

The impact of school smoking policies and student perceptions of enforcement on school smoking prevalence and location of smoking

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Abstract

The purpose of this study was to comprehensively assess the impact of school tobacco policy intention, implementation and students' perceptions of policy enforcement on smoking rates and location of tobacco use during the school day. Data were obtained from all students in Grades 10–11 ($n = 22\ 318$) in 81 randomly selected schools from five Canadian provinces. Policy intention was assessed by coding written school tobacco policies. School administrators most familiar with the tobacco policy completed a survey to assess policy implementation. Results revealed policy intention and implementation subscales did not significantly predict school smoking prevalence but resulted in moderate prediction of tobacco use on school property ($R^2 = 0.21\text{--}0.27$). Students' perceptions of policy enforcement significantly predicted school smoking prevalence ($R^2 = 0.36$) and location of tobacco use ($R^2 = 0.23\text{--}0.63$). The research findings emphasize: (i) the need to consider both written policy intention and actual policy implementation and

(ii) the existence of a policy is not effective in controlling tobacco use unless the policy is implemented and is perceived to be strongly enforced.

Introduction

School-based strategies are a key element in adolescent tobacco control because school environments are established systems in which adolescent behavior can be targeted and in which social behaviors are reinforced [1, 2]. School tobacco policies are critical to a comprehensive adolescent tobacco control program, yet research to date shows inconsistencies in the way policies are measured and evaluated. Furthermore, little is known about the most effective strategies linking characteristics of school tobacco policies to adolescent tobacco use.

There has been an increased interest and emphasis on tobacco policies and their impact on youth tobacco use. Studies have shown that school tobacco policies are effective only if they are strongly enforced [3, 4]. A comprehensive review of the effects of school policies on youth smoking rates shows inconclusive findings [4–11]. Some of the ambiguity in strength of relations between policies and smoking behavior is likely a result of the differences in dates when the research was conducted (spanning the 17 years from 1989 to 2006), geography (i.e. Australia, Canada, Scotland and the United States), definitions of smoking behavior used as the outcome variable (i.e. current smoker, daily smoker, occasional smoker, susceptible smoker), sample size, operationalization of tobacco policies (i.e. intention, implementation,

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enforcement) and conceptualization of tobacco policy strength (i.e. students' versus teachers' perceptions of the policies and/or coded written policies). Based on these observations, it is important to identify consistencies in the way school policies are examined and to determine the relationships among policy intentions, implementation, enforcement and smoking behaviors during adolescence.

Policies that prohibit tobacco use vary in their target application, location of application and timing of enforcement. It is understood that strong policy intention and implementation should include emphases on comprehensiveness, prevention, cessation, punishment, consistency of enforcement, strength and visibility [3, 11–13]. The difficulty in exploring distinctions between strength of policy intention and implementation lies in the assessment of written policies with inherent intention to curtail smoking behaviors, and in exploring school informants' strategies to implement written policies. The application of these assessments to research and practice is of value to understanding policy impact.

A written policy can be viewed as a statement of intent addressing tobacco control in the school environment. The application of the written policy is not actualized in practice until the policy is implemented at the school. Furthermore, this actualization may not impact the school environment unless compliance is ensured through enforcement. This level of distinction is often overlooked in policy reviews, yet the use of consistent definitions of policy intention and implementation is critical to the examination of policy content, enforcement and effectiveness. One method of ensuring consistency of policy evaluation is to employ coding rubrics that capture the complexities of both policy intention and implementation. For example, a comprehensive coding rubric for written tobacco policies has been developed to include the main factors critical to strong policies [13]. The coding system includes five main components: developing, overseeing and communicating the policy, purpose and goals, tobacco-free environments (including prohibition, strength and characteristics of enforcement), tobacco use prevention education and assistance to

overcome tobacco addictions. Despite some initial testing of the rubric [13] it has seen limited use. More importantly, the different roles that school policy components play in influencing adolescent smoking behaviors remains elusive.

