UNDERSTANDING THE IMPACT OF TOBACCO INDUSTRY PROMOTIONAL ACTIVITIES ON YOUTH SMOKING BEHAVIOUR

by

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ABSTRACT

Background: Tobacco marketing has been established as the main motivator for tobacco use among youth. A proliferation of tobacco promotional activities in retail stores has been observed yet little is known about its impact on adolescent smoking behaviours. The purpose of this study is to use secondary data to describe the prevalence of retail tobacco point-of-purchase (PoP) activities, examine its associations with adolescent smoking behaviours, and determine what ecological factors moderate the relationship between PoP activities and student smoking behaviours in British Columbia.

Methods: This cross-sectional study surveyed grade 10-11 students from 22 randomly-selected schools in BC on student smoking behaviour and conducted observations in 57 retail stores on tobacco PoP activities located within a 1km radius of these schools. Descriptive analysis was conducted on retail tobacco PoP variables. Individual data on smoking behaviour and school level data on retailers were linked to analyse the association between retail tobacco PoP activities and student smoking behaviour using logistic regression. Moderating effects of contextual factors were also examined. GIS maps were generated to illustrate study findings.

Result: A moderate to strong presence of tobacco PoP activities was observed in all tobacco retail stores located in BC school neighbourhoods. Nearly all stores displayed cigarette products in a visible manner (98.25%) and posted tobacco control signage (94.74%). In this model, proportion of stores in the school neighbourhood with presence of tobacco advertising increased the odds of a student being a smoker (OR = 1.28-3.27). proportion of stores in the school neighbourhood with presence of tobacco control signage decreased the odds of a student being a smoker (OR = 0.11-0.66). The odds of a student being a smoker increased if they resided on the island compared to living in the lower mainland (OR = 1.11-1.75).
Discussion: Convenience stores exhibited more tobacco PoP activities than other store types. Retailers in the school neighbourhood that had tobacco advertisements and tobacco control signage exhibited both detrimental and protective effects on student smoking. This provides supportive evidence to ban tobacco advertising in retail stores and increase efforts for creating an anti-tobacco environment in neighbourhood retail stores. Maps generated served descriptive and hypothesis generating purposes.
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CHAPTER 1 – INTRODUCTION

1.0 Background

Tobacco use is the most significant cancer risk factor in both developing and industrialized nations worldwide (American Cancer Society, 2003; 2003). In Canada, smoking is responsible for killing more people than HIV/AIDS, intentional and unintentional injuries and illicit drug use combined (BC Ministry of Health Services, 2004), accounting for more than 45,000 premature deaths per year (Health Canada, 1996) and 30% of all cancer deaths (Illing & Kaiserman, 1995). Canada is considered a world leader in tobacco control efforts with its progressive, comprehensive tobacco control strategies committed at the federal, provincial and local levels yielding positive outcomes which have translated into declining smoking trends.

In 2006, the Canadian Tobacco Use Monitoring Survey (CTUMS) reported approximately 5 million Canadians, or 19% of the population age 15 years and older were current smokers (daily and non-daily smokers), compared to 24% in 2000 (Health Canada, 2007). This downward trend was also observed for youth smokers. For youth aged 15-19 years, there was a significant decrease in smoking rate with 15% of youth (~320,000) reporting smoking in 2006, down from 18% for the same period one year earlier. This declining trend is also observed at the provincial level in British Columbia (BC).

The rate of smoking for British Columbians among the 15-19 year old age group in 2006 was 12.4% (~279,000 teens) for current smokers, compared to 14% in 2005 (Health Canada, 2007). BC has consistently had the lowest smoking rate compared to the national level as well as to other Canadian provinces and territories due to its comprehensive tobacco control strategy that strongly emphasizes prevention for the youth population, which is most at risk for experimentation, initiation and eventual addiction to smoking. BC has made significant progress in reducing the rate of smoking in the province, however, the numbers are still high, and
smoking remains the single most preventable cause of mortality and morbidity in BC, with
approximately 6000 deaths attributable to smoking in 2002 with an estimated direct and indirect
cost of $1.25 billion annually (BC Ministry of Health Services, 2004). These health and
economic burdens reinforce the fact that tobacco use continues to be an important public health
issue for British Columbia.

Adolescence is a developmental period of accelerating physical, psychological,
sociocultural, and cognitive development often characterized by confrontations with a myriad of
internal and external challenges, and attempts to establish one’s self-identify and autonomy
(Perry & Staufacker, 1996). As such, adolescence is a critical period for the adoption of health
and risk behaviours because it establishes lifestyle habits and attitudes that contribute to one’s
sense of self. To encourage experimentation with the ultimate goal of tobacco addiction among
youth, the tobacco industry develops advertising and promotional campaigns using sophisticated
persuasive communication strategies that appeal to young people’s desire to establish self-
identity (Pollay, 1997; Pollay, 1994; Pollay, 2000b). Considerable research to-date has provided
evidence for the causal role tobacco promotions and advertising play in adolescents’ decision to
smoke because they strategically influence the multitude of individual, social and contextual
smoking determinants to enhance positive perceptions and acceptability of tobacco use
(DiFranza et al., 2006; Lovato et al., 2002). Thus increasing youth’s susceptibility to
experimentation, initiation and eventual dependence on tobacco use.

Recognizing the effectiveness that tobacco marketing practices have on tobacco use,
especially among adolescents, legislative efforts to protect and prevent young Canadians from
exposure to tobacco promotions and tobacco use include aggressive restrictions on venues
available for tobacco marketing. For example, most traditional forms of product advertisements
including radio, television, billboard and youth-focused publications have been prohibited and
sponsorship events banned under the 1995 Federal Tobacco Control Act. This has resulted in the retail environment as one of the only communication channels available for tobacco companies to promote their products to their current and future customers. Evidence supporting increased marketing efforts at the retailers have been confirmed by voluminous studies that have shown that the majority of the tobacco industry’s marketing dollars have not been curtailed in the face of escalating restrictions. Rather, increasing marketing dollars are being spent on shaping retail environments using point-of-purchase (PoP) promotional programs relative to other methods of advertising and promotion (Terry-McElrath et al., 2002; Wakefield et al., 2002c; Ruel et al., 2004; Feighery et al., 2001; Dewhirst, 2004; Celebucki & Diskin, 2002; U.S.Federal Trade Commission, 2005).

PoP is one of the most important tools that tobacco companies have for promoting tobacco products. It is a sophisticated marketing strategy designed to offset the potential beneficial effect of tax increases, marketing restrictions and policies on tobacco advertising (Pollay, 2007). This is evidenced by documentations of increased levels of tobacco promotions and advertising in retail stores following implementation of the 1998 Master Settlement Agreement that increased tobacco advertising restrictions in United States. (Celebucki & Diskin, 2002; Donovan et al., 2002; Slater et al., 2000b; Slater et al., 2001; Wakefield et al., 2000; Wakefield & Chaloupka, 2000; Eule et al., 2004; Wakefield et al., 2002a). Furthermore, studies in Canada have found the ubiquitous presence of large, prominent displays of tobacco products covering walls and counter tops enhanced with brand colours and accessories that carry tobacco brand names and logos in retail stores across the country (Cohen et al., 2005; Health Canada, 2004). Given this saturation, it is virtually impossible for young shoppers to avoid exposure to pro-smoking messages when buying their snacks, food, beverages, or gasoline, especially when young people are known to be frequent visitors of retail stores (MacFadyen et al., 2001;
Henriksen et al., 2004b; Wakefield et al., 2006). This is an important public health concern and has policy implications as evidence shows that exposure to various tobacco marketing, such as brand advertising, is effective among young people (Pierce et al., 1998; Biener & Siegel, 2000; Lee et al., 2004). Currently, Saskatchewan, Manitoba and Nunavut are the only provincial and territorial governments that have implemented a complete ban on retail tobacco displays. Several other provinces (e.g. Ontario, Nova Scotia, New Brunswick, Alberta, British Columbia and Quebec) have committed to or are in the process of implementing selected or complete restrictions in the near future. In BC, retail displays of tobacco products will be banned and signage restricted in premises accessible by minors effective March 31, 2008.

The retail environment exerts a unique influence in promoting smoking as a desirable social norm. Specifically, it allows for many traditional advertising strategies to be used together in one context including brand promotion, and creating positive brand image (Pollay, 2007; Wakefield et al., 2002b; Henriksen et al., 2002; Donovan et al., 2002). The result of pervasive and persistent tobacco merchandising and advertising is that children and adolescents are more likely than not to be exposed, on a frequent and regular basis, to all of the common types of cigarette messages, whether they are images of independence, social approval, pictures of health or other implied health re-assurances. Moreover, the repeated and consistent exposure to tobacco PoP advertising has the effect of altering product use perception, thus shaping behaviour (Pechmann & Knight, 2002). A norm is created wherein tobacco use is desirable, socially acceptable and prevalent, especially to children raised in heavily commercialized environments (Henriksen et al., 2002). Emerging research evidence has found associations between higher levels of advertising, lower cigarette prices, and greater availability of cigarette promotions in retail stores with smoking uptake among adolescents (Slater et al., 2007). Thus young people are
at disproportionate risk due to frequent visits to retail stores located in their home and school environment.

The neighbourhood environment has a strong influence on determining the distribution of health outcomes and behaviours (Diez-Roux, 2001; Luginaah et al., 2001; Birch et al., 2005). Understanding the role of neighbourhood environments on health outcomes is important because one’s neighbourhood is where one encounters social structure, lives out the life course, and interchanges with many of the people who will have profound influences on their life choices (Frohlich et al., 2002a). From a socio-ecological approach, there is empirical evidence that the school neighbourhood is an important social and physical context when it comes to understanding youth smoking behaviour, in particular with respect to retail PoP marketing. Henriksen et al. (2004) reported that retail stores more frequented by adolescents contain increased levels of tobacco marketing activities compared to stores that are less frequented by adolescents in the same community. Others studies reported that tobacco advertisements were more prevalent in stores located near schools, in lower income communities, and in ethnically diverse communities (Schneider et al., 2005; Wildey et al., 1992; Laws et al., 2002a; Barovich et al., 1991; Barbeau et al., 2004). Moreover, Ross & Taylor (1998) found that place is an important factor in accounting for individual variations in smoking attitudes, independent of smoking status. Thus an exploration of the interaction between social and geographical factors on retail tobacco PoP promotion and adolescent smoking may facilitate a better understanding of this relationship, and have important policy implications for changing the retail and school environment in an effort to protect young Canadians from the detrimental effects of tobacco use.

To date, the extent of retail tobacco PoP presence in BC is not known and as such the effect on youth smoking behaviour cannot be determined. An exploratory descriptive study is needed to document the prevalence of retail tobacco PoP activities in the school neighbourhood
environment and to evaluate its associations with youth smoking behaviour. This study will add to our understanding of tobacco industry marketing strategies and its effect on youth. In addition, the Canadian tobacco policy environment is changing rapidly in response to tobacco control advocates urging for retail display bans at the federal and provincial level. It is important to provide empirical evidence to guide such efforts. Therefore, documenting the prevalence of retail tobacco PoP will serve as a baseline evaluating the effectiveness of the BC retail tobacco ban legislation on adolescent smoking.

1.1 Study Purpose

The overall purpose of this study was to examine the relationship between retail tobacco PoP activities and adolescent smoking behaviour in school neighbourhoods. The aim of the research was to address gaps in knowledge related to the state of retail tobacco PoP activities in British Columbia and its association with adolescent smoking behaviour with consideration for the role of the school neighbourhood. Three research questions were addressed in this study:

1. What is the prevalence of tobacco PoP activities in retail stores located within school neighbourhoods in British Columbia?

2. What is the association between PoP activities in retail stores located within school neighbourhoods and student smoking behaviour in British Columbia?

3. What ecological factors moderate the relationship between PoP activities and student smoking behaviour in British Columbia?

1.2 Thesis Outline

The remainder of this thesis is organized into four chapters. The second chapter examines the published research on youth smoking determinants, theories and practices of tobacco retail PoP and its relationship with adolescent smoking. A review of literature about the role the school neighbourhood has on the relationship between tobacco retail PoP and adolescent smoking is
also discussed to provide rationale for the study. The Methods chapter outlines the sources of data, sampling and recruitment outcomes. Data collection instruments and protocols, as well as analysis procedures and mapping protocol that were used are also discussed in this chapter. In the Results chapter, study findings are presented; they include a description of the study sample and study variables followed by the results for each of the three research questions accompanied by thematic maps generated to present study findings. In the Discussion chapter, study findings are placed in context with existing published literature, strength and limitations of the study are identified, and implication for future research and practice are presented.
CHAPTER 2 – REVIEW OF THE LITERATURE

2.0 Overview

Tobacco remains the most addictive and harmful legalized product in Canada. Despite increasing legislation against tobacco marketing, young people are continuously indoctrinated with tobacco advertising and promotions. It has been estimated that today’s youth have already been exposed to nearly $20 billion worth of image advertising (CDC, 1999). Given legislative restrictions, retail stores are now one of the only venues where tobacco companies can communicate with and influence young people’s decision to smoke. Given that tobacco promotion and advertising has been established as the main motivator for experimentation and maintenance of tobacco use, understanding the influence tobacco marketing has on adolescent attitudes, beliefs and smoking behaviour is important for health advocates and public policy makers to create a safer environment for youth.

This chapter reviews published literature from disciplines of health studies, marketing and geography to describe theoretical frameworks and research to-date that elucidate the impact of tobacco industry marketing strategies, specifically, retail point-of-purchase (PoP) activities, and the pivotal contextual role of the school environment on adolescent smoking behaviour.

2.1 Youth Smoking Determinants

Adolescence is the critical developmental stage in life when most tobacco users begin, develop, and establish this addictive behaviour (US Department of Health and Human Services, 1994b). Young people face enormous pressure to smoke. The increased susceptibility of experimentation and maintenance of smoking in youth are associated with complex individual, social and contextual determinants that have been shown to be largely influenced by tobacco industry advertising and promotional activities (Lovato et al., 2004; US Department of Health
Literature Review

and Human Services, 1994b; US Department of Health and Human Services, 2000). Each of the three groups of determinants has a constellation of factors that have been confirmed by numerous studies to be associated with adolescent smoking (Geckova et al., 2002; Turner et al., 2004; Chaloupka, 2003). The pathways and interactions of determinants between and within the different groups are complex and context specific. All three streams of influence start at the distal level and contribute to specific affective/cognitive constructs at the more proximal level, and each of these then contributes to determining intentions to smoke and subsequent smoking behaviour (Turner et al., 2004). Tobacco marketing strategies cross all three levels of determinants and aim to affect proximal constructs such as adolescents’ awareness, perceptions, attitudes, opinions and/or beliefs about smoking through individual, social and environmental determinants to attract and retain youth smokers in order to achieve the ultimate goal of obtaining a customer base for profit maximization.

The following section provides a broad overview of key determinants that have been shown to directly or indirectly influence adolescent smoking, with emphasis on how tobacco marketing strategies mitigate the pathways.

2.1.1 Individual Determinants

Individual determinants include the effect of knowledge, intentions, attitudes, health-related behaviours, personal traits, and school-related factors (Geckova et al., 2002). Also included are demographic variables such as age, socioeconomic status (SES), gender, and ethnicity (Barbeau et al., 2004; Georgiades et al., 2006; US Department of Health and Human Services, 1994b). It has been well established that knowledge about the harmful nature of tobacco use alone is neither sufficient nor necessary to deter one from smoking onset (Horn et al., 2000; Griffin et al., 1999). Conversely, risk perception and positive attitude toward smoking have strong influences on adolescent smoking (Virgili et al., 1991). Research has consistently
shown that compared to non-smokers, adolescent smokers were found to have a tendency to
neglect health hazard, perceive less personal risk, associate more positive outcomes (e.g. relieve
stress), believe it is easy to quit, perceive a higher prevalence of smokers, and have more
positive attitudes toward cigarette advertisements (Turco, 1997). Other attitudinal factors that
have been shown to be influenced by tobacco marketing to predict smoking onset include
adolescent’s self-image, smoker stereotype of coolness, sociability, and intelligence. Smokers
are also characterised as having a more external locus of control with respect to their health in
comparison to non-smokers. The lack of confidence in self-control leads to increased
engagement in health risk behaviour, such as substance abuse, alcohol consumption, sexual
deviancy, and smoking. Incidentally, the tobacco industry commonly utilises image advertising
to portray personality variables related to this constellation of health risk behaviours such as
sensation seeking, risk-taking, rebelliousness, deviance acceptance, self-efficacy, self-esteem
and social assertiveness to impact smoking initiation and maintenance (Geckova et al., 2002;
Dewhirst, 2004; Pollay, 1995). Moreover, there is a well-established association between
adolescent smoking and behavioural problems or psychopathology such as attention-deficit
disorder, depression and delinquency. Finally, school-related factors such as academic
involvement, commitment to school and extracurricular activity have been shown to have
protective properties over experimentation with smoking (Geckova et al., 2002).

2.1.2 Social Determinants

Social relationships are strong influences on youth smoking behaviour. Widely studied
determinants at the social level are influences from parents, siblings and peers including their
characteristics, attitude towards and use of tobacco, all of which lead primarily to creating an
individual’s social normative belief system surrounding tobacco use (Geckova et al., 2002).
Parental, sibling and peer smoking are often treated as control variables while examining more
distal determinants of adolescent smoking (e.g. tobacco marketing) as they are strong predictors of adolescent smoking. A study by Unger & Chen (1999) on sociocultural influences of smoking reported that peer and sibling approval, attitudes, and norms towards smoking can influence susceptibility by creating positive attitudes to tobacco media and advertisement, which is a strong predictor of adolescent smoking initiation. In a separate study, peer smoking was found to be the most important predictor for U.S. seventh graders to experiment with smoking, followed by exposure to tobacco marketing (Schooler et al., 1996).

Socio-economic status (SES) represents variables on the border between individual and social characteristics that can have direct and indirect effects on adolescent smoking (Migliorini & Siahpush, 2006; Wilcox, 1998; Frohlich et al., 2002b; Diez Roux et al., 2003). A U.S. study found that youth at all socioeconomic levels were influenced by parental smoking behaviour; however, the prevalence of smoking among youth was greater in groups of lower SES and was associated with the higher smoking rate of adults in lower SES households (Millar & Hunter, 1990). Others have posited that the social environment of lower SES households tolerate and encourage smoking behaviour among low SES adolescents (De, 1995). Tobacco companies have been found to mitigate this effect by strategically placing increased level of tobacco advertising in lower income neighbourhoods (Barbeau et al., 2004).

2.1.3 Environmental/Contextual Determinants

Influences from the broader environmental or cultural context that lead to individual attitudes toward smoking include ecological or group-level variables such as community characteristics (e.g. physical attributes, socio-demographic variables), media influences (e.g. tobacco advertisement and promotions), and legislative/policy issues (Turner et al., 2004). The study of the contextual effects of group characteristics on individual-level health outcomes has been termed the ecological approach (Sallis & Owne, 2002; Diez-Roux, 1998; Diez-Roux, 2001;
Frohlich et al., 2002a). Group-level or ecological factors can consist of either compositional or contextual attributes. Compositional attributes are aggregate characteristics of persons living in a certain type of area, often referred to as socio-demographic factors. Examples of compositional characteristics of a population in a geographically bounded area include age structure, smoking rate, socio-economic status, and tobacco marketing exposure (Wilcox, 1998). Contextual attributes are properties of a geographically bounded area such as schools, retail stores, or smoke-free policies.

Contextual effects can impact directly both group and individual-level behaviour (e.g. main effect), and they can also indirectly impact or condition the effects of individual-level determinants on individual behaviour (e.g. moderating effect) such as smoking (Wilcox, 1998; Szko & Nieto, 1999). A prospective study illustrated how tobacco marketing possesses both main and moderating effects by reporting that cigarette advertising has both predictive as well as reinforcing effects on children’s intention to smoke in the future (Aitken et al., 1991).

Wilcox (2003) discussed how the variations that have been observed in youth smoking rates across states and communities reflect the importance of contextual factors in explaining youth smoking. Other epidemiological research has shown that there is a persistent, non-random pattern of smoking across communities defined by geographical areas such as rural versus urban and groups defined by compositional variables such as gender, race, education level, income, occupation and marital status (Ross & Taylor, 1998; Ennett et al., 1997; Migliorini & Siahpush, 2006). For example, an Australian study that examined the effect of social environment upon smoking among Australian adults found that using a group measure of SES had a stronger association with the likelihood of smoking than individual level indicators of SES (Siahpush et al., 2003). Furthermore, ecological studies that focus on effects of contextual attributes on smoking behaviour have found the following factors to influence smoking rate: regulations
regarding advertisement (Loomis et al., 2006), taxation of cigarettes (Chaloupka, 2003; Liang et al., 2003; Chaloupka et al., 2002), smoke-free policies at the population level (Nykiforuk et al., 2007), as well as retail outlet density in the school neighbourhood (Novak et al., 2006; Schneider et al., 2005; Leatherdale & Strath, 2007).

The etiology of smoking is best conceptualized as a complex, multi-factorial process, and as such, no single variable is a sufficient cause of smoking. Youth are equipped with a variety of risk and protective factors, but contextual variables such as tobacco marketing can moderate the impact of these factors leading to intention to or experimentation with smoking.

Youth continue to be a strategically important market segment for the tobacco industry. Major governmental reports, internal industry documents and empirical research have unanimously concluded, despite denial of these conclusions, that sophisticated advertising and promotional activities are developed to appeal to young people as evidenced by the important role tobacco promotion and advertising play in their decision to smoke (Lovato et al., 2004; US Department of Health and Human Services, 1994a; Pierce et al., 1991; Pierce et al., 1998; Pollay, 2000b).

The assertion by tobacco companies that all marketing efforts are aimed at retaining brand loyalty of their existing customer base and not youth has been refuted by numerous studies that have provided opposing evidence, which mainly assert that tobacco marketing is in fact deliberately targeting youth (Pollay, 2000a; Pollay, 2007; Cummings et al., 2002; Lavack & Toth, 2006). First, the high rate of quitting and dying due to health concerns and negative health effects means that cigarette sales would decline dramatically were it not for a continuing influx of new starters. The majority of new starters (or potential customers) are youth as this is the stage of life when people are most vulnerable to initiation and experimentation with tobacco use (US Department of Health and Human Services, 1994b). Second, high brand loyalty and
regular tobacco use is primarily established during adolescence as they are known to be three times more sensitive to tobacco advertising than adults and this is a critical time given the addictiveness of tobacco (Aquilino & Lowe, 2004; Pollay et al., 1996). Clearly, youth are an important customer base for the tobacco industry; therefore it is crucial to gain an understanding of tobacco marketing strategies and elucidate its role in adolescent smoking behaviour in order to further enhance tobacco control efforts.

2.2 Tobacco Marketing and Youth Smoking

2.2.1 Role of Advertising and Promotions in Tobacco Marketing

The tobacco industry achieves its ultimate goal of maximizing profit by employing expensive and sophisticated promotional strategies to reach intermediate objectives that aim to affect consumer (current and future) awareness, perceptions, attitudes, opinions, feelings and/or beliefs by affecting an individual’s cognitive, affective and behavioural experiences. The two major purposes of tobacco promotion are (1) the retention of a relationship with existing customers (current smokers) to retain their patronage, and (2) the recruitment of new young customers (potential smokers, e.g. youth) to replace those who are dying, quitting or switching brands (Pollay, 1997; Pollay, 2004b).

In order to understand how tobacco industry marketing practices work, it is important to review marketing principles and understand the theoretical foundation from which they are based. From the point of view of a profit-seeking organization, such as a tobacco company, marketing is the process of planning and executing combinations of four major marketing elements: product, pricing, promotions, and placement. These elements are commonly known as the 4 “Ps” or the “marketing mix.” Each of the four elements serves a slightly different function in achieving the overall purpose of generating maximum sales revenue. Retail PoP falls in the domain of promotional strategies. Promotions, involve disseminating information about a
product, product line, brand or company for the purpose of generating sales increases, new product acceptance, creation of brand equity, competitive retaliations, or creation of a corporate image. Advertising, sales promotions, personal selling, publicity and public relations are all strategies that fall under the umbrella of the promotion element of the marketing mix (Pollay, 2004a; Pollay, 2000a). In Canada, federal and provincial legislations have banned many avenues of tobacco promotion strategies such as personal selling, sponsorship events, media and billboard advertising in an effort to protect or curtail youth exposure as part of a comprehensive tobacco control strategy. In addition to the federal Tobacco Control Act, the policy environment varies between provinces, which partially explains the variation between smoking rates across the country. A comprehensive overview of the federal Tobacco Control Act as well as provincial tobacco legislation relating to tobacco marketing for British Columbia as of 2003 is presented in Appendix A to place this research in context.

### 2.2.2 Retail Point-of-Purchase (PoP) Promotion: Theories & Practice

Currently, retail point-of-purchase (PoP) promotion programs are the tobacco industry's main promotional avenue in countries with a strong tobacco control environment such Canada, Australia and the United States. It is a sophisticated marketing strategy designed to offset the potential beneficial effect of tax increases, marketing restrictions and policies on tobacco advertising (Pollay, 2007; Donovan et al., 2002; Slater et al., 2001; Wakefield & Chaloupka, 2000; Eule et al., 2004). This is evidenced by documented increases of tobacco promotions and advertising in retail stores following implementation of the 1998 Master Settlement Agreement that increased tobacco advertising restrictions in United States (Celebucki & Diskin, 2002; Donovan et al., 2002; Slater et al., 2000b; Slater et al., 2001; Wakefield et al., 2002b; Wakefield et al., 2000; Wakefield & Chaloupka, 2000; Eule et al., 2004). Two U.S. studies showed that tobacco promotion and advertising activities in retail stores were found to be more pervasive in
states with a comprehensive tobacco control program compared to states with less tobacco control programming; thus providing evidence that tobacco companies were compromising the effects of state tobacco control efforts (Slater et al., 2001; Loomis et al., 2006). Studies have also confirmed that tobacco companies are spending the most marketing dollars on retail stores than on any other advertising venue (U.S. Federal Trade Commission, 2005; Feighery et al., 2001; Feighery et al., 2003). Expenditure in this category has been on the rise. The Federal Trade Commission (2005) reported that expenditure on promotional allowance by U.S. tobacco companies totalled $12.72 billion, which accounted for 84.0 percent of all 2003 sales and marketing spending compared to $9.66 billion in 2002. A similar trend is reported in Canada where retail PoP expenditures have steadily increase from $74.2 million in 2001 to $100.1 million in 2005 (Health Canada, 2006). This gradual increase is disconcerting from the youth tobacco prevention perspective as trends of high tobacco industry promotional expenditure has been associated with increased rate of smoking initiation among teenagers (Redmond, 1999).

