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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

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Academic dissertation

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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

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DEDICATION

This thesis is dedicated to my husband Donnie and my children Chantelle and Darcy.

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LIST OF ORIGINAL ARTICLES

I

Murnaghan D, Sihvonen M, Leatherdale S, Kekki P. The relationship between school-based smoking policies and prevention programs on smoking behaviour among grade 12 students in Prince Edward Island: A multi level analysis. *Preventive Medicine* 2007; 44, 317-322.

II

Murnaghan D, Leatherdale S, Sihvonen M, Kekki P. A multi-level analysis examining the association between school-based smoking policies, prevention programs, and youth smoking behaviour: Evaluating a provincial tobacco control strategy. *Health Education Research* 2008; 23(6):1016-1028.

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.*

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GLOSSARY

School smoking policy	Statement describing what the tobacco policy means for the Board/school with accompanying regulations to guide how the policy will be implemented
School prevention programs	School approved activities designed to reduce tobacco use. Examples of activities might include curricula, social influences approaches, combined curricula and ecological approaches.
SHAPES	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.
Intervention	A policy or program designed to help reduce tobacco use.
CCS	Canadian Cancer Society
CDC	Centres Disease Control
CTUMS	Canadian Tobacco Use Monitoring Survey
ETS	Environmental Tobacco Smoke
HBM	Health Belief Model
ICC	Intra Class Correlation
Kick the Nic	Smoking cessation program
PEI	Prince Edward Island
PETRA	PEI Tobacco Reduction Alliance
PMT	Protection Motivation Theory
SCT	Social Cognitive Theory
SSP	School Smoking profile (precursor to SHAPES)

SWITCH	Students working in tobacco can help. Youth group working to reduce tobacco use in PEI.
TPB	Theory Planned Behaviour
TRA	Theory Reasoned Action
TTI	Theory Triadic Influence
TTM	Transtheoretical Model
WHO	World Health Organization
YSS	Youth Smoking Survey

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, Muslim, 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 analyze 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; Wium & 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 policies 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 utility¹ and the expectancy-value² 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 & Petraitis 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 (Wium & 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

	<u>1999</u> ^a		<u>2000</u> ^a		<u>2001</u> ^a	
	n ^a	%	n ^a	%	n ^a	%
Participants	4114	31.1	4427	33.7	4590	34.9
Grade10	1537	37.4	1384	33.6	1183	28.8
Grade11	1538	34.7	1514	34.2	1365	30.8
Grade12	1666	36.3	1484	32.3	1429	31.1
Age 15-19	4056	96.5	4287	96.9	4449	96.9
Female	2093	51.2	2264	51.4	2312	50.5
Male	1992	48.8	2141	48.6	2263	49.5
Smoking Status						
Tried Cigarette (one puff)	2967	72.1	3101	70.0	3030	66.0
Smoked since first time	2541	59.6	2494	56.5	2420	52.9
Smoked whole cigarette	2180	53.1	2249	51.0	2142	46.9
Smoked 100 cigarettes in lifetime	1074	33.5	1147	26.0	1041	22.7
Smoke every week	1016	24.7	1037	23.5	919	20.1
Smoke every day	848	20.6	858	19.4	779	17.0
Smoke occasionally	818	19.9	755	17.1	742	16.2
Smoked today	841	20.5	842	19.2	747	16.5
Smoked in last 30 days	720	17.5	726	16.4	647	14.1
Overestimation of % youth smoking (>30%)	3174	77.8	2937	67.2	2790	61.7
School Location						
Rural	2889	70.2	3154	71.2	3291	71.7
Urban	1225	29.8	1273	28.8	1299	28.3
School Boards						
Board 1	2772	67.4	2949	66.6	3022	65.8
Board 2	1342	32.6	1478	33.4	1568	34.2

^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 (1999-2001) by grade and year.

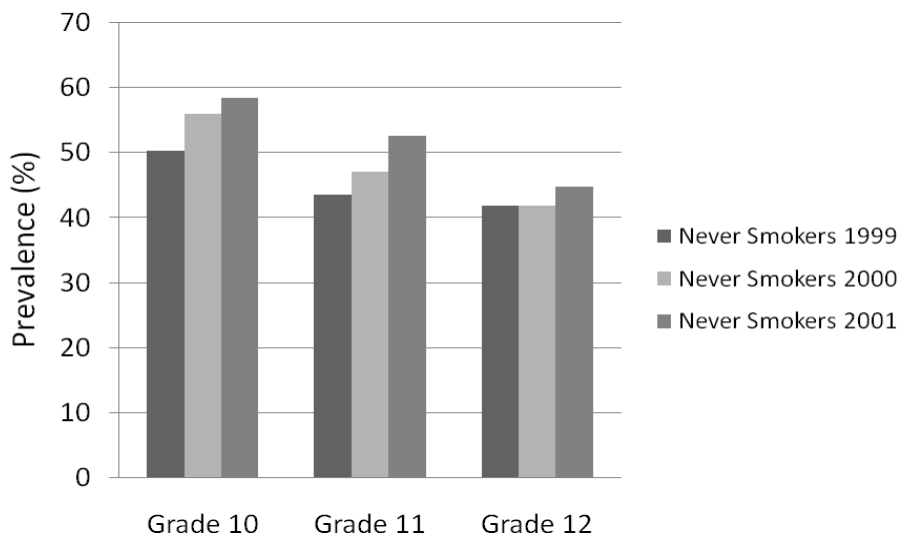


Figure 1. Percentage of never smokers in high school in PEI by grade and year

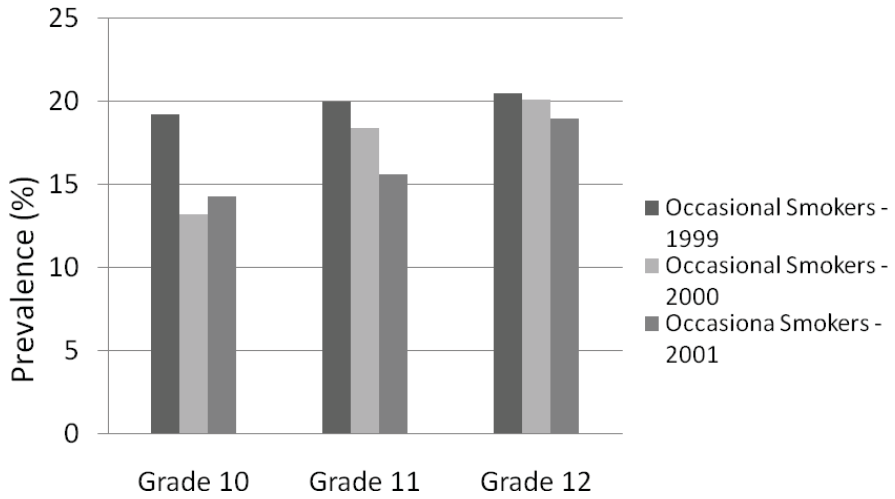


Figure 2. Percentage of occasional smokers in high schools in PEI by grade and year

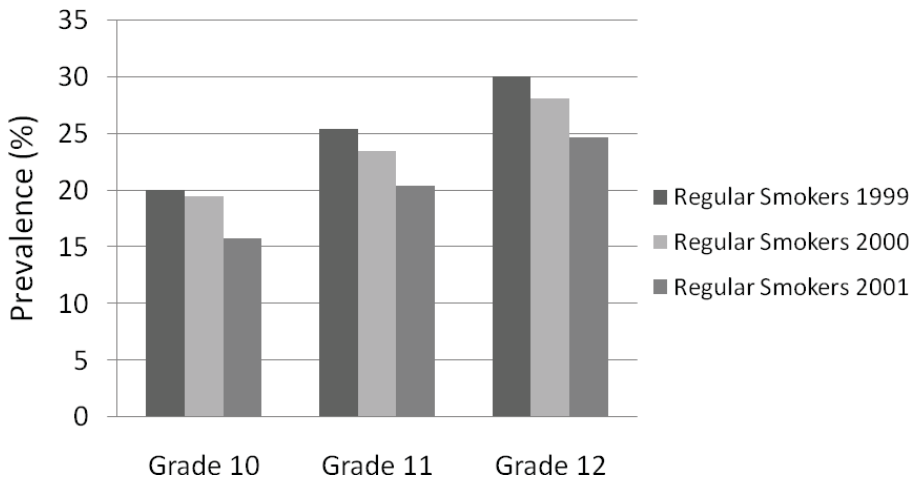


Figure 3. Percentage of regular smokers in high schools by grade and year

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 2. Factors influencing smoking behaviour

	1999^a		2000^a		2001^a	
	n^a	%	n^a	%	n^a	%
See students smoke near school						
Yes	3963	98.6	4286	98.0	4304	94.7
No	55	1.4	86	2.0	239	5.3
See teachers/staff smoke near school						
Yes	1204	30.0	868	19.9	685	15.1
No	2806	70.0	3501	80.1	3846	84.9
School has clear tobacco rules						
Yes	3596	89.8	3913	89.9	4285	94.8
no	409	10.2	441	10.1	237	1.8
Students who break rules- trouble						
Yes	2996	75.0	3341	77.0	3823	85.0
no	998	25.0	996	23.0	673	15.0
Students smoke where not allowed						
Yes	2516	62.8	2504	57.8	2702	60.1
No	1492	37.2	1831	42.2	1797	39.9
Asked age when buying cigarettes						
I do not buy cigarettes	2808	75.7	3300	76.8	3526	79.2
Never	486	13.1	519	12.1	510	11.5
Some of the time	317	8.6	263	7.7	345	7.7
Always/almost always	92	2.5	114	2.7	71	1.6
Think you will smoke in future						
Definitely will not	2097	51.4	2508	57.0	2741	60.3
Might/might not	1815	44.5	1719	39.1	1614	35.5
Definitely will	171	4.2	171	1.3	190	4.2
Overestimation of % youth smoking						
>30%	3174	77.8	2937	67.2	2790	61.7
<30%	907	22.2	1435	32.8	1735	38.3
smokers in home						
none	2002	49.0	2069	49.0	2056	46.6
1 or more	2084	51.0	2153	51.0	2354	53.4
friends who smoke						
none			2476	59.6	2377	54.4
1 or more			1698	40.4	1994	45.6

^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*

	<u>1999</u>		<u>2000</u>		<u>2001</u>	
	n	%	n	%	n	%
Participants	2772	31.7	2949	33.7	3022	34.6
Smoked 100 cigarettes in lifetime	650	23.4	756	25.6	663	21.9
Smoke weekly	638	23	667	22.6	593	19.6
Smoke occasionally	546	19.7	486	16.5	506	16.7
Will smoke in future	99	3.6	101	3.4	110	3.6
Will not smoke in future	1464	52.8	1708	57.9	1828	60.5

BOARD 2

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

* 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)

	Grade10 (n = 1537)^a		Grade11 (n = 1384)^a		Grade 12 (n =1183)^a	
	n	%	n	%	n	%
Gender						
Female	797	52.2	693	50.3	600	51.0
Male	730	47.8	684	49.7	576	49.0
Age						
15 or younger	649	42.2	4	0.3		
16	790	51.4	613	44.3	10	0.8
17 or older	95	6.2	650	47.0	515	43.5
18 or older			115	8.3	545	46.1
19 or older					111	9.4
SMOKING BEHAVIOUR						
Ever tried cigarette-even a puff?						
Yes	1035	67.4	1022	73.8	901	76.2
no	501	32.6	361	26.1	282	23.8
Ever smoked again since first time?						
Yes	845	55.1	843	60.9	755	63.8
No	190	12.4	182	13.2	145	12.3
I have never smoked	498	32.5	359	25.9	283	23.9
Ever smoked whole cigarette?						
Yes	746	48.5	749	54.1	678	57.5
No	288	18.7	277	20.1	222	18.8
I have never smoked	498	32.8	357	25.8	279	23.7
Smoked 100 or more cigarettes?						
Yes	440	57.8	363	58.1	270	55.3
Not that much	198	25.9	150	24.0	123	25.2
I have never smoked	124	16.3	112	17.9	95	19.5
Do you smoke every week?						
Yes	307	20.0	352	25.5	355	30.1
Occasionally	295	19.2	277	20.0	243	20.6
Tried once but not again	233	15.2	182	13.2	168	14.2
Quit	160	10.4	152	11.0	87	7.4
I have never smoked	539	35.2	419	30.3	326	27.7
Do you smoke every day, occasionally, or not at all?						
Every day	252	16.4	292	21.1	302	25.5
Occasionally	221	14.4	216	15.6	174	14.7
Not at all	534	34.8	475	34.4	401	33.9
I have never smoked	527	34.4	400	28.9	306	25.9
Have you smoked a cigarette today?						
Yes	256	16.7	293	21.3	288	24.4
No	583	38.1	538	39.0	459	38.9
I do not smoke	691	45.2	547	39.7	432	36.6

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

Table 5. Smoking behaviour of grade 10-12 students in high schools in PEI (2000)

		Grade 10 (n = 1538)^a		Grade 11 (n = 1514)^a		Grade 12 (n = 1365)^a	
		n	%	n	%	n	%
Gender	Female	765	50.0	785	51.9	712	52.5
	Male	764	50.0	727	48.1	645	47.5
Age	15 or younger	810	52.8	4	0.3		
	16	639	41.6	748	49.4	10	0.7
	17 or older	86	5.6	664	43.9	651	47.8
	18 or older			97	6.4	595	43.6
	19 or older					107	7.9
SMOKING BEHAVIOUR							
Ever tried cigarette –even a puff?							
	Yes	984	64.0	1075	71.1	1039	76.3
	no	553	40.0	438	28.9	323	23.7
Ever smoked again since first time?							
	Yes	738	74.8	887	82.6	868	83.6
	No	248	25.2	187	17.4	170	16.4
Ever smoked whole cigarette?							
	Yes	670	68.1	793	73.7	785	83.2
	No	314	31.9	283	26.3	259	27.4
Smoked 100 or more cigarettes?							
	Yes	325	21.2	382	25.2	438	32.2
	Not that much	547	35.7	597	39.3	498	36.5
	I have never smoked	662	43.2	540	35.5	427	31.3
Do you smoke every week?							
	Yes	298	19.4	354	23.4	383	28.1
	Occasionally	203	13.2	278	18.4	274	20.1
	Tried once but not again	245	16.0	206	13.6	185	13.6
	Quit	175	11.4	166	11.0	134	9.9
	I have never smoked	615	40.0	506	33.4	385	28.3
Do you smoke every day, occasionally, or not at all?							
	Every day	245	16.0	293	19.4	318	23.4
	Occasionally	167	10.9	180	11.9	207	15.2
	Not at all	535	34.9	548	36.3	471	34.6
	I have never smoked	587	38.2	487	32.4	365	26.8
Have you smoked a cigarette today?							
	Yes	246	16.2	285	19.0	309	22.8
	No	540	35.6	553	36.9	537	39.6
	I do not smoke	730	48.2	660	44.1	510	37.6

^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)

	Grade 10 (n = 1666) ^a		Grade11 (n = 1484) ^a		Grade 12 (n = 1429) ^a	
	n	%	n	%	n	%
Gender						
Female	831	50.0	728	50.2	752	52.8
Male	831	50.0	752	50.8	672	47.2
Age						
15 or younger	902	54.3				
16	676	40.7	803	54.2		
17 or older	82	4.9	587	39.6	714	50.0
18 or older			92	6.2	606	42.4
19 or older					109	7.6
SMOKING BEHAVIOR						
Ever tried cigarette –even a puff?						
Yes	1019	61.3	973	65.7	1030	72.3
no	643	38.7	508	34.3	395	27.7
Ever smoked again since first time?						
Yes	772	46.4	763	51.6	878	61.7
No	255	15.3	219	14.8	152	10.7
I have never smoked	637	38.3	496	33.6	392	27.6
Ever smoked whole cigarette?						
Yes	681	41.0	672	45.5	782	55.0
No	345	20.8	306	20.8	251	17.7
I have never smoked	634	38.2	498	33.7	388	27.3
Smoked 100 or more cigarettes?						
Yes	297	17.9	344	23.3	395	27.7
Not that much	619	37.2	519	35.1	536	37.6
I have never smoked	747	44.9	616	41.6	493	34.6
Do you smoke every week?						
Yes	262	15.8	302	20.4	351	24.6
Occasionally	238	14.3	231	15.6	272	19.1
Tried once but not again	283	17.1	201	13.6	162	11.4
Quit	188	11.3	165	11.2	161	11.3
I have never smoked	690	41.5	580	39.2	479	33.6
Do you smoke every day, occasionally, or not at all?						
Every day	216	13.0	264	17.8	296	20.8
Occasionally	202	12.2	152	10.3	186	13.1
Not at all	566	34.1	502	33.9	477	33.5
I have never smoked	678	40.7	562	38.0	464	32.6
Have you smoked a cigarette today?						
Yes	215	13.1	249	16.9	279	19.8
No	594	36.0	510	34.6	495	35.1
I do not smoke	838	50.9	713	48.4	636	45.1

^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)

	Grade 10 (n = 1537)^a		Grade11 (n = 1384)^a		Grade12 (n = 1183)^a	
	n	%	n	%	n	%
See students smoke near school						
Yes	1488	98.9	1324	98.2	1141	98.7
No	16	1.1	24	1.8	15	1.3
See teachers/staff smoke near school						
Yes	404	26.9	413	30.7	384	33.4
No	1098	73.1	934	69.3	767	66.6
School has clear tobacco rules						
Yes	1293	86.3	1226	91.1	1068	92.8
no	206	13.7	119	8.9	83	7.2
Students who break rules get into trouble						
Yes	1107	74.1	1014	75.4	868	75.7
no	386	25.9	330	24.6	279	24.3
Students smoke where not allowed						
Yes	912	60.9	840	62.5	756	65.5
No	586	39.1	505	37.5	399	34.5
Asked age when buying cigarettes						
I do not buy cigarettes	1118	82.0	955	76.1	728	67.7
Never	147	10.8	167	13.3	171	15.9
Some of the time	73	5.4	105	8.4	138	12.8
Always/almost always	25	1.8	28	2.2	39	3.6
Think you will smoke in future						
Definitely will not	797	52.1	707	51.3	590	50.6
Might/might not	664	43.3	626	45.5	520	44.6
Definitely will	70	4.6	44	3.2	55	4.7
Perception of % youth your age who smoke						
>30%	1401	91.7	1268	92.2	1090	93.4
<30%	127	8.3	108	7.8	77	6.6
smokers in home						
none	784	51.2	658	47.8	554	47.4
1 or more	746	48.8	720	52.2	614	52.6
friends who smoke						
none	n/a		n/a		n/a	
1 or more	n/a		n/a		n/a	

^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)

	Grade 10 (n = 1538)^a		Grade11 (n = 1514)^a		Grade12 (n = 1365)^a	
	n	%	n	%	n	%
See students smoke near school						
Yes	1481	97.7	1474	98.5	1324	98.0
No	35	2.3	23	1.5	27	2.0
See teachers/staff smoke near school						
Yes	277	18.2	296	19.8	292	21.6
No	1242	81.8	1197	80.2	1057	78.4
School has clear tobacco rules						
Yes	1307	86.5	1356	90.9	1243	92.6
no	204	13.5	136	9.1	99	7.4
Students who break rules get into trouble						
Yes	1205	80.0	1105	74.7	1025	76.4
no	301	20.0	375	25.3	317	23.6
Students smoke where not allowed						
Yes	786	52.5	866	58.3	846	63.0
No	712	47.5	619	41.7	497	37.0
Asked age when buying cigarettes						
I do not buy cigarettes	1222	82.3	1150	78.0	921	69.3
Never	131	8.8	185	12.5	202	15.2
Some of the time	98	6.6	110	7.5	155	11.7
Always/almost always	34	2.3	29	2.0	51	3.8
Think you will smoke in future						
Definitely will not	923	60.5	854	56.7	727	53.6
Might/might not	553	36.2	590	39.2	573	42.2
Definitely will	50	3.3	61	4.1	57	4.2
Perception of % youth your age who smoke						
>30%	1305	86.2	1283	85.7	1187	87.8
<30%	209	13.8	214	14.3	165	12.2
smokers in home						
none	726	49.9	690	47.9	647	49.0
1 or more	729	50.1	749	52.1	673	51.0
friends who smoke						
none	780	54.4	831	58.6	862	66.5
1 or more	654	45.6	586	41.4	434	33.5