In addition to the lack of consistent evaluation strategies associated with written tobacco policies, the other main limitations in research linking policies and smoking behavior include: (i) the dependence on adolescents' perceptions of the strength of school policies; (ii) limited assessments of the consistency between policy intention and implementation and (iii) unclear conceptual links between the tobacco policy variables and youth smoking classifications. Specifically, in research linking tobacco policies and smoking behavior, it is not necessarily that tobacco policies will directly impact whether an individual is a daily or an occasional smoker, or whether they have ever tried a cigarette, but rather they will impact how the school environment contributes to shaping these behaviors. School-based policies should, at minimum, impact the frequency and location of smoking behavior that occurs around and at school. Efforts should be focused on characteristics of smoking behavior that are likely to be influenced, both directly and indirectly, by school-based tobacco policies.

The purpose of this paper is to (i) describe an approach for assessing school smoking policies, (ii) examine differences between school written policy (intention) and reported implementation; (iii) examine characteristics of school written (intention) policies and reported implementation as predictors of school smoking prevalence, as well as smoking prevalence at school, on and off school property and (iv) examine students' perceptions of policy enforcement as predictors of school smoking prevalence.

Methods

Participants

Following ethics approvals from the University and Secondary School Districts, a multi-site cross-sectional study was conducted in 81 randomly

selected secondary schools from British Columbia, Manitoba, Newfoundland, Ontario and Quebec. The five provinces represent a reasonable geographical balance and have smoking rates that span the range of Canada's overall smoking rate for youth aged 15–19 years (15–24%) [14].

Following a passive parental consent approach, all students in Grades 10 and 11 ($n = 22\,318$) within the 81 sampled schools were asked to complete a questionnaire about their smoking attitudes and behavior. From each school, a senior school administrator with extensive knowledge of the tobacco policy was recruited to complete a questionnaire about the implementation of the school smoking policy (i.e. survey on school smoking policies). In the final sample, administrators included principals (50%), vice principals (47.4%), assistant vice principals (1.3%) and teachers (1.3%). Written tobacco policies were also collected from each school and each corresponding school district board for assessment of policy intention.

Data sources and measures

Written school tobacco policies (intention)

To assess policy intention, school policies were collected from administrators, official policy documents or web pages. In the event that schools did not have a written policy, the district policy was obtained since it was the school's official tobacco control document. To assess the strength of policy, the hard copies were coded by two trained researchers using a theoretical and conceptually derived rating scheme [13]. Modifications to the existing rubric were made to reflect the Canadian context and recent theoretical findings [3, 15, 16]. Several Canadian experts on policy evaluation and implementation were also consulted during this process. Modifications to Stephens and English rubric [13] involved creating separate subscales for prohibition, strength and characteristics of enforcement instead of using the broader category of 'tobacco-free environments'. The final rating system was composed of seven policy components that were derived from a number of items: developing,

overseeing and communicating the policy; purpose and goals; prohibition; strength of enforcement; characteristics of enforcement; tobacco use prevention education and assistance to overcome tobacco addictions (see Table I for sample items). Two trained researchers used the rating system as a directed assessment instrument to code to the policies. The coders read through the school and district written policies and rated each policy component from 'poor' to 'outstanding' using a combination of Likert scale and dichotomous response sets. When rating discrepancies occurred, they were discussed until consensus was established.

School tobacco policy implementation

To assess the implementation of school tobacco policies, it was necessary to develop a structured survey that supported the main policy rubric informing this study. Development of the survey incorporated school health questionnaires [17, 18] and guidelines from prominent policy research [3, 13]. The survey was pilot tested by three school administrators (not included in our sample) before it was finalized to a total of 41 items (survey can be obtained from first author).

The resulting survey of school smoking policies was completed by school administrators who were knowledgeable about tobacco policies. The responses were coded using the same protocol and scoring system was described for the written school policies (see Table I). Similar procedures were used to ensure comparability between written policies (intention) and the structured interviews (implementation). The final rating system for policy implementation included an additional subscale for consistency of enforcement.

Student smoking and perceptions of policy enforcement

Student smoking behaviors were assessed using the tobacco module of the School Health Action, Planning and Evaluation System (SHAPES) [19] which is a research-supported machine readable survey designed to collect perceptions related to

