 1999.
<table>
<thead>
<tr>
<th>factor</th>
<th>1999 a</th>
<th>2000 a</th>
<th>2001 a</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n a</td>
<td>%</td>
<td>n a</td>
</tr>
<tr>
<td>See students smoke near school</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>3963</td>
<td>98.6</td>
<td>4286</td>
</tr>
<tr>
<td>No</td>
<td>55</td>
<td>1.4</td>
<td>86</td>
</tr>
<tr>
<td>See teachers/staff smoke near school</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>1204</td>
<td>30.0</td>
<td>868</td>
</tr>
<tr>
<td>No</td>
<td>2806</td>
<td>70.0</td>
<td>3501</td>
</tr>
<tr>
<td>School has clear tobacco rules</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>3596</td>
<td>89.8</td>
<td>3913</td>
</tr>
<tr>
<td>No</td>
<td>409</td>
<td>10.2</td>
<td>441</td>
</tr>
<tr>
<td>Students who break rules- trouble</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>2996</td>
<td>75.0</td>
<td>3341</td>
</tr>
<tr>
<td>No</td>
<td>998</td>
<td>25.0</td>
<td>996</td>
</tr>
<tr>
<td>Students smoke where not allowed</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>2516</td>
<td>62.8</td>
<td>2504</td>
</tr>
<tr>
<td>No</td>
<td>1492</td>
<td>37.2</td>
<td>1831</td>
</tr>
<tr>
<td>Asked age when buying cigarettes</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I do not buy cigarettes</td>
<td>2808</td>
<td>75.7</td>
<td>3300</td>
</tr>
<tr>
<td>Never</td>
<td>486</td>
<td>13.1</td>
<td>519</td>
</tr>
<tr>
<td>Some of the time</td>
<td>317</td>
<td>8.6</td>
<td>263</td>
</tr>
<tr>
<td>Always/ almost always</td>
<td>92</td>
<td>2.5</td>
<td>114</td>
</tr>
<tr>
<td>Think you will smoke in future</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Definitely will not</td>
<td>2097</td>
<td>51.4</td>
<td>2508</td>
</tr>
<tr>
<td>Might/might not</td>
<td>1815</td>
<td>44.5</td>
<td>1719</td>
</tr>
<tr>
<td>Definitely will</td>
<td>171</td>
<td>4.2</td>
<td>171</td>
</tr>
<tr>
<td>Overestimation of % youth smoking</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt;30%</td>
<td>3174</td>
<td>77.8</td>
<td>2937</td>
</tr>
<tr>
<td>&lt;30%</td>
<td>907</td>
<td>22.2</td>
<td>1435</td>
</tr>
<tr>
<td>smokers in home</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>none</td>
<td>2002</td>
<td>49.0</td>
<td>2069</td>
</tr>
<tr>
<td>1 or more</td>
<td>2084</td>
<td>51.0</td>
<td>2153</td>
</tr>
<tr>
<td>friends who smoke</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>none</td>
<td>2476</td>
<td>59.6</td>
<td>2377</td>
</tr>
<tr>
<td>1 or more</td>
<td>1698</td>
<td>40.4</td>
<td>1994</td>
</tr>
</tbody>
</table>

a Numbers may not add to total because of missing values
3.4 Board differences

Table 3 provides a summary of smoking behaviour results by Board 1 and Board 2. Board 1 had a new tobacco policy in 2001 for 1 year of the study while Board 2 schools introduced the new tobacco policy in 2000 and therefore had the policy for 2 years of the study. Board 1 had nearly twice as many participants reflecting the sample distribution across the boards for the province. There appears to be a consistent trend of decreased reports of smoking behaviour across both boards over the three waves of data collection. However, consistently Board 2 (had new policy in place for two years) showed greater percentage decreases in smoking behaviours compared to Board 1 that had the new policy in place for one year. For example, regular (weekly) smoking behaviour decreased by 14% (23.0% in 1999 and 19.6% in 2001) for Board 1 while there was a 26% change for Board 2 (28.2% in 1999 to 20.8% in 2001). Similar results were noted for occasional smoking behaviour for Board 1 with a 15% change (19.7% in 1999 and 16.7% in 2001) compared to a Board 2 that showed a 26% change (20.3% in 1999 and 15.1% in 2001). Daily smoking behaviour changes were similar with Board 1 showing a 16% change in smoking behaviour and Board 2 showing a 27% change.
Table 3. Changes in smoking behaviour between Board 1 and Board 2 over three waves of data collection

**BOARD 1***

<table>
<thead>
<tr>
<th></th>
<th>1999</th>
<th>2000</th>
<th>2001</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Participants</strong></td>
<td>n</td>
<td>%</td>
<td>n</td>
</tr>
<tr>
<td></td>
<td>2772</td>
<td>31.7</td>
<td>2949</td>
</tr>
<tr>
<td>Smoked 100 cigarettes</td>
<td>650</td>
<td>23.4</td>
<td>756</td>
</tr>
<tr>
<td>in lifetime</td>
<td>638</td>
<td>23</td>
<td>667</td>
</tr>
<tr>
<td>Smoke weekly</td>
<td>546</td>
<td>19.7</td>
<td>486</td>
</tr>
<tr>
<td>Smoke occasionally</td>
<td>99</td>
<td>3.6</td>
<td>101</td>
</tr>
<tr>
<td>Will smoke in future</td>
<td>1464</td>
<td>52.8</td>
<td>1708</td>
</tr>
<tr>
<td>Will not smoke in</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>future</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**BOARD 2**

<table>
<thead>
<tr>
<th></th>
<th>n</th>
<th>%</th>
<th>n</th>
<th>%</th>
<th>n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Participants</strong></td>
<td>1342</td>
<td>30.7</td>
<td>1478</td>
<td>33.6</td>
<td>1568</td>
<td>35.7</td>
</tr>
<tr>
<td>Smoked 100 cigarettes</td>
<td>424</td>
<td>31.6</td>
<td>391</td>
<td>26.5</td>
<td>378</td>
<td>24.1</td>
</tr>
<tr>
<td>in lifetime</td>
<td>378</td>
<td>28.2</td>
<td>370</td>
<td>25</td>
<td>326</td>
<td>20.8</td>
</tr>
<tr>
<td>Smoke weekly</td>
<td>272</td>
<td>20.3</td>
<td>269</td>
<td>18.2</td>
<td>236</td>
<td>15.1</td>
</tr>
<tr>
<td>Smoke occasionally</td>
<td>225</td>
<td>5.1</td>
<td>70</td>
<td>4.7</td>
<td>80</td>
<td>5.1</td>
</tr>
<tr>
<td>Will smoke in future</td>
<td>633</td>
<td>47.2</td>
<td>800</td>
<td>54.1</td>
<td>931</td>
<td>58.2</td>
</tr>
<tr>
<td>Will not smoke in</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>future</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Board 1 introduced policy in 2001 while Board 2 introduced policy in 2000
3.5 Smoking behaviour differences by grade

Tables 4, 5, and 6 provide summaries of the descriptive statistics for each wave of data collection by grade. The smoking behaviour of students in grade 12 was consistently higher than that of students in grade 10 and grade 11. The smoking behaviour of students in grade 10 was lower than that of students in grade 11 or grade 12. For example, regular/weekly smoking behaviour of grade 10, 11 and grade 12 students ranged from 20 to 30.1% in 1999 and from 15.8% to 24.6% in 2001. Occasional smoking behaviour of students in grade 10, 11 and 12 ranged from 19.2% to 20.6% in 1999 and from 14.3% to 19.1% in 2001.
Table 4. Smoking behaviour of grade 10-12 students in high schools in PEI (1999)

<table>
<thead>
<tr>
<th></th>
<th>Grade 10 (n = 1537)</th>
<th>Grade 11 (n = 1384)</th>
<th>Grade 12 (n = 1183)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>%</td>
<td>n</td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>797</td>
<td>52.2</td>
<td>693</td>
</tr>
<tr>
<td>Male</td>
<td>730</td>
<td>47.8</td>
<td>684</td>
</tr>
<tr>
<td>Age</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15 or younger</td>
<td>649</td>
<td>42.2</td>
<td>4</td>
</tr>
<tr>
<td>16</td>
<td>790</td>
<td>51.4</td>
<td>613</td>
</tr>
<tr>
<td>17 or older</td>
<td>95</td>
<td>6.2</td>
<td>650</td>
</tr>
<tr>
<td>18 or older</td>
<td>115</td>
<td>8.3</td>
<td>545</td>
</tr>
<tr>
<td>19 or older</td>
<td></td>
<td></td>
<td>111</td>
</tr>
<tr>
<td>SMOKING BEHAVIOUR</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ever tried cigarette—even a puff?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>1035</td>
<td>67.4</td>
<td>1022</td>
</tr>
<tr>
<td>No</td>
<td>501</td>
<td>32.6</td>
<td>361</td>
</tr>
<tr>
<td>Ever smoked again since first time?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>845</td>
<td>55.1</td>
<td>843</td>
</tr>
<tr>
<td>No</td>
<td>190</td>
<td>12.4</td>
<td>182</td>
</tr>
<tr>
<td>I have never smoked</td>
<td>498</td>
<td>32.5</td>
<td>359</td>
</tr>
<tr>
<td>Ever smoked whole cigarette?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>746</td>
<td>48.5</td>
<td>749</td>
</tr>
<tr>
<td>No</td>
<td>288</td>
<td>18.7</td>
<td>277</td>
</tr>
<tr>
<td>I have never smoked</td>
<td>498</td>
<td>32.8</td>
<td>357</td>
</tr>
<tr>
<td>Smoked 100 or more cigarettes?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>440</td>
<td>57.8</td>
<td>363</td>
</tr>
<tr>
<td>Not that much</td>
<td>198</td>
<td>25.9</td>
<td>150</td>
</tr>
<tr>
<td>I have never smoked</td>
<td>124</td>
<td>16.3</td>
<td>112</td>
</tr>
<tr>
<td>Do you smoke every week?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>307</td>
<td>20.0</td>
<td>352</td>
</tr>
<tr>
<td>Occasionally</td>
<td>295</td>
<td>19.2</td>
<td>277</td>
</tr>
<tr>
<td>Tried once but not again</td>
<td>233</td>
<td>15.2</td>
<td>182</td>
</tr>
<tr>
<td>Quit</td>
<td>160</td>
<td>10.4</td>
<td>152</td>
</tr>
<tr>
<td>I have never smoked</td>
<td>539</td>
<td>35.2</td>
<td>419</td>
</tr>
<tr>
<td>Do you smoke every day, occasionally, or not at all?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Every day</td>
<td>252</td>
<td>16.4</td>
<td>292</td>
</tr>
<tr>
<td>Occasionally</td>
<td>221</td>
<td>14.4</td>
<td>216</td>
</tr>
<tr>
<td>Not at all</td>
<td>534</td>
<td>34.8</td>
<td>475</td>
</tr>
<tr>
<td>I have never smoked</td>
<td>527</td>
<td>34.4</td>
<td>400</td>
</tr>
<tr>
<td>Have you smoked a cigarette today?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>256</td>
<td>16.7</td>
<td>293</td>
</tr>
<tr>
<td>No</td>
<td>583</td>
<td>38.1</td>
<td>538</td>
</tr>
<tr>
<td>I do not smoke</td>
<td>691</td>
<td>45.2</td>
<td>547</td>
</tr>
</tbody>
</table>