^a 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)

	Grade 10 (n = 1666)^a		Grade11 (n = 1484)^a		Grade12 (n = 1429)^a	
	n	%	n	%	n	%
See students smoke near school						
Yes	1563	95.0	1395	94.4	1336	94.8
No	83	5.0	82	5.6	74	5.2
See teachers/staff smoke near school						
Yes	201	12.3	232	15.8	249	17.7
No	1439	87.7	1241	84.2	1159	82.3
School has clear tobacco rules						
Yes	1555	94.8	1397	95.3	1322	94.1
no	85	5.2	69	4.7	83	5.9
Students who break rules get into trouble						
Yes	1409	86.8	1267	87.0	1136	80.9
no	215	13.2	190	13.0	268	19.1
Students smoke where not allowed						
Yes	980	60.2	846	57.9	869	62.1
No	646	39.8	616	42.1	531	37.9
Asked age when buying cigarettes						
I do not buy cigarettes	1374	85.9	1132	78.4	1014	72.9
Never	133	8.3	177	12.3	198	14.2
Some of the time	71	4.4	112	7.8	151	11.0
Always/almost always	22	1.4	22	1.5	27	1.9
Think you will smoke in future						
Definitely will not	1033	62.8	872	59.2	831	58.7
Might/might not	559	34.0	536	36.3	514	36.4
Definitely will	53	3.2	67	4.5	70	4.9
Perception of % youth your age who smoke						
>30%	1366	83.4	1233	83.6	1149	81.2
<30%	273	16.6	241	16.4	266	18.8
smokers in home						
None	744	46.9	670	46.8	634	45.9
1 or more	843	53.1	763	53.2	746	54.1
friends who smoke						
none	768	48.9	763	53.7	841	61.4
1 or more	804	51.1	658	46.3	528	38.6

^a 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.

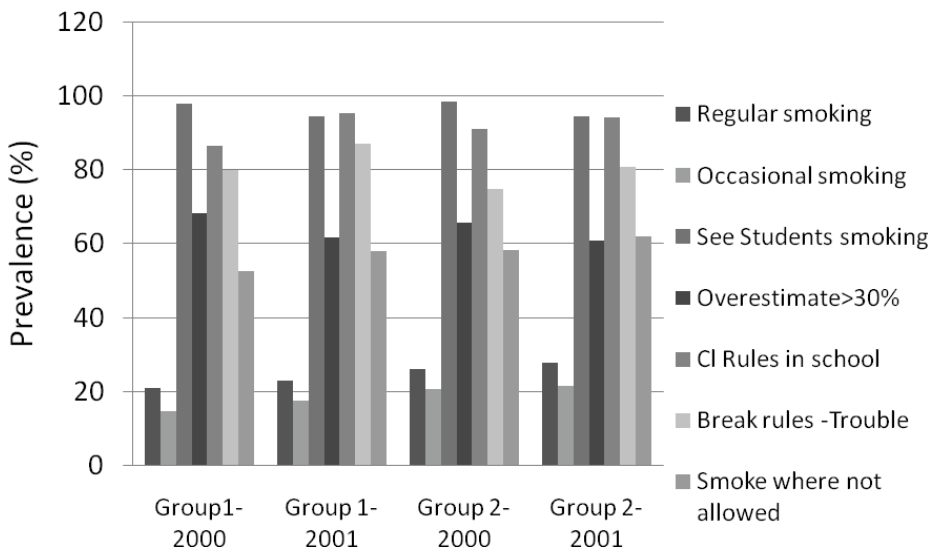


Figure 4. Comparison of group changes in smoking behaviour and school and students characteristics influencing smoking behaviour between 2000 and 2001

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 1.1.7 to 2.17) and Group 2 (OR = 1.56; 95% CI 1.16 to 2.10; OR = 1.30; CI 0.96, 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 than those who have advanced to a more regular pattern of smoking. Further, it might also suggest that 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

2008; Forester & Chen 2003). 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

(IV). 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 policies 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

1986). 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

- Abernathy TJ, Bertrand LD. Preventing cigarette smoking among children: Results of a four –year evaluation of the PAL program Canadian Journal of Public Health 1992; 84:226-9.
- About FE, Mendelson MJ. Determinants of friendship selection and quality: developmental perspectives. In: Bukowski W, Newcomb A, Hartup W (eds). The company they keep: friendship in childhood and adolescence. New York: Cambridge University Press, 1996; 87-112.
- Adams M, Jason L, Pokorny S, Hunt Y. The relationship between school policies and youth tobacco Use. Journal of School Health 2009; 79(1):17-23.
- Ajzen I, Fishbein M. Understanding attitudes and predicting social behavior. New Jersey; Prentice Hall, 1975.
- Ajzen I, Fishbein M. Understanding attitudes and predicting social behavior. NJ: Prentice Hall, Englewood Cliffs; 1980.
- Ajzen I. From intentions to actions: a theory of planned behavior. In: Kuhl J, Beckmann J. Action control: from cognition to behavior. Berlin & New York: Springer-Verlag, 1985.
- Ajzen I. The theory of planned behavior. Organ Behavior Human Decision Process 1991; 50:179-211.
- Alexander CS, Allen P, Crawford MA, Mc Cormac LK. *et al.* Taking a first puff: cigarette smoking experiences among ethnically diverse adolescents. Ethn Health 1999; 4: 245-257.

- Alexander C, Piazza M, Mekos D, Valente T. Peers, schools and adolescent cigarette smoking. *Journal of Adolescent Health* 2001; 29:22-30.
- Aloise –Young PA, Graham JW, Hansen WB. Peer influence on smoking initiation during early adolescence: a comparison of group members and group outsiders. *Journal Applied Psychology* 1994; 79: 281-287.
- Anatchkova MD, Redding C, Rossi J. Development and validation of transtheoretical model measures for Bulgarian adolescent non smokers, *Substance Use & Misuse* 2007; 42(1):23-41.
- Anderson-Johnson C, Hansen W, Collins L, Graham J. High-school smoking prevention: Results of a three-year longitudinal study. *Journal of Behavioral Medicine* 1986; 9(5):439-452.
- Armitage C A. Volitional help sheet to encourage smoking cessation: A randomized exploratory trial. *Health Psychology* 2008; 27:557-66.
- Armitage C, Connor M. Efficacy of Theory of planned behavior: A meta-analytic review. *British Journal of Social Psychology* 2001; 4:471-99.
- Armstrong BK, deKlerk NH, Shean RE, Dunn DA, Dolin PJ. Influence of education and advertising on the uptake of smoking by children *Medical Journal of Australia* 1990; 152:117-24.
- Arnett J. The myth of peer influence in adolescent smoking initiation, *Health Education & Behavior* 2007; 34(4):594-607.
- Audrey S, Cordall K, Moore L, Cohen D, Campbell R. The development and implementation of an intensive, peer led training program aimed at changing the smoking behavior of secondary school pupils using their established social networks. *Health Education Journal* 2004; 63: 266-84.

- Audrey S, Holliday J, Campbell R. It's good to talk: an adolescent perspective of talking to their friends about being smoke free. *Social Science & Medicine* 2006; 63: 320-334.
- Audrain-McGovern J, Rodriguez K, Cuevas J, Rodgers K, Patterson F. Identifying and characterizing adolescent smoking trajectories, *Cancer Epidemiology Biomarkers & Prevention* 2004; 13(12):2023-34.
- Ausems M, Mesters I, VanBreukelen G, de Vries H. Effects of in-school and tailored out of school smoking prevention among Dutch vocational school students. *Health Education Research* 2004; 19(1):51-63.
- Aveyard P, Markham WA, Cheng KK. A methodological and substantive review of the evidence that schools can cause pupils to smoke. *Social Science & Medicine* 2004; 58: 2253-2265.
- Aveyard P, Cheng KK, Almond J, Sharratt E, Lancaster R, Lawrence T, et al. Cluster randomized controlled trials of expert system based on the transtheoretical (stages of change) Model for smoking prevention and cessation in schools. *British Medical Journal* 1999; 319:948-53.
- Aveyard P, Markham WA, Lancashire E, Bullock A, Mac Arthur C, Cheng, KK, Daniels H. The influence of school culture on smoking among pupils *Social Science & Medicine* 2004; 58:1767-1780.
- Backinger C, Fagan P, Matthews E, Grana R. Adolescent and young adult tobacco prevention and cessation: current status and future direction, *Tobacco Control* 2003; 12(Sipp4) pp.146-153(Dec).
- Baker T, Brandon T, Chassin L. Motivational Influences on cigarette smoking Annual. *Review Psychology* 2004; 55:463-91
doi:10.1146/annurev.psych.55.090902.142054
- Baker JA, Dilly LJ, Aupperlee JL, Patil SA. The developmental context of school satisfaction: Schools as psychological healthy environments. *School Psychology Quarterly* 2003; 18(2):206-221.

- Bandura A. Social learning and personality development. Holt, Rinehart & Winston: New York; 1963.
- Bandura A. Social Learning Theory. Prentice Hall: Englewood Cliffs, NJ; 1977.
- Bandura A. Social foundations of thought and action: a social cognitive theory. Prentice Hall: Englewood Cliffs, New Jersey; 1986.
- Bangert-Drowns RL. The effects of school-based substance abuse education: A meta-analysis. *Journal of Drug Education* 1988; 18:243-264.
- Baranowski T, Anderson C, Carmack C. Mediating variable framework in physical activity interventions. How are we doing, how might we do better? *American Journal of Preventive Medicine* 1998; 15(4):256-297.
- Barnet T, Gauvin L, Lambert M, O'Loughlin J, Pradis G, McGrath J. The influence of school smoking policies on student tobacco use. *Archives Pediatric Adolescent Medicine* 2007; 161(9):842-48.
- Becker MH (Ed). *The Health Belief Model and Personal Health Behaviour*. Health Education Monographs, 1974; 12(4).
- Bergamasci A, Gambi A, Gentilini F, Monti C, Stampi S, Zunetti F. Tobacco smoking among high school students in Romanagna (Italy) and evaluation of a prevention campaign. *Substance Use Misuse* 2000; 35(9):1277-95.
- Berndt TJ, Murphy LM. Influences of friends and friendships: myths, truths and research recommendations. *Advances Child Development Behavior* 2002; 30:275-310.
- Biglan A, Lichtenstein E. A behaviour-analytical approach to smoking acquisition: some recent findings. *Journal Applied Social Psychology* 1984; 14:207-223.

- Biglan A, Ary DV, Smolkowski K, Duncan T, Black C. A randomized controlled trial of a community intervention to prevent adolescent tobacco use. *Tobacco Control* 2000; 9:24-32.
- Bond L, Glover, S., Godfrey C., Butler H, Patton GC. Building capacity for system-level change in schools: Lessons from the Gateway project. *Health Education and Behavior* 2001; 28:368-383.
- Botvin G. Preventing drug abuse in schools: Social and competence enhancement approaches targeting individual level etiologic factors. *Addictive Behaviors* 2000; 25(6):887-97.
- Botvin GJ, Baker E, Dusenbury L, Tortu S, Botvin E. Preventing adolescent drug abuse through a multimodal cognitive behavioural approach: Results of a 3 –year study. *Journal of Consulting and clinical psychology* 1990; 58(4): 437-446.
- Botvin GJ, Baker E, Dusenbury L, Botvin EM, Diaz T. Long-term follow-up results of a randomized drug abuse prevention trial in a white middle-class population. *JAMA* 1995; 273:1106-12.
- Botvin GJ, Griffin KW. School-based program to prevent alcohol, tobacco and other drug use. *International Review of Psychiatry*, 2007; 19(6): 607-15.
- Botvin GJ, Griffin KW, Diaz T, Ifill-Williams M. Drug abuse prevention among minority adolescents. Post- test and one-year follow up of a school-bases prevention intervention. *Preventive Medicine* 2001; 2(1):1-13.
- Bowen DJ, Kinne S, Orlandi M. School Policy in COMMIT: A promising strategy to reduce smoking by youth. *The Journal of School Health* 1995; 65(4): 1404.
- Bowker S, Tudor- Smith C. The European network of health promoting schools: development and evaluation in Wales. *Health Education* 1996; 55:457-64.

- Bricker J, Peterson A, Sarason I, Anderson MR, Rajan KB. Changes in the influence of parents and close friends' smoking on adolescent smoking transitions. *Addictive Behaviors* 2007; 32:740-57.
- Brown KS, Cameron R, Madill C, Payne ME, Filsinger S, Manske S, Best JA. Outcome evaluation of a high school smoking reduction intervention based on extracurricular activities *Preventive Medicine* 2002; 35:506-510.
- Bruvold WH. A meta-analysis of adolescent of adolescent smoking prevention programs. *American Journal Public Health* 1993; 83(6):872-880. 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.
- Cameron R, Brown KS, Manske S et al. Enabling communities to plan evidence based youth tobacco initiatives. Centre for Behavioural Research and Program Evaluation, Waterloo, Ontario, 1999. Available at <http://www.cbrpe.uwaterloo.ca>. Accessed 2008.
- Cameron R, Brown KS, Manske S et al. The School Smoking Profile Enabling communities to plan evidence based youth tobacco initiatives, Centre for Behavioural Research and Program Evaluation, editor. 1999, Waterloo, Ontario.
- Cameron R, Brown KS, Best JA, Pelkman CL, Manske SR, et al. Effectiveness of a social influences smoking prevention program as a function of provider type, training method, and school risk. *American Journal Public Health* 1999; 89(12): 1827-1831.
- Cameron R, Manske S, Brown KS, Jolin MA, Murnaghan D, Lovato C. Integrating public health policy, practice, evaluation, surveillance, and research: The School Health Action Planning and Evaluation System. *American Journal Public Health*, 2007; 97(4): 648-654.
- Campbell D, Stanley J. Experimental and quasi-experimental designs for research. Reprinted from *Handbook of Research on Teaching*. Rand McNally & Company: USA; 1966. PP5-12.

Canadian Cancer Society/National Cancer Institute of Canada, Canadian Cancer Statistics, Toronto, Canada, 2005.

Catford J. Illicit drugs: Effective prevention requires a health promotion approach. *Health Promotion International* 2001; 16:107-110.

Centers for Disease Control and Prevention. Cigarette use among high school students – United States, 1991-2003. *Morbidity Mortality Weekly Report* 2004; 53:499-502.

Chaloupka FJ, Hu TW, Warner KE, et al. The taxation of tobacco products. In Jha P & Chaloupka F, (Eds). *Tobacco control in developing countries*. New York: Oxford University Press; 2000. p 237-272.

Charlton A, White D. Smoking prevalence among 16-19 year olds related to staff and student smoking policies in sixth forms and further education. *Health Education Journal* 1994; 53:28-39.

Chassin L, Presson CC, Sherman SJ, et al. Cigarette smoking and adolescent psychosocial development. *Basic Applied Social Psychology* 1984; 5(4):295-315.

Chassin L, Presson CC, Sherman SJ, et al. Changes in peer and parent influence during adolescence: Longitudinal versus cross-sectional perspectives on smoking initiation. *Developmental Psychology* 1986; 22(3): 327-334.

Chassin L, Presson CC, Todd M, et al. Maternal socialization of adolescent smoking: The intergenerational transmission of parenting and smoking. *Developmental Psychology* 1998; 34: 1189-1201.

Chassin L, Presson P, Sherman SJ. The natural history of cigarette smoking from adolescence to adulthood in a mid western community sample: Multiple trajectories and their psychosocial correlates. *Health Psychology* 2000; 19:223-31.

- Chen J. Age at diagnosis of smoke related disease. *Health Report* 2003; 14(3): 9-19.
- Clark W. Youth smoking in Canada. *Canadian Social Trends* 1996; 43: 2-6.
- Cleveland HH, Wiebe RP. The moderation of adolescent-to-peer similarity in tobacco and alcohol use by school levels of substance use. *Child Development* 2003; 74: 279-291.
- Colder C, Mehta P, Balanda K, Campbell R, Mayhew K, et al. Identify trajectories of adolescent smoking: An application of latent growth mixture modeling. *Health Psychology* 2001; 20:127-35.
- Conrad KM, Flay BR, Hill D. Why children start smoking cigarettes: Predictors of onset, *British Journal Addiction* 1992; 87:1711-1724
- Crone MR, Reijneveld SA, Willemsen MC, VanLeerdam FJ, Spruijt RD, Sing RA. Prevention of smoking in adolescents with lower education: a school-based intervention study. *Journal of Epidemiology and Community Health*, 2003; 57(9): 675-80.
- Currie C, Roberts C, Morgan A, et al. Young people's health in context. *Health Behaviour in School-Aged Children Study: An International Report from the 2001/2002 Survey. Health Policy for Children and Adolescents No. 4*, WHO Regional Office for Europe 2004, Copenhagen, Denmark. Available at <http://www.hbsc.org/>. [Accessed March 18, 2008].
- Denman S, Pearson J, Hopkins D, Wallbanks C, Skuriat V. The management and organization of health promotion: a survey of school policies in Nottinghamshire. *Health Education Journal* 2004; 58:165-176.
- Dijkstra M, Mesters L, de Vries H, Breukelen G, Parcel GS. Effectiveness of a social influence approach and boosters to smoking prevention. *Health Education Research* 1999; 14:791-802.

- Deschesnes M, Martin C, Hill AJ. Comprehensive approaches to school health promotion: How to achieve broader implementation? *Health Promotion International* 2003; 18(4), 387-396.
- de Vries H, Mudde A, Dijkstra A, Willemsen MC. Differential beliefs, perceived social influences and self efficacy expectations among smokers in various motivational phases. *Preventive Medicine* 1998; 27: 681-689.
- de Vries H, Candel, M, Engels, R, Mercken L. Challenges to the peer influence paradigm: Results for the 12-13 year olds from six European countries from the European Smoking Prevention Framework Approach Study. *Tobacco Control* 2006; 15: 83-89.
- Distefan JM, Gilpin EA, Pierce JP. The effectiveness of tobacco control in California schools. *Journal School Health* 2000; 70: 28-30.
- Dobbins M, DeCorby K, Manske S, Goldblatt E. Effective practice for school-based tobacco use prevention. *Preventive Medicine* 2008; 46(4): 289-97.
- Dooris M. Healthy Settings: Challenges to generating evidence of effectiveness. *Health Promotion International* 2006; 21(1):55-65.
- Doubeni C, Wenjun L, Fouayzi MS, Di Franza J. Perceived accessibility as a predictor of youth smoking *Annals of Family Medicine* 2008; 6:323-330.
- Elder JP, Perry CL, Stone EJ, Johnson CC, Yang M, Edmundson EW, et al. Tobacco use measurement, prediction and intervention in elementary schools in four states: The CATCH Study. *Preventive Medicine* 1996; 25: 486-94.
- Ellickson PL, Bell RM. Drug prevention in junior high: A multisite longitudinal test. *Science* 1990; 247: 1299-1305.

- Ellickson PL, McCaffrey DF, Ghosh-Dastidar B, Longshore DL. Adolescent health. New inroads in preventing adolescent drug use: results from a large-scale trial of Project ALERT in middle schools. *American Journal of Public Health* 2003; 93(11), 1830-1836.
- Ellison LF, Mao Y, Gibbons L. Projected smoking -attributable mortality in Canada, 1991-2000. *Chronic Diseases in Canada* 1995; 16(2):84-89.
- Engels R, Vitaro F, Blokland E, Kemp R, Scholte R. Influence and selection processes in friendships and adolescent smoking behavior: The role of parental smoking. *Journal Adolescence* 2004; 27:5.
- Engels R, Knibbe RA, Drop MJ. Predictability of smoking in adolescence: Between optimism and pessimism, *Addiction* 1999; 94:115-124.
- Ennett S, Bauman K. The contribution of influence and selection to adolescent peer group homogeneity: the case of adolescent cigarette smoking. *Journal Personal Social Psychology* 1994; 67(4): 653-663.
- Ennett ST, Flewelling RL, Lindrooth RS, Northon E. School and neighborhood characteristics associated with school rates of alcohol, cigarette, and marijuana use. *Journal Health Social Behavior* 1997; 38: 55-71.
- Evans RI. Smoking in children: Developing a social psychological strategy of deterrence. *Preventive Medicine* 1976; 5(1):122-7.
- Evans R, Rozelle RM, Mittlemark MB, Hansen WB, Bane AL, Havis J. Determining the onset of smoking children: Knowledge of immediate physiological effects and coping with peer pressure, media pressure, and parent modelling. *Journal Applied Social Psychology* 1977; 62:521-23.
- Evans-Whipp T, Beyers J, Lloyd S, Lafazia A, Catalano R. A review of school drug policies and their impact on youth substance use. *Health Promotion International* 2004; 19(2):227-34.

- Farkas A, Gilpin E, White M, Pierce J. Association between household and workplace smoking restrictions and adolescent smoking. *Journal of the American Medical Association* 2000; 284:717-722 2000
- Fishbein M, Ajzen I. *Belief, attitude, and behavior: An introduction to theory and research*. Reading, MA: Addison-Wesley, 1975.
- Flay BR. Approaches to substance use and prevention utilizing school curriculum plus environment change, *Addictive Behavior*, 2000; 25(4):861-85.
- Flay BR, Hu FB, Siddiqui O, Day LE, Hedeker LE, Petraitis J, et al. Differential influence of parental smoking and friends' smoking on adolescent initiation and escalation of smoking. *Journal Health Social Behavior* 1994; 35(3): 248-265.
- Flay BR, Petraitis J. The Theory of Triadic Influence: A new theory of health behavior with implications for preventive interventions. *Advances in Medical Sociology*, 1994; 4:19-44.
- Flay BR, Petraitis J, Hu FB. Psychosocial risk and protective factors for adolescent tobacco use. *Nicotine Tobacco Research* 1999; 1: S59-S65.
- Flay BR, Ryan CB, Best JA, Brown KS, Kersell MW, d'Avernas JR, et al. Are social, psychological smoking programs effective? The Waterloo study. *Journal of Behavioural Medicine* 1985; 8(1): 35-59.
- Flynn BS. Cigarette smoking prevention effects of mass media and school interventions targeted to gender and age groups. *Journal Health Education* 1995; 26(2):545-51.
- Focarile F, Scaffino L. Results of a controlled randomized study on prevention of smoking habit in adolescents. *Epidemiology Prev*, 1994; 18(60):157-63.
- Forester J, Chen V, Blaine T, Perry C, Toomey T. Social exchange of cigarettes by youth. *Tobacco Control* 2003; 12: 148-154.

- Franks AL, Kelder SH, Dino GA, Horn KA, Gortmaker SL, Wiecha JL, Simoes EJ. (2007). School-based programs: Lessons learned from CATCH, Planet Health, and Not-on-Tobacco. *Preventing Chronic Disease* 4(2), 1-9.
- Geckova AM, Stewart R, van Dijk JP, Orosova O, Groothoff JW, Post D. Influence of socio-economic status, parents, and peers on smoking behaviour of adolescents. *European Addiction Research* 2005; 11: 204-209.
- Gilpin EA, Emery SL, Farkas AJ, Distefan JM, White MM, Pierce JP. The California tobacco control program; A decade of progress. Results from the California Tobacco Survey, 1990-98. University of California, San Diego, La Jolla, CA. 2001.
- Glantz K, Lewis F, Rimar B, Stretcher V, Rosenstock I, Montano D, Taplin H, Chapter 2. Linking Theory research and practice; Chapter 3: The Health Belief Model ; Chapter 5 The Theory Reasoned Action and The Theory Planned Behavior, 1997. Jossey Bass. AWiley Company.
- Goodstadt MS. Substance abuse curricula versus school drug policies. *Journal of School Health* 1989; 59:246-50.
- Greaves L, Johnson J, Bottorff J, Kirkland S, Jategaonkar N, McGowan M, McCullough L, Battersby L. What are the effects of tobacco policies on vulnerable populations? A better practices review. *Can J Public Health* 2006;97(4):310-15. Available at <http://journal.cpha.ca/index.php/cjph/article/view/753/753> (Accessed 2009-04-10).
- Greaves L, Barr V. Filtered Policy: Women and tobacco in Canada. Available at <http://www.cwhn.ca/cwhp-pcesf/filtered-policy/summary.html>. (Accessed 2008-08-11).
- Greaves L, Jategaonkar N. Tobacco policies for vulnerable girls and women: toward a framework for gender sensitive policy development. *Journal of Epidemiology and Community Health* 2005; 60: 57-65.

- Grenard J, Qian G, Unger J, Chou C, Gallaher P, Sun P, Palmer P, Anderson Johnson C. Influences affecting adolescent smoking behavior in China, *Nicotine & Tobacco Research* 2006; 8(2):245-55.
- Griesbach D, Inchley J, Currie C. More than words? The status and impact of smoking policies in Scottish schools. *Health Promotion International* 2002; 17:31-41.
- Hahn EJ, Simpson MR, Kidd P. Cues to parent involvement in drug prevention and school activities. *The Journal of School Health*, 2996; 66(5): 165-170.
- Hamilton G, Cross D, Lower T, Resnicow K, Williams P. School policy: What helps to reduce teenage smoking? *Nicotine & Tobacco Research* 2003; 5(4):507-13.
- Hanewinkel R, Aβhauer M. Fifteen-month follow-up results of a school-based life-skills approach to smoking prevention. *Health Education Research* 2004; 19(20): 125-37.
- Hansen WB, Graham JW. Preventing alcohol, marijuana and cigarette use among adolescent: Peer pressure resistance training versus established conservative norms. *Preventive Medicine* 1991; 20:414-30.
- Hansen WB, Johnson CA, Flay BR, Graham JW, Sobel J. Affective and social influences approaches to the prevention of multiple substance abuse among seventh grade students. Results from Project Smart. *Preventive Medicine* 1988; 17:135-54.
- Health Canada, 2007a. Summary of results of the 2004-05 Youth Smoking Survey. Youth Smoking Survey. Ottawa: ON. Available at http://www.hc-sc.gc.ca/hl-vs/tobac-tabac/research-recherche/stat/_survey-sondage_2004-2005/result_e.html. [Accessed 2008, March 19].
- Health Canada, 2007b. Table 6: Ever tried smoking a cigarette, by province and grade, all grades. Youth Smoking Survey. Ottawa:ON. Available at http://www.hc-sc.gc.ca/hl-vs/tobac-tabac/research-recherche/stat/_survey-sondage_2004-2005/table-6_e.html. [Accessed 2008, March 19].

- Health Canada, 2008a. Smoking and your body: Health effects of smoking. Ottawa: ON. Available at http://www.hc-sc.gc.ca/hl-vs/tobac-tabac/body-corps/index_e.html. [Accessed 2008, March 19].
- Health Canada. Smoking and your body: Health effects of smoking. Ottawa: ON. [updated 2008 January 24; cited 2008 March 19]. Available at http://www.hc-sc.gc.ca/hl-vs/tobac-tabac/body-corps/index_e.html.
- Health Canada. Summary of results of the 2004-05 Youth Smoking Survey. Youth Smoking Survey. Ottawa: ON. [updated 2007 December 12; cited 2008 March 19]. Available at http://www.hc-sc.gc.ca/hl-vs/tobac-tabac/research-recherche/stat/_survey-sondage_2004-2005/result_e.html.
- Health Canada. Table 6: Ever tried smoking a cigarette, by province and grade, all grades. Youth Smoking Survey. Ottawa: ON. [updated 2007 December 12; cited 2008 March 19]. Available at http://www.hc-sc.gc.ca/hl-vs/tobac-tabac/research-recherche/stat/_survey-sondage_2004-2005/table-6_e.html.
- Health Canada. Table 2: Smoking status by sex and grouped grades, all grades. Youth Smoking Survey. Ottawa: ON. [updated 2007 December 12; cited 2008 March 19]. Available at http://www.hc-sc.gc.ca/hl-vs/tobac-tabac/research-recherche/stat/_survey-sondage_2004-2005/table-2_e.html.
- Health Canada. Smoking prevalence 1999-2007. Canadian Tobacco Use Monitoring System. Ottawa: ON. [updated 2008 January 18; cited 2008 March 19]. Available at http://www.hc-sc.gc.ca/hl-vs/tobac-tabac/research-recherche/stat/_ctums-esutc_prevalence/prevalence_e.html
- 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) 2005. Summary of Results for the First Half of 2004 (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, 2005. Health Canada: Canadian Tobacco Use Monitoring Survey (CTUMS). Summary of Results for the First Half of 2005 (February to June), Ottawa, ON: Health, 2006.
- Health Canada: Canadian Tobacco Use Monitoring Survey (CTUMS). Summary of Results for the First Half of 2006 (February to June), Ottawa, ON: Health, 2007.
- Health Canada. Trends in smoking. CTUMS (Canadian Tobacco Use Monitoring Survey), Wave 2/Annual, February-December 1999.
- Health Canada. Youth smoking in Canada. CTUMS (Canadian Tobacco Use Monitoring survey), Annual, February-December 2000.
- Health Canada. Current smokers, by province, age group and sex, age 15+. CTUMS (Canadian Tobacco Use Monitoring Survey), Annual, February-December 2001. Health and Welfare Canada 1986 Ottawa Charter for Health Promotion
- Higgins A, Connor M. Understanding adolescent smoking : the role of the Theory of Planned Behavior and Implementation intentions. *Psychology Health & Medicine* 2003 ; 8(2) :173-86.
- Hochbaum GM. Why people seek diagnostic x-rays *Public Health Reports* 71, 377-80. 1956
- Hopkins DP, Briss PA, Harris JR, Ricard CJ, Rosenquist JN, Harris K. Strategies for reducing exposure to environmental tobacco smoke, increasing tobacco-use cessation, and reducing initiation in communities and health-care systems. *MMWR Morbidity Mortality Weekly Report*, 2000; 49: 1-11.

- Hoffman B, Sussman S, Unger JB, Valente Thomas W. Peer influences on adolescent cigarette smoking: A theoretical review of the literature. *Substance Use Misuse* 2006; 41: 103-155.
- Hoffman B, Monge P, Chou C, Valente Thomas W. Perceived peer influence and peer selection on adolescent smoking. *Addictive Behaviors* 2007; 32:1546-54.
- Horn K, Dino G, Kalsekar I, Moody R. The impact of Not On Tobacco on teen smoking cessation: End-of-program evaluation results, 1998-2003. *Journal of Adolescent Health* 2005; 20, 640-661.
- Hu FB, Flay BR, Hedeker D, Siddiqui O, Day LE. The influences of friends' and parental smoking on adolescent smoking behavior: The effects of time and prior smoking. *Journal Applied Social Psychology*, 1995; 25(22): 2018-2047.
- Hu TW, Lin Z, Keeler TE. Teenage smoking, attempts to quit and school performance. *American Journal Public Health* 1998; 88:940-3.
- Hwang MS, Yeagley KL, Petosa R. A meta-analysis of adolescent psychosocial smoking prevention programs published between 1978 and 1997 in the United States. *Health Education Behaviour* 2004; 31(6):702-719
- Jantz NK, Becker MH. The health belief model: a decade later. *Health Education Behavior* 1984; 11: 1-47.
- Jha P, Chaloupka FJ. *Tobacco control in developing countries*. New York: Oxford University Press 2000; p. 237-272.
- Johnson J, Lovato CY, Ratner PM, Shoveller J, Baillee L, Kalaw C. Smoking and adolescent narratives of identity . *Research Nursing and Health* 2003; 26(5):387-97.

- Jones DJ, Foster SE, Olson AL, Forehamd RL, Gaffney CA, Zens MS, Bau JJ. Longitudinal retention of families in the assessment of a prevention program targeting adolescent alcohol and tobacco use. *Behavior Modification* 2007; 31(5): 638-659.
- Kaiserman M, MacDonald PW. Chapter 13 – Overview and Conclusions. Youth Smoking survey. Ottawa: Minister of Supply and Services Canada. [updated 2007 December 18; cited 2008 May 9]. Available at http://www.hc-sc.gc.ca/hl-vs/pubs/tobac-tabac/yss-etj-2002/chap13_e.html.
- Kam JA, Matsunaga M. Hecht ML, Ndiaye K. Extending the Theory of Planned Behavior to predict alcohol, tobacco and marijuana use among youth of Mexican heritage. *The official Journal of the Society for Prevention Research* 2009; 10(1):41-53.
- Kandel DB. The parental and peer contexts of adolescent deviance: an algebra of interpersonal influences. *Journal Drug Issues*; 1996; **26**: 289-315.
- Kellem G, Anthony JC. Targeting early antecedents to prevent tobacco smoking : findings from an epidemiologically based randomized field trial. *American Journal of Public Health*; 1998; 88: 1490-95.
- Klepp KI, Tell GS, Vellar OD. Ten year follow-up of the Oslo youth smoking prevention program. *Preventive Medicine*; 1993; 22:453-62.
- Kobus K. Peers and adolescent smoking. *Addiction*, 2003; 98 (Suppl.1), 37-56, Review.
- Kolbe L, Kann L, Brener N. Overview and summary of findings: School health policies and programs study 2000. *Journal of School Health* 2001; 71(7):253-59.
- Krohn MD, Skinner WF, Massey JL, Akers R. Social learning theory and adolescent cigarette smoking: A longitudinal study. *Social Problems* 1985; 32(5):455-473.

Kumar R, O'Malley P, Johnston L. School tobacco control policies related to student smoking and attitudes toward smoking: National survey results 1999-2000. *Health Education and Behaviour* 2005; 32(6): 780-794.

Landis JR, Koch G. The measurement of observer agreement for categorical data. *Biometrics* 1977; 33:159-174.

Lantz PM, Jacobson PD, Warner KE, Wasserman J, Pollack HA, Berson J, et al. Investing in youth tobacco control: A review of smoking prevention and control strategies. *Tobacco Control* 2000; 9:47-63.

Leatherdale ST, Cameron R, Brown KS, MacDonald PW. Senior student smoking at school, school characteristics, and smoking onset among junior students: a multilevel analysis. *Preventive Medicine* 2005; 40:853-859

Leatherdale ST, Cameron R, Brown KS, Jolin MA, Kroeker C. The influence of friends, family and older peers on smoking among elementary school students: low risk students in high risk schools. *Preventive Medicine* 2006; 42: 218-222.

Leatherdale ST, Cameron R, Brown KS, Cameron R, Mc Donald PW. Social modelling in the school environment, student characteristics, and smoking susceptibility: a multi-level analysis. *Journal Adolescent Health* 2005a; 37:330-336.

Leatherdale ST, Manske S. The relationship between student smoking in the school environment and smoking onset in elementary school students. *Cancer Epidemiology Biomarkers Prevention* 2005; 14(7):1762-1765.

Leatherdale ST, McDonald PW, Cameron R, Brown KS. A multilevel analysis examining the relationship between social influences for smoking and smoking onset. *American Journal Health Behavior* 2005; 29(6): 520-530.

- Li C, Unger JB, Schuster D, Rohrbach LA, Howard-Pitney B, Norman G. Youths' exposure to environmental tobacco smoke (ETS) associations with health beliefs and social pressure. *Addictive Behaviors* 2003; 28(1), 39-53.
- Lovato CY, Sabiston CM, Hadd V, Nykiforuk C. The impact of school smoking policies and student perceptions of enforcement on school smoking prevalence and location of smoking. *Health Education Research* 2007; 22(6): 782-793.
- Lowenstein W, Avers P, Gouravier L, Porche A, Cohen JM, Nordmann F, Prevor B, Carrier C, Sanchez M. Physical activity and sports in the history of persons consulting for addiction problems. *Annals Internal Medicine*, 2001; 151: SuppA:18-26.
- Lucas K, Lloyd B, Starting smoking: girls' explanations of influence of peers. *Journal of Adolescence* 1999; 22:747-655.
- Lujic C, Reuter M, Netter P. Psychological theories of smoking and smoking motivation. *European Psychologist* 2005; 10(1): 1-24.
- Lynagh M, Schofield M, Fisher RW. School health promotion programs over the past decade; A review of the smoking, alcohol and solar protection literatures *Health Promotion International* 1997; 12(1):43-60.
- Maes L, Lievens J. Can the school make a difference? A multilevel analysis of adolescent risk and health behavior. *Social Science & Medicine* 2003; 56: 517-529.
- Maes L, Lievens J. Adolescent smoking behavior and the school: A multilevel analysis. In Chris Tudor-Smith, editor. *Tackling Tobacco: Working Together for Better Health*. Cardiff: Health Promotion Wales; 1999. p. 113-128.

- Mahabee-Gittens ME, Huang B, Slap GB, Gordon J. An emergency department intervention to increase parent-child tobacco communication: A pilot study. *Journal Child Adolescent Substance Abuse* 2008; 17(2): 71-83.
- Manske SR, Brown KS, Cameron R. School-based Smoking Control: a research agenda. *Cancer Prevention Control* 1999; 1:196-212.
- McCall D. The history and future of school health in Canada and other countries. *Canadian Association for School Health*.2003
- McGuire WJ. The nature of attitudes and attitudinal change: In Lindzey G. and Aronson E. (Eds) 1968 *Handbook of Social Psychology*, Addison Wesley Reading, MA PP 136-314.1968
- Mc Millan B, Connor M. Using the Theory of Planned Behavior to understand alcohol and tobacco use in students. *Psychology, Health & Medicine* 2003; 8(3):317-28.
- McMillan B, Higgins AR, Conner M. Using an extended theory of planned behavior to understand smoking amongst schoolchildren. *Addiction Research and Theory* 2005; 13, 293-306.
- Meijer B, Branski D, Knol K, Kerem E. Cigarette smoking habits among school children. *CHEST* 1996; 110: 921-926.
- Mercken L, Candel M, Willems P, de Vries H. Disentangling social selection and social influence effects on adolescent smoking: the importance of reciprocity in friendships. *Addiction* 2007; 102, 1483-1492.
- 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

Molyneaux A, Lewis S, Antoniak M, Brown W, et al. Prospective study of the effect of exposure to other smokers in high school tutor groups on the risk of incident smoking in adolescence *American Journal of Epidemiology* 2004; 159,127-132.

Moore L, Roberts C, Tudor-Smith C. School smoking policies and smoking prevalence among adolescents: multi-level analysis of cross sectional data from Wales. *Tobacco Control* 2001; 10:117-123.

Murnaghan D, Blanchard C, Rodgers W, La Rosa J, Mac Quarrie C, Mac Lellan D, et al. The influence of student level normative, control and behavioural beliefs on staying smoke free: an application of Ajzen's theory of planned behaviour. *Addiction Research & Theory*, (in press).

Murnaghan D, Blanchard C, Rodgers W, La Rosa J, Mac Quarrie C, Mac Lellan D, et al. Predictors of physical activity, healthy eating, and being smoke free in teens: A theory of planned behaviour approach. *Psychology & Health*, (April 28, 2009).

Nader PR, Stone EJ, Lytle LA, Perry CL, Osganian SK, Kelder S. Three year maintenance of improved diet and physical activity: The CATCH cohort. *Archives of Pediatrics and Adolescent Medicine* 1999; 153, 695-704.

Nichter M, Nichter M, Vuckovic N, Quintero G, Ritenbaugh C. Smoking experimentation and initiation among adolescent girls: qualitative and quantitative findings. *Tobacco Control* 1997; 6(4):285-295.

Noar S, Zimmerman R. Health behavior theory and cumulative knowledge regarding health behavior: are we moving in the right direction? *Health Education Research* 20(3): 275-90.

Nofziger S, Lee H. Differential associations and daily smoking of adolescents: The importance of same sex models. *Youth & Society* 2006; 37(4):453-78.

Noland MP, Kryscio RJ, Riggs RS, Linville LH, Ford VY, Tucker TC. The effectiveness of a tobacco prevention program with adolescents living in a tobacco producing region. *American Journal of Public Health* 1998; 88:1862-65.

Nutbeam D, Macaskill P, Smith C, Simpson JM, Catford J. Evaluation of two school smoking education programmes under normal classroom conditions. *British Medical Journal* 1993; 306:102-107.

Olds RR, Thombs DL. The relationship of adolescent perceptions of peer norms and parent involvement to cigarette and alcohol use, *Journal of School Health* 2001; 71, 223-228.

Orlando M, Tucker JS, Ellickson P, Klein DJ. Developmental trajectories of cigarette smoking and their correlates from early adolescence to young adulthood. *Journal Consulting Clinical Psychology* 2004; 72:400-410.

Orleans CT, Cummings KM. Population-based tobacco control: Progress and prospects. *American Journal Health Promotion* 1999; 14:83-91.

Paavola M, Vartianen E, Puska P. Smoking cessation between teenage years and adulthood. *Health Education Research* 2001; 16(1):49-57.

Parna K, Rahu K, Fischer K, Mussalo-Rauhamaa H, Zhuravleva I. Smoking and associated factors among adolescents in Tallinn, Helsinki and Moscow: A multilevel analysis. *Scandinavian Journal of Public Health* 2003; 34(5):350-358.

Pentz MA, Dwyer JH, Mac Kinnon DP, Flay BR, Hansen WB, Wang EY, Johnson CA. A multi community trial for primary prevention of adolescent drug abuse. *JAMA*, 1989a; 261(22):3259-66.

Pentz MA, Brannon BR, Charlin VL, Barrett EJ, Mac Kinnon DP, Flay BR. The power of policy: The relationship of smoking policy to adolescent smoking. *American Journal Pubic Health* 1989b; 79(7): 857-862.

Pentz MA, Sussman S, Newman T. The conflict between least harm and no-use tobacco policy for youth: ethical and policy implications. *Addiction*, 1997; 92:1165- 1173.

Perry CL, Komro KA, Mortenson S, Bosma LM, Farbakhsh K, Munson KA, et al. A randomized controlled trial of the middle and junior high school D.A.R.E. and D.A.R.E [Plus program. *Archives of Pediatric and Adolescent Medicine* 2003; 157:178-84.

Peterson A, Kealey K, Mann S, Marek PM, Sarason IG. Hutchinson smoking prevention project: Long term randomized trial in school-based tobacco use prevention - results on smoking. *Journal National Cancer Institute* 2000; 92(24):1979-1991.

Peterson AJ, Clark AW. Using group decision to reduce adolescent girls' smoking *Psychological Reports* 1986; 58(1):179-185.

Petrattis J, Flay BR, Miller TQ. Reviewing theories of adolescent substance abuse: Organizing pieces of the puzzle. *Psychological Bulletin* 1995; 117(1):67-86.

Pierce JP, Choi WS, Gilpin EA, Farkas AJ, Merritt RK. Validation of susceptibility as a predictor of which adolescents take up smoking in United States. *Health Psychology* 1996; 15:355-61.

Porter A. Disciplinary attitudes and cigarette smoking: A comparison of two schools. *British Medical Journal* 1982; 285:1725-26.

Prince Edward Island Department of Health. PEI Student Drug Survey: Highlights Report. [updated 2008 April 11; cited 2008 May 9]. 2007; Available at http://www.gov.pe.ca/photos/original/doh_sds_hl_eng.pdf

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

Prochaska JO, Di Clemente CC. Stages and processes of self change in
smoking; towards an interactive model of change. *J Cons Clinical
Psychology* 1983; 51: 390-95.

Proescholdbell RJ, Chassis L, MacKinnon D. Home smoking restrictions and
adolescent smoking. *Nicotine and Tobacco Research* 2000; 2:159-167.

Rasbash J, Browne W, Healey M, et al. MLwiN (Version 1.10.007): Interactive
software for multilevel analysis. Multilevel Models Project, Institute of
Education, London, U.K., 2001.

Raudenbush SW, Bryk AS. *Hierarchical Linear Models: Applications and data
analyses methods* 2nd Ed. Thousand Oaks, CA. Sage Publications, 2002.

Redmond WH. Trends in adolescent cigarette use: The diffusion of daily smoking
Journal of Behavioural Medicine 1999; 22: 379-395.

Reeder A, Glasgow H. Are New Zealand schools smoke free? Results from a
national survey of primary and intermediate school principals. *New
Zealand Medical Journal* 2000; 113:52-54.

Reid DJ, McNeill AD, Glynn TJ. Reducing the prevalence of smoking in youth in
Western countries: An international review. *Tobacco Control* 1995; 4:266-
277.

Reitsma A, Manske S. Smoking in Ontario schools: Does policy make a
difference? *Canadian Journal of Public Health* 2004; 95(3):214-218.

Rogers RW. Cognitive and physiological processes in fear appeals and attitude
change: A revised theory of protection motivation. In: Cacioppo J, Petty R
(eds). *Protection Motivation Theory*. New York: Guilford Press, 1983

- Rooney BL, Murray DM. A meta-analysis of smoking prevention programs after adjustment for errors in the unity of analysis. *Health Education Quarterly* 1996; 23:48-64.
- Rosenstock IM. The historical origins of the Health Belief Model. *Health Education Monographs* 1974; 2, 354-95.
- Rosenstock IM, Stretcher VJ, Becker MH. Social learning theory and the Health Belief Model. *Health Education Quarterly* 1988; 15:175-183.
- Rundall TG, Bruvold WH. A meta-analysis of school-based smoking and alcohol use prevention programs *Health Education* 1988; 15(3):317-334
- Sandford A. Trends in smoking among adolescents and young adults in United Kingdom: Implications for health education. *Health Education*, 2007; 108(3):223-236.
- Sargent JD, Beach ML, Dalton MA, Mott A, Ticktey J, Athrens MB, Heatherton TF. Effects of seeing tobacco use films on trying smoking among adolescents: cross sectional study. *British Medical Journal* 2001; 323 (1326):1394-97.
- Schofield MJ, Lynagh M, Mishra G. Evaluation of a Health Promoting Schools program to reduce smoking in Australian secondary schools. *Health Education Research* 2003; 18:678-92.
- Sharma, M. School-based interventions for childhood and adolescent obesity. *Obesity Reviews* 2006; 7, 261-269.
- Shean RE, deKlerk NH, Armstrong BK, Walker NS. Seven year follow-up of a smoking prevention program for children *Australian Journal of Public Health* 1994; 18(2): 205-8.

- Skara S, Sussman S. A review of 25 long-term adolescent tobacco and other drug use prevention program evaluations. *Preventive Medicine* 2003; 37:451-74.
- Slovic P. What does it mean to know a cumulative risk? Adolescents perceptions of short term and long term consequences of smoking. *Journal Behaviour Decision Making* 2000; 13(2):259-66.
- Smith BN, Bean MK, Mitchell KS, Speizer IS, Fries EA. Psychosocial factors associated with non-smoking adolescents' intentions to smoke. *Health Education Research* 2001; 22(2):238-247.
- Sowden A, Arblaster L. Community interventions for preventing smoking in young people. *Cochrane Library* 2 (2003).
- Spoth RL, Redmond C, Shin C. Randomized trial of brief family interventions for general populations: adolescent substance use outcomes 4 years following baseline. *Journal of Consulting and Clinical Psychology* 2001; 69:627-42.
- Stead M, Hastings G, Tudor-Smith C. Preventing adolescent smoking: A review of options. *Health Education Journal* 1996; 55, 31-54.
- 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.
- Storr CL, Lalongo NS, Kellems SG, Anthony JC. A randomized control trial of two primary school intervention strategies to prevent early onset tobacco smoking. *Drug and Alcohol Dependence*, 2002; 66 (1): 51-60.
- Sussman SY. School-based tobacco use prevention and cessation: where are we going? *American Journal Health Behavior* 2001; 25: 191-199.
- 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.

- Sussman SY, Dent CW, Stacy AW. Project towards no drug abuse: A review of the findings and future directions. *American Journal of Health Behavior* 2002; 26(5):354-65.
- Szabo E, White V, Hayman J. Can home smoking restrictions influence adolescents' smoking behaviours if their parents and friends smoke? *Addictive Behaviours* 2006; 31: 2298-2303.
- Telch MJ, Miller LM, Killen JD, Cooke S, Maccoby N. Social influences approach to smoking prevention: The effects of videotape delivery with and without same-age peer leader participation. *Addictive Behaviors* 1990; 15:21-8.
- Thomas R, Perera R. School-based programmes for preventing smoking. *Cochrane Database of Systematic Reviews* 2006; 3:1-166
- Thomas RE, Baker P, Lorenzetti D. Family-based programmes for preventing smoking by children and adolescents. *Cochrane Database of Syst Rev* 2006; 4: 1-44. [updated 2007 January 24; cited 2008 March 28]. Available at <http://www.mrw.interscience.wiley.com/cochrane/clsystrev/articles/CD004493/frame.html>.
- Tingen MS, Waller JL, Smith MT, Baker RR, Reyes J, Treiber FA. Tobacco prevention in children and cessation in family members. *Journal American Academy Nurse Practitioners* 2006; 18(4): 169-179.
- Tobler NS, Shaltor HS. Effectiveness of school-based drug prevention programs. A meta-analysis of the research. *The Journal of Primary Prevention* 1997; 18(1): 78-128.
- Tobler NS, Roona MR, Ochshorn P, Marshall DG, Streke AV, Stackpole KM. School-based adolescent smoking prevention programs: 1998 meta-analysis. *Journal Primary Prevention* 2000; 20(4): 275-336.

Tragessor S, Aloise-Young P, Swaim R. Peer influence, images of smokers, and beliefs about smoking among preadolescent nonsmokers. *Social Development* 2006; 15(2): 311-25.

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

Turner L, Mermelstein R, Flay B. Individual and contextual influences on adolescent smoking. *Ann NY Academy Science* 2006; 1021:175-197.

Tyas SL, Pederson LL. Psychosocial factors related to adolescent smoking: a critical review of the literature. *Tobacco Control* 1998; 7:409-420.

Unger JB, Chen X. The role of social networks and media receptivity in predicting age of smoking initiation: A proportional hazards model of risk and protective factors. *Addictive Behavior* 1999; 24:371-381.

Unger JB, Rohrbach LA. Why do adolescents overestimate their peer's smoking prevalence? Correlates of prevalence estimates among California 8th-grade students. *Journal Youth Adolescence* 2002; 31:147-153.

Urberg KA, Luo Q, Pilgrim C, Degirmencioglu SM. A two-stage model of peer influence in adolescent substance use: individual and relationship specific differences in susceptibility to influence. *Addictive Behavior*, 2003; 28:1243-1256.

U.S. Department Health and Human Services. *Reducing Tobacco Use: A Report of the Surgeon General*. Atlanta GA: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, Office on Smoking and Health, 2000.

US Department of Health and Human Services (USDHHS). Preventing tobacco use among young people. Report of the Surgeon-General, Atlanta. GA: US Department of Health and Human Services, Public Health Service, Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, Office on Smoking and Health, 1994.

U.S. Department Health and Human Services, 1994, 2000. Reducing tobacco use: a report of the Surgeon General. Atlanta GA: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, Office on Smoking and Health.

Van den Eijndent R, Spjkerman R, Enges R. Relative contributions of smoker prototypes in predicting smoking among adolescents: A comparison with factors from the Theory Planned Behavior. *European Addiction Research* 2006; 12(3):113-20.

Van Zundert R, Nijhof LM, Engels R. Testing Social Cognitive Theory as a theoretical framework to predict smoking relapse among daily smoking adolescents. *Addictive Behaviors* 2009; 34(3):281-286.

Vartiainen E, Paavola M, McAlister A, Puska P. Fifteen year follow-up of smoking prevention effects in North Karelia youth project. *American Journal Public Health* 1998; 88(1):81-5.

Walsh MM, Hilton JF, Ellison JA, Gee L, Chesney MA, Tomar SL, et al. Spit (smokeless) tobaxxo intervention for high school athletes. Results after 1 year. *Addictive Behaviors* 2003; 28(6):1095-1113.

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.

Wakefield M, Chaloupka F. Effectiveness of tobacco control programmes in reducing teenage smoking in USA. *Tobacco Control* 2000; 9:177-186.

Wakefield M, Chaloupka F, Kaufman N, Orleans CT, Barker D, Ruel E. Effect of restrictions on smoking at home, at school, and in public places on teenage smoking: cross sectional study. *British Medical Journal* 2000; 321:333-337.

Walter HJ, Vaughan RD, Wynder EI. Primary prevention of cancer among children: changes in cigarette smoking and diet after six years of intervention. *Journal National Cancer Institute* 1989; 81(13):995-9.

Weinstein N. Testing four competing theories of health protection behavior. *Health Psychology*, 1993; 12(4):324-333.

White HR, Pandina RJ, Chen PH. Developmental trajectories of cigarette use from early adolescence into young adulthood. *Drug alcohol Depend* 2002; 65:167-78.

White D, Pitts M. Educating young people about drugs: A systematic review. *Addiction* 1998; 93:1475-87.

WHO (1996) Promoting health through schools: The World Health Organization's Global School Health Initiative. WHO Geneva. Available at http://www.who.int/schoolyouth_health/media/en/86.pdf (last accessed November 2008).

WHO (1997) Tobacco and Health, A Global Status Report. Geneva: WHO

WHO (2001). Tobacco and the Rights of the Child. WHO Geneva

WHO (2005) WHO Framework Convention for Tobacco Control. WHO Geneva. Available at http://www.who.int/tobacco/framework/who-fctc_english.pdf (last accessed January 15, 2009).

- Wiecha JL, Ayadi AM, Fuemmeler BF, Carter JE, Handler S, Johnson S, et al. Diffusion of an integrated health education program in an urban school system: Planet Health. *Journal of Pediatric Psychology* 2004; 29(6):467-474.
- Wiehe SE, Garrison MM, Christakis DA, Christakis D. A systematic review of school-based smoking prevention trials with long-term follow-up. *Journal Adolescent Health*, 2005; 36(3):162-169.
- Wiiium N, Wold B. Family and social influences on adolescent smoking behaviour. *Health Education* 2006; 106(6):465-479.
- Wilkinson D, Abraham C. Constructing an integrated model of the antecedents of adolescent smoking. *British Journal Health Psychology* 2004; 9: 315-333.
- Willemsen M, DeZwart W. The effectiveness of policy and health education strategies for reducing adolescent smoking: a review of the evidence. *Journal of Adolescence* 1999; 22:587-99.
- Zhu S. Predictors of smoking cessation in U.S. adolescents. *American Journal of Preventive Medicine* 1998; 16(3):202-207.

APPENDICES

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
- Often Sometimes Never

29. How often do you smoke with the following people?

- By myself
 - With friends
 - With family
 - Other: _____
 - I do not smoke
- Often Sometimes Never

30. How often do you smoke at the following times?

- Before school
- During the school day
- After school
- In the evening Often Sometimes Never
- 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

True Usually true Usually false False

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!**

Appendix 2 Letter and consent form for Principal

Letter To Principals

May 17, 1999

FIELD(name)
FIELD(title)
FIELD(school)

Dear FIELD(salutation):

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 3 Letter and consent form for parents

14

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.

School of Nursing
Tel: (902) 566-0733
Fax: (902) 566-0777

Appendix 5 School Feedback Report

DRAFT

This is a prototypical report - data are fictitious.

Smoking at AnyPlace Secondary School, Prince Edward Island



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

Appendix 6 Research Ethic Certificates



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 Murnaghan

Date Submitted: May 7, 1999

Effective Date: 31 MAY 1999
DATE MONTH YEAR

Signature: Pony Costello Date: May 31, 1999
Chair, Ethics Committee



University of Prince Edward Island
Research Ethics Board

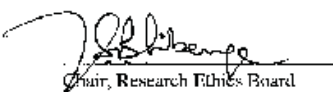
Certificate of Approval

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

Name of Investigator: Professor Dana Munnaghan

Date Submitted: March 10, 2000

Effective Date: 30th March 2000
DAY MONTH YEAR

Signature:  Date: March 29, 2000
Chair, Research Ethics Board

cc. President 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

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

^a 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

	Grade10 n=1538 ^a	Percent	Grade11 n=1514 ^a	Percent	Grade12 n=1365 ^a	Percent
Quit Behavior						
Have you quit smoking?						
Yes	447	29.1	438	28.9	362	26.5
No	349	22.7	431	28.5	471	34.5
I have never smoked	729	47.4	633	41.8	520	38.1
Time since you quit?						
I never smoked	759	49.3	671	44.3	570	41.8
Still smoking	334	21.7	413	27.3	451	33
<2 weeks	46	3	40	2.6	40	2.9
2wks – 6 months	93	6	71	4.7	61	4.5
6 mo-1 year	78	5.1	55	3.6	73	5.3
>1 year	211	13.7	245	16.2	156	11.4
Number of times in the past year that you intentionally tried to quit?						
I have not smoked in the last year	322	20.9	321	21.2	258	18.9
Once	176	11.4	143	9.4	201	14.7
Two times	80	5.2	107	7.1	110	8.1
Three times	49	3.2	45	3.0	59	4.3
Four times	68	4.4	65	4.3	59	4.3
I have not tried			224	14.8	198	14.5
I have never smoked			594	39.2	467	34.2
Do you plan to quit smoking?						
I have never smoked	764	49.7	671	44.3	567	41.5
I have already quit	386	25.1	386	25.2	304	22.3
Yes but not sure when	213	13.8	255	16.5	301	22.1
No, I do not plan to quit	68	4.4	91	6.0	68	5.0

^a 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

	Grade10 n=1666 ^a	Percent	Grade11 n=1484 ^a	Percent	Grade12 n=1429 ^a	Percent
Quit Behavior						
Have you quit smoking?						
Yes	474	28.5	398	26.8	392	27.4
No	348	20.9	378	25.3	447	31.3
I have never smoked	832	49.9	693	46.7	557	40.4
Time since you quit?						
I never smoked	689	41.4	608	41	563	39.4
Still smoking	266	16	268	18.1	311	21.8
<2 weeks	64	3.8	50	3.4	53	3.7
2wks – 6 months	93	5.6	68	4.6	64	4.5
6 mo-1 year	123	7.4	97	6.5	83	5.8
>1 year	417	25	380	25.6	340	23.8
Number of times in the past year that you intentionally tried to quit?						
I have not smoked in the last year	320	19.2	269	18.1	292	20.4
Once	230	13.8	203	13.7	213	14.9
Two times	70	4.2	96	6.5	84	5.9
Three times	43	2.6	39	2.6	38	2.7
Four times	49	2.9	62	4.2	56	3.9
I have not tried	365	21.9	357	24.1	332	23.2
I have never smoked	573	34.4	445	30	388	27.2
Do you plan to quit smoking?						
I have never smoked	869	52.2	733	49.4	607	42.5
I have already quit	426	25.6	345	23.2	364	25.2
Yes but not sure when	229	13.7	226	15.4	255	17.8
No, I do not plan to quit	57	3.4	69	4.6	70	4.9

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