Table I. *Sample questions from the policy intention and implementation subscales*

| Subscales | Policy intention | Policy implementation |
|---|--|--|
| Developing, overseeing and communicating policy | Is the tobacco policy written? | Does your school have written tobacco policy? |
| | Who should be involved in the development of tobacco policy? | Who was involved in developing your school tobacco policy? |
| | How should the policy be communicated to student, staff, and parents? | How are the students, staff, and parents informed about your school tobacco policy? |
| | Does the tobacco policy outline consequences of students, staff, and/or parents breaking the rules? | Does your school tobacco policy outline consequences of students, staff, and/or parents breaking the rules? |
| Purpose and goals | Are the intent and rationale of the tobacco policy outlined? | Are the intent and rationale of your school tobacco policy outlined? |
| Prohibition | Does the policy prohibit tobacco in specific locations? | Does your school policy prohibit tobacco in specific locations? |
| | Does the policy prohibit possession of tobacco by students? | Does your school policy prohibit possession of tobacco by students? |
| | Does the policy prohibit students from wearing tobacco brand-name apparel or carry merchandise from tobacco company? | Does your school tobacco policy prohibit students from wearing tobacco brand-name apparel or carry merchandise from tobacco company? |
| Strength of enforcement | Does the policy specify how often specific actions are taken when students violate the tobacco policy? | How often are specific actions taken when students violate your school tobacco policy? |
| | Does the policy specify a zero tolerance? | Does the policy specify a zero tolerance? |
| | Does the tobacco policy identify specific actions that should be taken when teachers and/or parents violate policy? | Identify specific actions that should be taken when teachers and/or parents violate your school tobacco policy? |
| Characteristics of enforcement | Does the tobacco policy specify that sanctions should get stronger with repeat offenses? | Does your school tobacco policy specify that sanctions should get stronger with repeat offenses? |
| | Is there an individual that is designed as primary responsible for enforcing policy? | Is there an individual that is designed as primary responsible for enforcing your school tobacco policy? |
| Consistency of enforcement | N/A | How consistently is your school tobacco policy enforced with students, staff and/or, parents? |
| Tobacco use prevention education | Does the tobacco policy mandate that all students receive instruction to avoid tobacco use? | Does your school tobacco policy mandate that all students receive instruction to avoid tobacco use? |
| Assistance to overcome tobacco addictions | Does the tobacco policy specify the availability of cessation programs for students and staff? | Does your school tobacco policy specify the availability of cessation programs for students and staff? |

multiple characteristics of youth tobacco use [19]. For this study, questions pertaining to frequency and quantity of tobacco consumption were used to define smoking behavior. A smoker was defined as an adolescent who had smoked at least a few puffs of a cigarette on ≥ 2 days in the last month. The individual data were used to create two dependent variables. First, a composite score assessing smoking status, which was then converted into a school prevalence rate by adding the number of smokers at each of the schools represented, divided by the total students at the school. Second, prevalence of smokers who smoke at school both on and off the property (location of smoking behavior) was calculated. Prevalence of smoking behavior location was calculated as a ratio of smokers indicating they smoked on and/or off school property divided by the total number of smokers at each school.

Items from SHAPES were also used to create five independent variables related to student perceptions of policy enforcement at the school: (i) perception regarding the percentage of students who smoke (10-point Likert scale ranging from 0–10% to 91–100%); (ii) whether there are punishments for smoking on school property (percentage of students reporting ‘true’ and ‘usually true’); (iii) existence of a clear set of tobacco use rules at school (percentage of students reporting ‘true’ and ‘usually true’); (iv) strong sanctions for breaking the tobacco rules (percentage of students reporting ‘true’ and ‘usually true’) and (v) whether students smoke where they are not allowed (four-point Likert scale ranging from none to a lot).

Data analyses

Prior to main analyses, it was important to assess the validity of the instruments used to code the policies. Nine completed surveys assessing both policy intention and implementation were randomly selected and given to six experts in the field of tobacco policy who were asked to rank order them in terms of strength, and to include rationale for their decisions. This rank ordering was compared with the strength of scores generated from the developed rating system as coded by the trained researchers. The survey and the rater’s rank-

ings elicited the same policy strength scores 83.4% of the time.

Following the validation of the policy measures, the psychometrics of the policy scale scores and aggregated data from SHAPES (i.e. smoking behaviors and students’ perceptions of policy enforcement) were examined. Descriptive analyses were conducted to examine correlations, means and standard deviations (SDs). *t*-tests were conducted to examine significant mean differences and between policy intention and implementation. The main analyses involved independent multiple linear regressions conducted to examine (i) policy implementation (reported by school administrators), (ii) policy intention (from written policies) and (iii) students’ perceptions of policy enforcement, as predictors of school smoking prevalence and smoking behaviors occurring on and off school property during the school day. No simultaneous models including intention, implementation and perceptions of enforcement were conducted due to the limited power resulting from the small sample size. Since there were no theoretical or conceptual reasons to expect differences among the predictors, all policy subscales were entered in step one. For all analyses, the significance level was set at 0.05. Given the number of predictors and sample size, we recognize the possibility of inflated Type I errors. However, the exploratory nature of this study begins to address an existing gap in the literature. It was desirable to use this approach to identify the majority of factors that may influence school smoking rates.

Results

The majority of schools (80%) had their own tobacco policy, with the remaining schools reporting use of the district policy (see Table II). The policy intention subscales for tobacco use prevention education and assistance to overcome tobacco addiction were indiscriminant across the schools and were not included in the main regression analyses.

The relationships among smoking prevalence and school-based tobacco control policies are

Table II. Means and SDs for the policy data

| | Scale range | Score range | Mean | SD |
|---|-------------|-------------|-------|-------|
| Smoking prevalence (%) | | | 20.99 | 7.18 |
| Policy intention | | | | |
| Developing, overseeing and communicating policy | 0–14 | 0–9 | 3.00 | 2.39 |
| Purpose and goals | 0–2 | 0–2 | 0.81 | 0.82 |
| Prohibition | 0–7 | 0–5 | 2.77 | 1.72 |
| Strength of enforcement | 0–18 | 0–8 | 1.55 | 2.09 |
| Characteristics of enforcement | 0–2 | 0–2 | 0.50 | 0.72 |
| Tobacco use prevention education | 0–1 | 0–1 | 0.06 | 0.25 |
| Assistance to overcome tobacco addictions | 0–2 | 0–1 | 0.12 | 0.43 |
| Policy implementation | | | | |
| Developing, overseeing and communicating policy | 0–14 | 3–13 | 9.19 | 2.08 |
| Purpose and goals | 0–2 | 0–2 | 0.65 | 0.81 |
| Prohibition | 0–7 | 0–7 | 4.74 | 1.66 |
| Strength of enforcement | 0–18 | 2–14 | 7.78 | 2.47 |
| Consistency of enforcement | 0–12 | 0–12 | 8.91 | 3.22 |
| Characteristics of enforcement | 0–2 | 0–2 | 1.23 | 0.56 |
| Tobacco use prevention education | 0–1 | 0–1 | 0.16 | 0.36 |
| Assistance to overcome tobacco addictions | 0–2 | 0–2 | 1.04 | 0.77 |
| Perceptions of policy enforcement | | | | |
| Students can be fined if caught smoking | 0–100 | 2.04–93.12 | 38.81 | 26.86 |
| Clear set of smoking rules | 0–100 | 29.76–92.18 | 67.63 | 13.76 |
| Consequences of getting caught smoking | 0–100 | 25.63–84.86 | 54.74 | 15.02 |
| Students smoke where not allowed | 1–5 | 2.25–3.41 | 2.87 | 0.25 |
| Smoking prevalence | 1–10 | 3.44–6.51 | 5.06 | 0.69 |

presented in Table III. Very few of the policy implementation subscales were related to policy intention. The majority of students' perceptions of policy enforcement items was significantly correlated with the intention and implementation subscales. None of the policy intention and implementation subscales was related to smoking prevalence. However, student perceptions regarding the percentage of smokers attending the school were related to school smoking prevalence. There were many significant relationships among policy intention, implementation and students' perceptions of school tobacco policy enforcement and smoking prevalence (at school) on and off school property.

Differences between intention and implementation subscales

To explore the differences in intention and implementation subscales, a number of *t*-tests were conducted using a Bonferroni technique to protect

against Type 1 errors. Implementation subscales were significantly higher than intention subscales: developing, overseeing and communicating policy, $t(1, 76) = 22.50, P < 0.001$; prohibition, $t(1, 76) = 12.79, P < 0.001$; strength of enforcement, $t(1, 76) = 9.64, P < 0.001$; characteristics of enforcement, $t(1, 76) = 9.31, P < 0.001$; tobacco use and prevention education, $t(1, 76) = 3.04, P < 0.001$ and assistance to overcome tobacco addiction, $t(1, 76) = 10.82, P < 0.001$. The subscales for purpose and goals were not significantly different. Policy implementation had an additional subscale (consistency of enforcement) that was not included in comparative analyses.

Predictors of school smoking prevalence and location of smoking behavior

School smoking prevalence

To examine policy intention and implementation as predictors of school smoking prevalence, a

Table III. Correlations among the policy subscales and smoking prevalence

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 |
|----|-------|-------|--------|-------|-------|--------|--------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 1 | — | | | | | | | | | | | | | | | | | | | | |
| 2 | 0.16 | — | | | | | | | | | | | | | | | | | | | |
| 3 | 0.31* | 0.08 | — | | | | | | | | | | | | | | | | | | |
| 4 | -0.08 | -0.05 | -0.02 | — | | | | | | | | | | | | | | | | | |
| 5 | 0.07 | 0.08 | 0.13 | 0.07 | — | | | | | | | | | | | | | | | | |
| 6 | -0.08 | -0.03 | -0.39* | 0.13 | 0.28* | — | | | | | | | | | | | | | | | |
| 7 | -0.02 | 0.03 | 0.23* | 0.49* | 0.12 | -0.02 | — | | | | | | | | | | | | | | |
| 8 | -0.06 | 0.01 | 0.00 | 0.43* | 0.02 | 0.15 | 0.45* | — | | | | | | | | | | | | | |
| 9 | -0.10 | 0.31* | -0.19 | 0.31* | 0.21 | 0.09 | 0.27* | 0.03 | — | | | | | | | | | | | | |
| 10 | -0.04 | -0.05 | -0.07 | -0.01 | 0.12 | 0.06 | 0.38* | 0.23* | -0.03 | — | | | | | | | | | | | |
| 11 | 0.08 | -0.05 | -0.01 | 0.16 | 0.12 | 0.15 | -0.07 | 0.22 | 0.06 | -0.18 | — | | | | | | | | | | |
| 12 | 0.16 | 0.17 | 0.00 | 0.05 | 0.20 | 0.05 | 0.07 | -0.05 | 0.07 | 0.17 | 0.28* | — | | | | | | | | | |
| 13 | -0.17 | 0.05 | -0.30* | 0.10 | -0.02 | 0.33* | 0.11 | 0.25* | 0.03 | 0.03 | 0.11 | 0.16 | — | | | | | | | | |
| 14 | 0.08 | 0.05 | 0.12 | 0.06 | 0.08 | -0.14 | 0.09 | -0.04 | 0.11 | 0.02 | 0.35* | 0.40* | -0.07 | — | | | | | | | |
| 15 | -0.09 | 0.01 | -0.11 | -0.01 | 0.02 | -0.12 | -0.09 | -0.04 | -0.07 | 0.16 | 0.21 | 0.30* | 0.15 | 0.39* | — | | | | | | |
| 16 | 0.11 | 0.28* | -0.28* | 0.17 | 0.10 | 0.21 | 0.04 | 0.29* | 0.16 | 0.10 | 0.22 | 0.23* | 0.29* | 0.12 | 0.21 | — | | | | | |
| 17 | 0.08 | -0.01 | 0.02 | 0.14 | 0.10 | -0.02 | 0.29* | 0.22 | 0.21 | -0.10 | 0.28* | 0.17 | 0.12 | 0.36* | 0.10 | 0.21 | — | | | | |
| 18 | 0.12 | 0.34* | 0.15 | 0.10 | 0.01 | -0.15 | 0.24* | -0.10 | 0.18 | 0.00 | -0.15 | 0.10 | -0.18 | -0.04 | -0.02 | 0.13 | -0.05 | — | | | |
| 19 | 0.59* | 0.32* | 0.37* | -0.11 | -0.06 | -0.23* | -0.01 | 0.02 | -0.21 | -0.04 | -0.01 | 0.20 | -0.20 | 0.05 | -0.02 | 0.14 | 0.00 | 0.28* | — | | |
| 20 | -0.04 | 0.20 | -0.70* | 0.07 | -0.01 | 0.40* | -0.11 | 0.07 | 0.15 | 0.03 | -0.05 | 0.09 | 0.25* | 0.03 | 0.19 | 0.35* | 0.04 | 0.04 | -0.10 | — | |
| 21 | 0.10 | 0.22* | -0.26* | -0.11 | 0.12 | 0.04 | -0.22 | -0.06 | -0.08 | 0.07 | 0.16 | 0.28* | 0.11 | 0.11 | 0.21 | 0.17 | -0.09 | 0.14 | 0.12 | 0.42* | — |
| 22 | 0.16 | 0.27* | -0.43* | -0.10 | -0.03 | 0.16 | -0.26* | -0.05 | -0.02 | -0.01 | 0.17 | 0.25* | 0.03 | 0.17 | 0.21 | 0.28* | -0.01 | 0.06 | 0.21 | 0.58* | 0.82* |