*a Numbers may not add to total because of missing values*
<table>
<thead>
<tr>
<th></th>
<th>Grade 10 (n = 1538)</th>
<th>Grade11 (n = 1514)</th>
<th>Grade 12 (n = 1365)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Gender</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>765  50.0</td>
<td>785  51.9</td>
<td>712  52.5</td>
</tr>
<tr>
<td>Male</td>
<td>764  50.0</td>
<td>727  48.1</td>
<td>645  47.5</td>
</tr>
<tr>
<td><strong>Age</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15 or younger</td>
<td>810  52.8</td>
<td>4  0.3</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>639  41.6</td>
<td>748  49.4</td>
<td>10  0.7</td>
</tr>
<tr>
<td>17 or older</td>
<td>86   5.6</td>
<td>664  43.9</td>
<td>651  47.8</td>
</tr>
<tr>
<td>18 or older</td>
<td>97   6.4</td>
<td>595  43.6</td>
<td></td>
</tr>
<tr>
<td>19 or older</td>
<td></td>
<td>107  7.9</td>
<td></td>
</tr>
<tr>
<td><strong>SMOKING BEHAVIOUR</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ever tried cigarette –even a puff?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>984  64.0</td>
<td>1075 71.1</td>
<td>1039 76.3</td>
</tr>
<tr>
<td>No</td>
<td>553  40.0</td>
<td>438  28.9</td>
<td>323  23.7</td>
</tr>
<tr>
<td>Ever smoked again since first time?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>738  74.8</td>
<td>887 82.6</td>
<td>868 83.6</td>
</tr>
<tr>
<td>No</td>
<td>248  25.2</td>
<td>187  17.4</td>
<td>170  16.4</td>
</tr>
<tr>
<td>Ever smoked whole cigarette?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>670  68.1</td>
<td>793 73.7</td>
<td>785 83.2</td>
</tr>
<tr>
<td>No</td>
<td>314  31.9</td>
<td>283  26.3</td>
<td>259  27.4</td>
</tr>
<tr>
<td>Smoked 100 or more cigarettes?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>325  21.2</td>
<td>382 25.2</td>
<td>438 32.2</td>
</tr>
<tr>
<td>Not that much</td>
<td>547  35.7</td>
<td>597 39.3</td>
<td>498 36.5</td>
</tr>
<tr>
<td>I have never smoked</td>
<td>662  43.2</td>
<td>540 35.5</td>
<td>427 31.3</td>
</tr>
<tr>
<td>Do you smoke every week?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>298  19.4</td>
<td>354 23.4</td>
<td>383 28.1</td>
</tr>
<tr>
<td>Occasionally</td>
<td>203  13.2</td>
<td>278 18.4</td>
<td>274 20.1</td>
</tr>
<tr>
<td>Tried once but not again</td>
<td>245  16.0</td>
<td>206 13.6</td>
<td>185 13.6</td>
</tr>
<tr>
<td>Quit</td>
<td>175  11.4</td>
<td>166 11.0</td>
<td>134  9.9</td>
</tr>
<tr>
<td>I have never smoked</td>
<td>615  40.0</td>
<td>506 33.4</td>
<td>385 28.3</td>
</tr>
<tr>
<td>Do you smoke every day, occasionally, or not at all?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Every day</td>
<td>245  16.0</td>
<td>293 19.4</td>
<td>318 23.4</td>
</tr>
<tr>
<td>Occasionally</td>
<td>167  10.9</td>
<td>180 11.9</td>
<td>207 15.2</td>
</tr>
<tr>
<td>Not at all</td>
<td>535  34.9</td>
<td>548 36.3</td>
<td>471 34.6</td>
</tr>
<tr>
<td>I have never smoked</td>
<td>587  38.2</td>
<td>487 32.4</td>
<td>365 26.8</td>
</tr>
<tr>
<td>Have you smoked a cigarette today?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>246  16.2</td>
<td>285 19.0</td>
<td>309 22.8</td>
</tr>
<tr>
<td>No</td>
<td>540  35.6</td>
<td>553 36.9</td>
<td>537 39.6</td>
</tr>
<tr>
<td>I do not smoke</td>
<td>730  48.2</td>
<td>660 44.1</td>
<td>510 37.6</td>
</tr>
</tbody>
</table>

*a Numbers may not add to total because of missing values*
Table 6. Smoking behaviour of Grade 10-12 students in high schools in PEI (2001)

<table>
<thead>
<tr>
<th></th>
<th>Grade 10 (n = 1666)</th>
<th>Grade 11 (n = 1484)</th>
<th>Grade 12 (n = 1429)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>%</td>
<td>n</td>
</tr>
<tr>
<td><strong>Gender</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>831</td>
<td>50.0</td>
<td>728</td>
</tr>
<tr>
<td>Male</td>
<td>831</td>
<td>50.0</td>
<td>752</td>
</tr>
<tr>
<td><strong>Age</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15 or younger</td>
<td>902</td>
<td>54.3</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>676</td>
<td>40.7</td>
<td>803</td>
</tr>
<tr>
<td>17 or older</td>
<td>82</td>
<td>4.9</td>
<td>587</td>
</tr>
<tr>
<td>18 or older</td>
<td>92</td>
<td>6.2</td>
<td>606</td>
</tr>
<tr>
<td>19 or older</td>
<td></td>
<td></td>
<td>109</td>
</tr>
<tr>
<td><strong>SMOKING BEHAVIOR</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ever tried cigarette –even a puff?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>1019</td>
<td>61.3</td>
<td>973</td>
</tr>
<tr>
<td>No</td>
<td>643</td>
<td>38.7</td>
<td>508</td>
</tr>
<tr>
<td>Ever smoked again since first time?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>772</td>
<td>46.4</td>
<td>763</td>
</tr>
<tr>
<td>No</td>
<td>255</td>
<td>15.3</td>
<td>219</td>
</tr>
<tr>
<td>I have never smoked</td>
<td>637</td>
<td>38.3</td>
<td>496</td>
</tr>
<tr>
<td>Ever smoked whole cigarette?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>681</td>
<td>41.0</td>
<td>672</td>
</tr>
<tr>
<td>No</td>
<td>345</td>
<td>20.8</td>
<td>306</td>
</tr>
<tr>
<td>I have never smoked</td>
<td>634</td>
<td>38.2</td>
<td>498</td>
</tr>
<tr>
<td>Smoked 100 or more cigarettes?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>297</td>
<td>17.9</td>
<td>344</td>
</tr>
<tr>
<td>Not that much</td>
<td>619</td>
<td>37.2</td>
<td>519</td>
</tr>
<tr>
<td>I have never smoked</td>
<td>747</td>
<td>44.9</td>
<td>616</td>
</tr>
<tr>
<td>Do you smoke every week?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>262</td>
<td>15.8</td>
<td>302</td>
</tr>
<tr>
<td>Occasionally</td>
<td>238</td>
<td>14.3</td>
<td>231</td>
</tr>
<tr>
<td>Tried once but not again</td>
<td>283</td>
<td>17.1</td>
<td>201</td>
</tr>
<tr>
<td>Quit</td>
<td>188</td>
<td>11.3</td>
<td>165</td>
</tr>
<tr>
<td>I have never smoked</td>
<td>690</td>
<td>41.5</td>
<td>580</td>
</tr>
<tr>
<td>Do you smoke every day, occasionally, or not at all?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Every day</td>
<td>216</td>
<td>13.0</td>
<td>264</td>
</tr>
<tr>
<td>Occasionally</td>
<td>202</td>
<td>12.2</td>
<td>152</td>
</tr>
<tr>
<td>Not at all</td>
<td>566</td>
<td>34.1</td>
<td>502</td>
</tr>
<tr>
<td>I have never smoked</td>
<td>678</td>
<td>40.7</td>
<td>562</td>
</tr>
<tr>
<td>Have you smoked a cigarette today?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>215</td>
<td>13.1</td>
<td>249</td>
</tr>
<tr>
<td>No</td>
<td>594</td>
<td>36.0</td>
<td>510</td>
</tr>
<tr>
<td>I do not smoke</td>
<td>838</td>
<td>50.9</td>
<td>713</td>
</tr>
</tbody>
</table>

*a* Numbers may not add to total because of missing values
3.6 Factors influencing smoking behaviour by grade and wave of data collection

Analyses were conducted to identify factors influencing smoking behaviour among youth adjusting for grade for all three waves of data collection (Tables 7, 8, 9). Although new school policy banning smoking on school property was implemented across all schools in the province, the percentage of students reporting seeing students smoking near school property remained at over 94% for all three waves of data collection.

Key risks around social influences of smoking behaviour (friends and family smoking behaviour) actually increased over time. Over 50% of students reported having one or more family members smoking in the home and over 40% reported having one or more close friends who smoke. Additionally, over 80% of all students still believed that more than 30% of youth their age smoke cigarettes.

Seeing teachers and staff smoking near school property decreased across all three waves of data collection. For example, students seeing teachers and staff smoking were reported by 26.9% of students in grade 10 in 1999, 18.2% of grade 10 students in 2000 and 12.3% of grade 10 students in 2001. This represents a 53% decrease in students in grade 10 reporting seeing teachers and staff smoking near school property.

Over the three waves of data collection, there was an increase in students’ knowledge about policy rules and enforcement. For example, students from grade 10, 11 and 12 in 2001 had a higher percentage of reports of knowledge
about tobacco policies in their schools. By 2001 students reports of knowing there are clear rules about smoking in their school and students get in trouble if they break the rules were higher than students’ reports in 1999 or 2000. However, reports of students smoking in this school where they were not allowed decreased. Further, the overestimation and therefore the misperception that smoking is the norm in school did decrease.

The self-reported smoking behaviours of grade 10 students in 2001 (Table 9) were lower than those behaviours of grade 10 students in 1999 or 2000 (Tables 7, 8). Similarly, the smoking behaviours of grade 11 and grade 12 students in 2001 were lower than self-reported smoking behaviour rates of grade 11 and 12 students from either 1999 or 2000.
Table 7. Factors influencing smoking behaviour of grade 10-12 high school students in PEI (1999)

<table>
<thead>
<tr>
<th>Factor</th>
<th>Grade 10 (n = 1537)</th>
<th>Grade 11 (n = 1384)</th>
<th>Grade 12 (n = 1183)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>%</td>
<td>n</td>
</tr>
<tr>
<td>See students smoke near school</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>1488</td>
<td>98.9</td>
<td>1324</td>
</tr>
<tr>
<td>No</td>
<td>16</td>
<td>1.1</td>
<td>24</td>
</tr>
<tr>
<td>See teachers/staff smoke near school</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>404</td>
<td>26.9</td>
<td>413</td>
</tr>
<tr>
<td>No</td>
<td>1098</td>
<td>73.1</td>
<td>934</td>
</tr>
<tr>
<td>School has clear tobacco rules</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>1293</td>
<td>86.3</td>
<td>1226</td>
</tr>
<tr>
<td>No</td>
<td>206</td>
<td>13.7</td>
<td>119</td>
</tr>
<tr>
<td>Students who break rules get into trouble</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>1107</td>
<td>74.1</td>
<td>1014</td>
</tr>
<tr>
<td>No</td>
<td>386</td>
<td>25.9</td>
<td>330</td>
</tr>
<tr>
<td>Students smoke where not allowed</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>912</td>
<td>60.9</td>
<td>840</td>
</tr>
<tr>
<td>No</td>
<td>586</td>
<td>39.1</td>
<td>505</td>
</tr>
<tr>
<td>Asked age when buying cigarettes</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I do not buy cigarettes</td>
<td>1118</td>
<td>82.0</td>
<td>955</td>
</tr>
<tr>
<td>Never</td>
<td>147</td>
<td>10.8</td>
<td>167</td>
</tr>
<tr>
<td>Some of the time</td>
<td>73</td>
<td>5.4</td>
<td>105</td>
</tr>
<tr>
<td>Always/almost always</td>
<td>25</td>
<td>1.8</td>
<td>28</td>
</tr>
<tr>
<td>Think you will smoke in future</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Definitely will not</td>
<td>797</td>
<td>52.1</td>
<td>707</td>
</tr>
<tr>
<td>Might/might not</td>
<td>664</td>
<td>43.3</td>
<td>626</td>
</tr>
<tr>
<td>Definitely will</td>
<td>70</td>
<td>4.6</td>
<td>44</td>
</tr>
<tr>
<td>Perception of % youth your age who smoke</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt;30%</td>
<td>1401</td>
<td>91.7</td>
<td>1268</td>
</tr>
<tr>
<td>&lt;30%</td>
<td>127</td>
<td>8.3</td>
<td>108</td>
</tr>
<tr>
<td>smokers in home</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>none</td>
<td>784</td>
<td>51.2</td>
<td>658</td>
</tr>
<tr>
<td>1 or more</td>
<td>746</td>
<td>48.8</td>
<td>720</td>
</tr>
<tr>
<td>friends who smoke</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>none</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
</tr>
<tr>
<td>1 or more</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
</tr>
</tbody>
</table>

*a Numbers may not add to total because of missing values*
Table 8. Factors influencing smoking behaviour of grade 10-12 high school students in PEI (2000)

<table>
<thead>
<tr>
<th>Factor</th>
<th>Grade 10 (n = 1538)&lt;sup&gt;a&lt;/sup&gt;</th>
<th>Grade 11 (n = 1514)&lt;sup&gt;a&lt;/sup&gt;</th>
<th>Grade 12 (n = 1365)&lt;sup&gt;a&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>%</td>
<td>n</td>
</tr>
<tr>
<td>See students smoke near school</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>1481</td>
<td>97.7</td>
<td>1474</td>
</tr>
<tr>
<td>No</td>
<td>35</td>
<td>2.3</td>
<td>23</td>
</tr>
<tr>
<td>See teachers/staff smoke near school</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>277</td>
<td>18.2</td>
<td>296</td>
</tr>
<tr>
<td>No</td>
<td>1242</td>
<td>81.8</td>
<td>1197</td>
</tr>
<tr>
<td>School has clear tobacco rules</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>1307</td>
<td>86.5</td>
<td>1356</td>
</tr>
<tr>
<td>no</td>
<td>204</td>
<td>13.5</td>
<td>136</td>
</tr>
<tr>
<td>Students who break rules get into trouble</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>1205</td>
<td>80.0</td>
<td>1105</td>
</tr>
<tr>
<td>no</td>
<td>301</td>
<td>20.0</td>
<td>375</td>
</tr>
<tr>
<td>Students smoke where not allowed</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>786</td>
<td>52.5</td>
<td>866</td>
</tr>
<tr>
<td>No</td>
<td>712</td>
<td>47.5</td>
<td>619</td>
</tr>
<tr>
<td>Asked age when buying cigarettes</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I do not buy cigarettes</td>
<td>1222</td>
<td>82.3</td>
<td>1150</td>
</tr>
<tr>
<td>Never</td>
<td>131</td>
<td>8.8</td>
<td>185</td>
</tr>
<tr>
<td>Some of the time</td>
<td>98</td>
<td>6.6</td>
<td>110</td>
</tr>
<tr>
<td>Always/almost always</td>
<td>34</td>
<td>2.3</td>
<td>29</td>
</tr>
<tr>
<td>Think you will smoke in future</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Definitely will not</td>
<td>923</td>
<td>60.5</td>
<td>854</td>
</tr>
<tr>
<td>Might/might not</td>
<td>553</td>
<td>36.2</td>
<td>590</td>
</tr>
<tr>
<td>Definitely will</td>
<td>50</td>
<td>3.3</td>
<td>61</td>
</tr>
<tr>
<td>Perception of % youth your age who smoke</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt;30%</td>
<td>1305</td>
<td>86.2</td>
<td>1283</td>
</tr>
<tr>
<td>&lt;30%</td>
<td>209</td>
<td>13.8</td>
<td>214</td>
</tr>
<tr>
<td>smokers in home</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>none</td>
<td>726</td>
<td>49.9</td>
<td>690</td>
</tr>
<tr>
<td>1 or more</td>
<td>729</td>
<td>50.1</td>
<td>749</td>
</tr>
<tr>
<td>friends who smoke</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>none</td>
<td>780</td>
<td>54.4</td>
<td>831</td>
</tr>
<tr>
<td>1 or more</td>
<td>654</td>
<td>45.6</td>
<td>586</td>
</tr>
</tbody>
</table>

<sup>a</sup> Numbers may not add to total because of missing values
Table 9. Factors influencing smoking behaviour of grade 10-12 high school students PEI (2001)

<table>
<thead>
<tr>
<th>Factor</th>
<th>Grade 10 (n = 1666)</th>
<th>Grade 11 (n = 1484)</th>
<th>Grade 12 (n = 1429)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>%</td>
<td>n</td>
</tr>
<tr>
<td>See students smoke near school</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>1563</td>
<td>95.0</td>
<td>1395</td>
</tr>
<tr>
<td>No</td>
<td>83</td>
<td>5.0</td>
<td>82</td>
</tr>
<tr>
<td>See teachers/staff smoke near school</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>201</td>
<td>12.3</td>
<td>232</td>
</tr>
<tr>
<td>No</td>
<td>1439</td>
<td>87.7</td>
<td>1241</td>
</tr>
<tr>
<td>School has clear tobacco rules</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>1555</td>
<td>94.8</td>
<td>1397</td>
</tr>
<tr>
<td>No</td>
<td>85</td>
<td>5.2</td>
<td>69</td>
</tr>
<tr>
<td>Students who break rules get into trouble</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>1409</td>
<td>86.8</td>
<td>1267</td>
</tr>
<tr>
<td>No</td>
<td>215</td>
<td>13.2</td>
<td>190</td>
</tr>
<tr>
<td>Students smoke where not allowed</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>980</td>
<td>60.2</td>
<td>846</td>
</tr>
<tr>
<td>No</td>
<td>646</td>
<td>39.8</td>
<td>616</td>
</tr>
<tr>
<td>Asked age when buying cigarettes</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I do not buy cigarettes</td>
<td>1374</td>
<td>85.9</td>
<td>1132</td>
</tr>
<tr>
<td>Never</td>
<td>133</td>
<td>8.3</td>
<td>177</td>
</tr>
<tr>
<td>Some of the time</td>
<td>71</td>
<td>4.4</td>
<td>112</td>
</tr>
<tr>
<td>Always/almost always</td>
<td>22</td>
<td>1.4</td>
<td>22</td>
</tr>
<tr>
<td>Think you will smoke in future</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Definitely will not</td>
<td>1033</td>
<td>62.8</td>
<td>872</td>
</tr>
<tr>
<td>Might/might not</td>
<td>559</td>
<td>34.0</td>
<td>536</td>
</tr>
<tr>
<td>Definitely will</td>
<td>53</td>
<td>3.2</td>
<td>67</td>
</tr>
<tr>
<td>Perception of % youth your age who smoke</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt;30%</td>
<td>1366</td>
<td>83.4</td>
<td>1233</td>
</tr>
<tr>
<td>&lt;30%</td>
<td>273</td>
<td>16.6</td>
<td>241</td>
</tr>
<tr>
<td>smokers in home</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>None</td>
<td>744</td>
<td>46.9</td>
<td>670</td>
</tr>
<tr>
<td>1 or more</td>
<td>843</td>
<td>53.1</td>
<td>763</td>
</tr>
<tr>
<td>friends who smoke</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>none</td>
<td>768</td>
<td>48.9</td>
<td>763</td>
</tr>
<tr>
<td>1 or more</td>
<td>804</td>
<td>51.1</td>
<td>658</td>
</tr>
</tbody>
</table>

* Numbers may not add to total because of missing values
3.7 School-based policies and programs and risk of smoking behaviour for senior students (Grade 12)

The first objective was to examine how school-based tobacco policies and programs were related to the smoking behaviour of senior level students (Grade 12) in high schools in Prince Edward Island (I).

The results showed that close to 50% of senior level students (grade 12) from the ten high schools in Prince Edward Island reported that they were smoking cigarettes. Of the 3965 grade 12 students in all three waves of data collection (1999, 2000, 2001), 1,089 (27.5%) were regular smokers and 789 (19.9%) were occasional smokers. Slightly more females (22.5%) than males (17%) were occasional smokers while more males (29.8%) than females (25.3%) were regular smokers. Tables 4, 5 and 6 provide a summary of smoking behaviour by grade (I).

The combination of both policies and programs was not associated with either a decrease or an increase risk of being an occasional or regular smoker. The probability of grade 12 students being occasional smokers was less for students attending schools with prevention programming only, compared to students attending schools with policy only or both policies and programs.

The schools that students attended were strongly associated with the likelihood that students would be occasional and/or regular smokers. However, the variation in the association provided mixed results. School-based prevention programming was associated with a decreased risk of being an occasional
smoker but not with the risk of being a regular smoker. Students attending schools where tobacco prevention programs only were in place were less likely to be occasional smokers. Students who attended schools where they believed clear rules about smoking were in place were at a decreased risk of occasional smoking. Students who reported having one or more close friends who smoke were at an increased risk for occasional smoking.

The presence of tobacco policy alone in a school was not associated with a decreased risk of occasional smoking. In fact, school policies banning smoking on school property increased the risk of being an occasional smoker among grade 12 students. However, a significant interaction was found between the presence of tobacco policies in a school and students beliefs regarding smoking rules at school. Students attending schools without the new tobacco policy and, who believed there were clear smoking rules in their schools was associated with a substantial decreased risk of occasional smoking. Increased risk of regular smoking behaviour was associated with attending schools where student believed that students caught breaking the tobacco rules would get into trouble and students who reported having one or more close friends who smoke.
3.8 Relationship of tobacco programs and policies to smoking behaviour or junior level high school students

The second objective was to examine how school smoking policies and prevention programs were associated with smoking behaviour among grade 10 (age 15-16) students and how these findings compared to those reported from the grade 12 students (II).

Comparisons of smoking behaviour by grade and wave of data collection are presented in Figures 1-3 (II). The cross sectional data for the three waves of data collection show a trend of decreasing smoking pattern. It appears that the pattern of regular and occasional smoking behaviour of grade 10 students is lower than that of grade 12 students for all three waves of data collection. Further, the percentage of occasional and regular smoking of grade 10 students in 1999 is higher than the percentages of smoking behaviours of students in grade 10 in 2000 and 2001. Similar patterns of changes in smoking behaviour are noted in grade 12 students across the three waves of data collection.

Multi level logistic regression analyses were used to examine how both school and student characteristics were associated with student smoking behaviour. Findings from these analyses showed that although the characteristics of the school environment were associated with smoking behaviour of students attending that school, the school prevention intervention implemented in schools across PEI was not associated with a decreased risk of occasional or regular smoking among grade 10 students who attended schools
with policies and programs. Students attending schools with prevention programs only were at a reduced risk for occasional smoking. Students attending schools with policies only were at increased risk for regular smoking. The smoking behaviour of older students (grade 12) at a school was associated with younger students (grade 10) smoking behaviour. In addition, students who were first enrolled in a high school in grade 9, rather than grade 10, were at increased risk of occasional smoking.

### 3.9 Factors influencing smoking behaviour during student transition through high school

The third objective was to determine the factors that most influence whether or not a school-based tobacco control program influences the smoking behaviour of students during their transition through high school (Grades 10-12) (III).

There were significant increases in the proportion of regular smokers as students transitioned through high school from 23.3% in 1999 to 27.8% in 2001 ($\chi^2 = 10.35, df = 1, p < 0.001$). During the three years of data collection, there was an increase in knowledge and awareness of the tobacco control policies (knowledge of clear rules in school), significant positive changes in school and student characteristics influencing smoking behaviour (seeing fewer students and teachers/staff smoking near school property, less exposure of smokers in the homes and decreased overestimation of percentage of youth their age smoking)
as well as enforcement of the tobacco policies (students get into trouble for breaking the rules).

Logistic regression models conducted on grade 12 data provided an understanding of the characteristics that were associated with smoking behaviour by the end of high school. All three logistic models showed that having one or more close friends who smoke and having one or more smokers in the home were the strongest characteristics associated with increased risk of smoking behaviour for grade 12 students.

In Model 1, having one or more close friends who smoke was a significant predictor for occasional smoking behaviour (OR = 2.57; 95% CI = 1.86 to 3.56). Females were more likely than males to be occasional smokers (OR = 1.38; 95% CI = 1.00 to 1.88). Further, females who had one or more smoking friends (OR = 2.99; 95% CI = 1.94 to 4.61), and who saw students smoking where they were not allowed (OR = 1.58; 95% CI = 1.02, 2.47) had a larger impact on the likelihood of females being occasional smokers.

In Model 2 students reporting having one or more family member(s) smoking in the home (OR = 2.58; 95% CI = 1.76 to 3.79) and having one or more close friend(s) who smoke (OR = 14.47; 95% CI = 7.17 to 29.20) was associated with the likelihood of being regular smokers. Gender analyses showed that both male (OR = 17.69; 95% CI = 6.43 to 48.67) and female (OR = 12.06; 95% CI = 4.52 to 32.22) students who had one or more close friends who smoke were at substantial risk for being regular smokers.
In Model 3 students who had one or more close friend(s) who smoke (OR = 37.46; 95% CI = 19.39 to 72.36), who had one or more smoker(s) in the home (OR = 2.35; 95% CI = 1.67 to 3.30); and who saw teachers and staff smoking on or near school property (OR = 1.78; 95% CI = 1.13 to 2.80) were significantly associated with regular smoking. Gender analyses showed that close friend smoking had a substantial influence on smoking behaviour for both males and females. Females with one or more close friend(s) who smoke were over forty times (OR = 41.16; 95% CI = 16.10 to 105.20) more likely to be regular smokers and males with one or more close friend(s) who smoke were over thirty-six times more likely to be regular smokers (OR = 36.04; 95% CI = 14.11 to 92.05). Both males (OR = 2.17; 95% CI = 1.33 to 3.51) and females (OR = 2.58; 95% CI = 1.56 to 4.25) reporting having one or more smokers in the home were at greater risk of regular smoking. Males who saw teachers and staff smoking near school property were more likely to be regular smokers. Females, on the other hand, were more likely to be regular smokers if they observed students smoking where they were not allowed (OR = 2.32; 95% CI = 1.37 to 3.93) or if they overestimated the percentage of youth their age who smoke (OR = 2.39; 95% CI = 1.36 to 4.21).

3.10 Examining differences in tobacco control efforts and smoking behaviour

The fourth objective was to examine whether school-based tobacco control efforts were associated with smoking behaviour between two groups of
students and determine whether predictors other than number of close friends smoking could be addressed more clearly through school level programming (IV).

The findings differentiate smoking behaviour and influences between two groups of students who experienced implementation of a new smoking policy one year apart. Findings showed increases in both occasional and regular smoking behaviour for both Group 1 (age 15-17; Grade 10 in 2000 and Grade 11 in 2001) and Group 2 (age 16-19; Grade 11 in 2000 and Grade 12 in 2001) students. Between 2000 and 2001, Group 1 students (Grade 10 in 2000 and Grade 11 in 2001) showed a strong positive (10.2%) change in awareness of the existence of tobacco policies in their schools, and that students who break the tobacco rules get into trouble (8.8%). Although there was a decrease (3.4%) in reports of seeing students smoking near school and students overestimating percentage of youth their age who smoke (9.7%), there was a negative change in smoking behaviour in that both regular (5.0%) and occasional smoking behaviour (18.5%) increased.

Between 2000 and 2001, occasional and regular smoking behaviour increased for both groups. The percentage change in Group 1 smoking behaviour, knowledge of the tobacco control policies and enforcement of those policies were greater than Group 2. For example, for Group 1 there was an 18% change in occasional smoking behaviour compared to a 3.95% increase in occasional smoking for Group 2. Additionally, factors related to school tobacco control policies being followed increased for both groups. Both groups showed a
decrease in seeing students smoking near school property and students overestimating the percentage of youth their age who smoke. However, both groups showed an increase in reports of students smoking where they were not allowed. Figure 4 provides a summary of the group differences in smoking behaviour and influencing characteristics.

![Figure 4. Comparison of group changes in smoking behaviour and school and students characteristics influencing smoking behaviour between 2000 and 2001](image)

Twelve multivariate logistic regression models were run to examine students perceptions of the characteristics in school that influence smoking behaviour for each group during wave 2 (2000) and wave 3 (2001) data collection. Overall school boards were not independently predictive of youth
smoking behaviour for either Group 1 or Group 2 students. Students who reported seeing teachers/staff smoking near the school were at an increased risk of both regular and occasional smoking compared to non-smoking. In Models 2 and 3, students getting into trouble for breaking the smoking rules, was associated with increased risk of being a regular smoker, and the impact of this increased between 2000 and 2001. Females from both Group 1 (OR = 1.64; 95% CI = 1.17 to 2.28; OR = 1.59; 95% CI 1.17 to 2.17) and Group 2 (OR = 1.56; 95% CI 1.16 to 2.10; OR = 1.30; CI 0.96 to 1.76) were consistently more likely to be occasional smokers than males. In general, the characteristic associated with an increased likelihood of regular and occasional smoking for 2000 and 2001 was students overestimating the percentage of youth their age who smoke. This finding was consistent for both Groups 1 and 2 and across all smoking behaviours (Models 1, 2, and 3). However, students overestimating percentage of youth their age smoking did not change significantly from 2000 to 2001.

For Group 1 seeing students smoking near school was associated with a decreased likelihood of regular versus non-smoking behaviour (OR = 0.42; 95% CI 0.19 to 0.94) and a substantial decrease in regular versus occasional smoking (OR = 0.11; 95% CI = 0.01 to 0.89). However, attending schools where students smoke where not allowed was associated with increase in regular smoking behaviour. In 2001, Group 1 students who had knowledge about clear rules about smoking in their school were less likely to be occasional smokers (OR = 0.42; 95% CI = 0.21 to 0.86) or regular smokers (OR = 0.46; 95% CI = 0.22 to 0.95). For both waves of data collection, females were more likely than males to
be occasional smokers (OR = 1.64; 95% CI = 1.17 to 2.28) and (OR = 1.59; 95% CI = 1.17 to 2.17).

Group 2 students were at a substantial increased risk of regular versus non-smoking (OR = 1.88; 95% CI 1.40 to 2.52 and OR = 2.38; 95% CI = 1.76 to 3.22) and regular versus occasional smoking (OR = 1.62; 95% CI = 1.12 to 2.35 and OR = 1.80; 95% CI = 1.24 to 2.60) when students overestimated the percentage of youth their age smoking. Between 2000 and 2001 there was a notable increased impact of the misperception about the percentage of youth smoking on the smoking behaviour of students in grade 11 and grade 12. In 2001, students who overestimated the percentage of youth their age who smoke (>30%) were at greater risk of occasional smoking (OR = 1.42; 95% CI = 1.05 to 1.94) compared to students who did not overestimate youth smoking rates.
4. DISCUSSION

4.1 Overview

This study examined the implementation of school-based tobacco policy and programs across high schools within one small province under a naturally occurring initiative to reduce tobacco use. The results have the potential to inform improved tobacco control programming in high schools by providing a greater understanding of grade level differences in smoking trajectory and how social and environmental factors influence the smoking behaviour of youth. However, we acknowledge that the quasi-experimental, cross sectional design and the results of the logistic regression analysis prevent us from inferring causality.

Students participating in the study represented approximately 70% of the student body for all public high schools (grade 10-12) in two school boards for all three waves of data collection in Prince Edward Island. The retention of participants was in line with previous studies using schools as data source such as Vartiainen et al. (1998) whose 15-year study in Finland reported 71% retention (1998). Gender distribution of the sample was representative of the Prince Edward Island students with approximately equal distribution of males and females for all three waves of data collection [(1999 F=51.2%, M=48.8%); (2000 F= 51.4%, M=48.6%); (2001 F=50.5%, M=49.5%)].
The results of the preliminary descriptive prevalence analysis showed increases in smoking behaviour in some schools and decreases in others. However, further analysis provided important new findings that may contribute to future school-based programming for tobacco control among youth. In study 1 with grade 12 students, smoking behaviour continued to increase across the three waves of data collection. School-based prevention programs alone were associated with a decreased risk of occasional smoking but not regular smoking behaviour. When schools had only a tobacco policy in place students were at an increased risk of occasional smoking. Moreover, a combination of both policy and programs was not associated with decreased risk of occasional or regular smoking. These findings suggest that school-based initiatives may not be effective unless they reach students prior to adopting advanced smoking behaviour and therefore warrant further analysis of the data.

Similarly, in our second study (II) with grade 10 students, school-based programs were not associated with a decreased risk of smoking behaviour (neither occasional nor regular smoking). However, the characteristics of the school students attended were associated with an increased likelihood of smoking. The presence of both programs and policy were both independently associated with the risk of smoking and the prevalence of smoking among older students at school was associated with the risk of occasional smoking. This suggests that the role of social influences on tobacco control programs for youth needs to be examined more fully.
In our third study (III), with a group of students as they transitioned through high school (grade 10 to grade 12) over the three waves of data collection, the prevalence of smoking behaviour increased even with the implementation of the new tobacco policy and programs. However, when we adjusted the analysis by grade we noted that the smoking behaviour of grade 11 students decreased during the same period suggesting that there were environmental or contextual specific effects in place. We identified the significant effect of social influences, particularly friends and family members who smoke, on the smoking behaviour of youth in those schools. The influence of close friends who smoke had an overwhelming effect on smoking behaviour.

Finally, we explored the data from two groups of students as they experienced the introduction of the new tobacco policy and programs within their schools one year apart (IV). This allowed us to understand a junior (Group 1) and a senior (Group 2) group of students who were in the schools between 2000 and 2001 when the policies and programs were implemented. Between 2000 and 2001, the smoking behaviour of both groups of students increased. Group 1 showed a much stronger increase in occasional smoking compared to Group 2. School boards were not independently predictive of student smoking behaviour for either Group 1 or Group 2. Further, females were more likely than males to be occasional smokers. To explore the influence of environmental and contextual factors more fully, we removed close friends and family smokers from the models. We identified that the characteristic associated with increased likelihood of smoking was students overestimating the percentage of youth their age who
smoke. We also learned that during the implementation of the study both groups of students enhanced their knowledge and awareness of smoking policies and enforcement, about clear rules being in place in their schools and that students who break the rules get into trouble. These findings supported the potential benefits of school-based programs in contributing to comprehensive tobacco reduction among youth.

4.2 Influence of new tobacco policy and programs on smoking behaviour

The new policies and programs alone were not successful in influencing smoking behaviour of youth in this study. Rather, factors within the students and schools contextual environment contributed to whether or not positive or negative changes in smoking behaviour were reported. This finding is supportive of a review by Dobbins et al. (2007) which found multi faceted and comprehensive programs are effective at reducing smoking prevalence and initiation. In addition, previous studies (Leatherdale et al. 2005; Jha & Chaloupka 2000; Griesbach 2002; Reid et al.1995; Stead et al. 1996; Tyas & Pederson 1998) also suggest multiple factors influence smoking behaviour and therefore comprehensive policies and programs that combine school, family and community work best (Wilkinsen et al. 2004; Chassin 1998;1986).

When schools had policies and programs, students were less likely to be occasional smokers but were at greater risk for regular smoking. This finding suggests that school-based programs and policies may be more beneficial to
students who are at an earlier stage of smoking that those who have advanced to more regular pattern of smoking. Further, it might also suggest typical prevention and cessation programs may not address students who are at the transition point of moving to a more advanced stage of smoking. A robust study by Spoth (2001) included two comprehensive interventions (ISFP, a family strengthening program and PDFY, a drug prevention program) building on prosocial skills with 6th graders in 33 rural schools in the US over four years. They found significant positive effects of the intervention compared to the control groups; however, they were not able to say if there was a difference by adding competence skills as well as influence skills. Previous studies, using social influences models, have reported some positive effects on smoking prevalence (Botvin 2001; Brown 2002; Walsh 2003). However, none of these studies differentiated occasional or regular smoking.

The programs and policies provided to students in this study addressed a combination of social influence and social competence skills supportive of Social Cognitive Theory (Bandura 1986) and the Theory of Triadic Influence (Flay 1999). The difficulty is, the dose measure of uptake for the programs in the schools was not documented. The programming may have reached students who were at an earlier stage of experimenting with tobacco and had not progressed to weekly/regular smoking. This type of problem is consistent with findings by Sussman (2001) and Thomas and Perera (2006) that suggest school-based programs need to be rigorously designed and analyzed. The challenge to do that is the costs of implementing, the burden on the school system and
teachers (Reid et al. 1995) and the desire for locally relevant public health data that is available in the short term (Cameron 2007).

The presence of the new tobacco policy was not associated with decreased risk of smoking unless there were clear rules in place (I). If students believed their school did not have clear rules, the policy was not associated with decreased risk of occasional smoking; however, if students believed there were clear rules their risk of occasional smoking was decreased substantially. This finding supports the benefits of school-based programming particularly if the programs are able to limit or decrease the uptake of smoking behaviour among adolescents. Similarly, positive school-based programs were identified by Dobbins et al. (2007), Bruvold (1993), Rooney (1996) and Tobler (2000). However, Thomas and Perera (2006) suggest that there is continued uncertainty about the effectiveness of school-based programs in the long term. One might challenge that school-based programs should not be measured alone but rather contribute as one component of a larger comprehensive program that must reach beyond the school into the community.

School-based primary prevention initiatives may not be effective unless they reach students prior to adopting advanced smoking behaviour (I). Students who are at an early stage of experimentation with cigarettes may be more likely to benefit from prevention programs that can reach them in the short term. Further, there may be a need to develop prevention interventions that address students who are escalating in their use of tobacco but who have not become addicted to cigarettes and who do not perceive cessation programs as
necessary. Previous studies support the effectiveness of school-based initiatives using social influence models to affect smoking in the short term (Dobbins et al. 2007). A Life Skill Training study (Botvin 1995) reported a 25% reduction in packs-a- day cigarette smoking until the end of grade 12. Similarly, the Towards No Tobacco Use project (Sussman et al. 1993) showed a reduction in initiation of smoking across two-year junior high to senior high school period. Lessons learned from these programs need to be modified for new contexts and resources within different schools and communities.

4.2.1 Grade Differences

Unique differences were found on the influence of tobacco policy and programs on smoking behaviour of grade 10 (II) and grade 12 students (I, III). These differences were linked to student beliefs about knowledge of the presence of the policy and/or program, enforcement of the policies. In addition, the grade when students were first enrolled into high school and the smoking behaviour of the senior students in a school influenced the likelihood of smoking among students. The importance of comprehensive policy and program interventions in schools has been described in a robust body of literature (Reid et al. 1995). However, in this study students attending a school with prevention programs only were at decreased risk of occasional smoking (I). This finding was consistent with studies by Brown et al. (2002) and Sussman et al. (2001) that suggest that programs tailored to the needs of smoking youth are effective at reducing smoking uptake. Moreover, students attending a school with new
tobacco policy only were not at a decreased risk for either occasional or regular smoking. This finding was contrary to the existing literature (Pentz et al. 1989; Wakefield et al. 2000; Moore et al. 2001; Maes and Livens 2003). However, the finding that sub-populations of students were at an increased risk of occasional smoking if they attended a school with such policies is consistent with a review by Thomas and Perera (2006) and studies by Leatherdale et al. (2005a, b) and Cameron et al. (2007) who identified similar relationships for susceptibility among non-smoking youth.

4.2.2 Senior and junior student differences

Examining two groups of students, a junior (Group 1, age 15-16 years) and senior (Group 2, age 17-18+ years) group, who experienced the implementation of the new tobacco policies and programs provided additional information (IV). The increase in both occasional and regular smoking behaviour, particularly among the junior group of students, reinforces the strong influences of school and social influences on younger student smoking behaviour (IV). If the seniors in a school adopt healthy behaviours then potentially they will be the role models for the junior students. However, the corollary is when senior students adopt unhealthy behaviours that become the role modelling for the junior students. It may be that student smoking behaviour is influenced by pressure from friends (Geckova et al. 2005; Reid & Mc Neil 1995), that smoking near school property undermined the policy impact (Kumar & O’Malley 2005) and the smoking areas near schools enhanced access to cigarettes (Doubeni
Moreover, the increased visibility of students smoking near the school may have contributed to smoking behaviour through observational learning and vicarious association with youth their age who are smoking (Bandura 1986). These multiple domains of influence, as described by the Theory of Triadic Influence (Flay & Petraitis 1994), speak to the multi-faceted dimensions of influences within the student’s personal, social and environmental context (Flay & Petraitis 1994). Future studies are needed that can explore these broader contextual influences more fully.

Further, how junior and senior groups of students experience tobacco policy differently challenges policy and program planners to tailor and target future programs to the needs of these different populations. The increase in both occasional and regular smoking behaviour was greater for Group 1 (junior) (IV). This finding further supports the influence of senior students in a school as role models for junior students (Leatherdale et al. 2005).

Previous studies consistently report the strong influence of close friends and smokers in the home on the smoking behaviour of youth. Other factors in students’ environments may have been overpowered by the strength of these associations. Therefore, multi regression analyses of factors influencing the smoking behaviour of these two groups were refined by removing the two dominant influences of number of close friends who smoke and the number of smokers in the home (IV). In this analyses overestimates of the percentage of youth their age who smoke presented as the characteristic associated with increased regular and occasional smoking behaviour for both Groups 1 and 2.
Students’ knowledge and awareness of smoking policies and policy enforcement, students’ perceptions of schools having clear rules and students’ perceptions that students who break the rules get into trouble increased between 2000 and 2001. These changes in knowledge and perceptions were greater for Group 1.

One might suggest that the influence of close friend smoking has been so dominant that other factors have not been fully explored and therefore, prevention programs may not address other variables of influence. For example, it is very difficult to conduct prevention programs that tell youth that they smoke because of the influence of their smoking friends and family being so dominant. This message does not fit with the developmental needs of adolescents who believe that they are independent and possibly invincible. Nor does it fit with suggesting that students dump their key social supports systems such as their family and friends. However, helping students develop prevention programs that target changing the misperception of youth their age smoking patterns may provide a positive initiative for schools. Such a targeted initiative would need to be part of comprehensive program that tracks changes in smoking patterns in a school, and monitors enforcement of tobacco polices and programming that includes schools and community. This could provide a simple, cost effective initiative that facilitates dialogue about social competence and strategies to decrease uptake of cigarettes.
4.3 Social Influences and smoking behaviour

Results from this study showed that school-based policies and programs alone did not influence the smoking behaviour of students; however, the influence of student and school characteristics on the policies and programs provided some positive results. The new policy and programs offered in Prince Edward Island provided some important lessons to tobacco control. Over the past decade, the evidence to support school-based tobacco prevention programming has been mixed (Wiehe 2005; Hanewinkel 2004; Sussman 2001; Peterson 2000; Manske 1997). However, counterarguments and reviews (Cameron 1999; Thomas & Perera 2006; Dobbins et al. 2007) have presented some interesting findings around some of the methodological issues from previous studies, the difference in short term and long-term benefit and the challenge of conducting rigorous, long-term studies in schools.

4.3.1 Influence of close friends and family on smoking behaviour

The strongest and most consistent finding throughout this study was the influence of social networks, i.e. the number of close friends who smoke, on the smoking behaviour of adolescents in grades 10 through 12 (I, II, III, IV). Youth smoke with their friends and when their friends do not smoke with them, they will find new friends. The social situations where and when friends smoke is diverse and transcends social class and environmental contexts. The impact of social influences on smoking behaviour is well documented in the literature (Alexander 1999; de Vries 2006; Mercken 2007; Berndt et al. 2002); however, the strength of
this finding with adolescents in this study was very strong. Students who reported having one or more close friends who smoke were at a substantial risk for smoking. For the sample of students (III) who had transitioned through high school during the implementation of this new tobacco policy (grade 10-11-12), by the time they were in grade 12 they were nearly 40 times more likely to smoke than grade 12 students who had no smoking friends. This finding strongly supports the importance of social friendships (Parna 2003) and social influences in smoking prevention programs (Leatherdale et al. 2005). Further, this finding is linked strongly to how friendships develop and the meaning of friendships to students’ decisions around smoking (Mercken et al. 2007; de Vries, et al. 1998).

The influence of close friends’ smoking behaviour on occasional and regular smoking for males and females was substantial. Existing literature to support this finding is not clear (Tyas & Pederson 1998; Chassin et al. 1986; Flay et al. 1994; Hoffman et al. 2006). However, more refined studies conducted by de Vries et al. (2006) and Mercken et al. (2007) have shown that the relationship between smoking behaviour and close friendships is strongly linked to social selection of friends, as well as social influence, particularly between non-reciprocal and reciprocal friends. Grade 10 students were at a substantial risk for occasional smoking if they had close friends who smoked and if they attended school with prevention programs only (II). Consistent with Social Cognitive Theory, the school environment provides both social (e.g. smoking friends, teachers) and physical (e.g. smoking areas) environments where students can be influenced through observational learning and vicarious experiences (Bandura
Developmental changes in friendship patterns as youth transition through high school may create the social context where they embrace new roles and therefore experience higher need for emotional and social connectedness to peers (Berndt and Murphy 2002). Lessons can be learned from the robust body of research that supports prevention programs that change social norms (Wakefield et al. 2000, Gilpin et al. 2001) and include parents, siblings, and peers as important roles models for motivating students to not smoke (Trinidad et al. 2005; Nofziger & Lee 2006; Tragesser et al. 2006). The challenge is how to develop interventions that target close friend smoking behaviour and still reach the adolescent population. One might suggest that school-based programs that encourage a new cultural norm of friendship patterns that support non-smoking may have a potential to assist in counterbalancing the influence from smoking to non-smoking and therefore could lead to greater numbers of non-smoking youth.

Additionally, the gender differences of the influence of close friends on smoking behaviour challenge tobacco policy stakeholders to rethink how programs and policies are developed and implemented. If females are more likely to be occasional smokers then how are new prevention programs reaching out to the needs of females in their programs. In a groundbreaking paper, Greaves and colleagues (1999) provided a gender analysis perspective of the trend differences between male and female smokers and the implications of those differences to tobacco control efforts. Further, Greaves and Barr (2000) introduced strong recommendations for understanding the role tobacco plays in the lives of females compared to males and how that understanding is important.
to future tobacco policies and programs designed for school programs. A Gender Based Analysis framework could provide new direction for future tobacco control that is targeted and relevant to gender context.

The second strongest influence on smoking behaviour of youth in this study was smoking behaviour of family members in the home (I, II, III). This finding consistently creates a challenge for school-based prevention programs because students cannot choose their family. Family genetics as a risk for cigarette addiction is causing additional concern for youth who think they will be able to quit smoking when they choose. However, because of potential genetic risk some youth are clearly more readily addicted to cigarettes than others are. When addiction occurs more quickly, opportunity to participate in prevention programming may be too late. Further, family can be either positive or negative role models for smoking behaviour. Seeing role models such as parents and siblings smoking supports smoking as a positive normative behaviour. Further, when parents or siblings smoke cigarettes, youth have an easy access to experiment and steal cigarettes at early stages of cigarette use. The access point for cigarettes is within the youth’s home and therefore presents a normative event.

Prevention programs need to identify how to include family programs as a critical component for high school prevention and cessation programs. Such programs should be adjusted for both smoking and non-smoking family members.
4.3.2 Influence of teachers and staff on smoking behaviour

Across all schools in this study the percentage of students reporting seeing teachers and staff smoking near their school decreased (III, IV). Teachers and staff participation in decreasing the visibility of smoking near schools is supportive of the tenants of several theoretical models (Theory Triadic Influence; Social Cognitive Theory; Theory Planned Behaviour) that support the roles of modelling as influencers in health behaviour change. It may be that the new policy and programs have enhanced the social norm that cigarette smoking is no longer acceptable (Cleveland & Wiebe 2003; Unger & Rohrbach 2002). This is an encouraging finding for tobacco control stakeholders who are implementing a new tobacco policy study. They can build on the important role that teachers and staff play as roles models to students. However, we cannot suggest that teachers and staff have stopped or reduced their smoking behaviour. Nor can we suggest that this finding is because of the implementation of the new tobacco policy and programs. However, it may be that teachers and staff, who are smokers, are making a concerted effort to abide by the policy and programs of their schools.

4.4 School as a physical and social influence on smoking behaviour

The school students attend was related to their health risk behaviour (smoking) (I, II, III, IV). Important differences were found for targeted groups within schools such as grade (I, II) and groups (III, IV) and are consistent with
previous studies that showed population differences (Jha & Chaloupka 2000; Leatherdale et al. 2005). In this study, the school a grade 12 student attended was related to the likelihood of his/her being a regular or occasional smoker (I). For grade 10 students, (II) the school they attended was significantly related to his/her likelihood of being an occasional smoker. Similar findings, within the contextual environment of schools, found the school plays a role in student smoking behaviour (Aveyard 2004; Leatherdale et al. 2005). Additionally, this finding contributes to arguments about the benefits of school-based programming on student smoking behaviour (Dobbins et al. 2007). Dooris et al. (2006) have described settings as places that contribute (or not) to health. However, advancing how to incorporate a settings-based approach to health promotion in schools is at an early stage of development. A counter argument to advocating for health promoting schools is concern for contributing further to marginalizing at risk youth by the limitation of resources available for their schools. A problem for this study was inadequate measures to fully explore the pros and cons of the new tobacco control initiative, further contributing to the discourse on calls for more rigorous methodology and strong evaluation of tobacco control initiatives in the future (Sussman 2001).

The smoking behaviour of senior students (grade 12) in a school was associated with younger student smoking behaviour. Each 1% increase in the smoking rate among grade 12 students at a particular school increased the likelihood that a grade 10 student at that school was an occasional smoker (II). The smoking behaviour of senior students may suggest that smoking is
acceptable behaviour in that school (Cleveland and Weibe 2003; Unger and Rohrbach 2002; Ennett et al. 1997), that cigarettes will be available to them (Kumar et al. 2005) and that new friendships can be developed through these smoking areas (Urberg et al. 2003; Aloise-Young et al. 1994).

Grade of enrolment to high school was identified as a significant influence on smoking behaviour of those students (II). When students enrol into high school in grade nine (age 14-15 years), rather than grade 10, they were at an increased risk of occasional smoking. This new finding suggests that the timing for transitions can play a role in youth smoking behaviour. It may be that developmentally these younger students are looking for ways to adjust to this new environment with older students. Social access sites for cigarettes (areas near schools) provide new students with a place where they can go to smoke cigarettes and initiate new friendships. There have been studies on smoking patterns during transition events such as changing school (Leatherdale et al. 2005a; Meijer et al. 1996; Geckova et al. 2005). However, to date there have not been any studies that have looked at enrolment timelines and smoking behaviour.

4.5 Lessons learned implementing new tobacco policy and programs

While the outcome of smoking behaviour is the key deliverable for most smoking related studies, there are also many critical lessons from the programs being developed and implemented. During this study, there was an increased
trend in knowledge and awareness about clear tobacco policies over the three waves of data collection and there was evidence that enforcement of the policies was being noted by students as reflected in increasing reports of students who break the rules get into trouble. Consistent with previous literature, the number of students reporting having close friends who smoke (over 40%) and family members who smoke in the home (over 50%) were high for the adolescent population. The age-adjusted analyses showed that the smoking prevalence was decreasing by grade level each year of the study.

4.5.1 Trends in smoking behaviour

Between 1999 and 2001, there was a downward trend in regular, occasional and daily smoking behaviour. Decreasing rates of regular/weekly smoking (24.7% in 1999, 23.5% in 2000 and 20.1% in 2001), daily smoking rates (20.6% in 1999, 19.4% in 2000 and 17% in 2001) and occasional smoking behaviour (19.9% in 1999, 17.1% in 2000 and 16.2% in 2001) were reported over the three waves of data collection (Table 1). This finding is consistent with trends in tobacco prevalence of 15-19 year olds in Canada. For instance according to 2006 Canadian Tobacco Use Monitoring survey, 15% of 15-19 year old youth were current smokers (Health Canada 2006). Reasons for these decreases may include schools and external community, as well as provincial and national initiatives to promote reduction in tobacco use among youth. These decreases in smoking behaviour may reflect more enhanced enforcement of the policies and new programs being offered in schools. Previous studies showed a strong link
between smoking behaviour and policy enforcement (Trinidad 2004; Wakefield et al. 2000; Moore et al. 2001; Maes and Lievens 2002).

Results by grade, across the three waves of data collection, showed a somewhat different story. Consistently, the percentage of never smokers in grades 10 to 12 decreased each year. The percentage change in occasional smoking was greatest for junior students (grade 10) reporting occasional smoking across the three waves of data collection. It could be that students in grade 10 in these high schools were more receptive to new programs and policies at the school. Lovato and colleagues (2007) suggest that the dominant pattern in adolescent smoking patterns is occasional or experimental smoking behaviour. The percentage change in occasional smoking for grade 12 students was very small. These findings are to be expected because as students transition through high school the opportunities and desire for them to engage in risky behaviour increases. Further, senior level students are more likely to be in social situations where access to cigarettes is high.

Consistent increases in regular smoking behaviour at approximately 5% difference were noted across the three waves of data collection. Even when the smoking rates were declining, the smoking prevalence rates of grade 12 students were consistently higher than that of grade 10 or 11 students for each wave of data collection. This finding is consistent with previous studies that address the smoking rates of senior level students in schools. Leatherdale et al. (2005) noted that the smoking behaviour of senior level students influences the smoking behaviour of junior level students in that school. One could suggest that the new
tobacco policy and programs offered in schools in PEI during this time may have accounted for these positive results. This finding is supportive of a review by Skara & Sussman (2003) who reported that 15 of 25 studies that they reviewed demonstrated statistically significant program effects for smoking outcomes (Abernathy 1992; Bergamaschi 2000; Botvin 1995; Elder 1993; Flynn 1994; Hansen 1988; Klepp 1993; Pentz 2003; Perry 1992; Shean 1994; Sussman 1995; Taylor 2000; Telch 1982; Vartiainen 1998; Walter 1989). These findings suggest that prevention approaches were effective in preventing or reducing tobacco use, which supports Dobbins et al. (2007) findings that school-based tobacco use prevention interventions are effective in the short term. In Thomas and Perera’s (2006) review nine school-based studies using a social influence approach showed some positive effect of interventions on smoking prevalence (Botvin 2001; Brown 2002; Cameron 1999; Dijkstra 1999; Elder 1993; Ellickson 1990; Hansen 1991; Noland 1998; Walsh 2003). However, of the 23 high quality studies reviewed by Thomas and Perera (2006), school-based interventions were not effective in preventing uptake of smoking in the long term.

Junior and senior groups of students, who experienced the new smoking police between 2000 and 2001, showed an increase in prevalence of regular and occasional smoking between both groups of students (IV). For both groups student smoking behaviour was being measured as they are getting older and the uptake of cigarettes and other health risk behaviours are common. These findings add further support to the literature regarding concerns about the
continued rise in occasional smoking among adolescents (Lovato et al. 2007; Reitsma & Maske 2004; Leatherdale et al. 2005).

4.5.2 Board Differences

School boards were not independently predictive of smoking behaviour for either a senior or junior group of students between 2000 and 2001 (IV). There was a trend increase in both occasional and regular smoking across both Boards between 2000 and 2001(IV). Students from Board 2 showed a larger decreased percentage of smoking behaviours compared to Board 1 schools over Wave 2 of data collection. One might suggest that the dose effect of Board 2 students, who had the new policy in place for two waves of data collection, may have played a part. Moreover, it may have been that the new programs to help prevent students from smoking and/or to help students quit that were offered to student in Board 2 during Wave 3 may have enhanced the effectiveness of the policy banning smoking on school property.

4.5.3 Cessation Results

Quitting smoking can lead to virtually eliminating the harm from smoking. For this study, a cessation program called Kick the Nic was introduced to all high schools by the PETRA council and was offered by trained volunteers and health professionals. However, the uptake of students into the program was very limited and documentation was inadequate for analysis purposes (Appendix 7,8,9;
Tables 10-12 Cessation Results). The low uptake by students into cessation programs may be reflective of the developmental stage of this age group. They may not have been willing to declare that they are addicted to cigarettes in front of their peers. Moreover, they may not have informed their family of their cigarette smoking. Another possible explanation is that for this population of adolescents, the survey questions did not discriminate between those students who identify themselves with smoking and those who smoke occasionally and do not think they have any cessation needs. A gap in this study was the failure to ask questions that linked student responses to the interventions for cessation that were made available both in their school and in their community. Further, questions regarding their participation in the smoking cessation program called Kick the Nic were not explored. Future research should ensure that the survey questions are consistent with the program interventions.

4.6 Validity, reliability and study limitations

4.6.1 Validity and reliability

According to Campbell and Stanley (1963), internal validity refers to the ability to interpret findings. Validity answers the question - does the instrument measure what it says it does? External validity refers to the generalizability or representativeness of the findings that were based on data using this instrument. Concurrent validity of the tobacco module of SHAPES was assessed through descriptive statistics that determined the percentage of participants who
classified themselves as non-smokers yet had CO (Carbon Monoxide) values > 6 ppm. Results suggest that the SHAPES Tobacco Module yields high level of truthful data (Manske Unpublished Paper, 2008).

The School Health Action Planning and Evaluation (SHAPES) Instrument was developed from provincial and national surveys which is consistent with other surveillance protocols. Content experts in tobacco control reviewed and approved the items for the survey. Reliability refers to the extent that repeated measures by an instrument yields the same result (Campbell & Stanley 1963). Test-retest reliability (repeat measurement at mean of 8 days apart) of the SHAPES tobacco module was solid. During the three years of the study ongoing assessment of the tobacco module resulted in several items changing or being removed. The more consistent the responses were, the more reliable the instrument. Therefore, for this study items that were on all three waves of data collection were retained for data analyses. The reliability of the survey implementation was assured by the lead investigator being responsible and present for all school data collection. Training at each data collection site ensured consistency in teacher training and data collection protocols. Surveys were conducted at the same time of the year for each wave of data collection for all three waves of data collection.
4.6.2 Limitations

The quasi-experimental cross sectional design prevented any causality being determined. Longitudinal data would have allowed the temporal relationships between programs/policies and the onset and progression of student smoking behaviour to be examined. Moreover, additional information about policy and program enforcement was not available which may have contributed to data results in some schools.

Self reported surveys were used where the validity of the responses may be questioned. For example students’ self reports on the smoking behaviour of their friends may have overestimated their smoking influence.

It is not possible to generalize the findings because of the small sample of schools and the inability to link students from one wave of data collection to the next. We acknowledge that we cannot account for students who failed a grade and may have answered the questionnaire during the repeat year, students who may have answered the questionnaire one year but not the next, students who left the school for other reasons, and students who were new to the grade that year. Therefore, we cannot infer causality for whether or not the findings were directly related to the policy or programs.

Data collection occurred for students who participated in the survey at the time of data collection. Information about non-participating students was not available and therefore we cannot compare participators to non-participators.

Another limitation of the study is national generalizability. Although these data are provincially representative for PEI, the findings may not necessarily
reflect the situation in other Canadian jurisdictions. There may have been a selection bias in the sample due to the small sample size and the convenience sampling method. The small population of high schools was not sufficient power to conduct higher level analyses at the school level. Classroom level analysis could not be completed because of variability in the class level data collection procedures.

Without ongoing surveillance of multiple factors that influence smoking behaviour, we cannot answer questions about what else might have been happening in schools or communities that may have accounted for the changes that we have noted. Other environments and events that the students had experienced may have been responsible for the students’ smoking behaviour.

4.7 Implications for future

Future comprehensive school-based programs will need to clearly examine the impact of these broader social and environmental factors with larger samples of students in schools. To date there are very few documented programs for use in high schools. Of those that were developed, very few evaluated in high school settings. Future programs that are developed for high school should identify interventions that can compete with or possibly learn from these social and environmental factors, particularly that of close friends and smokers in the home.
Failure to do so may result in enormous resources being allocated which are ineffective in the long-term.

From this study, it is clear that it is not enough to put a policy or program in place. The quality of the program and policy require clarity, transparency and continued documentation of the relevance of the program and policy to different age groups and different groups within a school. Moreover, programs must reach beyond the school borders to homes and communities that can assist the school in reaching targets of decreasing smoking among adolescents.

Future research programs are necessary to advance our understanding of school-based tobacco control efforts. Further study is required to enhance lessons learned from implementing school-based programs, particularly within a local context. Targeted approaches that address sub populations within schools are required but we require studies that look at differences within targeted approaches.

Use of randomised control trial designs and more rigorous methodologies with long-term follow up are necessary to address the challenge that school-based tobacco efforts do not work.

### 4.8 Conclusions

(1) Tobacco policies and programs alone were not effective in reducing the risk of smoking among adolescents in schools in Prince Edward Island. In fact, by the time students are in grade 12 (17-18 years) the risk of smoking is high
and the ability of any policy or program to influence a change in that behaviour is limited. Social and environmental factors within the school and student environment had a strong negative influence on both occasional and regular smoking behaviour. One might suggest that these factors (i.e. close friend smoking behaviour, family smoking behaviour) may be responsible for the failure of the new policies and programs implemented in Prince Edward Island.

(2) The characteristic of the school is strongly associated with risk of smoking behaviour of adolescents. When schools have high rates of smoking among their senior level students (grade 12, age 17-18), when the tobacco control rules are not clear and tobacco policies are not enforced then those environments are linked to higher levels of students smoking. This finding is counter to the philosophy of schools being healthy environments for children to learn and grow.

(3) Targeted approaches to implementing school-based tobacco prevention and policy initiatives are important for the future. Often school-based programs are developed and implemented in the context of the whole student body. However, adolescence is a period of instability and change as students go through puberty on to young adulthood. Therefore, the variability of this age and the relationship of those changes to how adolescents interpret their environment should be reflected in how school-based research is conducted. In this study, policy and programs affected senior students (grade 12), junior students (grade 10) and females differently. The senior student seemed to be roles models for smoking behaviour rather than the role models of health that one would want to
have in a school. Further, the younger groups of students (Grade 10; Group 1) and females were much more likely to be at risk for occasional smoking. This movement of increasing numbers of youth smoking occasionally and thinking that they can control their habit to this level is threatening the many years of success in decreasing tobacco use among youth.

(4) The introduction of new school-based tobacco policies and programs provided important data to schools for the short term. Locally relevant data about the prevalence rates and factors that are influencing tobacco use in their schools can provide lessons for guiding school-based interventions and evaluation for tobacco control efforts for adolescents in the short term. The data does not explain whether the changes in youth smoking behaviour were due specifically to policy and programs introduced during the study. However, the benefits of having resources to bring tobacco prevention initiatives to the school and the broader community may have played an important part in helping adolescents change their smoking behaviour. The results from the prevalence data and the feedback reports provided a forum for schools who were interested to discuss strategies to go forward for the future. The trends in the prevalence data also provided guidance to conduct more in dept analyses to glean a better understanding of factors influencing smoking behaviour of high school students in Prince Edward Island.

(5) This study adds further data to the difficulties of evaluating the influence of school-based policy and programs when adequate measurements and follow up are not in place. Schools need to implement integrated,
coordinated and comprehensive school-based programs that provide students with (1) knowledge about the harms of tobacco use, (2) proactive approaches to high quality information and, (3) an environment that is conducive to both learning and health and promotes a culture without tobacco. Use of a randomised control trial design and more rigorous methodologies, with long-term follow up, are necessary to address the challenge that school-based tobacco efforts do not work. The challenge of this recommendation is having the necessary resources and support for schools to conduct this level of follow-up over time.
REFERENCE LIST


doi:10.1146/annurev.psych.55.090902.142054


Cameron R. Correspondence Re Hutchinson smoking prevention project: Long-term randomized trial in school-based tobacco use prevention- Results on smoking. Journal of the National Cancer Institute, 2001; 93(16):1267-68.


132


Health Canada: Canadian Tobacco Use Monitoring Survey (CTUMS) 2001- Summary of Results for the First Half of (February to June), Ottawa, ON: Health Canada.
Health Canada: Canadian Tobacco Use Monitoring Survey (CTUMS). Summary of Results for the First Half of 2004 (February to June), Ottawa, ON: Health Canada.


Hochbaum GM. Why people seek diagnostic x-rays Public Health Reports 71, 377-80. 1956


McCall D. The history and future of school health in Canada and other countries. Canadian Association for School Health. 2003


Mermelstein R. Explanations of ethnic and gender differences in youth smoking: a multi-site qualitative investigation. The tobacco control network writing group. Nicotine Tobacco Research 1999; 1(Suppl. 1), S91-98


Prince Edward Island Student Drug Survey 2002 on Highlights Report, Charlottetown, PE: Prince Edward Island Department Health and Social Services, 2000


Rosenstock IM. The historical origins of the Health Belief Model. Health Education Monographs 1974; 2, 354-95.


Stewart- Brown S. What is the evidence on school health promotion in improving health or preventing disease and specifically, what is the effectiveness of the health promoting schools approach. WHO: Health Evidence Network. 2006 1-26.


Sussman SY. Correspondence Re Hutchinson smoking prevention project: Long-term randomized trial in school-based tobacco use prevention- Results on smoking. Journal of the National Cancer Institute, 2001; 93(16):1267.


Thomas R, Perera R. School-based programmes for preventing smoking. Cochrane Database of Systematic Reviews 2006; 3:1-166


Trinidad DR, Gilpin EA, Pierce JP. Compliance and support for smoke-free school policies Health Education Research 2005; 20: 466-475.


Walsh R, Tzelepis F. Adolescents and tobacco Use: Systematic review of qualitative research methodologies and partial synthesis of findings. Substance Use & Misuse 2007; 42(8):1269-1321.


Appendix 1. SHAPES Student Drug Survey

Student Tobacco Survey

Health Behaviour Research Group,
University of Waterloo

These questions are about the smoking experiences and attitudes of students like yourself. Read each question carefully and answer as honestly as you can. The information you give will be kept completely secret and confidential. This survey is anonymous, so please do NOT put your name on any of the pages.

For each question, mark your answer by making a dark pencil mark that fills the circle completely. Fill in only one (1) circle for each question unless the instructions tell you to do something different.

Today's Date
- Month
  - Jan
  - Feb
  - Mar
  - Apr
  - May
  - Jun
  - Jul
  - Aug
  - Sep
  - Oct
  - Nov
  - Dec
- Day
- Year
  - 1998
  - 1999

1. What grade are you in?
- 9
- 10
- 11
- 12
- OAC

2. How old are you?
13 or younger
14
15
16
17
18
19 or older

3. Are you male or female?
   - Male
   - Female

4. How long have you been attending this particular school?
   - Less than one year
   - Between 1 and 2 years
   - Between 2 and 3 years
   - Between 3 and 4 years
   - More than 4 years

5. Have you ever tried cigarette smoking (even just one puff)?
   - Yes
   - No

6. Have you ever smoked again since the first time you tried a cigarette?
   - Yes
   - No
   - I have never smoked

7. Have you ever smoked a whole cigarette?
   - Yes
   - No
   - I have never smoked

8. In the last 12 months, how often did you use tobacco?
   - I have never smoked
   - I have smoked, but not in the last 12 months
   - I have tried one cigarette in the last 12 months
   - I have had more than one cigarette in the last 12 months

9. Have you smoked 100 or more cigarettes in your life?
   - Yes
   - No
   - I have smoked, but not that much
   - I have never smoked
10. Do you usually smoke every week?
- Yes
- No, I don’t smoke that often
- No, I have only tried once
- No, I have quit
- I have never smoked

11. Since this day last week, how many cigarettes have you smoked?
- None
- 1-5
- 6-10
- 11-20
- 21-30
- 31-50
- 51-100
- More than 100

12. At this time do you smoke cigarettes everyday, occasionally, or not at all?
- Every day
- Occasionally (less than every day)
- Not at all
- I have never smoked

13. Have you smoked a cigarette today?
- Yes
- No
- I do not smoke

14. On how many of the last 30 days did you smoke one or more cigarettes?
- None
- 1-5 days
- 6-10 days
- 11-20 days
- 21-29 days
- 30 days (everyday)

15. Please answer ONE of the following sections:
   a) If you currently smoke cigarettes, which of the following reasons explain why you smoke? FILL IN ALL RESPONSES THAT APPLY.
   - I’m addicted to cigarettes
   - I smoke when I’m stressed out and want to relax
   - I like the image smoking gives me
   - It’s easy to get cigarettes
   - My friends smoke
   - It’s enjoyable
• My brothers and sisters smoke
• I smoke at special events (e.g., concert, parties)
• I’m bored, there is nothing else to do
• My parents offer it to me
• Someone pressures me into it.
• Other: ____________________

OR

b) If you DON’T currently smoke, which of the following reasons explain why you don’t smoke? FILL IN ALL RESPONSES THAT APPLY.
• I think it may be harmful to my health
• I tried smoking, but I don’t like the taste
• I think it may be addictive
• I just experimented with smoking and did not plan to do it again
• I am not interested in smoking
• I tried smoking, but I don’t like the effect it has on me
• I know that my parents would disapprove
• It will affect my athletic ability
• I have seen bad examples of what smoking can do
• I have other things I enjoy doing
• It is a waste of money
• Other: ____________________

16. At this time, have you quit smoking?
   • Yes
   • No
   • I have never smoked

17. How long ago did you quit smoking?
   • I am still smoking
   • Less than 2 weeks ago
   • Between 2 weeks and 6 months ago
   • Between 6 months and one year ago
   • More than one year ago
   • I have never smoked

18. How many times in the past year have you tried to quit smoking?
   • I have not smoked in the last year
   • I have tried to quit smoking once in the last year
   • I have tried to quit smoking more than once in the last year
   • I have not tried to quit smoking in the last year
   • I have never smoked

19. Do you plan to quit smoking cigarettes?
   • I have never smoked
• I have already quit
• Yes, within one week
• Yes, within 30 days
• Yes, within six months
• Yes, within one year
• Yes, but I’m not sure when
• No, I do not plan to quit smoking

20. Would you join a quit smoking program if one was offered at your school?
• Yes
• No
• I do not smoke cigarettes anymore
• I have never smoked

21. If you were thinking about quitting, where would you go to get help? FILL IN ALL THAT APPLY.
• A self-help program
• A group program
• My doctor
• A teacher or guidance counsellor
• I would ask my friends
• I would quit on my own
• I don’t smoke

22. Is there help available at this school for students who want to quit smoking?
• Yes
• No
• I’m not sure

23. How likely do you think it is that smoking will lead to health problems for you?
• I have never smoked
• Very likely
• Somewhat likely
• Somewhat unlikely
• Very unlikely
• I don’t know

24. How do you usually get your cigarettes? FILL IN ALL THAT APPLY.
• I buy them
• Someone buys them for me
• I get them from my friends
• I get them from home
• Other: ___________________
• I do not smoke
25. How often do you buy a package of cigarettes?
   - Once a week or more
   - 1 to 3 times a month
   - Less than once a month
   - I do not buy cigarettes

26. If you buy your own cigarettes, where do you buy them? FILL IN ALL THAT APPLY.
   - Convenience store (e.g., 7-11)
   - Gas station
   - Grocery store / supermarket
   - Restaurant / diner / cafeteria
   - Bar
   - Friend or other person
   - Other: _________________
   - I do not buy cigarettes

27. In the past month, when you tried to buy cigarettes, how often were you asked your age?
   - I do not buy cigarettes
   - Never
   - Less than half the time
   - About half the time
   - More than half the time
   - Always or almost always

28. How often do you smoke in each of the following places?
   - At home
   - Walking to or from school
   - At school but off school property
   - At school on school property
   - At the mall food court
   - In restaurants / coffee shops
   - At parties
   - Other: _________________
   - I do not smoke

29. How often do you smoke with the following people?
   - By myself
   - With friends
   - With family
   - Other: _________________
   - I do not smoke
30. How often do you smoke at the following times?
   - Before school
   - During the school day
   - After school
   - In the evening
   - On weekends
   - Other: __________________
   - I do not smoke

The next questions are about your opinions and perceptions of smoking-related issues.

31. Do you think you will smoke cigarettes in the future?
   - I definitely will not smoke cigarettes
   - I probably won’t smoke cigarettes
   - I might smoke cigarettes or I might not smoke cigarettes
   - I probably will smoke cigarettes
   - I definitely will smoke cigarettes

32. How many people your age do you think smoke cigarettes?
   - 91-100%
   - 81-90%
   - 71-80%
   - 61-70%
   - 51-60%
   - 41-50%
   - 31-40%
   - 21-30%
   - 11-20%
   - 0-10%

33. Not counting yourself, how many people in your home smoke every day or almost every day?
   - 0
   - 1
   - 2
   - 3
   - 4
   - More than 4

34. How many cigarettes do you think are smoked in your home each day?
   - 0
   - 1-9
   - 10-19
   - 20-29
• 30-39
• 40 or more

35. Does the smoke from other people’s cigarettes bother you?
• Always
• Usually
• Sometimes
• Seldom
• Never

36. Would you like your local government to make all public places (e.g., malls, restaurants, arcades, etc.) smoke-free?
• Yes
• No
• I’m not sure

37. You can be fined for smoking on school property.
• True
• False
• I’m not sure

38. Second-hand smoke is not harmful.
• True
• False
• I’m not sure

39. Tobacco smoking is addictive.
• True
• False
• I’m not sure

40. If your friends smoke, you’re more likely to smoke too.
• True
• False
• I’m not sure

1. I often see students smoking near this school.
2. I often see teachers or staff smoking near this school.
3. In this school there is a clear set of rules about smoking for students to follow.
4. If a student is caught breaking the smoking rules at this school, they get

<table>
<thead>
<tr>
<th></th>
<th>True</th>
<th>Usually true</th>
<th>Usually false</th>
<th>False</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
into trouble.
5. In this school many students smoke where they are not allowed to.
6. In this school, many teachers and staff smoke where they are not allowed to.

You are now finished with the survey.
Your help and cooperation are greatly appreciated!
May 17, 1999

Dear Principal:

I am seeking the interest and cooperation of your school to participate in a Student Tobacco Survey to be carried out in early June.

I am a nurse researcher at UPEI, working in collaboration with researchers from the University of Waterloo. This data will provide important information about the smoking status of your school.

A letter requesting parent's consent for their child to participate will be forwarded to each parent. Parents who contact the school and refuse to participate will not be included. Students will also be asked permission to participate prior to conducting the survey. Any student who refuses to participate will not be included. Any student who is absent at the time the survey is conducted will be contacted to participate at a later time by the researcher.

I have met with representatives of the School Board and received their approval for this study to be completed in their unit. If you agree for your school to be part of this study, please sign the attached consent form and fax it to me at (902) 566-0777.

If you have any positive or negative comments about participation in this survey, please contact the Chairperson of the UPEI Research Ethics Committee. If you have any questions or concerns, that I, as the researcher, could answer, please call me at (902) 566-0749. Thank you for your help.

Yours truly,

Donna Murnaghan, R.N., M.N.

Enc.
Appendix 2
Letter to Parents

Date

Dear Parent:

This letter describes a study I am conducting at your son/daughter’s high school. I am a faculty member at the University of Prince Edward Island School of Nursing and a student at the University of Helsinki Department of General Practice and Primary Health Care. I am interested in studying ways to help students live healthier lives.

The main purpose of the study is to conduct a brief survey on cigarette smoking with students from all grades at the school. Feedback from the School Smoking Survey can be used: (1) to help teachers and students to develop interventions to promote nonsmoking; (2) to help communities determine the school level smoking rates; and (3) to assess the impact of tobacco policies and programs.

During the next two years, the survey will be repeated in schools in the spring. The survey is anonymous; we do not require your child’s name to be written on the survey. Individual student responses will be kept confidential and no individual results will be made available to school or other personnel. Codes, not participant names, will be used when entering survey data into computer files for analysis. All data will be published in group form so that determining the responses from any individual student will not be possible. There are no anticipated risks associated with participation in this study. However, the final decision to participate in this study must be made by individual parents and students.

Some students may be asked to provide a breath sample that will be tested for carbon monoxide levels in their breath gases. We can only conduct these breath samples on a small number of classes in your child’s school. Therefore only students who are present in the randomly assigned classes will be tested. The results of this sample will help us confirm student reports of smoking activity. The individual results will be kept completely confidential and no individual results will be made available to school or other personnel.

The survey will take ten to twenty minutes to complete. Teachers will administer the survey during home room or another designated class time. A researcher will be available to help with questions regarding the survey. Once the surveys are completed, they will be placed in sealed envelopes and collected by the researcher.

We have received permission from the school board and the principal of the school to conduct this research. The research has been reviewed and has been granted ethics clearance by the University of Prince Edward Island Research Ethics Board. Approval by this board is based on their
Appendix 4 Letters and consent form for students

May 28, 1999

Dear Student:

I am requesting your participation in a School Smoking Survey that will be carried out in your school the first week of June.

I am a nurse researcher at UPEI, working with researchers from the University of Waterloo. The information provided by this survey can be useful to: 1) help communities determine the school level smoking rates in order to assess the impact of tobacco policies and programs; and 2) help teachers and students to develop interventions to promote non-smoking. You may be asked to submit a breath sample that will be tested for the presence of carbon monoxide. This test involves breathing into a tube and the researcher will record the results. The purpose of this test is to help us confirm the results of the information you provide about smoking activity. The results of this test will be kept confidential and no individual results will be shared.

You are under no obligation to participate. If you do participate, all information you share will be kept confidential. You do not put your name on the survey so no one will be able to identify your personal responses.

If you do not want to participate, you can leave the survey blank or you may choose to complete the smoking survey but sign the form at the front of the survey indicating that you do not want to participate officially in this survey and you want your survey discarded and your answers not recorded. You may choose to not complete any survey and remain seated or leave the room while others complete the survey. You will not be penalized in any way for not participating.

If you have any positive or negative comments about participation in this survey, please contact the secretary at (902) 566-0637 and your comments will be passed on to the Chairperson of the UPEI Research Ethics Committee.

Yours truly,

Donna Murnaghan, R.N., M.N.
Appendix 5 School Feedback Report
This School Smoking Profile report presents the results of a survey conducted at Any School in October 2000 by the Department of Nursing at the University of Prince Edward Island, the Health Behaviour Research Group at the University of Waterloo and the Canadian Cancer Society/National Cancer Institute of Canada's Centre for Behavioural Research and Program Evaluation.

Please note that this report contains results based on only [X] grade 10 classes and [Y] grade 12 classes and may not be representative of the entire student body.

The survey was conducted as part of a study to investigate how to effectively help community leaders (educators, students and public health workers) accurately measure local youth smoking rates and behaviours. The study is funded by the Social Sciences and Humanities Research Council of Canada through a grant awarded to faculty at the University of Waterloo (Roy Cameron, principal investigator), University of British Columbia, McMaster University, and University of Prince Edward Island in partnership with the Canadian Cancer Society.

Your Confidential Report

Our research team will be distributing this report only to those individuals you selected to attend your school feedback meeting. Any results that are published or otherwise disseminated by the researchers will maintain the anonymity of your school. School officials should decide how best to distribute this report to meet needs.

For more information on this report, or the research project associated with it, please contact:
Donna Murnaghan, Investigator
Department of Nursing
University of Prince Edward Island
902-566-0749
dmurnaghan@upei.ca

OR

Mari Alice Jolin, Project Manager
Health Behaviour Research Group
University of Waterloo
1-800-667-1804
majolin@healthy.uwaterloo.ca
University of Prince Edward Island
Research Ethics Board

Certificate of Approval

Title of Proposal: Assessment of School Smoking Profile in Island High Schools

Name of Investigator: Prof. Donna Munnaghan

Date Submitted: May 7, 1999

Effective Date: 31 May 1999

Signature: [Signature]
Chair, Ethics Committee

Date: May 31, 1999
University of Prince Edward Island
Research Ethics Board

Certificate of Approval

Title of Proposal: Development and Measurement of a Smoke Free Intervention for High School Youth

Name of Investigator: Professor Donna MacPhail

Date Submitted: March 19, 2000

Effective Date: 30th March, 2000

D.A. MOTHERWELL
Chair, Research Ethics Board

Date: March 29, 2000

cc: Dr. Wade MacLauchlan, UPEI
    Director, Office of Research Development, UPEI
## Appendix 7 Cessation Results 1999

### Table 10 Cessation Behaviour in high school students in grades 10-12 in PEI 1999

<table>
<thead>
<tr>
<th></th>
<th>Grade10</th>
<th></th>
<th>Grade11</th>
<th></th>
<th>Grade12</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n=1537</td>
<td></td>
<td>n=1384</td>
<td></td>
<td>n=1183</td>
<td></td>
</tr>
<tr>
<td><strong>Quit Behavior</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Have you quit smoking?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>432</td>
<td>28.1</td>
<td>374</td>
<td>27</td>
<td>278</td>
<td>23.5</td>
</tr>
<tr>
<td>No</td>
<td>398</td>
<td>25.9</td>
<td>423</td>
<td>30.6</td>
<td>410</td>
<td>34.7</td>
</tr>
<tr>
<td>I have never smoked</td>
<td>688</td>
<td>44.8</td>
<td>577</td>
<td>41.7</td>
<td>483</td>
<td>40.8</td>
</tr>
<tr>
<td><strong>Time since you quit?</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I never smoked</td>
<td>373</td>
<td>24.3</td>
<td>384</td>
<td>27.7</td>
<td>366</td>
<td>30.9</td>
</tr>
<tr>
<td>Still smoking</td>
<td>43</td>
<td>2.8</td>
<td>42</td>
<td>3.0</td>
<td>34</td>
<td>2.9</td>
</tr>
<tr>
<td>&lt;2 weeks</td>
<td>73</td>
<td>4.7</td>
<td>70</td>
<td>5.1</td>
<td>60</td>
<td>5.1</td>
</tr>
<tr>
<td>2wks – 6 months</td>
<td>74</td>
<td>4.8</td>
<td>66</td>
<td>4.8</td>
<td>44</td>
<td>3.7</td>
</tr>
<tr>
<td>6 mo-1 year</td>
<td>237</td>
<td>15.4</td>
<td>186</td>
<td>13.4</td>
<td>137</td>
<td>11.6</td>
</tr>
<tr>
<td>&gt;1 year</td>
<td>698</td>
<td>45.4</td>
<td>594</td>
<td>42.9</td>
<td>495</td>
<td>41.8</td>
</tr>
<tr>
<td><strong>Number of times in the past year that you intentionally tried to quit?</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I have not smoked in the last year</td>
<td>298</td>
<td>19.4</td>
<td>227</td>
<td>16.4</td>
<td>171</td>
<td>14.5</td>
</tr>
<tr>
<td>Once</td>
<td>161</td>
<td>10.5</td>
<td>167</td>
<td>12.1</td>
<td>157</td>
<td>13.3</td>
</tr>
<tr>
<td>Two times</td>
<td>163</td>
<td>10.6</td>
<td>186</td>
<td>13.4</td>
<td>164</td>
<td>13.9</td>
</tr>
<tr>
<td>Three times</td>
<td>213</td>
<td>13.9</td>
<td>215</td>
<td>15.5</td>
<td>193</td>
<td>16.3</td>
</tr>
<tr>
<td>Four times</td>
<td>681</td>
<td>44.3</td>
<td>580</td>
<td>41.9</td>
<td>465</td>
<td>39.3</td>
</tr>
<tr>
<td>I have not tried</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I have never smoked</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Do you plan to quit smoking?</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I have never smoked</td>
<td>696</td>
<td>45.3</td>
<td>590</td>
<td>42.6</td>
<td>493</td>
<td>41.7</td>
</tr>
<tr>
<td>I have already quit</td>
<td>399</td>
<td>26</td>
<td>340</td>
<td>24.6</td>
<td>241</td>
<td>20.4</td>
</tr>
<tr>
<td>Yes but not sure when</td>
<td>247</td>
<td>16.14</td>
<td>266</td>
<td>19.2</td>
<td>241</td>
<td>20.4</td>
</tr>
<tr>
<td>No, I do not plan to quit</td>
<td>114</td>
<td>7.4</td>
<td>85</td>
<td>6.1</td>
<td>86</td>
<td>7.3</td>
</tr>
</tbody>
</table>

*Numbers may not add to total because of missing values*
Appendix 8 Cessation Results 2000

Table 11. Cessation Behaviour in high school students in grades 10-12 in PEI 2000

<table>
<thead>
<tr>
<th>Grade 10 n=1538</th>
<th>Grade 11 n=1514</th>
<th>Grade 12 n=1365</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Quit Behavior</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Have you quit smoking?</td>
<td>Yes</td>
<td>447</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>349</td>
</tr>
<tr>
<td></td>
<td>I have never smoked</td>
<td>729</td>
</tr>
<tr>
<td><strong>Time since you quit?</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I never smoked</td>
<td>759</td>
<td>49.3</td>
</tr>
<tr>
<td>Still smoking</td>
<td>334</td>
<td>21.7</td>
</tr>
<tr>
<td>&lt;2 weeks</td>
<td>46</td>
<td>3</td>
</tr>
<tr>
<td>2wks – 6 months</td>
<td>93</td>
<td>6</td>
</tr>
<tr>
<td>6 mo-1 year</td>
<td>78</td>
<td>5.1</td>
</tr>
<tr>
<td>&gt;1 year</td>
<td>211</td>
<td>13.7</td>
</tr>
<tr>
<td><strong>Number of times in the past year that you intentionally tried to quit?</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I have not smoked in the last year</td>
<td>322</td>
<td>20.9</td>
</tr>
<tr>
<td>Once</td>
<td>176</td>
<td>11.4</td>
</tr>
<tr>
<td>Two times</td>
<td>80</td>
<td>5.2</td>
</tr>
<tr>
<td>Three times</td>
<td>49</td>
<td>3.2</td>
</tr>
<tr>
<td>Four times</td>
<td>68</td>
<td>4.4</td>
</tr>
<tr>
<td>I have not tried</td>
<td>224</td>
<td>14.8</td>
</tr>
<tr>
<td>I have never smoked</td>
<td>594</td>
<td>39.2</td>
</tr>
<tr>
<td><strong>Do you plan to quit smoking?</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I have never smoked</td>
<td>764</td>
<td>49.7</td>
</tr>
<tr>
<td>I have already quit</td>
<td>386</td>
<td>25.1</td>
</tr>
<tr>
<td>Yes but not sure when</td>
<td>213</td>
<td>13.8</td>
</tr>
<tr>
<td>No, I do not plan to quit</td>
<td>68</td>
<td>4.4</td>
</tr>
</tbody>
</table>

* Numbers may not add to total because of missing values
## Appendix 9 Cessation Results 2001

### Table 12 Cessation Behaviour in high school students in grades 10-12 in PEI 2001

<table>
<thead>
<tr>
<th></th>
<th>Grade 10</th>
<th></th>
<th>Grade 11</th>
<th></th>
<th>Grade 12</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n=1666^a</td>
<td>Percent</td>
<td>n=1484^a</td>
<td>Percent</td>
<td>n=1429^a</td>
<td>Percent</td>
</tr>
<tr>
<td><strong>Quit Behavior</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Have you quit smoking?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>474</td>
<td>28.5</td>
<td>398</td>
<td>26.8</td>
<td>392</td>
<td>27.4</td>
</tr>
<tr>
<td>No</td>
<td>348</td>
<td>20.9</td>
<td>378</td>
<td>25.3</td>
<td>447</td>
<td>31.3</td>
</tr>
<tr>
<td>I have never smoked</td>
<td>832</td>
<td>49.9</td>
<td>693</td>
<td>46.7</td>
<td>557</td>
<td>40.4</td>
</tr>
<tr>
<td><strong>Time since you quit?</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I never smoked</td>
<td>689</td>
<td>41.4</td>
<td>608</td>
<td>41</td>
<td>563</td>
<td>39.4</td>
</tr>
<tr>
<td>Still smoking</td>
<td>266</td>
<td>16</td>
<td>268</td>
<td>18.1</td>
<td>311</td>
<td>21.8</td>
</tr>
<tr>
<td>&lt;2 weeks</td>
<td>64</td>
<td>3.8</td>
<td>50</td>
<td>3.4</td>
<td>53</td>
<td>3.7</td>
</tr>
<tr>
<td>2wks – 6 months</td>
<td>93</td>
<td>5.6</td>
<td>68</td>
<td>46</td>
<td>64</td>
<td>4.5</td>
</tr>
<tr>
<td>6 mo-1 year</td>
<td>123</td>
<td>7.4</td>
<td>97</td>
<td>6.5</td>
<td>83</td>
<td>5.8</td>
</tr>
<tr>
<td>&gt;1 year</td>
<td>417</td>
<td>25</td>
<td>380</td>
<td>25.6</td>
<td>340</td>
<td>23.8</td>
</tr>
<tr>
<td><strong>Number of times in the past year that you intentionally tried to quit?</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I have not smoked in the last year</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Once</td>
<td>230</td>
<td>13.8</td>
<td>203</td>
<td>13.7</td>
<td>213</td>
<td>14.9</td>
</tr>
<tr>
<td>Two times</td>
<td>70</td>
<td>4.2</td>
<td>96</td>
<td>6.5</td>
<td>84</td>
<td>5.9</td>
</tr>
<tr>
<td>Three times</td>
<td>43</td>
<td>2.6</td>
<td>39</td>
<td>2.6</td>
<td>38</td>
<td>2.7</td>
</tr>
<tr>
<td>Four times</td>
<td>49</td>
<td>2.9</td>
<td>62</td>
<td>4.2</td>
<td>56</td>
<td>3.9</td>
</tr>
<tr>
<td>I have not tried</td>
<td>365</td>
<td>21.9</td>
<td>357</td>
<td>24.1</td>
<td>332</td>
<td>23.2</td>
</tr>
<tr>
<td>I have never smoked</td>
<td>573</td>
<td>34.4</td>
<td>445</td>
<td>30</td>
<td>388</td>
<td>27.2</td>
</tr>
<tr>
<td><strong>Do you plan to quit smoking?</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I have never smoked</td>
<td>869</td>
<td>52.2</td>
<td>733</td>
<td>49.4</td>
<td>607</td>
<td>42.5</td>
</tr>
<tr>
<td>I have already quit</td>
<td>426</td>
<td>25.6</td>
<td>345</td>
<td>23.2</td>
<td>364</td>
<td>25.2</td>
</tr>
<tr>
<td>Yes but not sure when</td>
<td>229</td>
<td>13.7</td>
<td>226</td>
<td>15.4</td>
<td>255</td>
<td>17.8</td>
</tr>
<tr>
<td>No, I do not plan to quit</td>
<td>57</td>
<td>3.4</td>
<td>69</td>
<td>4.6</td>
<td>70</td>
<td>4.9</td>
</tr>
</tbody>
</table>

^a Numbers may not add to total because of missing values