PoP merchandising displays and signage are a significant medium of sales promotion and advertising used to create better marketing impact by using the retail environment as a channel to communicate the values of a product more effectively. PoP marketing includes signs and displays located in, on, or adjacent to the cash register, or point-of-purchase. Tobacco PoP promotional strategies can be directed at the customer (via the retail environment), and at the distribution channel members (e.g. retailers). For the latter group, the goal is to shape in-store displays of the retail environment. Modes of PoP advertising include, “...banners, displays, posters, easels, shelf signs, streamers, wall units or display cabinets (also known as power walls [to prominently display tobacco products]), window displays and cards, floor stands, dump bins, counter-top units, illuminated signs, cash register tools (e.g. change trays, customer
merchandise dividers, receipt coupons and message imprints), price cards, clocks, “hours open” signage, etc” (Pollay, 2004b).

Great efforts are made by the tobacco companies to encourage retailers to enhance tobacco product displays by using these items. Findings from qualitative studies with tobacco retailers across the U.S. revealed specific promotional strategies that tobacco companies use to influence and shape the retail environment. For example, in order to ensure that retailers utilize PoP materials to create optimal tobacco PoP promotional environment, tobacco companies enter contractual agreements with retailers using a number of methods such as paying “slotting fees” to ensure most prominent placement of their products (e.g. power wall displays). This is evident by AC Nielsen’s report that estimated the average Canadian convenience store receives $1500 in listing allowances for stocking tobacco products (Non-Smokers' Rights Association/Smoking and Health Action Foundation, 2005). Other methods to ensure maximum utilization of PoP materials include: offering discounts, promising inventory buy-backs, providing direct monetary incentives, display materials at or below cost, offering advertising support conditional upon use of merchandising tools and of specific amounts and types of advertising in prime locations in the store (Feighery et al., 2003; Bloom, 2001; Cummings et al., 1991; DiFranza et al., 1999). Prime locations for product and promotional materials are strategically chosen, such as positioning tobacco products where young people are most likely to see them (e.g. next to candy displays) (Cohen et al., 2005).

The retail PoP environment is carefully crafted to achieve four main purposes: (1) to inform the consumer of the presence of the brand, (2) to promote recognition of the brand, (3) to generate positive attitudes and opinions about the brand image, and (4) to stimulate trial purchase and repurchase (Pollay, 2004b). Two psychological theories: routes of persuasion and mere exposure effect, explain how tobacco retail PoP promotions work.
Routes of Persuasion: Persuasive communication theories state that persuasion can occur along either “central” or “peripheral” routes depending on the individual’s motivation and ability to pay attention to the message. Persuasion via the central route occurs when people are motivated to pay attention to the facts and logic in a communication and therefore, actively engage in careful thinking and processing of the explicit and overt content of the communication. Under conditions when individuals are not motivated to pay attention to the facts, they are persuaded by surface characteristics and/or associative cues, such as the model, setting, activity or scenery. These surface characteristics and associative cues implicitly and covertly communicate a message that leads to changes in attitude and behaviour which are independent of any rational reasoning or active cognitive engagement (Aronson et al., 1999). Through the peripheral route, such persuasion devices can be experienced and taken in at a glance, in the simple apprehension of imagery, with its portrayals, tonalities and style as an implicit reminder of the product existence, as in the case with specific tobacco brands (Pollay, 2000b).

Mere Exposure Effect/Friendly Familiarity: A second theory related to promotion and persuasive communication is the “mere exposure effect”. First suggested by Zajonc in 1968, this theory is based on the observation that “mere repeated exposure of the individual to a stimulus (e.g. object or person) is a sufficient condition for the enhancement of his attitude toward it” (Zajonc, 1968). This suggests that simple, un-reinforced, and repeated exposure lead to increased liking for a product, thereby affecting subsequent judgement or behaviour. This positive affection is achieved through the peripheral route or communication, as it does not require conscious awareness or cognitive processing of the attitude toward the object. In advertising terms, this phenomenon is also known as “friendly familiarity” (Goldberg, 2003). Marketing studies have reported that consumers tend to form their preferences on the basis of affective elements, such as liking, feelings, and emotions induced by advertising or familiarity
triggered by mere exposure to advertising (Batra & Ray, 1986; Janiszewski, 1993). These unintentional mere exposure effects encourage the consumer to have a more favourable attitude toward the brand, even when the consumer can not recollect the initial exposure. This is a concern for children and adolescents as the presence of tobacco in retail stores alongside everyday items such as confectionary, soft drinks, and magazines help create a sense of “friendly familiarity” with tobacco products. This familiarity may de-emphasize health consequences, increase perceptions of smoking prevalence and perceived access to tobacco (Wakefield et al., 2006). The two main concepts of these theories, attitudes can change without cognition and mere exposure makes attitudes more favourable, lead to a greater understanding of retail tobacco PoP promotional strategies. The following discussion further elucidates key advertising principles and factors required to maximize the effectiveness of retail PoP promotion programs.

2.2.2.1 Imagery and Branding

The theories of communication persuasion and mere exposure lead to a discussion on brand image establishment through the use of imagery and branding, achieved through transformational or lifestyle advertising. Transformational advertising, a well known advertising technique used by the tobacco industry, is advertising that associates product usage with images, feelings or implicit meanings to suggest the experience of using the product without actually showing the product in use (American Marketing Association, 2006). For example, one brand might be given a marketing personality of ‘independent and masculine’ (e.g. Marlboro), and another ‘adventurous and bold’ (e.g. Export A) (Donovan et al., 2002). Corresponding imagery is then used to advertise those brands. Imagery enables people to take in the advertisements at a glance and register the brand name in association with the experience. It is experienced through the peripheral route of communication since it requires minimal level of cognitive processing.
This type of advertising is common when the products on their own cannot be easily differentiated between brands, as in the case with all Canadian cigarettes. Moreover, imagery is necessary in the case of cigarettes especially, as the addictive nature of nicotine and the negative health consequences of smoking prevents advertising messages to be based on the attributes of the product. The associations between specific brands and their images are further held together by visual branding. Trademark colours, lettering, and graphic design create visual cues which prompt associations that draw diverse elements of a tobacco promotion campaign together.

Once a product or brand personality is established it becomes an emblem of the lifestyle, also called a 'badge product,' that that product or brand represents. This means that by using a brand with a particular image, a smoker can identify his/herself with that same image (Physicians for a Smoke-Free Canada, 2002).

Young people are particularly vulnerable to brand imagery as it contributes to self-identity. A positive association has been established between the most heavily advertised brand in the school neighbourhood and brand choices of teenage smokers. A cross-sectional study in the U.S. examined brand-specific advertising and promotions in convenience stores located in store neighbourhoods and brand preference of teenage smokers. The results revealed that brand share of PoP advertising and promotion for Marlboro in convenience stores is positively associated with teenage smokers choosing Marlboro as their brand of choice (Wakefield et al., 2002b). The impact of brand imagery is also prevalent among non-smokers. Donovan and colleagues (2002) found that 9 out of 10 Australian children in grades 6 and 7 were able to recognize the names of cigarette brands, even though all forms of media advertising except for retail PoP promotions have been banned in Australia since before these children learned to read. Moreover, two experimental studies have shown that cigarette pack displays are an extremely effective communication vehicle to promote brand awareness and recognition (Henriksen et al.,
Repeated exposure to creative uses of imagery tactics such as visual branding on cigarette pack displays or advertisements in the retail environment can increase brand awareness and influence positive attitudes to the brand, thus creating the basis for a brand preference later in life and increasing susceptibility to later experimentation with smoking.

2.2.2.2 Repetition & Consistency

Another tobacco advertising technique to complement transformational advertising specific to retail PoP promotions is the use of “reminder advertising”. Through repetition and consistency, reminder advertising works by “building a comfortable familiarity and attraction toward the advertised brand, even in the total absence of any information within the advert that might provide a rationale for the evoked feelings of trust” (Pollay, 2004b). Using transformational advertising requires repeated exposure to the advertisements, and the advertising message/imagery needs to be consistent in order to strengthen the associated “brand imagery” of the product over time. Mere exposure effects enhance brand imagery; and retail PoP promotional programs in particular, have the benefit of naturally occurring repetition to advertising exposure. Within the retail settings, the unavoidable displays at the point-of-purchase consist of the most fundamental brand identifiers (such as the brand name in a characteristic font, the trade dress colours, or an identifiable symbol like a crest), which naturally contribute to creating brand awareness and enhancing brand imagery. This persistent messaging gives the general impression that tobacco use is desirable, socially acceptable, and prevalent, while at the same time entrenching the image characteristics of particular brands (Dewhirst, 2004).
2.2.2.3 Reach & Frequency

For a promotional program to be effective via mere exposure, it also needs to maximize the reach and frequency, or the proportion of consumers that get exposed to the advertisements, and the number of times that the consumer is exposed to the advertisements, respectively. Retail PoP promotional programs have the natural benefit of a very large reach and a high exposure frequency (Dewhirst, 2004; Pollay, 2004b). Young people are frequent visitors of retail stores, especially in their school neighbourhood. Studies examining frequency of youth exposure to retail PoP promotions has consistently found that approximately 75% of adolescents reported visiting convenience stores at least once a week in the U.K., U.S., and Australia (MacFadyen et al., 2001; Henriksen et al., 2004b; Wakefield et al., 2006). Also, an Australian study reported that students who were experimenting with smoking visited convenience stores more often than non-smokers (Wakefield et al., 2006). The routine exposure to tobacco PoP promotion and advertising in retail stores places young people at a disproportionate risk for tobacco use (Feighery et al., 2001; Terry-McElrath et al., 2002).

Retail stores are now the primary communication channel between tobacco companies and youth (Dewhirst, 2004). The retail environment exerts a unique influence in promoting smoking as a desirable social norm. Specifically, it serves many traditional advertising functions together in one context including brand promotion, creating positive brand image, and encouraging maintenance or reuptake of daily smoking (Pollay, 2007). Moreover, PoP promotion plays a central role in stimulating impulse purchases. Research has shown that 70 percent of all purchases occur at the cashier check-out or PoP (Pollay, 2004b). Despite legislation against selling tobacco products to minors, 48% of Canadian youth between 15-18 years that identified themselves as current smokers said they purchase cigarettes on their own
from a retail source, including one-third who said they purchased them from a small
grocery/corner store (Health Canada, 2004).

2.2.3. Effects of tobacco PoP on Youth Smoking

The result of pervasive and persistent cigarette merchandising and advertising in retail
environments is that consumers are immersed in an environment that is dense with cigarette
advertising imagery. Each individual is likely to be exposed on a frequent and regular basis to
all of the common types of cigarette messages, whether they are images of independence, social
approval, pictures of health and other implied health reassurances. Moreover, the repeated and
consistent exposure to tobacco PoP advertising has the effect of altering product use perception,
thus shaping behaviour (Pechmann & Knight, 2002). The norm is created where tobacco use is
desirable, socially acceptable and prevalent, especially to children raised in a heavily
commercialized environment (Henriksen et al., 2002). In an Ontario descriptive study of 480
retail stores, all stores had power wall displays with 72% of power walls being at least 6 feet
long, 58% of stores had at least one cigarette counter-top displays, and 85% of stores contained
tobacco accessories located within one foot of candy, snack foods or toys (Cohen et al., 2005).
Given this saturation, it is virtually impossible for young shoppers to avoid exposure to pro-
smoking messages when buying their snacks, food, beverages, or gasoline.

The majority of the published research on retail PoP promotion focuses on describing the
prevalence and identifying types of tobacco PoP activities in the retail environment.
Comparatively little is known about the effects of retail tobacco PoP promotion and advertising
on youth smoking behaviour.

Two studies were found that examined the effect of exposure to retail tobacco
advertising on proximal outcome factors of youth smoking including perceptions, beliefs and
attitudes about smoking. The first study to demonstrate that retail tobacco advertising can
Literature Review

contribute to an environment that encourages pro-smoking attitudes among youth utilized an experimental design to examine whether manipulating exposure to retail tobacco advertising affected adolescents’ perceptions and attitude about tobacco use (Henriksen et al., 2002). This U.S. study found that after controlling for susceptibility to smoking, grade 8 and 9 students exposed to pictures of tobacco-saturated stores perceived significantly easier access to cigarettes, believed more peers tried and approved of smoking, and expressed weaker support for tobacco control policies than did a comparison group that was exposed to a tobacco-free store. Since it is unlikely that neighbourhood retail stores are devoid of tobacco advertising, the authors used manipulation checks (e.g. unaided recall, cued recall and perceived exposure) before, during, and after the photographs of retail stores were shown to ensure veracity of responses in the control group.

A second experimental study (Wakefield et al., 2006) conducted in Australia used a similar protocol as the study by Henriksen et al. This study compared the effect of different types of advertising on students’ smoking related perceptions, beliefs and intentions. The groups were exposed to cigarette packing displays only, or cigarette advertising including pack displays, or no tobacco advertising at PoP Three conditions were used instead of two because tobacco advertisements in retail stores are prohibited in Australia, but pack displays are still permissible. Outcome variables included perceived ease of access to cigarettes, perceived smoking prevalence, popularity of brands and smoking approval among peers, as well as perceived harm related to smoking. Control variables included susceptibility to smoking, sex, and peer and family exposure to smoking. Students in grade nine from five schools located in both high and low income neighbourhoods were surveyed. The majority of findings were consistent with the U.S. study in that students exposed to photographs of tobacco advertising-saturated stores perceived easier access and higher smoking prevalence. Moreover, students who saw the
cigarette advertising condition were more likely to consider smoking one or two cigarettes occasionally as less dangerous and expressed future intention to smoke than their counterparts. While these two studies used a controlled experimental condition to delineate the specific effects of tobacco PoP advertising, having an artificial stimulus to model retail tobacco PoP exposure, and small sample sizes (five schools in each country) limit the generalisability of the study result to real world conditions. Furthermore, inferences to the impact of retail tobacco PoP exposure to smoking behaviour cannot be drawn.

Three studies were found that examined the impact of retail tobacco marketing on adolescent smoking behaviour. The first study surveyed grade seven students in low socio-economic and ethnically diverse neighbourhoods in California to determine the effect of perceived exposure to cigarette marketing on smoking behaviour defined as experimentation with smoking (Schooler et al., 1996). The study found that experimenters were more likely than non-experimenters to report exposure to tobacco marketing in stores. Moreover, seeing tobacco marketing in stores increased the likelihood of experimenting with cigarette smoking by 38%, even after controlling for exposure to family and peer smoking. Since the study was conducted prior to the 1998 MSA Settlement, several avenues of exposure to cigarette marketing including mass media, billboard ads, retail stores and tobacco promotions (direct mailing, sponsorship events) were investigated. The results pertaining to retail exposure need to be interpreted with caution as it is hard to differentiate whether exposure to retail marketing effects on smoking experimentation is confounded by their exposure to other marketing avenues available at the time when the study was conducted because tobacco marketing strategies work synergistically. Also, since cigarette advertising is more noticeable to experimenters than to abstinent youth, the finding may be attributable to perceived exposure alone and not actual exposure.
The second is a cross-sectional study that examined whether actual exposure to stores that contain widespread tobacco marketing is associated with smoking behaviour of adolescents in grades 6-8 in California (Henriksen et al., 2004b). After controlling for known confounders including risk taking, maternal supervision and self-reported grades, the study found weekly or more frequent exposures to retail tobacco marketing was associated with a 50% increase in the odds of ever smoking (even just a puff). Relative to other forms of tobacco marketing (owning a promotional item and seeing smoking in movies), exposure to retail PoP marketing was second only to owning a cigarette promotional item in increasing the odds of smoking. The survey employed in this study included photographs and addresses of 12 retail tobacco outlets in the school neighbourhood that have been previously identified by student focus groups as popular student destinations and obtained information on frequency of exposure to these 12 stores as well as question on frequency of visits to convenience, liquor or small grocery stores in general. This study however, did not collect data on the type and amount of retail tobacco marketing present in the neighbourhood retail stores, therefore one cannot draw inferences on whether dose-response relationship exist between amount of retail PoP and smoking behaviour.

The third study (Slater et al., 2007) was a large scale 5-year observational study conducted in the U.S. that examined the differential associations of cigarette retail marketing practices on progression of youth smoking uptake from 1999 to 2003. The smoking uptake measure accounted for six progressive stages: never smoker, puffer, non-recent experimenter, former established smoker, recent experimenter, and current established smoker. The sample consisted of outcome data on 26,301 grades 8, 10 and 12 students collected using annual surveys administered nationally. The retail tobacco marketing data were also collected annually by conducting observations in retail stores in the 966 communities around the schools where student samples were drawn. School community was defined as the area from which a school
literature review draws its student population. 17476 store observations were made in the 5-year sample. Up to 30 retail outlets were observed per community, random selections were used in dense communities that had more than 30 retail stores. Trained data collectors conducted unobtrusive in-store observations and recorded the information on tobacco product placement, the extent of related advertising and promotions, and tobacco prices on a data collection form upon exiting the stores. Data were weighted and controlled for demographic and socioeconomic characteristics at the community level to calculate odds ratios and confidence intervals using generalized ordered logit analyses. The study found that higher levels of advertising increased the likelihood of youth initiating smoking, price increased the likelihood of smoking at most levels of uptake, and availability of promotions increased the likelihood that youth will move from experimentation to regular smoking. In contrast with previous studies, this study used objectively measured data on tobacco marketing to assess exposure, however, the frequency or extent of exposure to retail tobacco marketing is unknown from the students’ perspective which would have strengthen the findings of this study. Furthermore, details regarding advertising content were not captured and the extent of promotions were captured at one point in time, therefore the functionalities of different retail tobacco marketing strategies could not be analysed at a finer level. However, this is one of the most rigorous studies conducted in this research topic area, and the findings show that the mere presence of retail tobacco marketing in school communities significantly influences student smoking behaviour after controlling for known individual and social determinants.

Consistent with other research on effects of exposure to outdoor tobacco marketing strategies (e.g. billboards, posters, bus banners, retail stores), questions regarding frequency of (perceived) exposure are generally limited to the adolescents’ immediate social environment operationalised as the school neighbourhood. The school neighbourhood is widely accepted as
the social environment where students spend a significant proportion of their time engaging in daily activities; both travelling to and from school, as well as before, during and after school hours. To fully understand how retail tobacco PoP promotion programs impact youth behaviour, it is important to discuss the knowledge to-date on the role school neighbourhood environment plays in the context of youth smoking and how tobacco marketing strategies mediate that relationship.

2.3 Tobacco Marketing and the School Neighbourhood Environment

There is empirical evidence that the school neighbourhood is an important context when it comes to understanding youth smoking in particular with respect to retail PoP marketing. The influence of the school neighbourhood environment in determining the distribution of health outcomes and behaviours has been widely researched across several disciplines including social and behavioural sciences, epidemiology and geography (Diez-Roux, 2001; Luginaah et al., 2001; Birch et al., 2005; Eyles, 2006). Understanding the role of neighbourhood environments on health or behavioural outcomes is important as neighbourhoods are where individuals encounter social structure, live out the life course, and interchange with many of the people who will have profound influences on their life choices (Frohlich et al., 2002a). Wilcox (1998) for example, examined cross-school differences in rates of substance use, including smoking, to hint at the effects of school context. Further, the study of cigarette, alcohol and marijuana use across 36 schools by Ennett et al. (1997) examined both school-level influences and neighbourhood influences. They found that some of the variations in life-time cigarette use across schools in the U.S. were accounted for by neighbourhood characteristics. More specifically, they found that smoking rates were higher in schools located in low density neighbourhoods where parents reported greater neighbourhood attachments. A Canadian study found that store density in
school neighbourhoods is related to cigarette access behaviour among high school students (Leatherdale & Strath, 2007).

The literature has demonstrated that contextual factors in the neighbourhood community influence how tobacco companies tailor their marketing strategies to reach their target customers. For example, studies by Chaloupka and the ImpacTeen research group (Chaloupka, 2003; Harwood et al., 2003; Slater et al., 2000b; Terry-McElrath et al., 2002; Wakefield et al., 2002b), and Henriksen and colleagues (2004a) on tobacco PoP environments all concluded that retail stores more frequented by adolescents contain increased levels of tobacco marketing activities compared to stores less frequented by adolescents in the same community. Others studies concluded that tobacco advertisements were found to be more prevalent in stores located near schools, and in lower income communities (Schneider et al., 2005; Wildey et al., 1992; Laws et al., 2002a; Barovich et al., 1991). This suggests that ecological factors may help explain the distribution of retail tobacco PoP activities and thereby modify the effect of retail tobacco PoP programs and adolescent smoking.

2.4 Summary

The review revealed that tobacco companies continue to market towards adolescents and have now targeted efforts in the retail environment as a result of the policy climate. Research on retail tobacco PoP marketing however is limited. A gap in knowledge exists on the prevalence of retail tobacco PoP activities in school neighbourhoods and their impact on adolescent smoking behaviour, especially in the Canadian context and more specifically in British Columbia. Furthermore, research-to-date has established that tobacco marketing practices differ by some neighbourhood socio-demographic characteristics such as income level. However, whether the level of tobacco promotion and advertising in the retail environment differs by school neighbourhood characteristics have yet to be established. Therefore, as a first step in the
research process and to contribute to the understanding of tobacco marketing practices, an exploratory descriptive study is needed to document the prevalence of retail tobacco PoP activities in the school neighbourhood environment and evaluate the association with youth smoking behaviour.
CHAPTER 3 – METHODS

3.0 Research Questions

The purpose of this exploratory descriptive study was to examine the relationship between retail tobacco point-of-purchase activities and adolescent smoking behaviour in school neighbourhoods. This cross-sectional study involves a secondary data analysis from the British Columbia sub-sample of the Project Impact study to address the following three research questions:

1. What is the prevalence of tobacco PoP activities in retail stores in school neighbourhoods in British Columbia?
2. What is the association between PoP activities in retail stores located within school neighbourhoods and student smoking behaviour in British Columbia?
3. What ecological factors moderate the relationship between PoP activities and student smoking behaviour in British Columbia?

Chapter Three provides an overview and discussion of the methods used including data sources, data collection, and study variables. The chapter concludes with a description of the analytic approach describing the data linkage, statistical analyses and map generation that were performed.

3.1 Data Source

3.1.1 Project Impact: Youth and Tobacco Overview

The primary data source for this study is from a Canadian Institute of Health Research (CIHR) funded study, Project Impact: Youth and Tobacco, led by Dr. Chris Lovato and a multidisciplinary team of researchers. Project Impact is an observational study that aimed to determine the relationship between adolescent tobacco use and tobacco control strategies.
including policies, programs, and other community factors. The study was conducted in the 2004 school year in 5 provinces (Ontario, Manitoba, Prince Edward Island, Quebec and British Columbia).

### 3.1.1.1 Sampling Framework and Method

Eligibility criteria included high schools with grades 10 and 11 students that are located in municipalities with populations greater than 10,000. Vancouver, Toronto and Montreal were excluded as these major cities are culturally unique and significantly larger and denser than average Canadian municipalities thus would likely bias the results. This exclusion criteria therefore increased the study’s internal validity and was also a measure to ensure that results could be generalisable to the average Canadian municipalities. In addition, municipalities in close proximity to these three major cities (including Burnaby, BC; Richmond, BC; Brampton, ON; Mississauga, ON; Montreal Island, QC) were excluded since they were considered to be continuations of suburban neighbourhoods and/or lacked their own downtown core. For feasibility reasons, private schools, special religious schools and charter schools were also ineligible.

The target population for this study is BC; therefore the sampling framework and recruitment outcomes for the BC sample for Project Impact are described here. Cluster random sampling was employed to select a random sample of secondary school districts, from which a list of schools was selected at random for recruitment. A sampling frame consisting of information about each eligible region/municipality provided the framework for randomly sampling school district groups and schools. Within eligible municipalities, school districts were grouped together based on their health region’s smoking rate provided by the 2001 Canadian Community Health Survey (Cycle 1.1). The school districts were grouped in such a way to ensure all municipalities in the same group were located in the same health district and hence,
the same smoking rate. Six groups of school districts in BC were randomly sampled that were proportional to the required sample size of secondary schools (N=24). Within the randomly selected groups of school districts, project staff listed and enumerated all eligible secondary schools. Secondary schools from each school district group were then randomly selected and given a number, the first four randomly selected schools formed a school district group. Additional school district groups were also randomly selected to form a substitute list of groups. In the event that a group refused to participate, a back up group was selected from the substitute list by matching smoking rates. This criteria for group and school substitution were created by project staff and approved by an investigator with sampling expertise prior to start of recruitment.

3.1.1.2 Recruitment Outcomes

District and school recruitment for the project began in early November 2003. Sixteen school districts were approached in BC, with 10 districts agreeing and 6 districts refusing to participate for a response rate of 62.5%. The majority of the districts cited already participating in other tobacco research (i.e., BC Youth Survey on Smoking) and/or being too busy to participate as reasons for refusal.

Twenty-eight schools were approached, with 22 schools agreeing and 6 schools refusing to participate resulting in a 78.6% response rate. Reasons for school refusals included being too busy to participate, being over researched and staff burden/teacher issues. One school was ineligible to participate as it was an adult education school and should not have been sampled in the first place.

A total of two district and six school substitutions were made. As a consequence of the substitution principles, 22 instead of 24 schools were successfully recruited in BC (Lovato, 2004).
3.1.2 Data Collection Instruments and Protocols

Student, store and regional socio-demographic data were provided from the Project Impact study. The data collection protocol and psychometric properties of each instrument are described in the following section.

3.1.2.1 Student data

Student level data was collected using the Tobacco module of the School Health Action, Planning and Evaluation System (SHAPES), a paper-and-pencil self-administered survey. At the time of project implementation, this survey was referred to as the School Smoking Profile (SSP). For consistency purposes, this survey will be referred hereafter as SHAPES (Appendix B). The surveys were administered by teachers to all grade 10 and 11 students with parental permission obtained through passive consent. Teacher instructions, consent forms, and SHAPES surveys were delivered to the schools prior to data collection. Two data collectors were present on the day of data collection to facilitate survey administration, answer questions and collect returned survey packages from participating classes.

The Tobacco module of SHAPES was developed and validated in earlier research (Cameron et al., 2002b) that aimed to have a standard set of measures for monitoring tobacco use. This four-page 46-item multiple choice survey is machine-readable and covers several domains: demographics, smoking status, circumstances of smoking, smoking cessation, access to cigarettes, environmental tobacco smoke exposure, school policy and enforcement, and tobacco related knowledge, attitudes and perceptions. With few exceptions, SHAPES items demonstrated solid test-retest reliability. Overall, SHAPES item Kappa coefficients are similar to those observed with tobacco items in CDC's Youth Risk Behavior Surveillance System, which had a mean kappa of 68.8% (Brener et al., 2002).
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### 3.1.2.2 Store Data

The objective of the store observations was to determine the prevalence of tobacco point-of-purchase activities in the retail environment (e.g. pro- and anti-tobacco PoP activities) and the density of retail stores in the 1 kilometre area surrounding the school. The store observation instrument and protocol was adapted from the *ImpacTeen* project at the University of Illinois, Chicago (Chaloupka & Wechsler, 1997; Slater et al., 2007). The original instrument includes items related to tobacco, beer, and malt liquor, of which only the tobacco-related items were used in this study. Refinement of the instrument and adaptation of the protocol for the Canadian context have been previously completed through other Canadian studies (Kawash & Brown, 2002). The final instrument was a five page questionnaire that included 20 items measuring characteristics of the store and items related to tobacco PoP activities including tobacco promotions, advertisements, tobacco industry endorsement, product display, tobacco branding, and tobacco control warning signs (Appendix C). Inter-rater reliability has been demonstrated in the original *ImpacTeen* study, with most of the observation items resulting in 70 to 100% agreement between 4 teams of observers (Myllyuoma, 2003). In the *Project Impact* study, each province was asked to submit pairs of store observations that had been completed independently by all data collectors in training sessions prior to official data collection and feedback was provided by research coordinators in order to improve consistency within and across provinces.

Unobtrusive observations were made at all tobacco retail stores located in the “school neighbourhood”, operationally defined as the one kilometre radius around each participating school. The area was determined to be both representative of an area a student might reasonably walk from the school during the day (e.g. during lunch period), and practical for data collection purposes. Figure 3.1 is a map of a school neighbourhood to demonstrate enumeration of tobacco
store density in the school neighbourhood and the different types of retail stores that sell tobacco products.

All observations were completed by a data collection team consisting of one lead and one assistant data collector. A training workshop led by study research coordinators was held at the University of Waterloo. Data collectors were trained in a full-day workshop through presentation of tobacco products and types of retail pro- and anti-tobacco PoP activities. The training protocol included an extensive review of the instrument as well as an additional half-day field practice in retail stores. A data collection manual was provided to the data collection team to use in the field for clarification needs. Data collectors were instructed to drive all the streets within the school neighbourhood area by following a previously defined route map of the one-kilometre radius and enumerate all tobacco retailers present. Following the counts, the data collection team entered each store and acted as customers by looking around and purchasing a small item ($1 or less). The store observation forms were completed after they left the store. Data collectors completed the store observation forms independently and, in the event of a disagreement, they returned to the store to verify the observation. In this way the two person data collection team served as a reliability check. In the event that the store clerk inquired what they were doing, the data collectors explained the purpose of their visit and provided a letter summarizing the project. In only one case was a data collection team queried by a store clerk, who subsequently allowed the data collectors to complete their store observations.
Figure 3.1 Enumeration of tobacco retail stores by store type in school neighbourhood

Methods
3.1.2.3 **Regional Socio-demographic Data**

Selected socio-demographic characteristics of the municipalities were accessed from 2001 Canadian census data to describe the community context of the school neighbourhood. The dataset was selected because the data collection cycle matched most closely with that of the Project Impact study, which occurred in 2003-2004. Access to the data file was granted through the University of British Columbia data library.

The 2001 Canadian Census was accessed for socio-demographic data on each school neighbourhood’s population size, immigrant population, employment rate, median household income and education level. These variables were selected based on the literature review which suggested them to be determinants of smoking behaviour. These variables are also commonly used to describe the neighbourhood. Data for the census variables were extracted at the dissemination area (DA) level. The DA is a small, relatively stable geographic area composed of one of more neighbouring blocks with a population of 400-700 persons (Statistics Canada, 2003).

3.2 **Study Variables**

As described in the literature review, youth smoking determinants can be grouped into three sources of influence: individual, social and environmental/contextual. This study focuses on the impact of environmental/contextual determinants on youth tobacco use such as retail pro- and anti-tobacco point-of-purchase (PoP) activities, socio-demographic, and physical characteristics of school neighbourhoods. Descriptions of study variables are presented below.

3.2.1 **Outcome (Dependent) Variable**

*Student smoking status* is a dichotomous variable, where each individual student is assigned to a smoker or non-smoker status. The operational definition of a smoker is an individual who had smoked at least a few puffs of a cigarette on 1 or more days in the last 30 days. Three items
from SHAPES were used to construct this variable: (1) Have you ever smoked 100 or more cigarettes in your life? (2) Think about the last 30 days, did you smoke a cigarette, even just a puff?” and (3) “Think about the last 30 days. On the days that you smoked, how many cigarettes did you usually smoke?” Each of the three items were coded into a binary response (0,1) from multiple response options. A student was assigned “0” if they answered “I have never smoked”, “Not at all”, or “I did not smoke at all” for the three items respectively; all other responses were coded as “1”. The binary responses were then added together to obtain a summary score. A student was coded as a smoker=1 if the summary score was 3 and a non-smoker=0 if the summary score was less than 3. This outcome variable was selected to be inclusive of varying smoking uptake stages and captured both experimental and established smokers.

3.2.1.1 Mapping Variables

School smoking prevalence and median school smoking prevalence were computed using student level data for descriptive and mapping purposes.

*School smoking prevalence* is a continuous variable constructed using the “smoking status” variable. It was calculated by adding the number of smokers at each school divided by the total number of student participants at the school.

*Median school smoking prevalence* was computed using the “school smoking prevalence” variable and was used to divide the schools into high and low smoking prevalence groups. The median school smoking prevalence for the study sample was 13.80%.

3.2.2 Explanatory (Independent) Variables

The explanatory variables used in this study were arranged into two groups: retail tobacco PoP activities that described the pro- and anti-tobacco marketing activities in the retail environment, and ecological factors to give context to and describe the school neighbourhood environment.
Types of retail tobacco PoP activities and ecological factors associated with youth smoking behaviour were identified through the review of the literature.

**Store Density**: Some literature on tobacco outlet density have found an association between retail tobacco availability and smoking behaviour (Pokorny et al., 2003), as well as increased tobacco store density in lower SES and higher smoking neighbourhoods (Novak et al., 2006; Leatherdale & Strath, 2007). Store density is the total number of tobacco retail stores located in a school neighbourhood, enumerated by the data collection team within a one-kilometre radius around each school as described in section 3.1. Bars and other adult-only establishments that sell tobacco products are not included in the enumeration of tobacco retailers as the target sample is minors in grades 10 and 11 who are not permitted to enter adult establishments by law.

This variable was also used as the denominator to calculate proportions of retail tobacco PoP activities present in a school neighbourhood for each store variable to allow for comparison across school neighbourhoods. Thus, each tobacco PoP variable is defined as the proportion of stores in each school neighbourhood with presence of a given type of tobacco PoP activity. For example, 70% of the total retail stores in a school neighbourhood with tobacco advertising indicate that a student visiting a neighbourhood retail store would be in a store with tobacco advertisement seven out of ten times.

**3.2.2.1 Retail Tobacco Point-of-Purchase Activities**

At the point-of-purchase, both pro- and anti-tobacco marketing variables were used to describe the overall retail tobacco PoP environment. Five measures captured pro-tobacco PoP activities: (1) tobacco advertising, (2) visible display of cigarettes, (3) purpose-built display (PBD) cabinets, (4) in-store promotions, and (5) tobacco branding. A summary score, PoP Index, was created to index the amount of pro-tobacco PoP activities that were present in retail stores based
on the five measures listed above. Anti-tobacco PoP activity was measured using one variable: tobacco control signage.

### Pro-tobacco PoP Variables

Tobacco marketing is a strong risk factor for increasing smoking intention and experimentation. This positive association has been documented across cultural settings and populations using different research designs and methodologies. In a recent review article, DiFranza & colleagues (2006) supported evidence for a causal relationship between all tobacco marketing activities and adolescent smoking behaviour using the Bradford-Hill epidemiologic criteria for determining causality. The pro-tobacco PoP variables described below are hypothesized to have a positive association with smoking behaviour.

**Tobacco advertising:** The operational definition of tobacco advertising is defined as *any activity or [signage] display to promote and sell tobacco products, including any specific or general message relating to the sale of any tobacco product or brand of product. Specific advertising includes any signage materials that contain a brand logo or use brand colours to attract attention to a particular brand (e.g., sign, notice, fixture, fitting or accessories that makes reference to tobacco). General advertising refers to two-dimensional signs advertising the general price of cigarettes, or that the store sells cigarettes. Tobacco sponsored shelving/cabinet or Plexiglas displays are not included in this definition* (Lovato, 2004). This is a dichotomous variable used to describe the presence and absence of either exterior or interior tobacco advertisements in the retail stores. Two dichotomous variables were first constructed, one for presence/absence of external advertising, and one for presence/absence of interior advertising. A retail store was considered to have tobacco advertising if it has either exterior or interior advertising present. The stores with tobacco advertising were then summed and divided by store density resulting in the proportion of stores in the school neighbourhood having tobacco.
Methods

advertisements. This value represented the probability that a student would be exposed to advertisements when visiting a retail store in their school neighbourhood.

Visible Display of Cigarettes: Continuous exposures to cigarette displays have been posited to increase positive attitude towards smoking (Wakefield et al., 2006). This variable measured the visibility of the display of cigarette packages at the point-of-purchase in retail stores. Using the question for placement of cigarettes from the store observation form, a dichotomous code of presence=1 was given if the response indicated that cigarette packs were placed “over or behind counter”, “behind special customer service desk”, at “general check-out”, “tobacco-only counters” or in “plexiglas display”. A code of absence = 0 was given if the response indicated that cigarette packs were located “under any counter, not visible” or in a “locked or closed cabinet”. The stores with visible cigarette displays were then summed and divided by store density resulting in the proportion of stores in the school neighbourhood that have cigarettes visibly displayed. This value represents the probability that a student would be exposed to a visible display of cigarette products when visiting a retail store in his/her school neighbourhood.

Purpose-built display (PBD) Cabinets: There is evidence from qualitative research and internal industry documents on tobacco industry efforts to ensure prime placement of tobacco products to attract attention through offering shelving units or cabinets that enhance the display of tobacco products and packaging (Feighery et al., 2001; Feighery et al., 1999; Bloom, 2001). 

PBD Cabinets is a dichotomous variable that measured whether the shelving units were purposely built for enhancing the display of tobacco products through presence = 1 or absence = 0 of brand colours or logos on the shelving unit. This variable was operationally defined as any colour or branding enhancements that were present on shelving for displays of tobacco products. The stores with PBD cabinets were then summed and divided by store density resulting in the proportion of stores in the school neighbourhood that have shelving displays endorsed by the
tobacco industry. This value represented the probability that a student would be exposed to an enhanced display of tobacco products on industry-endorsed cabinets when visiting a retail store in his/her school neighbourhood.

**In-store Promotions:** In-store promotional activities consist of a variety of techniques used to lure or attract people to purchase tobacco products. Increased availability of cigarette promotions has been found to be associated with smoking uptake among youth (Slater et al., 2007; Lovato et al., 2007). These techniques include: “multi-pack discounts” that may be noted as “two for the price of one” signs in the retail store; “special price offers”; “bonus offers” such as offering a bonus loose tobacco tin with purchase of other tobacco products. A dichotomous variable was created to capture presence = 1 or absence = 0 of any type of tobacco promotional activities listed above. The stores with any in-store promotional activities were then summed and divided by store density to determine the proportion of stores in the school neighbourhood that have in-store promotions. This value represents the probability that a student would be exposed to any tobacco promotions when visiting a retail store in his/her school neighbourhood.

**Tobacco Branding:** The number of branded items in a store or on a store property can be an indication of how cooperative the financial arrangements are between the industry and the store. Moreover, increased brand presence in the retail PoP environment has been associated with preferred brand choice by teenage smokers (Wakefield et al., 2002b). The owners are sometimes paid to have and display branded functional objects (Bloom, 2001). Students can recognize logos and colours and relate them to tobacco whether they are used directly with tobacco products or other products (Lovato, 2004). A dichotomous variable was created indicating presence = 1 or absence = 0 of tobacco branding using logos or colour schemes (e.g. du Maurier is red and silver, Players is blue and white) on any of the following functional items: pens, clocks, lighters/matches, and signage. This excludes branding of shelving units, which was
measured by the tobacco industry endorsement variable. The stores with any tobacco branding were then summed and divided by store density resulting in the proportion of stores in the school neighbourhood that had tobacco branding on functional objects. This value represents the probability that a student would be exposed to tobacco branding when visiting a retail store in their school neighbourhood.

**PoP Index:** In this study, five pro-tobacco PoP activities were measured to represent distinct industry marketing activities present in the retail environment: tobacco advertising, visible cigarette display, PBD cabinets, in-store promotions, and tobacco branding. A summary index was created to capture the extent of pro-tobacco PoP activities that were present in the retail stores to represent overall tobacco marketing presence. PoP Index is a scale that can have a score range from zero to five; zero meaning no pro-tobacco PoP activity was present and a score of five denotes maximum pro-tobacco PoP activities were present. To ensure comparability across the sample, all the PoP Indices for stores located in the school neighbourhood were summed and divided by the store density resulting in the average number of PoP activities (mean PoP Index) in the retail stores of the school neighbourhood. This index measure was used for descriptive purposes; theoretical and statistical properties of this measure have not been explored and do not fall within the scope of this study.

**Median PoP Index** was computed using the “median PoP Index” and was used to dichotomize the schools measuring high and low levels of PoP. This median-split method was used examining interactions between pro-tobacco PoP activities and socio-demographic factors on adolescent smoking behaviour.

**Anti-tobacco PoP Variable**

Literature on anti-tobacco PoP activities are scarce. Lovato et al (2007) reported increased government-sponsored health warning signs posted in stores located in school neighbourhoods
that had low school smoking prevalence compared to schools with high smoking prevalence using the full five-province store sample from the Project Impact study. If tobacco marketing is a risk factor for adolescent smoking, anti-tobacco promotion should theoretically have protective effects. A negative relationship between tobacco control signage and smoking behaviour is therefore hypothesized and explored in this study.

**Tobacco Control Signage:** Canadian federal law requires every retailer to post at least one of three types of retail signage: (i) that selling or giving a tobacco product to a young person is prohibited, (ii) the penalties for underage purchase, or (iii) that contains a prescribed health message. This does not include health warnings displayed on tobacco products. The BC government further regulates the specific size, place and manner the warning signs are to be placed in retail stores (see Appendix A for provincial legislations in BC). The majority of retailers display government-sponsored signage due to enforced regulations and local tobacco control efforts (e.g. tobacco enforcement officers) on increasing retailer compliance for refusing to sell cigarettes to minors. Some stores also display store-made signage. A dichotomous variable was created to measure the presence =1 or absence = 0 of government or store-sponsored tobacco control signage displayed at the point-of-purchase. Stores with any tobacco control signage were then summed and divided by store density resulting in the proportion of stores in the school neighbourhood that display tobacco control signs. This value represents the probability that a student would be exposed to tobacco control signage when visiting a retail store in his/her school neighbourhood.

3.2.2.2 Ecological Factors

The second grouping of variables was a list of ecological factors selected to describe the compositional attributes or socio-demographic characteristics of the school neighbourhood, as well as the contextual attribute, or physical environment of the school neighbourhood.
variables have previously been shown to be associated with smoking behaviour and some have been associated with tobacco marketing. They include: median household income, education level, unemployment rate, immigrant population and island/mainland. Descriptions of the variables are presented below:

**Median Household Income:** It is well established that low socio-economic status (SES), measured at the individual as well as group level are associated with higher smoking rates (Diez Roux et al., 2003; Birch et al., 2005) and these neighbourhoods are targeted by tobacco marketing activities (Slater et al., 2000b; Barbeau et al., 2004). Median household income is a common proxy indicator for SES and was used in this study to represent affluence of the school neighbourhood.

**Education level:** Education level is another common indicator for SES. People with lower level of education completed have been associated with higher smoking rates. This variable was constructed by totalling those reporting less than grade-nine education achieved divided by sum of all education achievements. It represents the proportion of people in the school neighbourhood with the lowest level of education.

**Unemployment rate:** Cigarette smoking is highly associated with unemployment. This is a continuous variable and was chosen to represent the unemployed labour force of the school neighbourhood. A positive association is hypothesized for unemployment rate and student smoking.

**Immigrant population:** Research on immigrant status and smoking behaviour have reported negative associations with the strength of association depending on country of origin (Baluja et al., 2003). Recent immigrant youth in Canada and U.S. report less tobacco use than North American-born youth (Georgiades et al., 2006). However, the difference decreases as immigrant youth become assimilated into North American culture (Lock Kunz & Hanvey, 2000).
Immigrant population is a continuous variable that represented the proportion of people in the school neighbourhood who are or who have ever been landed immigrants. Landed immigrants are people who have been permitted by immigration authorities to live in Canada permanently.

Median-split technique was used for each of the four socio-demographic factors to dichotomize the variables into high and low levels for purpose of examining interaction effect with high and low levels of PoP on adolescent smoking status. Table 3.1 presents the median statistic and grouping rule for each dichotomised variable.

### Table 3.1 Median and sample size for high and low levels of socio-demographic factors

<table>
<thead>
<tr>
<th>Variable Name</th>
<th>Median</th>
<th>High (1)</th>
<th>N (%)</th>
<th>Low (0)</th>
<th>N (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Immigrant population (%)</td>
<td>17.60</td>
<td>&gt; 17.60</td>
<td>2654</td>
<td>≤ 17.60</td>
<td>1715</td>
</tr>
<tr>
<td>Unemployment rate</td>
<td>7.48</td>
<td>&gt; 7.48</td>
<td>2532</td>
<td>≤ 7.48</td>
<td>1837</td>
</tr>
<tr>
<td>Education Level (&lt;gr.9) (%)</td>
<td>6.01</td>
<td>&gt; 6.01</td>
<td>1615</td>
<td>≤ 6.01</td>
<td>2754</td>
</tr>
<tr>
<td>Median Household Income ($)</td>
<td>50690.68</td>
<td>&gt; 50690.68</td>
<td>1552</td>
<td>≤ 50690.68</td>
<td>2817</td>
</tr>
</tbody>
</table>

**Island/Mainland:** The sample of schools in this study is located on either Vancouver Island or the lower mainland of BC. The two geographic locations have different physical attributes and may dictate different lifestyles and cultural norms. For example, rhythm of life may be slower on the island compared to the mainland and attitude towards smoking may differ between island and mainland residents. Studies have documented smoking norms and culture may differ by
contextual factors such as geographical location (Ross & Taylor, 1998). Island/Mainland is a dichotomous variable specifying whether schools are located on Vancouver Island (1) or the lower mainland (0).

3.3 Data Linkage

Contextual influence such as presence of and exposure to tobacco marketing can have individual as well as ecological effects at the student and school level respectively. The main unit of analysis for this study was at the student level as the purpose of the research was to examine adolescent smoking behaviour. A school level dataset was created for descriptive and mapping purposes to better understand retail tobacco PoP activities in the school neighbourhood context.

Original data files at the student, store and regional (dissemination area) levels were first cleaned to become familiar with the data and reformatted to enable data linkage. Two linked data files were created for statistical analyses to be conducted at the student level and at the school level. A school ID was used as the common unique identifier to link the student and school files at each level of analysis using SPSS.

The store observation data were aggregated to the school level. The mean score was calculated for each variable by summing the store variables and dividing by the total number of stores per school neighbourhood (store density). The school-level store data were then merged with the student data file at the student level.

As required by Statistics Canada, the census data was downloaded using Beyond 2020 Viewer. Through manual review and selection, the four variables previously identified for analysis were extracted for the municipalities in which the participating schools were located at the DA level. The cleaned data set was exported into SPSS in preparation for data linkage and into Microsoft Excel to import into the ArcView GIS software. To understand how school
neighbourhood context moderated the relationship between retail tobacco PoP factors and adolescent smoking, data at the DA level were aggregated to the one-kilometre school neighbourhood area. Depending on population density, each school neighbourhood may be comprised of a range of 2 to 33 dissemination areas. Identification and selection of DAs for each school neighbourhood was completed using thematic maps created in the ArcView GIS software. Selection of DAs was conducted using the selection by location command in ArcView GIS (see Figure 3.2).

Figure 3.2 Identification and selection of DA
The ruling principle for inclusion of DAs for a particular school neighbourhood was that all dissemination areas that fall completely or partially within the one-kilometre school buffer were considered part of the school neighbourhood. Figure 3.2 depicts the DA identification and selection process, the green circle denotes school neighbourhood boundary and the highlighted polygons represent the DAs that met the inclusion criteria for each school neighbourhood. These inclusion criteria was chosen in recognition of the artificial boundary marked by the one-kilometre radius of the school so it is likely that both the dissemination areas that fell within and also those that extend beyond the school neighbourhood boundary will contribute to understanding the socio-demographics characteristics of the school. To describe the school neighbourhood context, a mean value was calculated for each of the four census variables (e.g. median household income) by averaging the DA data for each school neighbourhood.

The census data were disaggregated to the school and student level dataset through matching the aggregated DA data to corresponding schools.

3.4 Data Analyses

The data analyses occurred in three stages to address the research questions (RQ) stated in section 3.0: For RQ1: descriptive analyses for retail tobacco PoP variables were conducted at the store and school level. For RQ2: correlation and logistic regression analyses were performed at the student level. For RQ3: descriptive and logistic regression analyses were conducted at the student level. All data analyses were conducted using SPSS version 15.0 for Windows. Descriptive analysis at the store level was completed for data familiarity and an understanding of the overall distribution of pro- and anti-tobacco marketing activities in the retail stores (Appendix D). In addition, a school neighbourhood profile was created to summarise study variables for all participating schools that enabled further contextual comprehension of the school neighbourhood (see Appendix E).
The results of the analyses described in Chapter 4 was used to inform the GIS mapping component of this study for displaying study results, described in detail in section 3.5.

3.4.1 Descriptive Statistics

Descriptive analyses were conducted for all variables described in section 3.2 to summarise the study sample and to address RQ1 which aimed to describe the prevalence of tobacco PoP activities in retail stores. Descriptive statistics were generated using measures of central tendency (mean and median), and variation (min, max, skewness and kurtosis). The summary statistics allowed for description of variable distribution, examination of possible outliers, and to select explanatory variables for inclusion in subsequent analysis.

3.4.2 Correlation Analyses

A correlation analysis was conducted at the store level to explore the association between retail tobacco PoP activities. Correlated explanatory variables were identified and further examined in the multiple regression modeling for indications of collinearity and confounding. Pearson product-moment coefficient ($r$) was used to explore bivariate relationships. Alpha-level was set at 0.05 to determine if the correlation significantly differs from zero. It was expected that the pro-tobacco PoP variables were moderately correlated since they each represented some type of pro-tobacco marketing strategy. As a rule of thumb, a correlation coefficient of greater than 0.6 indicated possible collinearity or confounding and therefore would indicate the need for closer examination of the variable’s influence on the model. In the case of collinearity, only one variable would be chosen to be included in the model. Decisions were informed by the literature. In the case of possible confounders, the variable would be retained in the model to control for its effects. Confounders were identified if inclusion in the model altered the beta coefficients of any explanatory variables significantly as compared to the model without the
variable in question and if it was significantly or conceptually correlated with the outcome and other explanatory variables.

3.4.3 Logistic Regression Analyses

3.4.3.1 Research Question 2

Univariate logistic regression was conducted to explore potential associations between student smoking status (smoker vs. non-smoker) and each explanatory variable with respect to tobacco PoP activities using the store data assigned at the student level (Equations 1-8).

\begin{align*}
\text{(Equation 1)} & \quad \log (\text{smoking status}) = \beta_0 + \beta_1(\text{store density}) \\
\text{(Equation 2)} & \quad \log (\text{smoking status}) = \beta_0 + \beta_1(\text{tobacco advertising}) \\
\text{(Equation 3)} & \quad \log (\text{smoking status}) = \beta_0 + \beta_1(\text{cigarette displays}) \\
\text{(Equation 4)} & \quad \log (\text{smoking status}) = \beta_0 + \beta_1(\text{PBD Cabinets}) \\
\text{(Equation 5)} & \quad \log (\text{smoking status}) = \beta_0 + \beta_1(\text{In-store Promotions}) \\
\text{(Equation 6)} & \quad \log (\text{smoking status}) = \beta_0 + \beta_1(\text{Tobacco Branding}) \\
\text{(Equation 7)} & \quad \log (\text{smoking status}) = \beta_0 + \beta_1(\text{PoP Index}) \\
\text{(Equation 8)} & \quad \log (\text{smoking status}) = \beta_0 + \beta_1(\text{Tobacco Control Signage})
\end{align*}

Furthermore, to examine the combined effect of retail PoP variables, two logistic regression analyses were performed to examine how tobacco PoP activities in the retail environment together were related to the likelihood that a student was a smoker. Both regression models used student smoking status as the dependent variable. One model used individual pro-tobacco PoP activities, and a second model used PoP Index to represent the overall pro-tobacco PoP environment. For model one (Equation 9), the explanatory variables included: store density, tobacco advertising, visible cigarette displays, PBD cabinets, in-store promotions, tobacco
branding and tobacco control signage. In model two (Equation 10), the explanatory variables included store density, PoP Index and tobacco control signage.

\[
\text{(Equation 9) } \log (\text{smoking status}) = \beta_0 + \beta_1(\text{store density}) + \beta_2(\text{tobacco advertising}) + \\
\beta_3(\text{cigarette displays}) + \beta_4(\text{PBD Cabinets}) + \beta_5(\text{in-store promotions}) + \\
\beta_6(\text{Tobacco Branding}) + \beta_7(\text{Tobacco Control Signage})
\]

\[
\text{(Equation 10) } \log (\text{smoking status}) = \beta_0 + \beta_1(\text{store density}) + \beta_2(\text{PoP Index}) + \\
\beta_2(\text{Tobacco Control Signage})
\]

Based on the literature review, the anticipated direction of association between smoking behaviour and retail PoP variables are summarised in Table 3.2.

<table>
<thead>
<tr>
<th>Positive association:</th>
<th>Negative association:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tobacco advertising</td>
<td>Tobacco control signage</td>
</tr>
<tr>
<td>Visible Cigarette displays</td>
<td></td>
</tr>
<tr>
<td>PBD Cabinets</td>
<td></td>
</tr>
<tr>
<td>In-store Promotions</td>
<td></td>
</tr>
<tr>
<td>Tobacco Branding</td>
<td></td>
</tr>
<tr>
<td>Store density</td>
<td></td>
</tr>
</tbody>
</table>
3.4.3.2 Research Question 3

Moderating effects of contextual factors associated with the PoP Index influence on student smoking status were tested with separate logistic regression models. The dependent variable was student smoking status. The predictors for the five separate models included each dichotomised contextual factor (e.g. unemployment rate), high/low PoP Index, and the interaction term (unemployment rate and PoP Index).

3.5 Map Generation in GIS

A Geographic Information System (GIS) is a geomatics tool that provides a method of linking, displaying and analyzing social, economic, ecological, and demographic factors with individual-level data aggregated at a variety of geographic ranges (World Health Organization, 1999). Essentially, GIS refers to “an organized collection of computer hardware, software, geographical data and personnel designed to efficiently capture, store, update, manipulate, analyze and display all forms of geographically referenced information” (World Health Organization, 1999). GIS methods are characterized by three essential and interrelated functions: 1) the organization of geographically referenced data, or spatial data in a relational database, 2) the visualization of data through maps, and 3) the analysis of data spatially and at multiple geographical levels (Parchman et al., 2002; Clarke et al., 1996). Furthermore, GIS mapping can be used for three main functions; 1) hypothesis generating, 2) hypothesis testing, and 3) spatial testing. The GIS component of this study was used for descriptive and hypothesis generating purposes and for communication of study results. This section provides a description of the steps used to generate maps in GIS, including data synthesis, and mapping.

3.5.1 Data Synthesis

The relational database in GIS comprises two types of information: spatial data (e.g., street address, postal code, city, province, coordinates of longitude, and latitude) and attribute
data (factual information such as smoking rates, store density, retail tobacco PoP activities, income level, and education level). The first step of data synthesis was to identify a list of data files and spatial files to import into the system and how they were to be related to create relational databases. The second step involved acquiring databases, including coverage maps of British Columbia, street files, boundary files of census geographic units, attribute data files of census data. In the third step, all datasets were imported including ones that were used in statistical analyses into the ArcView GIS 9.2 software.

At this point, although the school and store database records already have a geographic identifier (e.g., postal codes), they were not assigned coordinates; the locations or addresses were therefore needed to be geocoded (to have locational coordinates assigned) to permit mapping, without which GIS is not possible. In this process, each record (store and school locations) is assigned X and Y coordinates based either on its formal street address or on the 6-digit postal code for the data. In general, the idea is to assign a point based on a specific street address. This process created new school and store data files in preparation for mapping. Spatial relational databases are required for GIS. Through geocoding, variables were assigned to points, lines, and polygons (e.g., number of injuries at a point or the average household income of a small area). The two types of data (e.g. spatial and attribute) are usually stored in separate databases. They are related by means of key fields that assign attributes to the spatial entities. Relating the final databases therefore involved linking the coverage (spatial) maps with data files that used a unique ‘Census ID’ from Statistics Canada or school ID as the common variable.

3.5.2 Mapping

The most common function and main purpose for the use of GIS in this thesis is the generation of descriptive maps, as GIS is a tool for displaying multiple levels of variables in a simple and effective manner that is both intuitive and visually informative.
Maps can be used as a communication tool for knowledge translation purposes. This is especially the case when the study variables are spatially distributed in patterns or are interrelated with other variables with similar or related geographical patterns. For example, the Human Early Learning Partnership in British Columbia (Hertzman et al., 2002; 2005) used a range of map outputs to communicate the results of social determinants (e.g. SES) and outcomes of early child development. In addition to communicate study findings, maps can be an effective decision making tool for evidence-based policy making or neighbourhood planning (Eyles, 2006; Odoi et al., 2005). For example, Dr. Nykiforuk created community profiles using GIS to display the relationship between community characteristics and smoke-free bylaw status and strength in Alberta and Ontario municipalities (Nykiforuk, 2004).

Two types of map outputs were created for this project. The first and most basic was the *point or dot map*, which placed a dot at each location representing a schools and stores. This type of map was used to depict the geographical distribution and density of tobacco retailers in the school neighbourhoods. Different types of retailers were shown on the same map with different colours or symbols (see Figure 3.1). In addition to display areas, the ‘buffering’ tool was used to display the one kilometre radius of the school neighbourhood. It should be noted that although students were the unit of analysis, it was not feasible nor conceptually sound to display numerous points of student smoking status for each school, therefore school smoking prevalence was used as a proxy to display student smoking behaviour.

The second kind of map was the thematic or *choropleth map* in which areas, regions, or polygons are mapped, and each was given a different colour, or a different shading or pattern to reflect its value class (as in a histogram). These maps are suitable for many purposes, including showing the variations in distribution of variable values (such as average household incomes). These maps are the most common GIS or geomatics maps and were the principal mapping
outputs produced for displaying contextual data. Point and choropleth maps were displayed simultaneously using the map overlay technique. Queries were also conducted to explore different combinations of the study variables. For example, one query was conducted to display all schools in high-smoking prevalence groups and varied levels of income.

3.6 Ethical Clearance

This study has received ethical clearance for use of secondary data from the Behavioural Research Ethics Board at the University of British Columbia. Appendix F includes a copy of the documentation.
CHAPTER 4 - RESULTS

4.0 Overview

Results of the analyses revealed moderate to strong presence of tobacco PoP activities in all tobacco retail stores located within school neighbourhoods in BC. Nearly all stores display cigarette products in a visible manner and post tobacco control signage. Tobacco control signage was identified as a confounder for tobacco advertising and was adjusted for its effect on smoking status in a regression model. In this model, tobacco advertising and tobacco control signage resulted as significant predictors exhibiting risk and protective effects respectively on the odds of a student being a smoker. Place of residence influenced adolescent smoking behaviour. The odds of a student being a smoker increases if they reside on the island compared to living in the lower mainland. However, living on the island versus the mainland did not moderate the relationship between high and low levels of PoP Index and student smoking status. Thematic maps created using GIS are presented to illustrate the above findings.

4.1 Description of Study Sample

The final study sample included 22 secondary schools located across 12 municipalities in south-western BC. Figure 4.1 is a map of BC describing the locations of participating schools. The descriptive map illustrates that participating schools are concentrated in lower mainland (Mainland, N=10) and Vancouver Island (Island, N=12) of BC. Schools from central or northern BC were not part of the study sample despite random sampling. Not all schools had tobacco retailers present in their school neighbourhoods as portrayed by the map indicated by the black flags. Thirty-two percent (7/22) of school neighbourhoods had no tobacco retailers present for data collection. In the remaining 15 schools, 57 retail stores were enumerated and store observations were conducted. On average, each school neighbourhood had three stores located
Overview of BC School Sample

Figure 4.1 Location of Schools with Retail Presence and Absence in Surrounding School Neighbourhood
within its 1km school neighbourhood, with a range of one to seven stores. In all 22 participating schools, 6,771 grade 10 and 11 students with passive parental consent provided self-reported data on smoking behaviour and demographic information. 15.6% (N=1043) of students were classified as smokers and 84.4% (N=5640) students were classified as non-smokers. Eighty-eight (1.3%) students had missing data on smoking behaviour. At the school level, the smoking prevalence ranged from 11.76% to 22.06% with a mean school smoking prevalence of 15.57%.

The final sample for analyses comprised of 4314 students from 15 schools with retail presence. Within this sample, 85.3% (N=3678) of students were classified as non-smokers and 14.7% (N=636) were classified as smokers. The mean school smoking prevalence was 15.21%. Schools were divided into high- and low-smoking prevalence schools using median school smoking prevalence (13.80%). The school sample was equally distributed, with eight and seven schools being in the low- and high-smoking prevalence groups respectively.

36.3% (2457) of students from seven schools with no store presence were excluded from analyses because the presence of tobacco retailers was necessary to investigate the associations between retail tobacco PoP activities, ecological characteristics and adolescent smoking behaviour. The decision to exclude schools with no store observations was reached by comparing mean school smoking prevalence between schools with store observations and schools with no store observations in the study sample. Table 4.1 presents descriptive data on school smoking prevalence for school neighbourhoods with and without tobacco retailer presence, as well as for the overall sample. School smoking prevalence for schools with store observations did not differ significantly from schools without store observations (t (20) =1.25, p =.225).
Table 4.1. Descriptive of school smoking prevalence for school neighbourhoods with and without tobacco retailer presence in British Columbia.

<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>Mean</th>
<th>SD</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>School with no stores</td>
<td>7</td>
<td>16.99</td>
<td>2.64</td>
<td>13.9</td>
<td>21.4</td>
</tr>
<tr>
<td>Schools with stores</td>
<td>15</td>
<td>15.21</td>
<td>3.27</td>
<td>11.7</td>
<td>21.7</td>
</tr>
<tr>
<td>Total</td>
<td>22</td>
<td>15.57</td>
<td>3.09</td>
<td>11.7</td>
<td>21.7</td>
</tr>
</tbody>
</table>

A total of 57 store observations were conducted in BC. The retail stores that sold tobacco products and displayed tobacco PoP activities varied by store type. Figure 4.2 is a bar graph showing the frequency of store observations conducted by nine types of retail stores. Both stand-alone convenience stores and convenience stores attached to gas stations are most prevalent in school neighbourhoods.

Figure 4.2 Frequency of retail stores by store type
4.2 Prevalence of Retail Tobacco PoP Activities in School Neighbourhoods

Five types of pro-tobacco PoP activities and one type of anti-tobacco PoP activity together describe the overall retail PoP environment. A summary score, PoP index was calculated to capture the overall pro-tobacco PoP activities per store (possible score range 0-5). Prevalence of retail tobacco PoP activities in school neighbourhoods were examined at the store and school level separately.

4.2.1 Store Level

Table 4.2 presents the prevalence of overall retail tobacco PoP activities in school neighbourhoods with tobacco retailer presence. Cigarettes were visibly displayed in almost all retail stores (98.25%, N=56). The one store that did not visibly display cigarette products was a specialty cigar store. Approximately half of the stores (52.63%) used purpose-built display (PBD) cabinets to display cigarette products that were sponsored by the tobacco industry. Excluding the specialty cigar store, at least one type of pro-tobacco PoP activity was visibly displayed in the remaining store sample. Descriptive statistics for mean PoP Index score revealed that there were at least two to three pro-tobacco PoP activities present across retailers.
### Table 4.2 Descriptive statistics for store level tobacco PoP activities

<table>
<thead>
<tr>
<th>Activity</th>
<th>Mean</th>
<th>SD</th>
<th>Min, Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tobacco Advertising (%)</td>
<td>61.40</td>
<td>49.11</td>
<td>0,100</td>
</tr>
<tr>
<td>Cigarette displays (%)</td>
<td>98.25</td>
<td>13.25</td>
<td>0,100</td>
</tr>
<tr>
<td>PBD cabinet (%)</td>
<td>52.63</td>
<td>50.37</td>
<td>0,100</td>
</tr>
<tr>
<td>In-store Promotions (%)</td>
<td>17.54</td>
<td>38.37</td>
<td>0,100</td>
</tr>
<tr>
<td>Tobacco Branding (%)</td>
<td>15.79</td>
<td>36.79</td>
<td>0,100</td>
</tr>
<tr>
<td>Tobacco Control Signs (%)</td>
<td>94.74</td>
<td>22.53</td>
<td>0,100</td>
</tr>
<tr>
<td>PoP Index</td>
<td>2.46</td>
<td>1.27</td>
<td>0,5</td>
</tr>
</tbody>
</table>

To illustrate this, Figure 4.3 (pg. 64) is a map showing presence of pro-tobacco PoP activities by retailer type located within the three school neighbourhoods in Surrey, BC. Anti-tobacco PoP activities measured by visible display of tobacco control signage (government and/or store-sponsored) were highly prevalent across all stores at 94.7% of stores.
Figure 4.3
Prevalence of Retail Tobacco PoP Activities by Store Types Observed in School Neighbourhoods

Lower Mainland (Surrey)
Figure 4.4 illustrates variation in pro-tobacco PoP activities by store types. In BC, mean PoP index was highest in convenience stores attached to gas stations (3.4/5 PoP activities per store), followed by small, independently owned grocery stores (2.5/5 PoP activities per store) and stand-alone convenience stores (2.2/5 PoP activities per store). There was one tobacco store that had no PoP activities however it sells specialty tobacco products only.

4.2.2 School Level
Tobacco PoP variables, store density and school smoking prevalence were examined at the school level to explore overall tobacco PoP prevalence in school neighbourhoods to determine whether retail PoP activities differed by school smoking behaviour. Using the median-split technique, schools were divided into low (≤13.80%) and high smoking prevalence (>13.80%) groups to examine differences in central tendency and distribution of tobacco PoP activities by
high and low smoking prevalence. Table 4.3 presents means and standard deviations for school smoking prevalence, store density and pro- and anti-tobacco PoP activities for schools with low- and high-smoking prevalence schools, and overall. All the pro- and anti-tobacco PoP variables except PoP Index are defined as the proportion of stores in a school neighbourhood that had a given type of tobacco PoP activity. For example, the in-store promotions variable reflects the proportion of stores in the school neighbourhood that offered some type of in-store tobacco promotion. PoP Index at the school level represents the average number of tobacco PoP activities present in retailers located in the school neighbourhood.

A comparison of prevalence of tobacco PoP activities in school neighbourhoods aggregated at the school level is similar to the results at the individual store level presented in Table 4.1. In BC, a higher number of schools belonged to the low-smoking prevalence group (N=8) compared to the high-smoking prevalence group (N=7). Store densities were equally distributed between high- and low-smoking prevalence schools (N=4). Visible displays of cigarette products were prevalent in all retailers within high-smoking prevalence school neighbourhoods (100%). In this study sample, a higher proportion of stores exhibited tobacco advertising (63%), PBD cabinets (56%), and tobacco control signage (98%) in low-prevalence school neighbourhoods compared to high-prevalence school neighbourhoods.
Table 4.3 Descriptive statistics for school smoking prevalence, store density and tobacco PoP activities for high- and low-smoking prevalence schools and overall at school level

<table>
<thead>
<tr>
<th></th>
<th>Smoking Prevalence (%)</th>
<th>Store density (%d)</th>
<th>Tobacco Advertising (%)</th>
<th>Cigarette Displays (%)</th>
<th>PBD Cabinets (%)</th>
<th>In-store Promotions (%)</th>
<th>Tobacco Branding (%)</th>
<th>PoP Index (%)</th>
<th>Tobacco Control Signs (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Low (N=8)</strong></td>
<td>13.13</td>
<td>4</td>
<td>63.31</td>
<td>97.92</td>
<td>55.95</td>
<td>18.16</td>
<td>10.12</td>
<td>2.43</td>
<td>97.92</td>
</tr>
<tr>
<td></td>
<td>(0.68)</td>
<td>(2.56)</td>
<td>(34.83)</td>
<td>(5.89)</td>
<td>(33.82)</td>
<td>(22.22)</td>
<td>(17.58)</td>
<td>(0.82)</td>
<td>(5.89)</td>
</tr>
<tr>
<td><strong>High (N=7)</strong></td>
<td>17.60</td>
<td>4</td>
<td>62.38</td>
<td>100.00</td>
<td>51.67</td>
<td>25.95</td>
<td>20.71</td>
<td>2.61</td>
<td>93.57</td>
</tr>
<tr>
<td></td>
<td>(3.45)</td>
<td>(1.16)</td>
<td>(32.54)</td>
<td>(0.00)</td>
<td>(19.75)</td>
<td>(19.29)</td>
<td>(24.42)</td>
<td>(0.47)</td>
<td>(11.07)</td>
</tr>
<tr>
<td><strong>Total (N=15)</strong></td>
<td>15.22</td>
<td>4</td>
<td>61.81</td>
<td>98.89</td>
<td>53.95</td>
<td>21.79</td>
<td>15.06</td>
<td>2.52</td>
<td>95.89</td>
</tr>
<tr>
<td></td>
<td>(3.27)</td>
<td>(1.97)</td>
<td>(32.57)</td>
<td>(4.30)</td>
<td>(27.27)</td>
<td>(20.56)</td>
<td>(20.97)</td>
<td>(0.67)</td>
<td>(8.66)</td>
</tr>
</tbody>
</table>

4.3 Association of Retail Tobacco PoP Activities and Adolescent Smoking

Behaviour

Bivariate relationships between store level pro- and anti-tobacco PoP activities and PoP Index were assessed using Pearson’s product-moment correlation coefficient (r) to reveal intercorrelations among explanatory variables for variable selection purposes. The correlation matrix is presented in Table 4.4.
Presence of tobacco control signage, a measure of anti-tobacco PoP exhibited moderate positive correlations with two pro-tobacco PoP variables, including higher presence of tobacco advertising \((r = 0.30)\), and visible tobacco display \((r = 0.57)\). PoP Index was positively correlated with tobacco advertising \((r = 0.77)\), Visible cigarette display \((r = 0.26)\), PBD cabinets \((r = 0.85)\), in-store promotions \((r = 0.60)\) and tobacco branding \((r = 0.53)\). This positive association was expected as PoP Index is a summary measure of these five pro-tobacco PoP activities. With the exception of PoP Index, the low to moderate associations between the variables indicates that this set of explanatory variables did not exhibit multicollinearity. However, tobacco control signage, an anti-tobacco measure may be a possible confounder given its significant positive correlation with tobacco advertising and visible cigarette displays, both pro-tobacco PoP measures. Therefore all explanatory variables were entered into a logistic regression model concurrently to study the combined effects as well as control for possible confounding effects of tobacco control signage in predicting adolescent smoking behaviour.
Since the retail tobacco PoP variables were aggregated at the school level and reported as a proportion (e.g. 62% of stores contained tobacco advertising), store density was included in both regression models to account for the different levels of tobacco availability between school neighbourhoods.

### 4.3.1 Univariate Logistic Regression Models

A univariate logistic regression analysis was conducted to examine the potential association between student smoking status and each of the eight explanatory variables. Table 4.5 presents the corresponding odds ratio \( \text{Exp} (B) \), and 95% confidence interval (CI) and suggests that the presence of tobacco control signage in the retail environment located in the school neighbourhood decreases the odds of students being a smoker. It is the only potential predictor of student smoking status.

<table>
<thead>
<tr>
<th>Model</th>
<th>Variables</th>
<th>B</th>
<th>S.E.</th>
<th>Wald</th>
<th>Sig.</th>
<th>Odds Ratio</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Store Density</td>
<td>-0.01</td>
<td>0.02</td>
<td>0.37</td>
<td>0.54</td>
<td>0.99</td>
<td>0.95 to 1.03</td>
</tr>
<tr>
<td>2</td>
<td>Tobacco Advertising</td>
<td>-0.10</td>
<td>0.15</td>
<td>0.48</td>
<td>0.49</td>
<td>0.90</td>
<td>0.68 to 1.20</td>
</tr>
<tr>
<td>3</td>
<td>Visible Cigarette Displays</td>
<td>0.51</td>
<td>0.87</td>
<td>0.35</td>
<td>0.56</td>
<td>1.67</td>
<td>0.30 to 9.20</td>
</tr>
<tr>
<td>4</td>
<td>PBD Cabinets</td>
<td>-0.17</td>
<td>0.16</td>
<td>1.16</td>
<td>0.28</td>
<td>0.84</td>
<td>0.62 to 1.15</td>
</tr>
<tr>
<td>5</td>
<td>In-store Promotions</td>
<td>0.17</td>
<td>0.22</td>
<td>0.56</td>
<td>0.46</td>
<td>1.18</td>
<td>0.76 to 1.82</td>
</tr>
<tr>
<td>6</td>
<td>Tobacco branding</td>
<td>0.05</td>
<td>0.21</td>
<td>0.05</td>
<td>0.83</td>
<td>1.05</td>
<td>0.69 to 1.58</td>
</tr>
<tr>
<td>7</td>
<td>PoP Index</td>
<td>-0.03</td>
<td>0.07</td>
<td>0.20</td>
<td>0.66</td>
<td>0.97</td>
<td>0.85 to 1.11</td>
</tr>
<tr>
<td>8</td>
<td>Tobacco control signage</td>
<td>-1.33</td>
<td>0.47</td>
<td>8.15</td>
<td>0.00</td>
<td><strong>0.27</strong></td>
<td><strong>0.11</strong> to <strong>0.66</strong></td>
</tr>
</tbody>
</table>

\( df = 1 \)
4.3.2 Multiple Logistic Regression model #1: Student Smoking Status and Tobacco PoP Variables

A multiple logistic regression analysis was carried out to explore student’s smoking behaviour given the current retail tobacco PoP environment located in school neighbourhoods. Student smoking status was the outcome variable. The explanatory variables that were considered in this analysis were the proportions of stores with presence of (1) tobacco advertising, (2) visible display of cigarette products, (3) industry sponsored PBD cabinets, (4) in-store promotions, (5) tobacco branding, (6) tobacco control signage and (7) store density, or number of tobacco retailers present in school neighbourhoods.

Table 4.6 presents the regression coefficient (B), the Wald statistics, significance level, odds ratio [Exp (B)], and the 95% confidence interval (CI) for odds ratios (OR) for each predictor. The Wald test reports that tobacco advertising and tobacco control signage are statistically significant predictors of student smoking status.

The predictor level results show that the proportion of stores with any tobacco control signage located in the school neighbourhood significantly decreases the odds of a student from being a smoker. In addition, the proportion of stores with any tobacco advertising located in the school neighbourhood significantly increases the odds of youth being a smoker. It should be noted that a change in the direction of association occurred for tobacco advertising regression coefficient in this model (B = .63) compared to the univariate model (B = -.10). As detected by the correlation matrix in Table 4.4, this further suggests that tobacco control signage is a possible confounder.
Table 4.6 Logistic regression results for examining individual retail tobacco PoP predictors on student smoking behaviour

<table>
<thead>
<tr>
<th>Predictor</th>
<th>B</th>
<th>S.E.</th>
<th>Wald $\chi^2$</th>
<th>Sig.</th>
<th>Odds Ratio</th>
<th>95.0% C.I.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Store Density</td>
<td>-0.04</td>
<td>0.03</td>
<td>2.23</td>
<td>0.14</td>
<td>0.96</td>
<td>0.92 to 1.01</td>
</tr>
<tr>
<td>Tobacco advertising</td>
<td>0.63</td>
<td>0.28</td>
<td>5.02</td>
<td>0.03</td>
<td>1.88</td>
<td><strong>1.08 to 3.27</strong></td>
</tr>
<tr>
<td>Visible Cigarette Display</td>
<td>1.70</td>
<td>1.01</td>
<td>2.86</td>
<td>0.09</td>
<td>5.47</td>
<td>0.76 to 39.28</td>
</tr>
<tr>
<td>Industry-sponsored PBD cabinets</td>
<td>-0.40</td>
<td>0.25</td>
<td>2.64</td>
<td>0.10</td>
<td>0.67</td>
<td>0.41 to 1.09</td>
</tr>
<tr>
<td>In-store Promotions</td>
<td>-0.25</td>
<td>0.27</td>
<td>0.89</td>
<td>0.35</td>
<td>0.78</td>
<td>0.46 to 1.31</td>
</tr>
<tr>
<td>Tobacco Branding</td>
<td>0.33</td>
<td>0.28</td>
<td>1.37</td>
<td>0.24</td>
<td>1.39</td>
<td>0.80 to 2.43</td>
</tr>
<tr>
<td>Tobacco Control Signage</td>
<td>-2.72</td>
<td>0.72</td>
<td>14.35</td>
<td>0.00</td>
<td>0.07</td>
<td><strong>0.02 to 0.27</strong></td>
</tr>
<tr>
<td>Constant</td>
<td>-0.85</td>
<td>1.05</td>
<td>0.65</td>
<td>0.42</td>
<td>0.43</td>
<td></td>
</tr>
</tbody>
</table>

Model $\chi^2_{df=7} = 17.72$, p <.01

Figure 4.5 is a thematic map to depict the association of tobacco advertising and tobacco control signage at the point-of-purchase in retailers at the school level.
Figure 4.5 Proportion of stores with tobacco control signage and tobacco advertising in high and low smoking prevalence schools
4.3.3 Multiple Logistic Regression Model #2: Student Smoking Status and PoP Index

A second logistic regression was used to model student's smoking status given the current retail tobacco PoP environment near schools, using a summary index to represent pro-tobacco PoP activities. The explanatory variables in this model were (1) PoP Index score, (2) proportion of stores with tobacco control signage present and (3) store density.

Table 4.7 presents the results of this analysis. The Wald test reports that tobacco control signage is a statistically significant predictor of student smoking status. As such, the odds of being a smoker significantly decreases with proportion of stores having any tobacco control signage in the school neighbourhood compared to stores with no tobacco control signage (CI=48% - 94%).

Table 4.7 Logistic Regression Results for Examining Store Density, Tobacco Control Signage and PoP Index on Student Smoking Behaviour

<table>
<thead>
<tr>
<th></th>
<th>B</th>
<th>S.E.</th>
<th>Wald</th>
<th>Sig.</th>
<th>Odds Ratio</th>
<th>95.0% C.I.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Store Density</td>
<td>-.033</td>
<td>.023</td>
<td>1.947</td>
<td>.163</td>
<td>.968</td>
<td>.924 to 1.013</td>
</tr>
<tr>
<td>Tobacco Control Signage</td>
<td>-1.697</td>
<td>.533</td>
<td>10.158</td>
<td>.001</td>
<td>.183</td>
<td>.064 to .520</td>
</tr>
<tr>
<td>PoP Index</td>
<td>.063</td>
<td>.077</td>
<td>.670</td>
<td>.413</td>
<td>1.065</td>
<td>.916 to 1.237</td>
</tr>
<tr>
<td>Constant</td>
<td>-.172</td>
<td>.493</td>
<td>.122</td>
<td>.727</td>
<td>.842</td>
<td></td>
</tr>
</tbody>
</table>

Model $\chi^2_{df=3} = 10.55$, p <.01
4.4 Moderating Effects of Ecological Factors on Retail Tobacco PoP Activities and Adolescent Smoking Behaviour (Research Question #3)

Six out of seven schools (N=1387 students) in the high-smoking prevalence groups are located on Vancouver Island; one school (N=424) located on the lower mainland belong to this group. In the low-smoking prevalence group, two schools (N=933) are located on the Vancouver Island and six schools (N=1625) are located on the lower mainland.

Table 4.8 presents descriptive statistics for the four socio-demographic variables describing the context of the 1km school neighbourhood environment for schools in the low- and high smoking prevalence group and for the overall sample. Students from low-smoking prevalence schools are from school neighbourhoods that have higher proportions of immigrant population, lower unemployment rate, higher proportion of people with less than grade 9 education completed and higher median household income than students from high-smoking prevalence schools.

**Table 4.8 Descriptive statistics for socio-demographic variables in low- and high smoking prevalence schools and overall**

<table>
<thead>
<tr>
<th>Immigrants (%)</th>
<th>Unemployment rate</th>
<th>Education level (&lt;Gr. 9) (%)</th>
<th>Median Household Income ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean (SD)</td>
<td>Min, Max</td>
<td>Mean (SD)</td>
</tr>
<tr>
<td>Low (N=2558)</td>
<td>24.26 (7.85)</td>
<td>14.20 (2.43)</td>
<td>6.95 (10.59)</td>
</tr>
<tr>
<td>High (N=1811)</td>
<td>20.57 (11.05)</td>
<td>7.08 (4.50)</td>
<td>11.24 (16.98)</td>
</tr>
<tr>
<td>Overall (N=4369)</td>
<td>22.73 (9.48)</td>
<td>7.08 (4.04)</td>
<td>8.73 (16.98)</td>
</tr>
</tbody>
</table>
Results

Socio-demographic variables and PoP Index were dichotomized to high and low levels using median-split method for each variable to create interaction terms for testing moderating effects. The summary statistics for the dichotomous variables are described below.

On average, 46.33% (SD = 49.87%) of students come from school neighbourhoods with mean PoP Index greater than 2.5. 60.75% (SD=48.84%) of students are from schools in school neighbourhoods with greater than 17.60% immigrant population. 57.95% (SD = 48.84%) of students are from schools located in neighbourhoods with unemployment rate that is greater than 7.48. 63.04% (SD=48.28%) of students are from schools located in neighbourhoods where greater than 6.02% of the population achieved less than grade 9 education. 35.52% (47.86%) of students are from schools located in neighbourhoods where the mean median household income is greater than $50690.68.

4.4.1 Contextual Moderators on Student Smoking Behaviour and PoP Index

The five contextual variables were tested as moderators of the relationship between PoP index and adolescent smoking behaviour through separate logistic regression models.

A logistic regression was used to model student's smoking behaviour given high and low levels of PoP activities, island vs. mainland and the interaction between PoP Index and island/mainland. Table 4.9 presents the regression coefficient (B), the Wald statistics, significance level, odds ratio [Exp (B)], and the 95% confidence interval (CI) for odds ratios (OR) for each predictor. The Wald test reports that island/mainland is a statistically significant predictor of student smoking status. The odds of a student being a smoker increase by 39% when their place of residence is on Vancouver Island compared to living on lower Mainland. The interaction term did not reach statistical significance.
Table 4.9 Logistic regression examining the moderating effect of island vs. mainland between PoP Index and student smoking status

<table>
<thead>
<tr>
<th></th>
<th>B</th>
<th>S.E.</th>
<th>Wald</th>
<th>df</th>
<th>Sig.</th>
<th>Odds Ratio</th>
<th>95.0% C.I.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Island/Mainland</td>
<td>.330</td>
<td>.116</td>
<td>8.055</td>
<td>1</td>
<td>.005</td>
<td>1.391</td>
<td>1.108 to 1.747</td>
</tr>
<tr>
<td>PoP Index</td>
<td>-.011</td>
<td>.132</td>
<td>.007</td>
<td>1</td>
<td>.934</td>
<td>.989</td>
<td>.763 to 1.282</td>
</tr>
<tr>
<td>Island/Mainland * PoP Index</td>
<td>-.206</td>
<td>.175</td>
<td>1.392</td>
<td>1</td>
<td>.238</td>
<td>.814</td>
<td>.577 to 1.146</td>
</tr>
<tr>
<td>Constant</td>
<td>-1.878</td>
<td>.087</td>
<td>462.155</td>
<td>1</td>
<td>.000</td>
<td>.153</td>
<td></td>
</tr>
</tbody>
</table>

Figure 4.6 emphasizes the association between school smoking prevalence and physical geography of living on the island vs. mainland. In addition, this thematic map shows that this finding is consistent with smoking surveillance data from the 2003 Canadian Community Health Survey.
Figure 4.6 High and Low Smoking Prevalence Schools by Municipality Smoking Prevalence on Vancouver Island vs. Lower Mainland
Results

Socio-demographic characteristics of the school neighbourhood did not moderate the association between high and low levels of PoP Index and student smoking status. Main and interaction effects for each of the four models for immigrant population, unemployment rate, education level (< Grade 9) and median household income did not reach statistical significance. Results are presented in tables 4.10 to 4.13.

Table 4.10 Logistic regression examining the moderating effect of High and Low levels of Immigrant Population between PoP Index and Student Smoking Status

<table>
<thead>
<tr>
<th></th>
<th>B</th>
<th>S.E.</th>
<th>Wald</th>
<th>Sig.</th>
<th>Odds Ratio</th>
<th>95.0% C.I.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Immigrant</td>
<td>-.205</td>
<td>.120</td>
<td>2.937</td>
<td>.087</td>
<td>.815</td>
<td>.644 to 1.030</td>
</tr>
<tr>
<td>PoP Index</td>
<td>-.154</td>
<td>.132</td>
<td>1.346</td>
<td>.246</td>
<td>.858</td>
<td>.662 to 1.112</td>
</tr>
<tr>
<td>Immigrant * PoP Index</td>
<td>.017</td>
<td>.176</td>
<td>.010</td>
<td>.922</td>
<td>1.017</td>
<td>.720 to 1.437</td>
</tr>
<tr>
<td>Constant</td>
<td>1.568</td>
<td>.095</td>
<td>270.585</td>
<td>.000</td>
<td>.208</td>
<td></td>
</tr>
</tbody>
</table>

$\chi^2 (3, N = 4314) = 6.88, p=.076$

Table 4.11 Logistic regression examining the moderating effect of High and Low levels of Unemployment Rate between PoP Index on Student Smoking Status

<table>
<thead>
<tr>
<th></th>
<th>B</th>
<th>S.E.</th>
<th>Wald</th>
<th>Sig.</th>
<th>Odds Ratio</th>
<th>95.0% C.I.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unemployment Rate</td>
<td>.209</td>
<td>.116</td>
<td>3.268</td>
<td>.071</td>
<td>1.233</td>
<td>.983 to 1.547</td>
</tr>
<tr>
<td>PoP Index</td>
<td>-.096</td>
<td>.180</td>
<td>.287</td>
<td>.592</td>
<td>.908</td>
<td>.639 to 1.292</td>
</tr>
<tr>
<td>Unemployment Rate * PoP Index</td>
<td>-.080</td>
<td>.142</td>
<td>.322</td>
<td>.571</td>
<td>.923</td>
<td>.699 to 1.218</td>
</tr>
<tr>
<td>Constant</td>
<td>-1.814</td>
<td>.086</td>
<td>441.358</td>
<td>.000</td>
<td>.163</td>
<td></td>
</tr>
</tbody>
</table>

$\chi^2 (3, N = 4314) = 5.84, p=.12$
Table 4.12 Logistic regression examining the moderating effect of High and Low levels of Education level (<Grade 9) between PoP Index and Student Smoking Status

<table>
<thead>
<tr>
<th></th>
<th>B</th>
<th>S.E.</th>
<th>Wald</th>
<th>Sig.</th>
<th>Odds Ratio</th>
<th>95.0% C.I.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Education level (&lt;Gr.9)</td>
<td>-.099</td>
<td>.162</td>
<td>.370</td>
<td>.543</td>
<td>.906</td>
<td>.659 to 1.245</td>
</tr>
<tr>
<td>PoP Index</td>
<td>.209</td>
<td>.116</td>
<td>3.268</td>
<td>.071</td>
<td>1.233</td>
<td>.983 to 1.547</td>
</tr>
<tr>
<td>Education level (&lt;Gr.9) * PoP Index</td>
<td>-.089</td>
<td>.194</td>
<td>.209</td>
<td>.647</td>
<td>.915</td>
<td>.626 to 1.338</td>
</tr>
<tr>
<td>Constant</td>
<td>-1.814</td>
<td>.086</td>
<td>441.358</td>
<td>.000</td>
<td>.163</td>
<td></td>
</tr>
</tbody>
</table>

\(\chi^2 (3, N = 4314) = 5.77, p=.12\)

Table 4.13 Logistic regression examining the moderating effect of High and Low level of Median Household Income between PoP Index and Student Smoking Status

<table>
<thead>
<tr>
<th></th>
<th>B</th>
<th>S.E.</th>
<th>Wald</th>
<th>Sig.</th>
<th>Odds Ratio</th>
<th>95.0% C.I.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Median Household Income</td>
<td>-.084</td>
<td>.107</td>
<td>.622</td>
<td>.430</td>
<td>.919</td>
<td>.745 to 1.133</td>
</tr>
<tr>
<td>PoP Index</td>
<td>-.140</td>
<td>.130</td>
<td>1.167</td>
<td>.280</td>
<td>.869</td>
<td>.674 to 1.121</td>
</tr>
<tr>
<td>Median Household Income * PoP Index</td>
<td>-.037</td>
<td>.185</td>
<td>.039</td>
<td>.843</td>
<td>.964</td>
<td>.671 to 1.385</td>
</tr>
<tr>
<td>Constant</td>
<td>-1.662</td>
<td>.067</td>
<td>608.462</td>
<td>.000</td>
<td>.190</td>
<td></td>
</tr>
</tbody>
</table>

\(\chi^2 (3, N = 4314) = 4.86, p=.18\)
CHAPTER 5 – DISCUSSION

5.0 Overview

Data on 4,314 grades 10 and 11 students from 15 secondary schools and 57 tobacco retailers in the province of BC were used in an exploratory descriptive observational study to understand the relationship between retail tobacco PoP activities and adolescent smoking behaviour. Specifically, this study sought to examine the prevalence of retail tobacco PoP activities in school neighbourhoods, determine its association with student smoking behaviour and explore whether community characteristics moderate this relationship. This chapter provides a discussion of the study findings and its conceptual and methodological implications for research with comparisons to existing theory and current literature. The use of GIS mapping is discussed, including its benefits, challenges and future directions. Implications of this research for public health policy and practice followed by study limitations are also discussed. The chapter concludes with recommendations for future research and practice in the area of youth tobacco prevention and control.

5.1 Review of Findings and Implications for Research

This is the first research study to objectively measure the tobacco PoP retail environment and simultaneously examine its impact on adolescent smoking in BC. Similar studies have been conducted in Ontario and Quebec (Health Canada, 2006), but no such examination has been reported in western Canada. This section provides a discussion of study findings in light of current research and theory, and highlights some methodological and conceptual benefits as well as recommendations for a number of possible modifications. Considerations for future research to further understanding of the relationship between retail tobacco marketing activities and adolescent smoking behaviour are discussed.
5.1.1 Prevalence of Tobacco PoP Activities in School Neighbourhood Retail Stores

The cross-sectional findings of this study provide preliminary evidence that tobacco PoP activities are prevalent in retail stores located in BC school neighbourhoods where students spend a majority of their time during the school week. Convenience stores (both stand-alone and attached to gas stations) accounted for 65% of retailers in the sample and were the most common types of tobacco retailers located within a one kilometre radius school neighbourhood. Convenience stores that are attached to gas stations exhibit the most tobacco PoP activities as measured by the summary measure PoP Index (3.4 PoP activities per store); followed by small independently owned "mom and pop" groceries (2.5 PoP activities per store) and local convenience stores (2.2 PoP activities per store). Convenience stores (stand-alone and attached to gas stations) have also been identified in other U.S. descriptive studies on the retail tobacco PoP environment to exhibit most prevalent pro-tobacco PoP activities (Cummings et al.; 1991; Pierce et al., 1998; Terry-McElrath et al., 2002). As the most prevalent type of retailer found in the immediate surrounding of schools in this study, coupled with supportive evidence on students’ weekly visits to convenience stores reported in other studies (MacFadyen et al., 2001; Henriksen et al., 2004a; Wakefield et al., 2006) this finding suggests that adolescents are frequently exposed to high levels of pro-tobacco messaging in south-western areas of BC. To confirm extent of exposure, future studies should collect student data on frequency and type of stores visited in addition to the observational data.

In Canada, advertising of tobacco products is largely prohibited for most forms of advertising media such as billboards, radio, television, and event sponsorship. Notable exceptions include advertising by direct mail to adults and in publications with 85% adult readership, vending machines in adult-only establishments (e.g. bars, taverns) and in the retail environment. The federal Tobacco Control Act prohibits self-service displays in the retail
environment and allows for further regulations in the retail environment by the provincial
government. Currently, restrictions in the retail environment do not exist at the federal level
although a proposal from Health Canada to regulate the retail display and promotion of tobacco
and tobacco-related products is currently underway (Health Canada, 2006) and several
provincial and territorial governments have implemented retail controls in their comprehensive
tobacco control legislation (i.e. Saskatchewan, Manitoba, and Nunuvut, PEI, Northwest
Territories, and Nova Scotia), while other provinces (i.e. British Columbia, Ontario, Quebec and
Alberta) have committed to implementing similar legislations in the near future (see Appendix
A). While BC is implementing a retail display ban in premises accessible by minors in March
2008, at the time this study was conducted tobacco legislation in BC did not have any retail
advertising restrictions. Therefore, tobacco companies have been free to shape the retail stores
into an environment inundated with pro-tobacco messages to communicate with their past,
current and future customers.

Across all store observations, cigarette products were visibly and prominently displayed
in all but one cigar specialty store (98.25%) and approximately half of the stores visited
(52.63%) used purpose-built display cabinets with pronounced brand logos and colour
trimmings that were supplied by tobacco companies to enhance the visibility of their products.
Over half of the stores (61.4%) exhibited tobacco advertising either on the interior or exterior of
the retail stores. Tobacco promotion and branding were less prevalent, approximately one in six
stores displayed promotional offers (17.54%) such as multi-pack discounts and tobacco
branding on functional objects (e.g. matchbooks or lighters, 15.79%). On average, retailers
exhibited half (2.5 out of 5) of pro-tobacco PoP activities as measured by the PoP Index. These
findings are consistent with previous studies, confirming that pro-tobacco messages are
ubiquitously present in retail stores and that various tobacco promotional and advertising
strategies are used in the retail environment (Ruel et al., 2004; Celebucki & Diskin, 2002; Wakefield et al., 2002c; Cummings et al., 1991; Pollay, 2007). This finding also adds to other studies which confirmed the preponderance of tobacco PoP in stores located in close proximity to secondary schools (Glanz et al., 2006; Barovich et al., 1991; Henriksen et al., 2004a).

Both the Tobacco Control Act and Tobacco Sales Act, at the federal and BC provincial levels respectively, require posting of signs that prohibit sales to minors and/or health warning at the point-of-purchase in retail stores. In this study, 94.74% (n=54) of stores displayed such tobacco control signs sponsored by either store and/or the federal/provincial government. This suggests a high retailer compliance of federal and provincial legislations. A closer examination at the non-compliant stores (n=3) revealed that they are all in school neighbourhoods of high smoking prevalence schools on Vancouver Island. Given the small number of non-compliant stores, inferences on the association of non-compliant stores and neighbourhood smoking prevalence cannot be drawn at this time. Possible reasons for non-compliance may be due to retailer characteristics such as attitudes toward government tobacco regulations, or data collection error.

At the school level, because all store observations were conducted within the one-kilometre radius of the school, we are able to consider potential average exposure to all tobacco retailers located within the school neighbourhood concurrently by averaging individual store data to the school level. The mean and distribution of all tobacco PoP activities at the school level was similar to the store level results, with slightly higher mean values due to data aggregation. However, a comparison of the PoP variables by high and low school smoking prevalence revealed interesting patterns. Firstly, while cigarette products were visibly displayed in all retail stores and there were an equal number of tobacco retailers present between the two groups of neighbourhoods, in the low-smoking prevalence school neighbourhoods, more stores
displayed their tobacco products using purpose-built display cabinets (55.95% vs. 51.67%), more stores contained tobacco advertising (63.31% vs. 62.38%) and more stores displayed tobacco control signage (97.92% vs. 93.57%). Whereas, in high-smoking prevalence school neighbourhoods, more stores exhibited in-store promotional offers and branding of functional products compared to low-smoking prevalence school neighbourhoods. These findings suggest different strategies of retail tobacco PoP programs may be employed between school neighbourhoods with different smoking behaviour. Specifically, these findings imply that purpose-built display cabinets and tobacco advertisements are more effective at creating pro-smoking norms among non-smokers, whereas the presence of in-store promotions and tobacco branded functional objects may be more successful techniques for encouraging smokers to maintain tobacco use. Similar findings were reported in the ImpacTeen study where different types of tobacco PoP activities exhibited differential effects on progressive stages of youth smoking uptake. Specifically, tobacco advertisings were associated with encouraging non-smoking youth to try smoking, whereas cigarette promotions were associated with influencing those youth already experimenting with cigarettes to progress to regular smoking, moreover, established smokers were most influenced by promotional offers (Slater et al., 2007). However, given that this is a cross-sectional study, direction of association cannot be assumed, although it does indicate that school neighbourhoods with pro vs. anti-smoking norms generate a different set of retail tobacco PoP strategies. Longitudinal data are required to better understand the temporal sequence and mechanisms of the relationships between retail tobacco PoP strategies, smoking norms and other contextual factors in school neighbourhood communities and adolescent smoking behaviour.

Further, the PoP Index is only nominally higher in high-smoking prevalence schools compared to schools with low-smoking prevalence, which further supports the notion that
tobacco PoP activities are tailored to different but equally important target customer groups (e.g. smokers vs. non-smokers) since both recruiting new smokers as well as retaining current ones are crucial to achieving profit for the tobacco industry. Therefore the effectiveness of retail PoP programs may not be in the number of PoP activities present, but in the synergistic effect of combining different PoP activities as suggested in the literature (Pollay, 2007). It is important to note that these comparisons are only observational since statistical comparisons between the two groups of schools have not been conducted due to small sample size. However, these findings are consistent with those found from the larger Project Impact study sample that demonstrated different levels of PoP activities were associated with high and low school smoking prevalence across five Canadian provinces (Lovato et al., 2007).

The descriptive results revealed that a preponderance of tobacco PoP activities are present in the school neighbourhood which demonstrates that persistent presence of tobacco industry marketing activities do exist in students’ immediate environment (Barovich et al., 1991; Henriksen et al., 2004a). The observational data on tobacco PoP activities collected for this study is an accurate depiction of the current retail tobacco environment that students can potentially be exposed to, and it provides a baseline for monitoring and evaluation of retail tobacco marketing activities and the impact thereof on adolescent smoking behaviour in future studies. The pervasive cigarette merchandising and advertising found in the retail environment imply that students are more likely to be exposed on a frequent and regular basis to pro-tobacco messages. Considering persuasive communication theories that posit the effect of mere exposure on creating positive attitudes, in combination with the evidence that pro-tobacco attitudes lead to tobacco use, the findings of this study suggest cigarette smoking is indeed being promoted as a positive and desirable social norm through the retail environment thus students are at increased risk for current or future addiction to tobacco use. Moreover, the preliminary findings showing a
Discussion

discrepancy between retail tobacco PoP activities found in high and low-smoking prevalence schools lay the groundwork for further understanding of tobacco industry promotional and advertising practices.

5.1.2 Retail Tobacco PoP Activities and Adolescent Smoking Behaviour

Health Canada estimates there are approximately 60,000 points of sale for tobacco products in Canada, including vending machines (Health Canada, 2006). Given the widespread tobacco PoP marketing presence in the retail environment, and overwhelming evidence from literature on the effect of tobacco marketing on adolescent smoking initiation and maintenance, this study sought to examine the association between adolescent smoking behaviour and objectively collected measures of the tobacco PoP retail environment in school neighbourhoods.

This is one of the first studies that objectively measured retail tobacco PoP activities and student smoking behaviour. Tobacco advertising and tobacco control signage were found to be significantly related to student smoking status. Proportion of stores with tobacco control signage present in school neighbourhoods consistently emerged as a significant protective factor for the odds of a student being a smoker in all regression models (univariate and multivariate) employed in the analyses. This suggests that presence of tobacco control signage displayed at the PoP is an effective tobacco control strategy and may possibly counter the effects of pro-tobacco PoP activities for adolescent smoking. This is the first study that revealed this protective effect of tobacco control signage in the retail environment. No published studies were identified through literature review that examined the effect of posting of tobacco control signage on adolescent smoking although the display of anti-tobacco messages at the retail PoP has previously been recommended (Cummings et al., 1991). Hence, this finding provides evidence to policy makers that displaying anti-tobacco messages at the retail PoP is an effective tobacco control policy.
Proportion of stores in the school neighbourhood with tobacco advertisements displayed at the point-of-purchase increases the odds of a student being a smoker. This is consistent with findings from the *ImpacTeen* study, from which the current study adapted its store instrument and protocol. Slater et al (2007) reported that proportion of retailers with tobacco advertising located in school communities were found to increase the likelihood of adolescent smoking initiation. The finding from this study suggests that removal of tobacco advertisements would be beneficial for experimenters and regular smoking youth as well as susceptible non-smoking youth as suggested in the *ImpacTeen* study.

The analysis also revealed the effect of tobacco advertising on student smoking is modified by the presence of tobacco control signage. The positive correlation found between advertising and tobacco control signage means that advertising is often present in stores with tobacco control signage. The univariate relationship between tobacco advertising and student smoking status did not reach statistical significance, however, a significant positive association was revealed when entered into a simultaneous model with tobacco control signage suggesting that the risk effect of advertising was weakened when the protective effect of tobacco control signage is not adjusted for. Therefore, this finding provides further evidence for the need to create anti-tobacco messages such as tobacco control signage in the retail PoP environment and implement a complete ban of tobacco advertisements and displays in the retail environment to eliminate pro-tobacco messages being communicated to students. It should be noted that these are preliminary findings and the associations are crude due to the ecological nature of the independent variables (e.g. store data). As such, the statistical significances revealed need to be interpreted with caution because the analyses may not have had adequate power to detect the effect of retail tobacco PoP on the student sample. The statistical power was artificially inflated as the impact of retail tobacco PoP was not measured for each student individually but through
attributing a sample of tobacco retailers within fifteen school neighbourhoods to over four thousand students. However, as this is an exploratory study, the finding should be interpreted as a trend being revealed. As such, further study with appropriate use of analysis is required to account for individual and group level variables such as multilevel/hierarchical modelling to confirm findings from this study.

Students are simultaneously exposed to positive and negative messages about smoking in the retail environment as it contains both pro- and anti-tobacco PoP activities. Both types of messages were measured and found to be associated with student smoking behaviour in this study and suggested that student smoking status was positively associated with presence of tobacco advertising (pro-tobacco) and negatively associated with presence of tobacco control signage (anti-tobacco). Although the mechanisms by which students perceive and process the conflicting tobacco messages and how that influences their decision to experiment or refrain from cigarette smoking cannot be inferred from this study, the objectively measured data was able to adequately differentiate the intended effect of pro- and anti-tobacco PoP activities. Feighery et. al (2006) evaluated the use of four different measures of adolescent exposure to retail tobacco marketing using combinations of objective and subjective data and their findings suggested that different measures of exposure tap into distinct outcome constructs (e.g. attitude, belief and behaviour). Future studies on the impact of retail tobacco marketing on smoking should therefore include both objectively and subjectively measured data on retail tobacco marketing (e.g. store observations on actual PoP and student perceived exposure to PoP) as well as different constructs of the outcome variable (e.g. attitude, belief and behaviour to smoking) to better understand the underlying mechanisms of retail tobacco marketing on youth smoking behaviour.
Discussion

It is further recommended that both primary observations and student perception of retail tobacco marketing, as well as student characteristics be measured. Student perception data using recall allows for differentiation of the impact that pro-tobacco vs. anti-tobacco has on smoking behaviour. The type of message that resonates and ultimately influence the students’ decision to smoke will vary between students. The review of the literature on youth smoking determinants provided an overview of the factors that fall within the three categories of determinants: individual, social and contextual. The impact that tobacco PoP has on students’ decision to smoke will vary with different composition of individual and social risk and protective factors for the students. For example, a student with a set of strong protective factors (e.g. high academic achievement, smoke-free family, etc) may be more aware and influenced by the anti-tobacco messages than other students who are more at risk for accepting pro-tobacco messages due to individual determinants such as low self-esteem, need for social approval, etc. Therefore collecting student characteristics and perception data will be helpful in understanding how tobacco PoP impact students decision to acquire or abstain from experimenting with tobacco use. Researchers interested in studying the mechanisms by which students process pro- vs. anti-tobacco messages from exposure to retail environment, and how to shape the retail environment for policy and programming development, should consider collecting student characteristics and perception data in addition to objectively measuring the types and levels of tobacco PoP activities in the retail environment.

The store observation form used in this study to collect store data measured the presence versus absence of different types of tobacco PoP activities, but not the amount of tobacco PoP activities such as the number or frequency of tobacco advertising, promotions, functional products, or size of tobacco displays. This crude measurement method may explain the insignificant univariate associations between other pro-tobacco PoP activities and student
smoking status. It is possible that concentrated levels of tobacco PoP presence may impact student smoking behaviour differently and therefore it is further recommended that refinements are made to the store observation instrument to collect data on the amount or size for different types of tobacco PoP activities for more robust analysis and better understanding of the mechanisms of influence tobacco PoP has on adolescent smoking.

The lack of association with student smoking status using the crude PoP index measure may also be due to instrument and variable construction limitations. Conceptually, PoP Index was created as a descriptive measure to illustrate the overall presence of tobacco PoP activities in a particular store. The current construction of the PoP Index (total number of PoP activities present) assumes that each PoP activity exerts equal influence on adolescent smoking. This may not be a sound measure as some PoP activities may be more effective than others as suggested by the significant finding of the presence of tobacco advertising compared to other pro-tobacco PoP activities in this study. Again, it is crucial to gain a better understanding of the mechanisms or relative contributions each type of PoP activity has on student smoking attitude, belief and behaviour. Therefore, the instrument should be refined to enable the use of continuous variables to measure the level of each PoP activity. Factor analysis or principle component analysis should also be employed to develop a more robust index that demonstrates the relative strength of tobacco PoP to accurately depict the tobacco PoP retail environment.

To-date, most studies on the impact of the tobacco retail environment on adolescents examined student perceptions or attitudes as outcome measures and therefore were measuring the effect of retail tobacco marketing on the cognitive construct of student attitude and beliefs, not behavioural constructs such as tobacco use (Wakefield et al., 2006; Henriksen et al., 2002; Donovan et al., 2002). Other studies that did use smoking behaviour as the outcome variable measured exposure subjectively through student recall. For example, students were asked to
recall cigarette brands, or slogans from neighbourhood retail stores (Schooler et al., 1996; MacFadyen et al., 2001). These studies are subject to recall bias. However, similar to this study, the ImpacTeen study used smoking behaviour as the outcome variable and also measured exposure objectively and reported a significant relationship between retail cigarette marketing practices and adolescent smoking uptake (Slater et al., 2007). There are two explanations why a stronger relationship was observed in the ImpacTeen study compared to this Project Impact sub-study. First, both their student and store samples were considerably larger. The student sample was drawn from five annual surveys collected from 1999-2003 from 8th, 10th and 12th grade students (N=26,301), and the store sample was drawn from 966 communities where the students resided (Slater et al., 2007). Therefore the study had adequate power compared to this study. Second, smoking uptake was the outcome measure used which accounted for the different stages of adolescent smoking (e.g. never smoker, puffer, non-recent experimenter, former established smoker, recent experimenter, and current established smoker), given the large sample size of this study, a finer analysis was on smoking uptake was made possible. In addition, while the use of an inclusive smoking definition in this study meant that the influence of pro- and anti-tobacco messages can be applied to both regular and experimenter smokers, an inclusive outcome measure also means that the effect of retail tobacco marketing on different stages of smoking cannot be distinguished. Other studies such as Pierce et al. (1998) provided longitudinal evidence that tobacco promotional activities are causally related to the onset of smoking with a cohort of susceptible non-smokers. Therefore, as suggested in the ImpacTeen study, different types of retail tobacco PoP activities may have specific impacts on various stages of smoking uptake. Future work in this area should consider other outcome measures for smoking behaviour, such as number of cigarettes smoked or different stages of smoking onset, which will have implications for targeted intervention development.
5.1.3 Ecological Factors, Tobacco PoP Activities, and Adolescent Smoking Behaviour

School neighbourhood is an important social and physical context in shaping and influencing risk behaviour in adolescents such as cigarette smoking. There is abundant empirical evidence showing the relationship between smoking and neighbourhood characteristics in general and more specifically between tobacco companies’ marketing strategies and neighbourhood characteristics (Birch et al., 2005; Ennett et al., 1997; Ross & Taylor, 1998; Migliorini & Siahpush, 2006; Diez Roux et al., 2003). Ecological studies on retail tobacco marketing in communities have consistently found differentiated retail tobacco marketing activities in neighbourhoods with particular contextual characteristics suggesting that tobacco companies employ tailored marketing strategies to influence smoking attitude and behaviour at the neighbourhood level based on known contextual determinants. For example, increased retail density has been found in communities with low SES neighbourhoods (Schneider et al., 2005; Barbeau et al., 2004; Laws et al., 2002b; Slater et al., 2000a; Novak et al., 2006), increased brand advertising targeted to a specific ethnicity has been observed in ethnic neighbourhoods (Laws et al., 2002b; Wildey et al., 1992), and increased retail tobacco marketing activities were observed in areas with strong tobacco control policies in an effort to undermine the effects of those policies (Slater et al., 2001; Wakefield et al., 2002c; Loomis et al., 2006). This study sought to explore the moderating effect of selected contextual factors of the BC school neighbourhood on retail tobacco PoP activities and adolescent smoking behaviour.

Living on Vancouver Island ('island') in BC was a main effect accounting for student smoking compared to living on the mainland of BC. Geographic environment however did not moderate the relationship between tobacco PoP and adolescent smoking in this study. There have been no reported studies found on the impact of living on the island compared to the mainland on smoking behaviour. However, comparison of health region smoking rates obtained
from the 2003 Canadian Community Health Survey revealed a significant difference between the two geographically distinct environments. Therefore, the independent relationship found between living on the island vs. mainland and adolescent smoking may also be a result of geographic settings such as lower density neighbourhoods or isolated communities on the island compared to the mainland because living in a low-density neighbourhood has been associated increased school level smoking in a U.S. study (Ennett, 1997). An alternative explanation is that geographic environment may be a distal measure for other factors such as attitudes toward smoking as suggested by Ross & Taylor (1998) who have found geographic variations in individual attitudes toward smoking in the U.S.. Further research is required to understand the mechanisms that differentiate smoking behaviour between different types of geographical settings, to determine whether the physical geographic environment impacts smoking behaviour, and to understand what constructs physical geographic environment represent.

This study failed to find independent and moderating effects of three socio-economic indicators of the school neighbourhood (median household income, education and unemployment rate) on adolescent smoking behaviour and tobacco PoP retail environment. These findings are not consistent with the literature. One explanation is due to inflated Type II errors as a result of assigning neighbourhood characteristics of the small sample of 15 school neighbourhoods to over four thousand students. It is recommended that future studies consider obtaining primary data on socio-demographic measures from the students or their parents, which would also address the issue of ecological fallacy made by making inferences about neighbourhood characteristics to individual students.

Furthermore, there are conceptual issues for dichotomizing the variables into high vs. low levels to enable interaction analysis to examine modification effects. For example, in addition to the previous discussion on the reliability of PoP index measure, the use of high vs.
Discussion

low levels on the PoP Index assumes that low levels of PoP are safe, or safer than high levels. Without understanding the mechanism of impact for each pro-tobacco PoP activity, such an assumption can be erroneous. However, dichotomizing variables for interaction analysis is a standard statistical practice and given the exploratory nature of this study, it further confirmed the need to create a more robust index for tobacco PoP.

Another explanation for lack of association found between sociodemographic factors and adolescent smoking behaviour is the conceptualisation of school neighbourhood. The operational definition of school neighbourhood is the one-kilometre radius of the school. Delimiting the geographic boundary of school neighbourhood means that all retailers located in this defined area are within walking distance from the school, therefore accessibility and exposure to students can be reasonably inferred. However, the one-kilometre school neighbourhood is not the only context where students are exposed to retail tobacco PoP. The socio-demographic characteristics of the neighbourhood where students’ reside may be a more meaningful proxy measure for individual socio-demographic status and therefore have more influence on shaping behaviour such as smoking. In previous studies, neighbourhood area size and area measures of neighbourhoods have been conceptualised, such as the school catchment area (e.g. ImpacTeen study), and various census defined areas (municipality, census tract, etc) with the latter producing mixed results on smoking behaviour (Diez Roux et al., 2003). Therefore, future studies should consider broadening the conceptualisation of neighbourhood in terms of exposure and expand store data collection to the school catchment area which will include both the immediate school neighbourhood and where the majority of the students reside. However, budget and data collection feasibility need to be weighed and carefully considered as primary data collection can be costly and time-consuming. Therefore it is important to clearly define a meaningful neighbourhood area that encompasses the students’ daily environment.
Additionally, while school neighbourhood was characterised using select socio-demographic factors in this study, there are other methods to characterize school neighbourhood that can be explored in future studies dependent on how school neighbourhood as a place is defined. For example, school neighbourhood can be characterized contextually as walk-ability by its physical attributes such as walkways, fences, freeways; or by social perceptions such as school connectedness, and social cohesion. Future studies that are concerned with the relationship between place and behaviour (e.g. school neighbourhood and smoking) may consider using qualitative methodologies as a preliminary approach to define the place of influence by asking students to describe their immediate neighbourhood or about walk-ability in their neighbourhood in order to understand the contextual influence from students’ perspective.

Another recommendation is to use GIS to explore different levels of census-defined areas and socio-demographic measures to graphically present students’ description of their school neighbourhood as representations to define a meaningful community. In addition, the Project Impact study is collecting information on the school catchment zone for further analysis using GIS in addition to multi-level modelling in order to take into account the broader environmental influence that will impact student smoking status.

5.2 GIS Mapping

GIS mapping was used in this study to explore the plausibility of its use for descriptive purposes with secondary data from the Project Impact study to illustrate its results to local decision makers. This section will address the purposes that the maps created in this study served and discuss lessons learned, design implications including recommendations for future work. It is important to note that while the selection of variables for mapping was informed by statistical analyses, the mapping itself did not include any spatial analyses, which is outside the scope of this study.
Maps have high visual impact; it is a powerful communication tool as it can convey a message that is "worth a thousand words". The implications that a map is misunderstood by decision makers may have severe consequences in terms of policy making, funding allocation or program implementation and therefore careful consideration was given to ensure that each map clearly captures the key messages that it was designed to communicate. For example, in Figure 3.1, the main message was to illustrate the data collection methodology whereas in Figure 4.1, the main purpose for mapping the distribution of study sample was to caution against generalisability of study findings to other areas of BC that are contextually dissimilar to the study sample such as Northern BC. Figures 4.3 to 4.5 were developed to highlight key study findings for each research question. Figure 4.3 selected a cluster of school neighbourhoods in Surrey, BC to illustrate the preponderance of retail tobacco PoP in the school neighbourhood, especially in convenience stores (research question #1). Figures 4.4 wanted to visually present the significant statistical findings between the presence of tobacco control signage and tobacco advertisements in the school neighbourhood and its impact on smoking behaviour at the school level (research question #2). Finally, Figure 4.6 illustrated the contextual relationship between smoking prevalence at the school level and at the municipality level given the statistically significant finding between smoking behaviour and living on the island vs. mainland (research question #3). A number of lessons were learned from the GIS mapping process, key design consideration and recommendations are provided below.

When depicting a scaled or categorical variable, careful consideration needs to be given to the colour gradient or icon selection to ensure the variable categories stand out distinctly so there will be no room for misinterpreting what is on the map. For example, in both Figures 3.1 and 4.3, tobacco only stores and convenience stores, as well as gas stations and general merchandise stores are represented by similar shades of the same colour, potentially making the
differentiation between the store types difficult. The colours used to represent different types of retail stores were chosen from a default setting in the GIS software, this illustrates that more consideration should have been given to make the colours more distinct from one store type to another.

The scale of symbols and its proportionality to the overall map also require careful consideration. For example, the size of the school symbol and the municipality boundary is not proportional in Figures 4.5 and 4.6. In Figure 4.6, caution needed to be given that the size of the school symbols were not meant to represent proportionally the total number of schools in relation to the size of the municipality boundary, the schools are in fact much smaller than the symbol signify. For example, the three schools in Mission do not represent the all school communities in that municipality or proportionally represent the schools in southern Missions. The map was generated to convey the general message that high smoking prevalence schools are mainly located on the island in municipalities that have high smoking prevalence compared to the low-smoking prevalence schools located on the lower mainland in municipalities that tend to have lower smoking prevalence rates. However, from a quick glance at the map, one can see that this message does not hold true for the three low-smoking prevalence schools located in Mission which have high municipal smoking prevalence and vice versa. Furthermore, the one high-smoking prevalence school, located in West Vancouver, is in a city with low smoking prevalence. In this situation, a caption should be placed on the map to communicate that the school and municipalities were not mapped to scale to ensure that the key message is understood and not mis-communicated.

GIS mapping was not a primary objective for the Project Impact study, as a result, there were a number of challenges associated with the use of GIS mapping to present study findings.
Discussion

Firstly, scale was an issue as the school locations were widely distributed or spatially spread out making comprehensive visualisation of the sample difficult. Therefore a decision was made to separate the school sample and focus on clusters of schools that allow for closer examination of study factors. However, as depicted in Figure 4.4, the scale of the map does not allow for differentiation between smokers and non-smokers within a school, meaning the level of analysis conducted at the student level cannot be accurately depicted on the map.

Second, in addition to the scale issue, the type of data available (e.g. school and store locations) was mainly point data. With the wide distribution of schools across south-western BC, it was difficult for patterns to emerge, especially in the absence of polygon data to provide context across the full study sample. For example, the different levels of tobacco PoP activities present in neighbourhoods of high vs. low smoking prevalence schools cannot be adequately depicted. However, variations did emerge when one specific school neighbourhood was focused in and enlarged (e.g. Figure 4.3).

Finally, using aggregated DA level data to present socio-demographic characteristics of school neighbourhoods lead to a potential source of error called Modifiable Areal Unit Problem (MAUP) that is related to the concept of ecological fallacy (Gatrell, 2002). The MAUP consists of both a scale and aggregation problem as contextual variables were constrained to predetermined boundaries set by the Canadian Census. The ruling principles for which DAs to include (or exclude) as part of school neighbourhood will implicate the resulting aggregated value of socio-demographic factors that describes the school neighbourhood. Thus, using a different decision rule will result in a different number of DAs to be included as part of the school neighbourhood and thus yield different values to describe the school neighbourhood. For example, this study chose to include all DAs that are completely or partially included in the one kilometre radius boundary, and the values for the socio-demographic factors (e.g. income) were
Discussion

generated by averaging the income value of the number of DAs (e.g. 15) that met this decision rule. An alternative decision could have been made that included only DAs which fell completely within the one kilometre radius and excluded the DAs that only partially fell within the one kilometre radius boundary, and therefore a different income value would have been generated as the number of DAs (e.g. 10) that are used to depict the school neighbourhood would be different. This is especially crucial when considering “area of influence” or community research with implications for local policy and program development.

Although the datasets used in this study did not allow for patterns or trends to emerge due to abovementioned limitations, it allowed for the exploration of study factors, and varying levels of geographical boundaries. It also highlighted the lesson that maps can be manipulated to convey results that may or may not exist, thus underscoring the importance of creating purposeful maps. This exercise also provided insight on methodological and conceptual considerations to build on for future research that wishes to incorporate GIS mapping.

Recommendations include identifying at the outset of the study the type of map and the message that the map ought to convey in order to collect the proper types of data; and identifying the maps’ target audience in order to inform the types of maps created. The general recommendation for other researchers or practitioners who wish to map data that has already been collected is to give careful consideration to the following: 1) the types of available data, 2) the types of maps that one would like generated, 3) the purpose for which one is generating each map, 3) what kind of message each map will convey, and 4) to which audience each map is directed. If the key message of the map is compromised given data limitations, GIS mapping is not recommended given the serious implications for its misuse. In this situation, other communication methods to convey study findings should be explored. Ultimately, it is good
practice to anticipate how the target audience of the map(s) will understand the message that it is trying to convey and ways that it can be misunderstood to minimize miscommunication.

5.3 Policy & Practice Implications

The issue of whether tobacco PoP marketing strategies influence youth smoking has important public policy implications. As demonstrated in this study, the tobacco industry is still finding ways to widely market its products despite comprehensive Canadian federal and provincial tobacco control laws. The results of this study provide evidence that the retail environment is a key outlet for the tobacco industry to market its products to youth. This study also provides evidence that an association exists between youth smoking behaviour among grades 10 and 11 students and the presence of tobacco PoP activities in the retail environment. The findings of this research are especially important for decision makers developing tobacco control policies and programs at the provincial (e.g. BC Ministry of Health) and municipal levels as well as decision-makers within the school system (e.g. School District & School Administration).

From the research perspective, it is important to continue to study retail and tobacco industry advertising practices to help shape policy efforts that can be implemented to decrease the industry’s influence in the retail environment. In addition, evaluations of tobacco policies to ban retail tobacco displays should be conducted to study the effects of policy on industry practices and adolescent smoking. The current study provides a baseline for conducting longitudinal studies pre- and post- retail tobacco PoP ban in BC.

BC has very recently passed legislation (Tobacco Sales Amendment Act) to be implemented in March 2008 that will place restrictions on tobacco industry marketing activities in retail stores. Specifically, any retail display in premises accessible by minors will be restricted.
Results from this study support the need for this kind of policy. Studies such as this also provide a baseline for evaluating regulation changes over time.

From the school policy perspective, school tobacco prevention education should inform students about tobacco industry marketing practices and how it targets youth and its effect on smoking uptake in order to continue educating and raising awareness among students and creating an anti-smoking culture. In light of declining smoking trends and despite the industry’s firm stance on not intentionally marketing to adolescents, the current study supports other research in this area, in addition, previous research has provided causal evidence on the effectiveness of advertising and promotion in shaping positive attitude, encouraging experimentation and eventual addiction to cigarette smoking (Lovato et al., 2004; DiFranza et al., 2006; Pierce et al., 1998).

Within the school environment, the preponderance of tobacco PoP activities found in school neighbourhood combined with evidence from previous research in tobacco marketing and adolescent smoking suggests the need for implementing a tobacco promotion-free zone around the school neighbourhood. School administrators can form collaborations with community agencies, local municipal governments to develop and implement such tobacco control initiative.

The findings in this study demonstrate that tobacco control signage is an effective anti-tobacco communication tool and has protective properties to student smoking behaviour. The high percentage of retailers found with tobacco control signage provides evidence to the federal and provincial government that BC retailers are compliant with requirements to post health and minimum age purchase signage for tobacco control effort. Also, that this type of retail tobacco control expenditure is cost-effective and efforts should continue to create a retail environment that promotes an anti-tobacco norm.
5.4 Limitations of Research

The findings of the present study are subject to limitations that should be considered when interpreting the results. This discussion adds to some of the methodological and conceptual limitations that have already been discussed in section 5.1.

First, the SHAPES data on student smoking behaviour was based on self-reports so the validity of the responses cannot be guaranteed. Since tobacco use in southern BC is not widely accepted norm and is generally associated with negative attitudes, social desirability bias may have occurred. However, efforts were taken to ensure that the data was robust. The measures in the SHAPES instrument have been previously demonstrated to be reliable and valid (Cameron et al., 2002a), and students were ensured that their responses were confidential. Moreover, the smoking behaviours of students in this study were representative of current provincial estimates (Health Canada, 2007) thereby validity of data can be inferred. In addition, smoking behaviour data was collected from grades 10 and 11 students and the use of passive consent approach ensured a high response rate from the available study population. Therefore, the associations found between retail tobacco marketing and adolescent smoking can be plausibly generalised to the intended study population of high school students of the average Canadian town as delimited by the sampling eligibility criteria.

Second, the ‘school neighbourhood’ measured in this study may not have accurately encompassed the environment that actually influences students at a school. Students that spend the majority of their time outside of the designated “school neighbourhood” are also exposed to retail tobacco PoP located elsewhere. Future studies should consider obtaining student data on the neighbourhood stores that students visit and the frequency with which they visit the stores for a more robust measure of exposure. The second phase of the Project Impact study conducted in 2006-2007 has incorporated items on the student questionnaire on frequency of store visits as
well as the types of stores that students visit the most. The collection of this data will validate findings from this study.

Third, since the present study was a secondary data analysis of existing data sets, the study was not designed based on the research question, as such data were not available for all the measures that would have been examined for a more robust analysis to gain understanding of the relationship between adolescent smoking and retail tobacco marketing when considering the known determinants that mediate or moderate this relationship. For example, previous studies such as Slater et al. (2007) included contextual determinants such as policy climate in addition to retail tobacco PoP and student smoking data, and some have examined social influences such as peer or parental smoking. Others looked at individual factors such as receptivity to tobacco promotional products, academic achievement, and perception data to disentangle the impact of tobacco marketing on student smoking in the presence of these factors (Geckova et al., 2002; Pokorny et al., 2003; Pierce et al., 1998). However, as this is an exploratory descriptive study, the results of the study provided preliminary evidence and allowed for recommendations for future research to be drawn.

Fourth, all the explanatory variables in this study were ecological factors such as store density, school level pro- and anti-tobacco PoP activities, and socio-demographic characteristics of the school neighbourhood to make inference on smoking behaviour at the individual level. By doing this, a couple of assumptions were made: that all students from the same school are equally exposed to the same level of tobacco PoP promotions and advertising. Second, all students from the same school spend the majority of their time in a homogenous one-kilometre radius school neighbourhood that has the same income level, education level, unemployment rate, and immigrant density. Making such generalisations on individual behaviour from area-level data without considering the effects of individual factors is known as ecological fallacy.
and limits the interpretation of study findings. The statistical analyses in this study did not take into account that variables belong to different levels of analyses. As a result, this decreased the variability of the explanatory variables and may have lead to an under-estimation of the impact of these aggregated variables. Hierarchical or multi-level modeling is the most appropriate statistical analysis as it disentangles the influences of composition (aggregated socio-demographic factors) from contextual factors (physical contextual factors). Multilevel analyses avoid the constraints of individual and population-based analyses by explicitly modelling the contributions made from the different levels within these analyses (Diez-Roux, 1998; Diez-Roux, 2001; Cook, 2003). The Project Impact study was designed to answer its research questions using multi-level modelling to explicate how much variance is explained with factors collected from different levels of influence for adolescent smoking, this analysis is currently underway.

Fifth, use of the census and aggregation of PoP variables created temporal fallacies in the data. As mentioned previously, the smoking data was collected in 2004 and the closest census data available was for 2001. It is possible that the demographics of the school neighbourhood may have changed as a result of urbanization and therefore are not representative of the school neighbourhood in 2004. Longitudinal studies would address temporality.

Lastly the student samples were drawn from 15 secondary schools located in south-western BC. As demonstrated in this study, the physical environment plays a role in student smoking behaviour, and therefore the study results cannot be generalised to other areas of BC where the physical environment is distinctly different from this study sample. Moreover, the results from these data only pertain to students who attended secondary school and therefore
should not be generalised to marginalised youth such as dropouts and homeless youth as they were not included in the school data collection.

5.5 Future Direction and Concluding Remarks

This was the first study to provide a description of retail tobacco PoP activities located in BC school neighbourhoods and investigated its association with student smoking behaviour and the moderating effects of contextual variables to better understand this relationship. The use of GIS mapping to display the study results provided a method to visually enhance the understanding of study methodology, findings and interpretations. Maps can be used as a knowledge translation tool to decision-makers to provide evidence that can be readily understood, it can also illustrate the lack of association as basis for hypothesis generation and further research. Moreover, the acquisition of knowledge and skills to create maps using GIS software provided insight on conceptual and methodological considerations for ensuring key messages are clearly presented for future studies. Although the associations between retail tobacco marketing and student smoking behaviour were weak, this study builds on the scant body of literature about retail tobacco PoP and adolescent smoking. Furthermore, it gave insight into conceptual and methodological issues for future research studies. As Krugman (2005) pointed out, the issue is not whether advertising and promotion are the most powerful forces in smoking initiation and maintenance; rather the issue is whether advertising and promotion are meaningful factors in smoking initiation and maintenance. This research provided evidence that tobacco PoP activities are prevalent in all retail environments located in the school neighbourhood and suggests patterns of tobacco PoP activities that contribute to the understanding of tobacco industry marketing practices. Given that this study was limited to the province of BC, to provide further evidence and to address some of the study limitations, it is recommended that the next step is to
apply the same methodology used in this study to the larger Project Impact sample (e.g. 81 schools, 487 tobacco retailers).

Policy makers need to take action to protect and prevent children and adolescents alike from being routinely exposed to tobacco promotional messages in the retail environment by implementing a complete ban on tobacco display and advertising, thus eliminating retail stores as a marketing venue. The majority of provinces and territories in Canada (10 out of 13) are recognizing this public health threat and have committed to legislation banning tobacco displays and promotions in the retail environment, findings from this study provide supportive evidence for British Columbia’s commitment to act and enhance the comprehensiveness of its youth tobacco control policies.

The rates of smoking have been declining in Canada in response to its comprehensive approach to tobacco control. The tobacco control community should not lose this momentum and policy makers, practitioners and researchers alike are encouraged to continue these efforts and advocate for a tobacco-free environment to protect the current and future youth generations.
Reference List


References


Appendix A – Tobacco Control Legislation in BC and Canada
<table>
<thead>
<tr>
<th><strong>Federal Canadian Tobacco Control Restrictions 2003</strong></th>
</tr>
</thead>
</table>
| **Smoking** | Smoking prohibited on commercial aircraft & broadcasting facilities, *Non-Smokers Health Act* & *Non-Smokers Health Regulation*.  
Smoking restricted on public transit & in transit stations. Smoking restricted at federal govt worksites & at worksites that are federally governed. |
| **Point of Sale** | No person shall furnish a tobacco product to a person under 18 years in a public place or in a place to which public reasonably has access, *Tobacco Act*.  
Tobacco retailers required to request specific photo ID, *Tobacco Act*.  
Signs with prescribed form & content to be posted by retailers as prescribed to inform public that sale or giving of tobacco product to a young person is prohibited, or contain prescribed health message, *Tobacco Act*.  
Retailers must post prominently specific prescribed signage, *Tobacco Access Regulation*.  
Vending machines are only allowed in (a) place to which public does not reasonably have access; or (b) bar, tavern, or beverage room, & have prescribed security mechanism, *Tobacco Act*.  
*Act* allows for regulations on display of tobacco products & accessories at retail, but none are introduced.  
*Act* allows suspension of tobacco sales for any retailer repeatedly contravening *Act*. |
| **Promotion, Advertising & Sponsorship** | According to the *Tobacco Act* no person shall promote a tobacco product or a tobacco product-related brand element except as authorized by the *Act* or the regulations.  
The *Act* prohibits any form of lifestyle advertising that could be construed on reasonable grounds to be appealing to young persons. No person shall promote a tobacco product by means of an advertisement that depicts, in whole or in part, a tobacco product, its package or a brand element of one or that evokes a tobacco product or a brand element.  
No person may display a tobacco product-related brand element or name of manufacturer in a promotion used, directly or indirectly, in sponsorship of a person, entity, event, activity or permanent facility.  
No person shall promote a tobacco product by any means that are false, misleading, or deceptive or are likely to create an erroneous impression about characteristics, health effects/ hazards of product or its emissions. |
| **Packaging & Labelling** | Sale only permitted for packages of 20 or more, *Tobacco Act*.  
Tobacco packages must display prescribed info required by product regulations & its emissions, & health hazards/ effects from |
| Tobacco Reporting Regulation specifies requirements for reporting ingredients & emissions; specify sampling, testing, & data collection requirements for emissions by brand (specific) category. |

| Manufactures & Distributors | Tobacco manufacturers & distributors are required to report certain marketing information (e.g., advertisements, sponsorship promotions, retail promotions, packaging, services, accessories, and non-tobacco products) and are required to report certain research information — any research related to product toxicity, health effects, ingredients, taste, flavour, product modification, marketing and consumer usage. Tobacco Reporting Regulation. In quarterly reports, tobacco manufacturers and distributors are required to disclose the ingredients and additives of tobacco products. |

| British Columbia Tobacco Control Restrictions 2003 |

| Smoking | Smoking prohibited in workplaces & public places, Occupational Health & safety Regulation. A policy prohibits smoking at all provincial govt work sites. Municipal Act provides municipal governments with authority to pass bylaws to restrict tobacco use. Regulation prohibits smoking in schools & post-secondary institutions; childcare, recreation, residential care; acute care facilities; retail stores; shopping malls; financial instit's; restaurants; public transit, vehicles, shelters & stations. |

| Point of Sale | Prohibition of sales to person under 18 years of ages, Tobacco Sales Act. Retailers required to post (specific) signs at point of each sale, Tobacco Sales Regulation. In cases of sales suspensions, retailers must post prominent signs indicating they are suspended from tobacco sales, Tobacco Sales Act. Prominent signs are required at point of sale with a specific health message, Tobacco Sales Regulation. |
| Promotion, Advertising & Sponsorship | Broad restrictions on promotions and advertising – A person must not deal, sell, offer for sale, distribute, advertise or promote the use of tobacco except in compliance with the Tobacco Sales Act and regulations.

This enabling clause is arguably broad enough to include restrictions on sponsorship promotions.

Tobacco Sales Act states that a person must not deal in, sell, offer for sale, distribute, advertise or promote the use of tobacco except in compliance with Act. |
|---|---|
| Packaging & Labelling | Tobacco Sales Act: regulations may be approved for labelling, packaging, selling, distributing, offering, exposing, promotion & advertising of tobacco in BC.

Act allows regulations for manufacturers to place inserts with health info inside tobacco packages.

Govt has statutory authority to approve regulations to require tobacco manufacturers to produce plain, non-promotional cigarette packages.

Act requires manufacturers to report all toxic emissions, additives, & ingredients in tobacco products. |
| Manufactures & Distributors | Tobacco Sales Act manufacturers & distributors must disclose product ingredients & additives & health hazards/effects of tobacco exposure.

Tobacco Fee Act manufacturers & distributors must be licensed & pay license fees; prohibits passing costs of license fees.

Tobacco Damages Recovery Act enables govt to undertake litigation to recover costs of treating tobacco-related illnesses.

Tobacco Fee Act (un-proclaimed) places product price controls. |

Jurisdictions Prohibiting the Visible Tobacco Product-Displays at Point of Purchase in Canada.

1. Saskatchewan (March 11, 2002)*
2. Manitoba (January 1, 2004)*
3. Nunavut (February 1, 2004)
4. Prince Edward Island (June 1, 2006)
5. Northwest Territories (Jan. 21, 2007)*
7. British Columbia (March 31, 2008)**
8. Ontario (May 31, 2008)
9. Quebec (May 31, 2008)
10. Alberta (July 1, 2008)
Appendix B – School Health Action, Planning and Evaluation Systems (SHAPES) – Tobacco Module
Student Tobacco Survey

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.

Please

Improper Marks

Proper Mark

The name of my school is: ______________________

1. What grade are you in?
   • 6
   • 7
   • 8
   • 9
   • 10
   • 11
   • 12

2. How old are you?
   • 11 or younger
   • 12
   • 13
   • 14
   • 15
   • 16
   • 17
   • 18 or older

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

4. Does your father (or stepfather or foster father) smoke cigarettes? Think about the father you see the most. Fill in the circle next to the one answer you choose.
   • I have no father
   • No, he has never smoked
   • No, he has stopped smoking
   • Yes, he smokes cigarettes, cigars or a pipe
   • I don't know

5. Does your mother (or stepmother or foster mother) smoke cigarettes? Think about the mother you see the most. Fill in the circle next to the one answer you choose.
   • I have no mother
   • No, she has never smoked
   • No, she has stopped smoking
   • Yes, she smokes cigarettes, cigars or a pipe
   • I don't know

6. Do any of your older brothers smoke cigarettes?
   • Yes
   • No
   • I don't know
   • I don't have any older brothers

7. Do any of your older sisters smoke cigarettes?
   • Yes
   • No
   • I don't know
   • I don't have any older sisters
8. Have you ever smoked a cigarette, even just a few puffs?
   - Yes
   - No

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

10. Have you smoked 100 or more whole cigarettes in your life?
    - Yes
    - No
    - I have never smoked

11. Think about the last 30 days. Did you smoke a cigarette, even just a few puffs?
    - Every day
    - Almost every day
    - Some days
    - 1 or 2 days
    - Not at all

12. Think about the last 30 days. On the days that you smoked, how many cigarettes did you usually smoke?
    - I did not smoke at all
    - A few puffs in a day
    - 1-2 cigarettes in a day
    - 3-5 cigarettes in a day
    - 6-10 cigarettes in a day
    - 11-19 cigarettes in a day
    - 20 or more cigarettes in a day

13. In the last 12 months, how often did you smoke?
    - 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

14. Are you a smoker?
    - Yes
    - No

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

16. Do you think in the future you might try smoking cigarettes?
    - Definitely yes
    - Probably yes
    - I already smoke
    - Probably not
    - Definitely not

17. If one of your best friends were to offer you a cigarette, would you smoke it?
    - Definitely yes
    - Probably yes
    - Probably not
    - Definitely not

18. At any time during the next year do you think that you will smoke a cigarette?
    - Definitely yes
    - Probably yes
    - I already smoke
    - Probably not
    - Definitely not

19. Your closest friends are the friends you like to spend the most time with. How many of your 5 closest friends smoke cigarettes?
    - None
    - 1
    - 2
    - 3
    - 4
    - 5

20. 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

21. How long ago did you quit smoking?
    - I have never smoked
    - I am still smoking
    - I quit less than 2 weeks ago
    - I quit between 2 weeks and 6 months ago
    - I quit between 6 months and one year ago
    - I quit more than one year ago

22. How many times in the past year have you tried to quit smoking?
    - I have not smoked in the last year
    - I have not tried to quit in the last year
    - I have tried to quit once in the last year
    - I have tried to quit 2 times in the last year
    - I have tried to quit 3 times in the last year
    - I have tried to quit 4 or more times in the last year

23. How sure are you that you could quit smoking if you wanted to?
    - Very sure
    - Sure
    - Unsure
    - Very unsure
    - I do not smoke
    - I do not want to quit

24. Is there help available at this school for students who want to quit smoking?
    - Yes
    - No
    - I'm not sure

25. Would you join a program to help you quit smoking if one was offered at your school?
    - Yes
    - No
    - I do not smoke cigarettes anymore
    - I have never smoked
### 25. If you were thinking about quitting smoking, rate whether you might use the following ways to quit.

<table>
<thead>
<tr>
<th></th>
<th>Definitely</th>
<th>Maybe</th>
<th>Never</th>
<th>I don't smoke</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. A self-help booklet</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. Group meetings at school</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>c. My doctor</td>
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<tr>
<td>d. Chat room on the Internet</td>
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<tr>
<td>e. Information site on the Internet</td>
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<tr>
<td>f. Teacher, guidance counsellor, or school nurse</td>
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<td></td>
<td></td>
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<tr>
<td>g. Free telephone quit line</td>
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<td></td>
</tr>
<tr>
<td>h. Friend's advice</td>
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</tr>
<tr>
<td>i. Quit on my own</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>j. Nicotine gum or nicotine patch</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>k. Other</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### 27. How often do you smoke in each of the following places?

<table>
<thead>
<tr>
<th></th>
<th>Often</th>
<th>Sometimes</th>
<th>Never</th>
<th>I don't smoke</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. At home</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. Walking to or from school</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>c. At school but off school property</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>d. At school on school property</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>e. At concerts/dances/clubs</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>f. In restaurants/coffee shops</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>g. At parties</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>h. Other</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### 28. How often do you smoke at the following times?

<table>
<thead>
<tr>
<th></th>
<th>Often</th>
<th>Sometimes</th>
<th>Never</th>
<th>I don't smoke</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Before school</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. During the school day</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>c. After school</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>d. In the evening</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>e. On weekends</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>f. Other</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th></th>
<th>Often</th>
<th>Sometimes</th>
<th>Never</th>
<th>I don't smoke</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. By myself</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. With my parents</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>c. With other family members</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>d. With friends</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>e. Other</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### 30. How strongly do you agree or disagree with each of the following statements?

<table>
<thead>
<tr>
<th></th>
<th>Strongly Agree</th>
<th>Agree</th>
<th>Disagree</th>
<th>Strongly Disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. I feel close to people at this school</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. I feel I am part of this school</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>c. I am happy to be at this school</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>d. The teachers at this school treat students fairly</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>e. I feel safe in my school</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
31. How do you usually get your cigarettes?
- I buy them
- Someone buys them for me
- I get them from my friends
- I get them from home
- Other
- I do not smoke

32. If you buy your own cigarettes, where do you buy them? PLEASE 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

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

34. How many people your age, in your school, 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%

35. Not counting yourself, how many people smoke inside your home every day or almost every day?
- 0
- 1
- 2
- 3
- 4
- 5 or more

36. Are you exposed to smoking at your job?
- Yes
- No
- I do not have a job outside of school

37. Do you think all public places (e.g., restaurants, malls, arcades, etc.) should be smoke-free?
- Definitely yes
- Probably yes
- Probably not
- Definitely not

38. You can be fined for smoking on school property.
- True
- False
- I'm not sure

39. I often see students smoking near this school.
- True
- Usually true
- Usually false
- False

40. This school has a clear set of rules about smoking for students to follow.
- True
- Usually true
- Usually false
- False

41. If students are caught breaking the smoking rules at this school, they get into trouble.
- True
- Usually true
- Usually false
- False

42. How many students at this school smoke where they are not allowed to?
- A lot
- Some
- A few
- None

43. In your free time away from home, how often does your mother or father know where you are?
- Always
- Usually
- Sometimes
- Seldom
- Never

44. How often do you talk to adults in your family about what you have done during the day?
- Less than once a week
- Once a week
- A few times a week
- Almost every day

45. How is cigarette smoking handled in your home?
- No one is allowed to smoke in my home
- Only special guests are allowed to smoke in my home
- People are allowed to smoke only in certain areas in my home
- People are allowed to smoke anywhere in my home

46. Have your parents ever expressed a desire for you not to smoke?
- Yes
- No
Appendix C – Store Observation Form
## Store Observation Form 2004

**Index School Number:** __________-_________  
**Store Sequence Number:** __________

**Store Name:** ____________________________  
**Street:** _________________________________  
**City:** _________________________________

**Date (dd:mm:yy):** ____________________________

**Observer names:** ____________________________

**Time Begin:** ____________(am/pm)  
**Time End:** ____________(am/pm)

### Final Status:

<table>
<thead>
<tr>
<th>Status</th>
<th>Type of Store</th>
</tr>
</thead>
<tbody>
<tr>
<td>Observation completed</td>
<td>Convenience</td>
</tr>
<tr>
<td>Store not open today</td>
<td>Convenience and gas</td>
</tr>
<tr>
<td>Out of business</td>
<td>Gas station</td>
</tr>
<tr>
<td>No tobacco sold</td>
<td>Mom &amp; Pop grocery</td>
</tr>
<tr>
<td>Not safe, explain below</td>
<td>Larger grocery</td>
</tr>
<tr>
<td>Staff suspicious, explain below</td>
<td>Supermarket</td>
</tr>
<tr>
<td>Other, explain below</td>
<td>Drug store/Pharmacy</td>
</tr>
<tr>
<td>Explanations:</td>
<td>Tobacco store</td>
</tr>
<tr>
<td></td>
<td>Newsstand/Kiosk</td>
</tr>
<tr>
<td></td>
<td>Delicatessen</td>
</tr>
<tr>
<td></td>
<td>Bulk warehouse</td>
</tr>
<tr>
<td></td>
<td>General merchandise</td>
</tr>
<tr>
<td></td>
<td>Bowling alley</td>
</tr>
<tr>
<td></td>
<td>Other, specify:</td>
</tr>
</tbody>
</table>

### School Proximity (code all that apply)

<table>
<thead>
<tr>
<th>Proximity</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Closest to index school</td>
<td>01</td>
</tr>
<tr>
<td>Index school visible from the store</td>
<td>02</td>
</tr>
<tr>
<td>Other schools visible from the store (K – 12)</td>
<td>03</td>
</tr>
<tr>
<td>None of the above</td>
<td>04</td>
</tr>
</tbody>
</table>

### External Advertising: Is there external advertising of tobacco?

<table>
<thead>
<tr>
<th>Advertising</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>YES, by specific tobacco brands</td>
<td>01</td>
</tr>
<tr>
<td>YES, but not by specific brands</td>
<td>02</td>
</tr>
<tr>
<td>NO, none visible</td>
<td>03</td>
</tr>
</tbody>
</table>
## Project Impact: Youth & Tobacco

### 5. Size of Outlet

<table>
<thead>
<tr>
<th></th>
<th>Cash Registers in Whole Outlet</th>
<th>Cash Registers for Tobacco Products Only</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### 6. Placement of Cigarettes and Smokeless Tobacco

**code all that apply**

<table>
<thead>
<tr>
<th>Placement</th>
<th>A. Cigarette Packs</th>
<th>B. Smokeless Tobacco</th>
</tr>
</thead>
<tbody>
<tr>
<td>Self Service:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>On counter</td>
<td>01</td>
<td>01</td>
</tr>
<tr>
<td>Off counter, in view of clerk</td>
<td>02</td>
<td>02</td>
</tr>
<tr>
<td>Off counter, not in view of clerk</td>
<td>03</td>
<td>03</td>
</tr>
<tr>
<td>Next to candy displays</td>
<td>04</td>
<td>04</td>
</tr>
<tr>
<td>Less than 3 ½ feet above ground</td>
<td>05</td>
<td>05</td>
</tr>
<tr>
<td>Clerk-assisted:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Over or behind counter</td>
<td>06</td>
<td>06</td>
</tr>
<tr>
<td>Behind special customer service desk</td>
<td>07</td>
<td>07</td>
</tr>
<tr>
<td>Under any counter, not visible</td>
<td>08</td>
<td>08</td>
</tr>
<tr>
<td>Locked or closed cabinet</td>
<td>09</td>
<td>09</td>
</tr>
<tr>
<td>General check-out</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>Tobacco-only counter</td>
<td>11</td>
<td>11</td>
</tr>
<tr>
<td>Plexiglas display</td>
<td>12</td>
<td>12</td>
</tr>
</tbody>
</table>

**Other Placement (specify)**

<table>
<thead>
<tr>
<th>Placement</th>
<th>A. Cigarette Packs</th>
<th>B. Smokeless Tobacco</th>
</tr>
</thead>
<tbody>
<tr>
<td>Could not determine/product not sold</td>
<td>77</td>
<td>77</td>
</tr>
</tbody>
</table>

### 7. Other Tobacco Products: Are the following other tobacco products visible?

<table>
<thead>
<tr>
<th>Tobacco Product</th>
<th>YES</th>
<th>NO</th>
<th>Tobacco Product</th>
<th>YES</th>
<th>NO</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Cigarette cartons</td>
<td>01</td>
<td>02</td>
<td>g. Clove cigarettes (Kreteks)</td>
<td>01</td>
<td>02</td>
</tr>
<tr>
<td>b. Cigars</td>
<td>01</td>
<td>02</td>
<td>h. Loose cigarettes</td>
<td>01</td>
<td>02</td>
</tr>
<tr>
<td>c. Cigarillos (Colts)</td>
<td>01</td>
<td>02</td>
<td>i. PREPs</td>
<td>01</td>
<td>02</td>
</tr>
<tr>
<td>d. Loose tobacco</td>
<td>01</td>
<td>02</td>
<td>j. Flavoured tobacco cigarettes</td>
<td>01</td>
<td>02</td>
</tr>
<tr>
<td>e. Rolling papers/tubes</td>
<td>01</td>
<td>02</td>
<td>k. Nicotine replacements</td>
<td>01</td>
<td>02</td>
</tr>
<tr>
<td>f. Bidis</td>
<td>01</td>
<td>02</td>
<td>l. Other</td>
<td>01</td>
<td>02</td>
</tr>
</tbody>
</table>
**Project Impact: Youth & Tobacco**

### 8. How are tobacco products displayed in the store? (code all that apply)

- In a purpose built display cabinet for tobacco products only ........................................... 01
- In a purpose built display cabinet for tobacco and non-tobacco products .......................... 02
- Displayed on standard shelving or counter ........................................................................ 03
- Other, specify: .................................................................................................................. 04

### 9. Tobacco displays: Are the following endorsed by tobacco manufacturers?

<table>
<thead>
<tr>
<th>YES</th>
<th>Which brand(s)?</th>
<th>NO</th>
<th>N/A</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Standard shelving or a counter</td>
<td>01</td>
<td></td>
<td>02</td>
</tr>
<tr>
<td>b. Purpose display cabinet</td>
<td>01</td>
<td></td>
<td>02</td>
</tr>
</tbody>
</table>

### 10. Health Warning Labels:

- Are the packs displayed so that health warnings are visible?
  - YES 01
  - NO 02
  - SOME 03

### 11. Which ONE brand occupies the largest observable amount of SHELF SPACE?

- du Maurier ..................................................................................................................... 01
- Players .......................................................................................................................... 02
- Export A ....................................................................................................................... 03
- Benson & Hedges ........................................................................................................ 04
- Other ........................................................................................................................... 05
- Not applicable ............................................................................................................... 77

### 12. Which ONE brand has the largest number of VISIBLE PACK FRONTS?

- du Maurier ..................................................................................................................... 01
- Players .......................................................................................................................... 02
- Export A ....................................................................................................................... 03
- Benson & Hedges ........................................................................................................ 04
- Other ........................................................................................................................... 05
- Not applicable ............................................................................................................... 77
### Project Impact: Youth & Tobacco

**13. Which brand(s) occupy an EYE-LEVEL SHELF POSITION (1 – 1.5 m)? (code all that apply)**

<table>
<thead>
<tr>
<th>Brand</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Du Maurier</td>
<td>.01</td>
</tr>
<tr>
<td>Players</td>
<td>.02</td>
</tr>
<tr>
<td>Export A</td>
<td>.03</td>
</tr>
<tr>
<td>Benson &amp; Hedges</td>
<td>.04</td>
</tr>
<tr>
<td>Other</td>
<td>.05</td>
</tr>
<tr>
<td>Not applicable</td>
<td>.77</td>
</tr>
</tbody>
</table>

**14. Which ONE INTERNATIONAL BRAND is most prominent?**

<table>
<thead>
<tr>
<th>Brand</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Marlboro</td>
<td>.01</td>
</tr>
<tr>
<td>Newport</td>
<td>.02</td>
</tr>
<tr>
<td>Camel</td>
<td>.03</td>
</tr>
<tr>
<td>Winston</td>
<td>.04</td>
</tr>
<tr>
<td>Other</td>
<td>.05</td>
</tr>
<tr>
<td>Not sold</td>
<td>.06</td>
</tr>
</tbody>
</table>

**15. Interior Advertising: Select the best statement for tobacco ads.**

<table>
<thead>
<tr>
<th>Statement</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>The store interior is free from any ads/logos.</td>
<td>.01</td>
</tr>
<tr>
<td>The store interior has some ads/logos, but only in areas where items are displayed</td>
<td>.02</td>
</tr>
<tr>
<td>The store interior has ads/logos in other areas as well.</td>
<td>.03</td>
</tr>
<tr>
<td>The store interior has ads/logos covering almost all available space.</td>
<td>.04</td>
</tr>
</tbody>
</table>

**16. Which ONE brand is most PROMINENTLY ADVERTISED?**

<table>
<thead>
<tr>
<th>Brand</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>du Maurier</td>
<td>.01</td>
</tr>
<tr>
<td>Players</td>
<td>.02</td>
</tr>
<tr>
<td>Export A</td>
<td>.03</td>
</tr>
<tr>
<td>Benson &amp; Hedges</td>
<td>.04</td>
</tr>
<tr>
<td>Other</td>
<td>.05</td>
</tr>
<tr>
<td>No ads</td>
<td>.06</td>
</tr>
</tbody>
</table>
### What types of promotions were observed inside the store? (code all that apply)

<table>
<thead>
<tr>
<th>Promotion Type</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>No promotions</td>
<td>01</td>
</tr>
<tr>
<td>Multi-pack discounts</td>
<td>02</td>
</tr>
<tr>
<td>Cents-off coupon offer</td>
<td>03</td>
</tr>
<tr>
<td>Advertised special price offer</td>
<td>04</td>
</tr>
<tr>
<td>Free gift(s) with purchase</td>
<td>05</td>
</tr>
<tr>
<td>Bonus offer (e.g., extra cigarettes in pack)</td>
<td>06</td>
</tr>
<tr>
<td>Other, explain:</td>
<td>07</td>
</tr>
</tbody>
</table>

### Tobacco Branding: Do any of the following have tobacco brand logos, use tobacco brand colour schemes or have any link with tobacco brands? (code all that apply)

<table>
<thead>
<tr>
<th>Branding Type</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>No branding</td>
<td>01</td>
</tr>
<tr>
<td>Pens</td>
<td>02</td>
</tr>
<tr>
<td>Clocks</td>
<td>03</td>
</tr>
<tr>
<td>Lighters/matches</td>
<td>04</td>
</tr>
<tr>
<td>Signs</td>
<td>05</td>
</tr>
<tr>
<td>Other, specify</td>
<td>06</td>
</tr>
</tbody>
</table>

### Tobacco Control: Does the store display tobacco control warnings and signs?

<table>
<thead>
<tr>
<th>Health Warnings</th>
<th>Yes, prominently</th>
<th>Yes, not prominently</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Government Health Warning</td>
<td>01</td>
<td>02</td>
<td>03</td>
</tr>
<tr>
<td>b. Tobacco Industry Warning</td>
<td>01</td>
<td>02</td>
<td>03</td>
</tr>
<tr>
<td>c. Store-specific Warning</td>
<td>01</td>
<td>02</td>
<td>03</td>
</tr>
<tr>
<td>MINIMUM AGE FOR PURCHASE</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>d. Government Sign</td>
<td>01</td>
<td>02</td>
<td>03</td>
</tr>
<tr>
<td>e. Tobacco Industry Sign</td>
<td>01</td>
<td>02</td>
<td>03</td>
</tr>
<tr>
<td>f. Store-specific Sign</td>
<td>01</td>
<td>02</td>
<td>03</td>
</tr>
<tr>
<td>PENALTIES FOR UNDERAGE PURCHASE</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>g. Government sign</td>
<td>01</td>
<td>02</td>
<td>03</td>
</tr>
<tr>
<td>h. Tobacco Industry Sign</td>
<td>01</td>
<td>02</td>
<td>03</td>
</tr>
<tr>
<td>i. Store-specific Sign</td>
<td>01</td>
<td>02</td>
<td>03</td>
</tr>
</tbody>
</table>
## Project Impact: Youth & Tobacco

### 20. Price of Tobacco Products

<table>
<thead>
<tr>
<th>PRODUCT</th>
<th>BRAND OF PRODUCT</th>
<th>SIZE OF PACK</th>
<th>PRICE (W/OUT TAX)</th>
<th>PRICE (W/ TAX)</th>
<th>HOW DETERMINED</th>
</tr>
</thead>
<tbody>
<tr>
<td>Du Maurier Pack</td>
<td></td>
<td>$</td>
<td>$</td>
<td>Visible .......................... 01</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Asked .................. 02</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
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*Comments about the store (use back of page if needed):*
Appendix D – Descriptive of Study Variables
### Outcome variable

#### Smoking status

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#### Smoking Status x Hi- and Low-Smoking prevalence School

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Explanatory Variables

Tobacco advertising

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Visible tobacco display

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Industry sponsored Purpose-built display cabinet

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In-store promotions

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### Tobacco control signage

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## Store Density

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Appendix E – School Community Profile
School ID: 2100
School District: Comox Valley #71
Municipality: Comox
Health Region: Upper Island/Central Coast
Grades: 8-12
Gr.10-11 (N): 424

Community Characteristics

Setting
School: residential
Community (Catchment area):
mixed rural + residential

Population Size
Total: 7381
Age 0-19 (%): 8.94
Age 15-19 (%): 26.85
Age 20-54 (%): 44.22
Age 55+ (%): 29.02
Male (%): 48.33
Female (%): 51.67

Land type: Island
Immigrant population (%): 11.01
Unemployment rate: 7.76
Education (< Gr.9, %): 3.03
Income Median: $51512.88

Smoking Norm

Current smokers
Overall (%): 0
15-19 yrs (%): 9.14
20-24 yrs (%): 31.07
25+ yrs (%): 23.83

School smoking prevalence (SD):
16.39 (0.37)
Smoking on school property: Yes
Smoking on school periphery: Yes

Tobacco Policy/Program

Municipality bylaw: Yes
School board tobacco policy: Yes
School tobacco policy: Yes
School tobacco control program: No

Comments: 140
School ID: 2101
School District: Langley #35
Municipality: Langley
Health Region: South Fraser Valley
Grades: 8-12
Gr.10-11 (N): 239

Community Characteristics

Setting
School: mixed residential + industrial
Community (Catchment area):
mixed residential + commercial

Population Size
Total: 5959
Age 0-19 (%): 6.92
Age 15-19 (%): 25.91
Age 20-54 (%): 45.96
Age 55+ (%): 28.32
Male (%): 47.14
Female (%): 53.02

Land type: Mainland
Immigrant population (%): 20.32
Unemployment rate: 4.54
Education (< Gr.9, %): 7.37
Income Median: $50608.63

Smoking Norm

Current smokers
Overall (%): 1
15-19 yrs (%): 5.48
20-24 yrs (%): 33.29
25+ yrs (%): 14.98

School smoking prevalence (SD):
13.51 (0.34)
Smoking on school property: No
Smoking on school periphery: Yes

Tobacco Policy/Program

Municipality bylaw: Yes
School board tobacco policy: Yes
School tobacco policy: Yes
School tobacco control program: Yes

Comments:

Store/PoP Characteristics

Store density: 2

Store Types
Convenience: 0
Convenience + Gas Stn: 1
Gas Station: 1
Small grocery: 0
Large grocery: 0
Supermarket: 0
Drug store/pharmacy: 0
Tobacco store: 0
Newsstand: 0
Deli: 0
Bulk warehouse: 0
Merchandise store: 0
Bowling alley: 0
Others: 0

PoP Variables
Tobacco advertising: 1
Visible display of cigarettes: 1
Industry-sponsored PBD Cabinet: 0.5
In-Store Promotions: 0.5
Tobacco Branding: 0
Tobacco Control Signage: 1
PoP Index: 3
School ID: 2102
School District: Comox Valley #71
Municipality: Courtenay
Health Region: Upper Island/Central Coast
Grades: 8-12
Gr.10-11 (N): 337

Community Characteristics

Setting
School: residential
Community (Catchment area): residential

Population Size
Total: 6684
Age 0-19 (%): 6.84
Age 15-19 (%): 25.40
Age 20-54 (%): 44.66
Age 55+ (%): 31.44
Male (%): 47.93
Female (%): 52.08

Land type: Island
Immigrant population (%): 14.85
Unemployment rate: 7.41
Education (< Gr.9, %): 3.75
Income Median: $50367.86

Smoking Norm

Current smokers
Overall (%): 0
15-19 yrs (%): 9.14
20-24 yrs (%): 31.07
25+ yrs (%): 23.83

School smoking prevalence (SD):
15.22 (0.36)
Smoking on school property: Yes
Smoking on school periphery: No

Tobacco Policy/Program

Municipality bylaw: Yes
School board tobacco policy: Yes
School tobacco policy: Yes
School tobacco control program: Yes

Comments:
School ID: 2103
School District: Greater Victoria #61
Municipality: Oak Bay
Health Region: Capital
Grades: 8-12
Gr.10-11 (N): 467

Community Characteristics

Setting
School: residential
Community (Catchment area): mixed residential + commercial

Population Size
Total: 14910
Age 0-19 (%): 6.49
Age 15-19 (%): 19.81
Age 20-54 (%): 44.78
Age 55+ (%): 35.57
Male (%): 44.05
Female (%): 55.96

Land type: Island
Immigrant population (%): 23.51
Unemployment rate: 6.59
Education (< Gr.9, %): 2.49
Income Median: $ 50100.31

Smoking Norm

Current smokers
Overall (%): 0
15-19 yrs (%): 23.21
20-24 yrs (%): 24.17
25+ yrs (%): 18.46

School smoking prevalence (SD):
13.80 (0.35)
Smoking on school property: Yes
Smoking on school periphery: No

Tobacco Policy/Program

Municipality bylaw: Yes
School board tobacco policy: Yes
School tobacco policy: No
School tobacco control program: Yes

Comments:

Store/PoP Characteristics

Store density: 6

Store Types
Convenience: 1
Convenience + Gas Stn: 1
Gas Station: 0
Small grocery: 0
Large grocery: 2
Supermarket: 2
Drug store/pharmacy: 0
Tobacco store: 0
Newsstand: 0
Deli: 0
Bulk warehouse: 0
Merchandise store: 0
Bowling alley: 0
Others: 1

PoP Variables
Tobacco advertising: 0.33
Visible display of cigarettes: 0.83
Industry-sponsored PBD Cabinet: 0.33
In-Store Promotions: 0.17
Tobacco Branding: 0.17
Tobacco Control Signage: 0.83
PoP Index: 1.83
School ID: 2104
School District: Greater Victoria #61
Municipality: Saanich
Health Region: Capital
Grades: 9-12
Gr.10-11 (N): 289

Community Characteristics

Setting
School: mixed residential + commercial
Community (Catchment area): mixed residential + commercial

Population Size
Total: 12214
Age 0-19 (%):6.98
Age 15-19 (%):21.53
Age 20-54 (%):53.06
Age 55+ (%):26.28
Male (%):47.38
Female (%):52.50

Land type: Island
Immigrant population (%):18.45
Unemployment rate: 5.68
Education (< Gr.9, %): 3.03
Income Median: $ 54585.86

Smoking Norm

Current smokers
Overall (%):0
15-19 yrs (%):23.21
20-24 yrs (%):24.17
25+ yrs (%):18.46

School smoking prevalence (SD): 15.42 (0.36)
Smoking on school property: No
Smoking on school periphery: No

Tobacco Policy/Program

Municipality bylaw: Yes
School board tobacco policy: Yes
School tobacco policy: Yes
School tobacco control program: Yes

Comments:

Store/PoP Characteristics

Store density: 5

Store Types
Convenience: 0
Convenience + Gas Stn: 2
Gas Station: 1
Small grocery: 0
Large grocery: 0
Supermarket: 1
Drug store/pharmacy: 1
Tobacco store: 0
Newsstand: 0
Deli: 0
Bulk warehouse: 0
Merchandise store: 0
Bowling alley: 0
Others: 0

PoP Variables
Tobacco advertising: 0.20
Visible display of cigarettes: 1
Industry-sponsored PBD Cabinet: 0.20
In-Store Promotions: 0.40
Tobacco Branding: 0.20
Tobacco Control Signage: 0.80
PoP Index: 2
School ID: 2106
School District: Nanaimo-LadySmith #68
Municipality: Nanaimo
Health Region: Central Vancouver
Grades: 8-12
Gr.10-11 (N): 288

Community Characteristics

Setting
School: residential
Community (Catchment area): mixed commercial + residential + industrial

Population Size
Total: 10633
Age 0-19 (%): 6.58
Age 15-19 (%): 22.13
Age 20-54 (%): 42.14
Age 55+ (%): 37.83
Male (%): 44.72
Female (%): 55.35

Land type: Island
Immigrant population (%): 16.74
Unemployment rate: 8.02
Education (< Gr.9, %): 7.84
Income Median: $37455.43

Smoking Norm

Current smokers
Overall (%): 0
15-19 yrs (%): 9.14
20-24 yrs (%): 31.07
25+ yrs (%): 23.83

School smoking prevalence (SD):
15.07 (0.36)
Smoking on school property: No
Smoking on school periphery: Yes

Tobacco Policy/Program

Municipality bylaw: Yes
School board tobacco policy: Yes
School tobacco policy: Yes
School tobacco control program: Yes

Comments:

Store/PoP Characteristics

Store density: 6

Store Types
Convenience: 1
Convenience + Gas Stn: 2
Gas Station: 0
Small grocery: 0
Large grocery: 0
Supermarket: 1
Drug store/pharmacy: 1
Tobacco store: 0
Newsstand: 0
Deli: 0
Bulk warehouse: 0
Merchandise store: 0
Bowling alley: 0
Others: 1

PoP Variables
Tobacco advertising: 0.5
Visible display of cigarettes: 1
Industry-sponsored PBD Cabinet: 0.5
In-Store Promotions: 0.5
Tobacco Branding: 0.33
Tobacco Control Signage: 1
PoP Index: 2.83
Community Characteristics

Setting
School: residential
Community (Catchment area): residential

Population Size
Total: 7812
Age 0-19 (%): 8.99
Age 15-19 (%): 31.05
Age 20-54 (%): 53.96
Age 55+ (%): 14.95
Male (%): 49.58
Female (%): 50.54

Land type: Island
Immigrant population (%): 13.23
Unemployment rate: 9.49
Education (< Gr.9, %): 5.03
Income Median: $57,646.57

Smoking Norm

Current smokers
Overall (%): 0
15-19 yrs (%): 9.14
20-24 yrs (%): 31.07
25+ yrs (%): 23.83

School smoking prevalence (SD):
19.12 (0.39)
Smoking on school property: Yes
Smoking on school periphery: No

Tobacco Policy/Program

Municipality bylaw: Yes
School board tobacco policy: Yes
School tobacco policy: Yes
School tobacco control program: Yes

Comments:
School ID: 2108
School District: Nanaimo-LadySmith #68
Municipality: Nanaimo
Health Region: Central Vancouver
Grades: 8-12
Gr.10-11 (N): 149

Community Characteristics

Setting
School: residential
Community (Catchment area): residential

Population Size
Total: 3753
Age 0-19 (%): 7.85
Age 15-19 (%): 28.63
Age 20-54 (%): 48.12
Age 55+ (%): 22.07
Male (%): 49.81
Female (%): 49.09

Land type: Island
Immigrant population (%): 7.08
Unemployment rate: 16.98
Education (< Gr.9, %): 6.66
Income Median: $31443.17

Smoking Norm

Current smokers
Overall (%): 0
15-19 yrs (%): 9.14
20-24 yrs (%): 31.07
25+ yrs (%): 23.83

School smoking prevalence (SD): 20 (0.40)
Smoking on school property: No
Smoking on school periphery: Yes

Tobacco Policy/Program

Municipality bylaw: Yes
School board tobacco policy: Yes
School tobacco policy: No
School tobacco control program: Yes

Comments:

Store/PoP Characteristics

Store density: 3

Store Types
Convenience: 0
Convenience + Gas Stn: 2
Gas Station: 0
Small grocery: 0
Large grocery: 1
Supermarket: 0
Drug store/pharmacy: 0
Tobacco store: 0
Newsstand: 0
Deli: 0
Bulk warehouse: 0
Merchandise store: 0
Bowling alley: 0
Others: 0

PoP Variables
Tobacco advertising: 1
Visible display of cigarettes: 1
Industry-sponsored PBD Cabinet: 0.67
In-Store Promotions: 0.33
Tobacco Branding: 0
Tobacco Control Signage: 1
PoP Index: 3
School ID: 2109  
School District: Campbell River #72  
Municipality: Campbell River  
Health Region: Upper Island/Central Coast  
Grades: 8-12  
Gr.10-11 (N): 392

### Community Characteristics

**Setting**
- School: residential  
- Community (Catchment area): mixed residential + commercial

**Population Size**
- Total: 8327  
- Age 0-19 (%):6.75  
- Age 15-19 (%):21.66  
- Age 20-54 (%):46.29  
- Age 55+ (%):33.87  
- Male (%):49.37  
- Female (%):50.72

- Land type: Island  
- Immigrant population (%):11.62  
- Unemployment rate: 16.76  
- Education (< Gr.9, %): 9.26  
- Income Median: $30779.75

### Smoking Norm

**Current smokers**
- Overall (%):0  
- 15-19 yrs (%):9.14  
- 20-24 yrs (%):31.07  
- 25+ yrs (%):23.83

**School smoking prevalence (SD):**  
- 22.06 (0.42)  
- Smoking on school property: Yes  
- Smoking on school periphery: No

### Tobacco Policy/Program

- Municipality bylaw: Yes  
- School board tobacco policy: Yes  
- School tobacco policy: Yes  
- School tobacco control program: Yes

### Store/PoP Characteristics

- Store density: 4

**Store Types**
- Convenience: 2  
- Convenience + Gas Stn: 0  
- Gas Station: 0  
- Small grocery: 1  
- Large grocery: 0  
- Supermarket: 0  
- Drug store/pharmacy: 0  
- Tobacco store: 0  
- Newsstand: 0  
- Deli: 0  
- Bulk warehouse: 0  
- Merchandise store: 0  
- Bowling alley: 0  
- Others: 1

**PoP Variables**
- Tobacco advertising: 0.25  
- Visible display of cigarettes: 1  
- Industry-sponsored PBD Cabinet: 0.5  
- In-Store Promotions: 0.25  
- Tobacco Branding: 0.25  
- Tobacco Control Signage: 0.75  
- PoP Index: 2.25
Community Characteristics

Setting
School: residential
Community (Catchment area): residential

Population Size
Total: 6900
Age 0-19 (%): 6.72
Age 15-19 (%): 20.16
Age 20-54 (%): 42.61
Age 55+ (%): 37.91
Male (%): 47.89
Female (%): 52.13

Land type: Island
Immigrant population (%): 26.41
Unemployment rate: 3.80
Education (< Gr.9, %): 2.46
Income Median: $69676.18

Smoking Norm

Current smokers
Overall (%): 0
15-19 yrs (%): 23.21
20-24 yrs (%): 24.17
25+ yrs (%): 18.46

School smoking prevalence (SD): 12.87 (0.34)
Smoking on school property: Yes
Smoking on school periphery: No

Tobacco Policy/Program

Municipality bylaw: Yes
School board tobacco policy: Yes
School tobacco policy: Yes
School tobacco control program: Yes

Comments:

Store/PoP Characteristics

Store density: 2

Store Types
Convenience: 1
Convenience + Gas Stn: 0
Gas Station: 0
Small grocery: 0
Large grocery: 1
Supermarket: 0
Drug store/pharmacy: 0
Tobacco store: 0
Newsstand: 0
Deli: 0
Bulk warehouse: 0
Merchandise store: 0
Bowling alley: 0
Others: 1

PoP Variables
Tobacco advertising: 0.5
Visible display of cigarettes: 1
Industry-sponsored PBD Cabinet: 1
In-Store Promotions: 0
Tobacco Branding: 0.5
Tobacco Control Signage: 1
PoP Index: 3
Community Characteristics

Setting
School: residential
Community (Catchment area): residential

Population Size
Total: 19079
Age 0-19 (%): 6.33
Age 15-19 (%): 29.96
Age 20-54 (%): 53.52
Age 55+ (%): 16.12
Male (%): 50.67
Female (%): 49.40

Land type: Mainland
Immigrant population (%): 38.60
Unemployment rate: 8.77
Education (< Gr.9, %): 12.87
Income Median: $50772.73

School ID: 2111
School District: Surrey #36
Municipality: Surrey
Health Region: South Fraser Valley
Grades: 8-12
Gr.10-11 (N): 435

School smoking prevalence (SD): 12.6 (0.33)
Smoking on school property: Yes
Smoking on school periphery: Yes

Tobacco Policy/Program
Municipality bylaw: Yes
School board tobacco policy: Yes
School tobacco policy: Yes
School tobacco control program: Yes

Smoking Norm
Current smokers
Overall (%): 1
15-19 yrs (%): 5.48
20-24 yrs (%): 33.29
25+ yrs (%): 14.98

Comments:

Store/PoP Characteristics

Store density: 7

Store Types
Convenience: 4
Convenience + Gas Stn: 2
Gas Station: 0
Small grocery: 0
Large grocery: 0
Supermarket: 1
Drug store/pharmacy: 0
Tobacco store: 0
Newsstand: 0
Deli: 0
Bulk warehouse: 0
Merchandise store: 0
Bowling alley: 0
Others: 0

PoP Variables
Tobacco advertising: 0.86
Visible display of cigarettes: 1
Industry-sponsored PBD Cabinet: 0.7
In-Store Promotions: 0.29
Tobacco Branding: 0.14
Tobacco Control Signage: 1
PoP Index: 3
School ID: 2112
School District: Nanaimo-LadySmith #68
Municipality: Nanaimo
Health Region: Central Vancouver
Grades: 8-12
Gr.10-11 (N): 291

**Community Characteristics**

**Setting**
School: residential
Community (Catchment area):
mixed residential + commercial

**Population Size**
Total: 11695
Age 0-19 (%): 7.5
Age 15-19 (%): 25.88
Age 20-54 (%): 50.79
Age 55+ (%): 22.97
Male (%): 47.52
Female (%): 52.45

Land type: Island
Immigrant population (%): 13.53
Unemployment rate: 16.20
Education (< Gr.9, %): 7.46
Income Median: $31319.77

**Smoking Norm**

**Current smokers**
Overall (%): 0
15-19 yrs (%): 9.14
20-24 yrs (%): 31.07
25+ yrs (%): 23.83

School smoking prevalence (SD):
15.02 (0.36)
Smoking on school property: Yes
Smoking on school periphery: Yes

**Tobacco Policy/Program**

Municipality bylaw: Yes
School board tobacco policy: Yes
School tobacco policy: No
School tobacco control program: Yes

Comments:

**Store/PoP Characteristics**

Store density: 3

**Store Types**
Convenience: 1
Convenience + Gas Stn: 2
Gas Station: 0
Small grocery: 0
Large grocery: 0
Supermarket: 0
Drug store/pharmacy: 0
Tobacco store: 0
Newsstand: 0
Deli: 0
Bulk warehouse: 0
Merchandise store: 0
Bowling alley: 0
Others: 0

**PoP Variables**
Tobacco advertising: 0.67
Visible display of cigarettes: 1
Industry-sponsored PBD Cabinet: 0.67
In-Store Promotions: 0.33
Tobacco Branding: 0.67
Tobacco Control Signage: 1
PoP Index: 3.33
School ID: 2113  
School District: Surrey #36  
Municipality: Surrey  
Health Region: South Fraser Valley  
Grades: 8-12  
Gr.10-11 (N): 471

### Community Characteristics

**Setting**
- School: mixed residential + commercial
- Community (Catchment area): mixed residential + commercial

**Population Size**
- Total: 19620  
- Age 0-19 (%): 5.98  
- Age 15-19 (%): 27.56  
- Age 20-54 (%): 52.15  
- Age 55+ (%): 20.09  
- Male (%): 49.27  
- Female (%): 50.67

- Land type: Mainland  
- Immigrant population (%): 39.70  
- Unemployment rate: 7.55  
- Education (< Gr.9, %): 10.88  
- Income Median: $47151.63

### Smoking Norm

**Current smokers**
- Overall (%): 1  
- 15-19 yrs (%): 5.48  
- 20-24 yrs (%): 33.29  
- 25+ yrs (%): 14.98

**School smoking prevalence (SD):**  
14.08 (0.35)

- Smoking on school property: Yes  
- Smoking on school Periphery: Yes

### Tobacco Policy/Program

- Municipality bylaw: Yes  
- School board tobacco policy: Yes  
- School tobacco policy: Yes  
- School tobacco control program: Yes

**Comments:**

### Store/PoP Characteristics

- Store density: 4

**Store Types**
- Convenience: 1  
- Convenience + Gas Stn: 2  
- Gas Station: 0  
- Small grocery: 1  
- Large grocery: 0  
- Supermarket: 0  
- Drug store/pharmacy: 0  
- Tobacco store: 0  
- Newsstand: 0  
- Deli: 0  
- Bulk warehouse: 0  
- Merchandise store: 0  
- Bowling alley: 0  
- Others: 0

### PoP Variables

- Tobacco advertising: 0.75  
- Visible display of cigarettes: 1  
- Industry-sponsored PBD Cabinet: 0.75  
- In-Store Promotions: 0  
- Tobacco Branding: 0  
- Tobacco Control Signage: 1  
- PoP Index: 2.5

---

153
Community Characteristics

Setting
School: residential
Community (Catchment area):
mixed commercial + residential + industrial

Population Size
Total: 3132
Age 0-19 (%): 5.83
Age 15-19 (%): 18.81
Age 20-54 (%): 40.37
Age 55+ (%): 41.45
Male (%): 47.04
Female (%): 52.87

Land type: Island
Immigrant population (%): 19.59
Unemployment rate: 11.26
Education (< Gr.9, %): 6.09
Income Median: $38142

Smoking Norm

Current smokers
Overall (%): 0
15-19 yrs (%): 9.14
20-24 yrs (%): 31.07
25+ yrs (%): 23.83

School smoking prevalence (SD):
21.57 (0.41)
Smoking on school property: No
Smoking on school Periphery: Yes

Tobacco Policy/Program

Municipality bylaw: Yes
School board tobacco policy: Yes
School tobacco policy: Yes
School tobacco control program: Yes

Comments:

Store/PoP Characteristics

Store density: 3

Store Types
Convenience: 0
Convenience + Gas Stn: 1
Gas Station: 0
Small grocery: 0
Large grocery: 1
Supermarket: 1
Drug store/pharmacy: 0
Tobacco store: 0
Newsstand: 0
Deli: 0
Bulk warehouse: 0
Merchandise store: 0
Bowling alley: 0
Others: 0

PoP Variables
Tobacco advertising: 1
Visible display of cigarettes: 1
Industry-sponsored PBD Cabinet: 0.33
In-Store Promotions: 0
Tobacco Branding: 0
Tobacco Control Signage: 1
PoP Index: 2.33
School ID: 2115
School District: Langley #35
Municipality: Langley
Health Region: South Fraser Valley
Grades: 8-12
Gr.10-11 (N): 392

**Community Characteristics**

Setting
School: residential
Community (Catchment area): residential

Population Size
Total: 3788
Age 0-19 (%): 9.31
Age 15-19 (%): 26.54
Age 20-54 (%): 49.79
Age 55+ (%): 24.97
Male (%): 50.58
Female (%): 49.73

Land type: Mainland
Immigrant population (%): 16.12
Unemployment rate: 4.83
Education (< Gr.9, %): 2.99
Income Median: $69399.83

**Smoking Norm**

Current smokers
Overall (%): 1
15-19 yrs (%): 5.48
20-24 yrs (%): 33.29
25+ yrs (%): 14.98

School smoking prevalence (SD): 21.81 (0.41)
Smoking on school property: No
Smoking on school Periphery: Yes

**Tobacco Policy/Program**

Municipality bylaw: Yes
School board tobacco policy: Yes
School tobacco policy: Yes
School tobacco control program: Yes

Comments:
Community Characteristics

Setting
School: residential
Community (Catchment area):
mixed residential + industrial

Population Size
Total: 7615
Age 0-19 (%): 6.41
Age 15-19 (%): 27.68
Age 20-54 (%): 55.28
Age 55+ (%): 16.99
Male (%): 52.31
Female (%): 47.46

Land type: Mainland
Immigrant population (%): 26.63
Unemployment rate: 6.85
Education (< Gr.9, %): 7.75
Income Median: $65118.60

Smoking Norm

Current smokers
Overall (%): 1
15-19 yrs (%): 5.48
20-24 yrs (%): 33.29
25+ yrs (%): 14.98

School smoking prevalence (SD):
14.05 (0.35)

Smoking on school property: No
Smoking on school Periphery: Yes

Tobacco Policy/Program

Municipality bylaw: Yes
School board tobacco policy: Yes
School tobacco policy: Yes
School tobacco control program: Yes

Comments:
School ID: 2117
School District: Saanich #63
Municipality: North Saanich
Health Region: Capital
Grades: 8-12
Gr.10-11 (N): 304

**Community Characteristics**

**Setting**
School: residential, rural, marina
Community (Catchment area): residential, rural, marina

**Population Size**
Total: 4631
Age 0-19 (%): 4.99
Age 15-19 (%): 17.94
Age 20-54 (%): 38.85
Age 55+ (%): 42.83
Male (%): 48.09
Female (%): 51.69

Land type: Island
Immigrant population (%): 23.79
Unemployment rate: 6.99
Education (< Gr.9, %): 3.79
Income Median: $55428

**Smoking Norm**

Current smokers
Overall (%): 0
15-19 yrs (%): 23.21
20-24 yrs (%): 24.17
25+ yrs (%): 18.46

School smoking prevalence (SD):
16.67 (0.37)
Smoking on school property: No
Smoking on school Periphery: Yes

**Tobacco Policy/Program**

Municipality bylaw: Yes
School board tobacco policy: Yes
School tobacco policy: Yes
School tobacco control program: Yes

Comments:
Community Characteristics

Setting
School: residential
Community (Catchment area): residential

Population Size
Total: 4075
Age 0-19 (%): 8.64
Age 15-19 (%): 30.07
Age 20-54 (%): 48.93
Age 55+ (%): 20.08
Male (%): 50.89
Female (%): 49.23

Land type: Mainland
Immigrant population (%): 14.20
Unemployment rate: 4.42
Education (< Gr. 9, %): 5.35
Income Median: $55227

Smoking Norm

Current smokers
Overall (%): 0
15-19 yrs (%): 19.25
20-24 yrs (%): 24.53
25+ yrs (%): 19.93

School smoking prevalence (SD): 13.54 (0.34)
Smoking on school property: Yes
Smoking on school Periphery: Yes

Tobacco Policy/Program

Municipality bylaw: Yes
School board tobacco policy: Yes
School tobacco policy: Yes
School tobacco control program: Yes

Comments:

Store/PoP Characteristics

Store density: 2

Store Types
Convenience: 0
Convenience + Gas Stn: 1
Gas Station: 0
Small grocery: 1
Large grocery: 0
Supermarket: 0
Drug store/pharmacy: 0
Tobacco store: 0
Newsstand: 0
Deli: 0
Bulk warehouse: 0
Merchandise store: 0
Bowling alley: 0
Others: 0

PoP Variables
Tobacco advertising: 0.5
Visible display of cigarettes: 1
Industry-sponsored PBD Cabinet: 0.5
In-Store Promotions: 0
Tobacco Branding: 0
Tobacco Control Signage: 1
PoP Index: 2
School ID: 2119  
School District: Surrey #36  
Municipality: Surrey  
Health Region: South Fraser Valley  
Grades: 8-12  
Gr.10-11 (N): 350

### Community Characteristics

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<thead>
<tr>
<th>Setting</th>
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<tbody>
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<td>School: residential</td>
<td>Community (Catchment area): residential</td>
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<table>
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<th>Population Size</th>
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<tbody>
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<td>Total: 15547</td>
<td>Age 0-19 (%): 5.65</td>
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<td>Male (%): 49.90</td>
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- Land type: Mainland
- Immigrant population (%): 29.32
- Unemployment rate: 9.89
- Education (< Gr.9, %): 9.83
- Income Median: $40350.82

### Smoking Norm

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<td>15-19 yrs (%): 5.48</td>
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<td>20-24 yrs (%): 33.29</td>
<td></td>
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<tr>
<td>25+ yrs (%): 14.98</td>
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</table>

- School smoking prevalence (SD): 11.76 (0.32)
- Smoking on school property: Yes
- Smoking on school Periphery: No

### Tobacco Policy/Program

- Municipality bylaw: Yes
- School board tobacco policy: Yes
- School tobacco policy: Yes
- School tobacco control program: Yes

### Comments:

### Store/PoP Characteristics

- Store density: 7

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<thead>
<tr>
<th>Store Types</th>
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<th>PoP Variables</th>
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<tr>
<td>Convenience: 3</td>
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<td>Tobacco advertising: 0.71</td>
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<td>Convenience + Gas Stn: 2</td>
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<td>Visible display of cigarettes: 1</td>
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<td>Gas Station: 0</td>
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<td>Industry-sponsored PBD Cabinet: 0.43</td>
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<td>Small grocery: 1</td>
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<td>Large grocery: 0</td>
<td></td>
<td>Tobacco Branding: 0</td>
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<td>Supermarket: 0</td>
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<td>Tobacco Control Signage: 1</td>
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<td>Drug store/pharmacy: 0</td>
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<td>Tobacco store: 0</td>
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<td>Newsstand: 0</td>
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<tr>
<td>Bulk warehouse: 0</td>
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<td>Merchandise store: 1</td>
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<td>Bowling alley: 0</td>
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<tr>
<td>Others: 0</td>
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</tbody>
</table>
Community Characteristics

Setting
School: residential
Community (Catchment area):
mixed residential + commercial

Population Size
Total: 12945
Age 0-19 (%): 7.92
Age 15-19 (%): 31.14
Age 20-54 (%): 48.71
Age 55+ (%): 19.93
Male (%): 49.22
Female (%): 50.70

Land type: Mainland
Immigrant population (%): 14.74
Unemployment rate: 10.59
Education (< Gr.9, %): 6.61
Income Median: $44293.18

Smoking Norm
Current smokers
Overall (%): 0
15-19 yrs (%): 19.25
20-24 yrs (%): 24.53
25+ yrs (%): 19.93

School smoking prevalence (SD):
13.54 (0.34)
Smoking on school property: Yes
Smoking on school Periphery: No

Tobacco Policy/Program
Municipality bylaw: Yes
School board tobacco policy: Yes
School tobacco policy: Yes
School tobacco control program: Yes

Comments:

Store/PoP Characteristics

Store density: 2

Store Types
Convenience: 1
Convenience + Gas Stn: 1
Gas Station: 0
Small grocery: 0
Large grocery: 0
Supermarket: 0
Drug store/pharmacy: 0
Tobacco store: 0
Newsstand: 0
Deli: 0
Bulk warehouse: 0
Merchandise store: 0
Bowling alley: 0
Others: 0

PoP Variables
Tobacco advertising: 1
Visible display of cigarettes: 1
Industry-sponsored PBD Cabinet: 1
In-Store Promotions: 0.5
Tobacco Branding: 0
Tobacco Control Signage: 1
PoP Index: 3.5
School ID: 2121
School District: Mission #75
Municipality: Mission
Health Region: Fraser Valley
Grades: 8-12
Gr.10-11 (N): 246

Community Characteristics

Setting
School: residential
Community (Catchment area): residential

Population Size
Total: 9172
Age 0-19 (%):7.98
Age 15-19 (%):30.14
Age 20-54 (%):49.78
Age 55+ (%):19.73
Male (%):50.12
Female (%):50.02

Land type: Mainland
Immigrant population (%):15.46
Unemployment rate: 7.40
Education (< Gr.9, %): 5.94
Income Median: $53979

Smoking Norm
Current smokers
Overall (%):0
15-19 yrs (%):19.25
20-24 yrs (%):24.53
25+ yrs (%):19.93

School smoking prevalence (SD): 13.39 (0.34)
Smoking on school property: Yes
Smoking on school Periphery: No

Tobacco Policy/Program
Municipality bylaw: Yes
School board tobacco policy: Yes
School tobacco policy: No
School tobacco control program: Yes

Comments:

Store/PoP Characteristics

Store density: 1

Store Types
Convenience: 1
Convenience + Gas Stn: 0
Gas Station: 0
Small grocery: 0
Large grocery: 0
Supermarket: 0
Drug store/pharmacy: 0
Tobacco store: 0
Newsstand: 0
Deli: 0
Bulk warehouse: 0
Merchandise store: 0
Bowling alley: 0
Others: 0

PoP Variables
Tobacco advertising: 0
Visible display of cigarettes: 1
Industry-sponsored PBD Cabinet: 0
In-Store Promotions: 0
Tobacco Branding: 0
Tobacco Control Signage: 1
PoP Index: 1
Appendix F – Ethics Clearance Certificate
CERTIFICATE OF APPROVAL- MINIMAL RISK RENEWAL

<table>
<thead>
<tr>
<th>PRINCIPAL INVESTIGATOR:</th>
<th>DEPARTMENT:</th>
<th>UBC BREB NUMBER:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chris Lovato</td>
<td></td>
<td>H05-80631</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>INSTITUTION(S) WHERE RESEARCH WILL BE CARRIED OUT:</th>
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<tbody>
<tr>
<td>Institution</td>
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<td>UBC</td>
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Other locations where the research will be conducted: N/A

<table>
<thead>
<tr>
<th>CO-INVESTIGATOR(S):</th>
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</thead>
<tbody>
<tr>
<td>Helen Hsu</td>
</tr>
<tr>
<td>John Eyles</td>
</tr>
<tr>
<td>Candace Nykiforuk</td>
</tr>
<tr>
<td>Michael D. Buzzelli</td>
</tr>
<tr>
<td>Ying C. MacNab</td>
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<tr>
<th>SPONSORING AGENCIES:</th>
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<tr>
<td>Canadian Tobacco Control Research Initiative - &quot;GIS and Tobacco Research: Understanding Impact of Tobacco Industry Promotional Activities on Youth Tobacco Use&quot;</td>
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<table>
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<tr>
<th>PROJECT TITLE:</th>
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<tbody>
<tr>
<td>GIS and Tobacco Research: Understanding Impact of Tobacco Industry Promotional Activities on Youth Tobacco Use</td>
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EXPIRY DATE OF THIS APPROVAL: January 30, 2008

APPROVAL DATE: January 30, 2007

The Annual Renewal for Study have been reviewed and the procedures were found to be acceptable on ethical grounds for research involving human subjects.

Approval is issued on behalf of the Behavioural Research Ethics Board and signed electronically by one of the following:

Dr. Peter Suedfeld, Chair
Dr. Jim Rupert, Associate Chair
Dr. Arminee Kazanjian, Associate Chair
Dr. M. Judith Lynam, Associate Chair