1, school smoking prevalence; 2, off school property smoking prevalence; 3, on school property smoking prevalence; 4–10, policy intention subscales (4, developing, overseeing and communicating policy; 5, purpose and goal; 6, prohibition; 7, strength; 8, characteristics; 9, tobacco use prevention education; 10, assistance to overcome tobacco addiction); 11–17, policy implementation subscales (11, developing, overseeing and communicating policy; 12, purpose and goal; 13, prohibition; 14, strength; 15, characteristics; 16, consistency; 17, tobacco use prevention education); 18, assistance to overcome tobacco addiction); 18, assistance to overcome tobacco addiction); 18, perception of smoking where not allowed; 19, perception of smoking prevalence; 20, prevalence perception that students can be fined; 21, prevalence perception of clear set of rules; 22, prevalence perception consequences of breaking rules.

* $P < 0.05$.

multiple regression was planned. However, the correlations among both policy implementation and intention showed little, if any, relationships and no further analyses were conducted. The model predicting school smoking prevalence from students' perceptions of school policy was significant, $F(5, 72) = 7.86, P < 0.001, R^2 = 0.36$, with perception of smokers emerging as an independent predictor (see Table IV).

Smoking location: at school, on school property

To test the hypothesis that schools with weaker policy intention and implementation would have more smokers using tobacco at school, separate regressions were conducted with location of smoking as the dependent variable (see Table V). For policy intention, the model was significant, $F(5, 70) = 5.17, P < 0.05$. The policy intention subscales accounted for 27% of the variance in on school property tobacco use, with prohibition, strength and purpose and goals emerging as significant individual predictors. For policy implementation, the model was also significant, $F(8, 69) = 2.28, P < 0.05, R^2 = 0.21$. The individual significant predictors included prohibition, consistency of enforcement and tobacco use prevention education. Finally, the model examining adolescents' perceptions of policy enforcement predicting smoking on school property was also significant, $F(5, 72) = 22.72, P < 0.001, R^2 = 0.62$. The significant independent predictors in the model included perceptions that students can be fined, breaking the rules leads to consequences and prevalence of smokers at school.

Smoking location: at school, off school property

Regressions were also conducted with smoking on school property as the dependent variable (see Table VI). The first regression included all policy intention subscales as predictors of smoking at school but off property. The model was not significant, $F(5, 70) = 0.190, P > 0.05, R^2 = 0.01$. The second regression included the policy implementation subscales as predictors of smoking off school property. The model was not significant, $F(8, 69) = 1.85, P = 0.09, R^2 = 0.17$. Finally, the model exploring adolescents' perceptions of policy enforcement as predictors of smoking off school property was tested. In this model, adolescents' perceptions of more students smoking where they are not allowed and greater perception of smokers at the school were significant independent predictors in the model, $F(5, 72) = 4.11, P < 0.001, R^2 = 0.23$.

Discussion

The coding scheme developed in this study was used to explore school written tobacco policy intention and administrator-reported policy implementation in secondary schools across Canada. Results revealed few of the school policy implementation subscales were related to written policies (intention) and none of the policy subscales was correlated to smoking prevalence. However, there were many significant relationships among policy intention, implementation and students' perceptions of school tobacco policy enforcement and smoking prevalence at

Table IV. Regression analyses predicting school smoking prevalence from perceptions of policy enforcement

| | <i>B</i> | Standard error (SE) of <i>B</i> | β | R^2 |
|---|----------|------------------------------------|---------|-------|
| Perceptions of policy enforcement | | | | 0.36* |
| Students can be fined | 0.12 | 3.29 | 0.01 | |
| School has a clear set of rules | -0.29 | 8.91 | -0.01 | |
| Rules can be broken | 1.86 | 9.45 | 0.04 | |
| Prevalence of smoking where not allowed | -1.49 | 2.87 | -0.05 | |
| School smoking prevalence | 6.26 | 1.12 | 0.60* | |

* $P < 0.05$.

Table V. Regression analyses predicting tobacco use on school property from policy intention (Model 1), policy implementation (Model 2) and perceptions of policy enforcement (Model 3)

| | <i>B</i> | SE of <i>B</i> | β | R^2 |
|---|----------|----------------|---------|-------|
| Model 1 | | | | |
| Policy intention | | | | 0.27* |
| Developing, overseeing and communicating policy | −1.15 | 1.29 | −0.11 | |
| Purpose and goals | 5.72 | 2.53 | 0.24* | |
| Prohibition | −5.81 | 1.44 | −0.44* | |
| Strength | 2.00 | 1.00 | 0.25* | |
| Characteristics | 0.44 | 3.71 | 0.01 | |
| Model 2 | | | | |
| Policy implementation | | | | 0.21* |
| Developing, overseeing and communicating policy | −0.28 | 0.98 | −0.04 | |
| Purpose and goals | 1.46 | 2.55 | 0.07 | |
| Prohibition | −2.89 | 1.21 | −0.29* | |
| Strength | 0.50 | 0.94 | 0.07 | |
| Characteristics | −1.49 | 3.70 | −0.05 | |
| Consistency | 1.27 | 0.62 | 0.25* | |
| Tobacco use prevention education | −11.11 | 5.40 | −0.24* | |
| Assistance to overcome tobacco addiction | 0.78 | 2.61 | 0.04 | |
| Model 3 | | | | |
| Perceptions of policy enforcement | | | | 0.62* |
| Students can be fined | −34.14 | 5.98 | −0.55* | |
| School has a clear set of rules | 24.48 | 16.14 | 0.20 | |
| Rules can be broken | −38.94 | 17.12 | −0.35* | |
| Prevalence of smoking where not allowed | 4.95 | 5.19 | 0.08 | |
| School smoking prevalence | 8.28 | 2.03 | 0.34* | |

* $P < 0.05$.

school (both on and off school property). Several moderate predictive models exploring characteristics of adolescent smoking behaviors were observed.

Comparing the strength of the policies, implementation scores were significantly higher than intention for all but one subscale (i.e. purpose/goals). In particular, it is encouraging to note that strength and characteristics of enforcement were higher than the intention subscales since tobacco policies have maximum benefit only when they are strongly enforced [3, 4]. The differences may be due to the length of time that the written policy has been in place at the school. However, it may also be that administrators were more optimistic in their reporting of implementation; thus this finding should be interpreted with caution. This result highlights the need to assess both policy intention and implementation.

School smoking prevalence was not significantly related to policy intention or implementation. This

suggests that school policies do not have direct consistent effects on smoking prevalence. A number of researchers have noted similar relationships among school tobacco use policies and adolescent smoking prevalence [i.e. 5, 8–11]. Conceptually, it is not surprising that a school policy alone fails to impact school smoking prevalence unless part of a comprehensive tobacco control program. The synergistic impact of tobacco control policies, prevention and cessation programs and other forms of tobacco control approaches in the school (such as health education curriculum and anti-smoking campaigns and promotions) are likely to be most influential and require further investigation for the impact on school smoking.

Students' perceptions of policy enforcement were moderately linked to smoking prevalence. In the predictive model, a perception that there were a higher number of smokers at school was the strongest predictor of smoking prevalence. This

Table VI. Regression analyses predicting tobacco use off school property from policy intention (Model 1), policy implementation (Model 2) and perceptions of policy enforcement (Model 3)

| | <i>B</i> | SE of <i>B</i> | β | <i>R</i> ² |
|---|----------|----------------|---------|-----------------------|
| Model 1 | | | | |
| Policy intention | | | | 0.01 |
| Developing, overseeing and communicating policy | -0.062 | 1.03 | -0.09 | |
| Purpose and goals | 1.41 | 2.02 | 0.09 | |
| Prohibition | -0.43 | 1.15 | -0.05 | |
| Strength | 0.24 | 0.80 | 0.04 | |
| Characteristics | 0.64 | 2.98 | 0.03 | |
| Model 2 | | | | |
| Policy implementation | | | | 0.17 |
| Developing, overseeing and communicating policy | -0.92 | 0.70 | -0.17 | |
| Purpose and goals | 2.42 | 1.83 | 0.17 | |
| Prohibition | -0.47 | 0.87 | -0.07 | |
| