School-based tobacco-control programming and student smoking behaviour

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Abstract

The study examined the association of a school-based tobacco-control program with students' smoking behaviour over time using three cross-sectional, provincial census datasets (grade 10 students in 1999, grade 11 students in 2000, grade 12 students in 2001). Data were collected from all secondary schools in Prince Edward Island (Canada) using the Tobacco module of the School Health Action, Planning and Evaluation System (SHAPES). The proportion of regular smokers increased from grade 10 (22.3%) to grade 12 (27.8%, $\chi^2 = 10.35$, $df = 1$, $p < 0.001$). Being exposed to different school-based tobacco programs and policies in grades 10 and 11 was not associated with the smoking behaviour of grade 12 students. The strongest predictors of smoking behaviour were having friends or close family members who smoke. This preliminary evidence suggests that programs and policies associated with banning smoking and enforcing smoking restrictions at school may be insufficient unless they also address the influence of smoking peers and family members and link to comprehensive programming within the broader context of other community and policy level interventions.

Key words: *policy, schools, tobacco control, social and environmental influences*

Introduction

Early initiation of tobacco use is associated with a longer time spent smoking, thus increasing the risk of many tobacco-related diseases.[1,2] Despite the overwhelming evidence of the harmful effects of smoking,[3] youth smoking rates remain high in Canada.[4] Most smokers (about 80 to 90%) start smoking while at school[5] and rates of smoking increase from youth to young adulthood.[6,7] According to the 2006 Canadian Tobacco Use Monitoring Survey, nationwide 15% of 15- to 19-year-olds and 27.3% of 20- to 24-year-olds were current smokers, while in the province of Prince Edward Island (PEI), 14% of 15- to 19-year-olds and 31% of 20- to 24-year-olds were current smokers[7]. Moreover, the increasing use of tobacco by youth in PEI schools was reported to range from a low of 3% of grade seven students to a high of 24% of grade 12 students.[8] This increase in the smoking behaviour of youth as they transition through high school represents a real health concern.

A strong body of literature supports the influence of family (parents and siblings), "popular kids", close friends and the school environment on youth smoking behaviour.[9-15] Previous studies have shown that, while school-based interventions may increase knowledge about the effects on health of tobacco,[16] they have had limited impact on tobacco-control efforts with youth.[16-19] School-based prevention programs can be improved when they are combined with intensive community-based interventions, and home supports such as parental supervision.[12,13,20,21] School-level tobacco-control policies[1,12,22,23] may contribute to youths' decisions not to smoke.[14] Students spend about 25 hours each week in school during which time they could be continually exposed to programs, policies and peer group activities to reduce or prevent tobacco use. Understanding how these different social and school influences may either support or inhibit tobacco use may contribute to a better understanding of the roles of schools in tobacco control.

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

Our previous results, using data from the PETRA initiative, showed significant differences in the influences of policy and programs on the smoking behaviour of grade 10 and grade 12 students.[24,25] For grade 10 students, attending a school

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with both smoking-prevention policies and programs was not associated with a decreased risk of occasional smoking; however, the grade when youth enrolled in high school, the smoking behaviour of senior students and close friends, and clear rules about smoking at school were associated with the effect of school-based tobacco programming. For grade 12 students, attending schools with smoking-prevention programming was associated with a decreased risk of occasional smoking (Odds ratio [OR] = 0.42, 95% confidence interval [CI]: 0.18, 0.95) and school-based policies banning smoking on school property were associated with a small increased risk of occasional smoking (OR = 1.06, 95% CI: 0.67, 1.68).

Given the findings from those studies, we were interested in understanding the experience of one group of high school students who might have witnessed the implementation of the tobacco policy and programs as they moved from grade 10 (at 15 to 16 years old) to grade 11 (at 16 to 17 years old) when four schools were introduced to the policy and six schools were introduced to programs, and then to grade 12 (at 17 to 19 years old) when all 10 schools had both the policy and the programs. Understanding how these different social and school influences may either support or inhibit tobacco use would provide valuable insight for future prevention programs within PEI and other jurisdictions. The purpose of this paper was to determine the factors that most influence whether or not a school-based tobacco-control program influenced the smoking behaviour of students during their transition through high school (grades 10 to 12).

Methods

Sampling procedure

We collected repeated cross-sectional smoking behaviour data from a census sample of all 10 English-speaking secondary schools* in PEI over three years (1999, 2000, 2001) using the tobacco module of the School Health Action, Planning and Evaluation System (SHAPES).[26] Overall, there were 13 131 observations over three waves of data collection (n = 4114 in 1999, n = 4427 in 2000, n = 4590 in 2001). For this paper, we reported on a group of students who were eligible to be followed over all three waves of data collection, grade 10 students in 1999 (n = 1537), grade 11 students in 2000 (n = 1514) and grade 12 students in 2001 (n = 1429). Without having longitudinally linked data, these observations are our most accurate representation of the students who may have participated in all three years of the study.

In Year 1 (1999), none of the schools had policies banning smoking on school property or were participating in provincially directed school-based smoking prevention programs; in Year 2 (2000), four of the schools had introduced a policy banning smoking on school property and the remaining six schools had implemented provincially directed school-based smoking prevention programs (Students Working in Tobacco Can Help [SWITCH] and Kick the Nic[24,25]); in Year 3 (2001), all 10 schools had introduced a policy banning smoking on school property and implemented the provincially directed school-based smoking prevention programs (SWITCH and Kick the Nic).

Measures

Demographic variables included age, grade and gender. We identified three smoking behaviours (smoking status): regular smoker (smokes every week), occasional smoker (smokes less often than weekly) and current non-smoker (never smoked or tried once but quit). Student characteristics included misperceptions about smoking behaviour of other youth their age, i.e. inaccurate estimation of the number of fellow students who actually smoke. School and environment characteristics included seeing fellow students smoking near the school, seeing teachers or staff smoking near the school, clear smoking policy rules existing in the school, students getting in trouble if they break the smoking rules, students smoking where they are not allowed in the school, and students being asked their age when buying cigarettes. Social influences included the number of smokers in the students' homes and the number of their close friends who smoke.

Questionnaire implementation

Data collection and research protocol procedures are fully described elsewhere.[24,25] Briefly, teachers implemented the tobacco-use questionnaires during class time using an exam-type protocol.[19,24] In accordance with ethical requirements, all data on the surveys were collected anonymously so that individual student smoking behaviour could not be tracked over time. The University of Prince Edward Island Research Ethics Board and appropriate school board ethics' committees approved all procedures, including passive consent.

Analysis

We examined changes in the prevalence of smoking and related characteristics over time with that group of students who may have participated in all three years of this study (grade 10 in 1999, grade 11 in 2000 and grade 12 in 2001) using descriptive statistics and chi-square analyses. In order to understand the characteristics that are associated with smoking behaviour by the end of high school, we conducted three logistic regression models using the grade 12 (2001) sample to differentiate current non-smokers from occasional smokers, occasional smokers from regular smokers, and current non-smokers from regular smokers. These analyses were also done separately by gender. SPSS 15.0 was used to conduct the analyses.[27]

Results

Table 1 shows the descriptive characteristics of student smoking behaviours. The majority of the students ranged in age from 15 to 19 years, were located predominantly in rural schools (70%), with slightly more females (about 52%) than males. There was a significant increase in the proportion of regular smokers from 1999 to 2001 (χ^2 = 10.35, df = 1, p < 0.001) and a significant decrease in current non-smokers (χ^2 = 7.93, df = 1, p < 0.01).

* The French school district was not included because confidentiality could not be guaranteed when reporting the data due to the small sample size of students.

School and environment characteristics and smoking behaviour

Between Year 1 (1999) and Year 3 (2001), there were significant decreases in reports of seeing students smoking near the school property ($\chi^2 = 42.57$, $df = 1$, $p < 0.001$) and teachers or staff smoking near the school property ($\chi^2 = 35.44$, $df = 1$, $p < 0.001$); students overestimating the percentage of students their age who smoke ($\chi^2 = 80.25$, $df = 1$ $p < 0.001$); and students being exposed to smoking in the home ($\chi^2 = 8.16$, $df = 1$, $p < 0.001$). Moreover, school policies and enforcement of those policies also improved during the three years of the study, with a greater percentage of students reporting that clear smoking rules were in place in their school ($\chi^2 = 49.68$, $df = 1$, $p < 0.001$) and that students who break the rules get in trouble ($\chi^2 = 18.95$, $df = 1$, $p < 0.001$).

School and environmental factors associated with current non-smoking versus occasional smoking (grade 12)

Table 2 shows the characteristics associated with differentiating current non-smokers from occasional smokers. In the full model, the only significant characteristic associated with an increased risk of being an occasional smoker was having one or more close friends who smoke. The odds of being an occasional smoker increased for students with one or more close friends who smoke (OR = 2.57; 95% CI = 1.86, 3.56). The gender specific models showed that having friends who smoke increased the likelihood of being an occasional smoker among female students (OR = 2.99; 95% CI = 1.94, 4.61) more than among male students (OR = 2.11; 95% CI = 1.29, 3.46). Female students who saw other students smoking where they were not allowed were more likely to be occasional smokers than male students (OR = 1.58; 95% CI = 1.02, 2.47). Moreover, female students were more likely than male students to be occasional smokers (OR = 1.38; 95% CI = 1.00, 1.88).

School and environmental factors associated with occasional smoking versus regular smoking (grade 12)

Table 3 shows the characteristics associated with differentiating occasional smokers from regular smokers. In the full model, two characteristics were associated with an increased likelihood of being a regular smoker: having one or more family members in the home who smoked (OR = 2.58; 95% CI = 1.76, 3.79) and having one or more close friends who smoke (OR = 14.47; 95% CI = 7.17, 29.20). When the models were run separately by gender, there was a difference in the size of the effect for close friends' smoking. For male students who had close friends who smoke, the odds of being a regular smoker were 17 times that of those who had no close friends who smoke (OR = 17.69; 95% CI = 6.43, 48.67). Similarly, female students who had one or more friends who smoke were 12 times more likely to be regular smokers compared to those with no close friends who smoke (OR = 12.06; 95% CI = 4.52, 32.22). Both male and female students with one or more smokers in the home were more likely to be regular smokers compared to students with no smokers in the home (female students, OR = 2.48; 95% CI = 1.49, 4.14; male students, OR = 2.63; 95% CI = 1.45, 4.76).

School and environmental factors associated with current non-smoking versus regular smoking (grade 12)

Table 4 shows the characteristics that differentiated current non-smokers from regular smokers. In the full model, three characteristics were significantly associated with being a regular smoker compared to a non-smoker: students who have one or more close friends who smoke compared to those with no close friends who smoke (OR = 37.46; 95% CI = 19.39, 72.36); who have one or more smokers in the home compared to those with no smokers in the home (OR = 2.35; 95% CI = 1.67, 3.30); and who see teachers and staff smoking on or near school property compared to those who did not report seeing teachers smoking near the school property (OR = 1.78; 95% CI = 1.13, 2.80).

Separate models for gender differences showed that the strongest influence on regular smoking behaviour for both male and female students was having one or more close friends who smoke. Female students with one or more close friends who smoke were over forty times more likely to be regular smokers than those with no close friends who smoke (OR = 41.16; 95% CI = 16.10, 105.20). Similarly, male students with one or more close friends who smoke were over thirty-six times more likely to be regular smokers than those with no close friends who smoke (OR = 36.04; 95% CI = 14.11, 92.05). Having one or more smokers in the home was associated with being a regular smoker for both female students (OR = 2.58; 95% CI = 1.56, 4.25) and male students (OR = 2.17; 95% CI = 1.33, 3.51). Female students who estimated that over 30% of their peers smoke were twice as likely to be regular smokers (OR = 2.39; 95% CI = 1.36, 4.21). Similarly, female students who reported seeing students smoke where they are not allowed were more likely to be regular smokers than those who didn't (OR = 2.32; 95% CI = 1.37, 3.93). Seeing teachers and staff smoking near the school was associated with an increased likelihood of regular smoking for male students (OR = 2.43; 95% CI = 1.35, 4.38).

Discussion

To our surprise, the prevalence of regular smoking among this group of secondary school students in PEI increased as they moved from grade 10 through 12. The tobacco-control initiatives implemented in PEI over the three years of data collection did not cause smoking rates to plateau—let alone decline—as youth in the province transition through adolescence. The comprehensive programming may not have been sufficiently intense or frequent to have had an effect.

However, although it may appear that this prevalence of regular smoking among this age of students was a result of a failure in the programming, it may also be a function of the natural timing of youth smoking behaviour, with rates of smoking onset peaking at this age. In fact, the literature consistently demonstrates that the smoking rates of senior high school students (i.e. grade 12) are usually higher than that of their younger colleagues.[19,28] There was no systematic data collection or evaluation completed around other community level interventions to determine what might have contributed to youth tobacco control. Our

TABLE 1
Descriptive student and school characteristics, smoking status, and beliefs among grade 10 to 12 students in Prince Edward Island high schools (1999 & 2001)

Demographics		1999 (n = 1537) %	1999 (n = 1537) (n)*	2001 (n = 1429) %	2001 (n = 1429) (n)*	Chi-square
Gender	Female	52.2	(797)	52.6	(752)	$\chi^2 = 0.11$, $df = 1$, $p < 0.74$
	Male	47.8	(740)	47.3	(677)	
Smoking status	Regular	22.3	(307)	27.8	(351)	$\chi^2 = 10.35$, $df = 1$, $p < 0.001$
	Occasional	21.5	(295)	21.5	(272)	$\chi^2 = 0.00$, $df = 1$, $p < 0.98$
	Current non-smoker	56.2	(772)	50.7	(641)	$\chi^2 = 7.93$, $df = 1$, $p < 0.01$
Misperception of youth smoking prevalence	≥ 30%	76.1	(1163)	60.8	(857)	$\chi^2 = 80.25$, $df = 1$, $p < 0.001$
	< 30%	23.9	(365)	39.2	(553)	
See students smoking near school	Yes	98.9	(1488)	94.8	(1336)	$\chi^2 = 42.57$, $df = 1$, $p < 0.001$
See teachers/staff smoking near school	Yes	26.9	(404)	17.7	(249)	$\chi^2 = 35.44$, $df = 1$, $p < 0.001$
In this school there are clear smoking rules	Yes	86.3	(1293)	94.1	(1322)	$\chi^2 = 49.68$, $df = 1$, $p < 0.001$
If students break the rules they get in trouble	Yes	74.1	(1107)	80.9	(1136)	$\chi^2 = 18.95$, $df = 1$, $p < 0.001$
Students smoke where not allowed at school	Yes	60.9	(912)	62.1	(869)	$\chi^2 = 0.43$, $df = 1$, $p < 0.51$
Students asked age when buying cigarettes†	Yes	54.1	(226)	48.9	(202)	$\chi^2 = 2.21$, $df = 1$, $p < 0.14$
Number of smokers in home	1 or >	51.2	(784)	45.9	(634)	$\chi^2 = 8.16$, $df = 1$, $p < 0.001$
	None	48.8	(746)	54.1	(746)	

* Numbers may not add to total because of missing values
† Regular smokers only

TABLE 2
Logistic regression analyses examining gender, school and environmental factors associated with current non-smokers versus occasional smokers among grade 12 students in Prince Edward Island high schools (2001)

		Current non-smoker (0) vs. occasional smoker (1)		
		Total (N = 831)	Females (n = 460)	Males (n = 371)
		OR (95% CI)	OR (95% CI)	OR (95% CI)
Gender	Female	1.38 (1.00, 1.88)*		
See students smoking near school	Yes	1.02 (0.49, 2.12)	1.01 (0.38, 2.75)	1.05 (0.35, 3.14)
	No	1.00	1.00	1.00
See teachers/staff smoke at school	Yes	1.45 (0.94, 2.25)	1.74 (0.93, 3.24)	1.33 (0.71, 2.52)
	No	1.00	1.00	1.00
In this school there are clear smoking rules	Yes	1.15 (0.55, 2.43)	1.63 (0.56, 4.75)	0.87 (0.30, 2.50)
	No	1.00	1.00	1.00
If students break the rules they get in trouble	Yes	1.03 (0.67, 1.56)	1.25 (0.71, 2.18)	0.83 (0.43, 1.60)
	No	1.00	1.00	1.00
Students smoke where not allowed at school	Yes	1.21 (0.86, 1.69)	1.58 (1.02, 2.47)*	0.87 (0.52, 1.47)
	No	1.00	1.00	1.00
Misperception of youth smoking prevalence	≥ 30%	1.22 (0.88, 1.69)	1.44 (0.93, 2.25)	0.96 (0.59, 1.58)
	< 30%	1.00	1.00	1.00
Number of smokers in the home	1 or >	0.96 (0.70, 1.32)	1.10 (0.72, 1.68)	0.86 (0.53, 1.41)
Number of close friends who smoke	1 or >	2.57 (1.86, 3.56)**	2.99 (1.94, 4.61)**	2.11 (1.29, 3.46)**

* Estimate is significantly different from estimate for reference category ($p < 0.05$)
** Estimate is significantly different from estimate for reference category ($p < 0.001$)

TABLE 3
Logistic regression analyses examining gender, school and environmental factors associated with occasional versus regular smokers among grade 12 students in Prince Edward Island high schools (2001)

		Occasional smoker (0) vs. regular smoker (1)		
		Total (N = 563)	Females (n = 302)	Males (n = 261)
		OR (95% CI)	OR (95% CI)	OR (95% CI)
Gender	Female	0.58 (0.39, 0.86)*		
See students smoking near school	Yes	1.08 (0.65, 1.72)	0.85 (0.23, 3.11)	1.67 (0.40, 6.92)
	No	1.00	1.00	1.00
See teachers/staff smoke at school	Yes	1.45 (0.94, 2.25)	0.64 (0.32, 1.27)	1.82 (0.89, 3.71)
	No	1.00	1.00	1.00
In this school there are clear smoking rules	Yes	0.76 (0.31, 1.87)	0.54 (0.13, 2.17)	1.10 (0.32, 3.78)
	No	1.00	1.00	1.00
If students break the rules they get in trouble	Yes	1.56 (0.89, 2.76)	1.86 (0.88, 3.93)	1.21 (0.49, 2.97)
	No	1.00	1.00	1.00
Students smoke where not allowed at school	Yes	1.02 (0.67, 1.56)	1.34 (0.76, 2.35)	0.70 (0.36, 1.34)
	No	1.00	1.00	1.00
Misperception of youth smoking prevalence	≥ 30%	1.28 (0.83, 1.97)	1.48 (0.79, 2.76)	1.14 (0.62, 2.09)
	< 30%	1.00	1.00	1.00
Number of smokers in the home	1 or >	2.58 (1.76, 3.79)**	2.48 (1.49, 4.14)**	2.63 (1.45, 4.76)**
Number of close friends who smoke	1 or >	14.47 (7.17, 29.20)**	12.06 (4.52, 32.22)**	17.69 (6.43, 48.67)**

* Estimate is significantly different from estimate for reference category ($p < 0.01$)
** Estimate is significantly different from estimate for reference category ($p < 0.001$)

TABLE 4
Logistic regression analyses examining gender and school and environmental factors associated with current non-smokers versus regular smokers among Grade 12 students in Prince Edward Island high schools in 2001

		Current non-smoker (0) vs. regular smoker (1)		
		Total (N = 906)	Females (n = 470)	Males (n = 436)
		OR (95% CI)	OR (95% CI)	OR (95% CI)
Gender	Female	1.03 (0.73, 1.45)*		
See students smoking near school	Yes	0.79 (0.35, 1.83)	0.51 (0.15, 1.82)	1.38 (0.42, 4.56)
	No	1.00	1.00	1.00
See teachers/staff smoke at school	Yes	1.78 (1.13, 2.80)**	1.29 (0.61, 2.73)	2.43 (1.35, 4.38)*
	No	1.00	1.00	1.00
In this school there are clear smoking rules	Yes	0.87 (0.38, 2.01)	0.99 (0.26, 3.72)	0.87 (0.28, 2.70)
	No	1.00	1.00	1.00
If students break the rules they get in trouble	Yes	1.44 (0.84, 2.45)	1.93 (0.94, 4.10)	1.00 (0.46, 2.19)
	No	1.00	1.00	1.00
Students smoke where not allowed at school	Yes	1.28 (0.89, 1.83)	2.32 (1.37, 3.93)**	0.72 (0.43, 1.20)
	No	1.00	1.00	1.00
Misperception of youth smoking prevalence	≥ 30%	1.41 (0.98, 2.05)	2.39 (1.36, 4.21)**	0.90 (0.54, 1.49)
	< 30%	1.00	1.00	1.00
Number of smokers in the home	1 or >	2.35 (1.67, 3.30)*	2.58 (1.56, 4.25)*	2.17 (1.33, 3.51)*
Number of close friends who smoke	1 or >	37.46 (19.39, 72.36)*	41.16 (16.10, 105.20)*	36.04 (14.11, 92.05)*

* Estimate is significantly different from estimate for reference category ($p < 0.01$)
** Estimate is significantly different from estimate for reference category ($p < 0.001$)

findings suggest that access to cigarettes for this population was high, as indicated both by students continuing to see others smoking near school property and by not regularly being asked their age when buying cigarettes. These findings support a recent study by Doubeni et al.[29] who reported that perceived accessibility of cigarettes increases the risk of smoking among youth. More robust studies are needed to continue to explore the role of schools[30] within a broader community context and to enhance systematic monitoring and surveillance for health promotion and prevention initiatives.

Additional analyses were used to better understand the increasing prevalence of smoking in this study population. For instance, when we adjusted for age in our analysis, it appears that both regular and occasional smoking rates decreased for grade 11 students during the same time period. This is consistent with our previous studies which highlighted that the prevalence of regular smoking of grade 10 and grade 12 students decreased over the three years of the study, from 20% to 15.8% and from 30.1% to 24.6%, respectively.[24,25] This finding also supports previous studies that suggest targeting tobacco control efforts at different age groups is particularly needed in high schools where tobacco use increases with the age and grade of students.[24,25,31]

Having close friends who smoke and having one or more smokers in the home were strongly associated with increased risk of smoking among high school students. Over the same period, the proportion of students overestimating smoking prevalence of peers and seeing students and teachers smoking near their school decreased. The existence of programs and policies in the school environment was not generally associated with smoking behaviour. Other strong reviews also showed that many factors, not just one single approach, influenced adolescent smoking[12,17,19,32-35] and that the most effective tobacco-control campaigns use a comprehensive set of policy measures, target different populations and meet different needs.[24,31,36] Consistent with a recent review by Sandford that suggests that there is little evidence that school-based smoking education programs have a lasting impact on youth smoking,[37] we consider that a population approach using government and community interventions would better address youth smoking prevention.

The changes in the social and environmental characteristics that influence tobacco behaviour suggest that during the three years of this study there were statistically significant differences in the knowledge and perceptions about tobacco use and policy control among the students we surveyed. These findings contribute to previous research about the importance of smoking policy and adolescents' knowledge about smoking.[38-40] However, in the logistic regression models these changes were not associated with smoking behaviour. This finding adds further support to the literature on the influence of schools and other environmental factors on smoking behaviour of youth.[12,34,39-41]

Policies that allow smoking on or near school property appeared to be potentially detrimental to smoking control efforts within the schools. For instance, we found that seeing teachers and staff smoke near the school was associated with greater likelihood of being a regular smoker in grade 12 students. Previous research suggests that seeing smoking near the school could undermine new policies when students perceive that teachers do not practice what they teach.[42] Additionally, female students who saw other students smoking where they were not allowed were more likely to be regular smokers. This finding contributes to previous research suggesting that strongly enforced policies are necessary for successful tobacco control.[43,44]

As expected, the behaviour of family members and friends was strongly associated with the likelihood of being a smoker. The large odds ratio may be explained by the fact that our results are drawn from a sample of students as they move from grade 10 through to grade 12, where typical increases in smoking behaviour occur. Moreover, our findings strongly support social influences as important components of smoking prevention programs.[24,45] A possible explanation for our findings is the important influence of social friendships on smoking behaviour during high school.[46] The relationship between smoking behaviour and close friendships is strongly linked to the type of friendships and how these friends influence behaviour.[9,11] The smoking behaviour of family members was also a strong trigger for regular smoking behaviour. However, developing effective family programs that target adolescent smoking within schools has been challenging.[47] Family-level interventions developed for elementary school students[48-50] or community-based programs[51-52] are often not appropriate for high school students. New research that brings families and youth together to address tobacco-control programming for students who are regular smokers may contribute to important lessons in tobacco control.

Having more close friends who smoke was a strong influence on the smoking behaviour of both male and female students. Existing literature suggests some gender differences in social influences, although conflicting results indicate no clear pattern.[12,13,53,54] This study showed that there was a substantial influence of close friends' smoking behaviour between occasional and regular smoking for both male and female students. A possible explanation is that by grade 12 both male and female students are experiencing strong pressure to smoke. Providing strong policy enforcement and negative messages about smoking behaviour may contribute to a cost-effective intervention; how to alter the influence of close friends who smoke is more problematic. Creating an environment for the most susceptible students in which smoking is viewed and modeled negatively is likely to be a key factor in their future behaviour. Recruiting the help of influential persons and role models to send powerful messages about what is normal and accepted in regard to smoking within a particular school may be a possible strategy.[23] For example, some students who smoke and are considered role models in the school may be able to play a role in helping other smoking students join cessation programs and/or prevention programming for those who have not transitioned to regular smoking.

Limitations of the study

This study is subject to limitations. Self-reported surveys were used where the validity of the responses is questionable. Since we used sealed envelopes for the student surveys to assure anonymity and confidentiality of responses, we cannot account for students who failed a grade and may have answered the questionnaire during the repeat year, who may have answered the questionnaire one year but not the next, who left the school for other reasons and who were new to the grade that year. The small number of high schools (ten) within the province was insufficient to conduct higher level analyses at the school level. Classroom level analysis could not be completed because of variability in the class level data collection procedures. Students' self reports on the smoking behaviour of their friends may have overestimated their smoking influence. Without ongoing surveillance of multiple factors that influence smoking behaviour, we cannot answer questions about what else might have been happening in schools or communities that may have accounted for the observed changes. Some other initiatives and events were happening locally and nationally over the course of the study; however, without systematic data collection we are unable to suggest any causality. Large studies that can compare across regions within the province and possibly target subpopulations might provide more robust data for informing policy and programs.

Conclusion

The school tobacco-control programs and policies implemented in PEI did not appear to affect the smoking behaviour of students by the time they were in grade 12, though students showed a significant increase in their knowledge and awareness of the tobacco policy and beliefs about it and its enforcement. Family and close friends were the social and environmental influences on the smoking behaviour of this population of youth, suggesting that programs and policies associated with banning smoking and enforcing smoking restrictions at school alone may not work unless they also adequately address the influence of smoking peers and family members and broader contextual environmental influences. While synergies within the comprehensive tobacco strategy may account for the overall decrease in smoking rates in the province, factors other than policy and program sentiments may have played a large part in the increase of tobacco use for this sample of students. Additional longitudinal research with larger populations, more schools, and linked student data may address these concerns more fully.

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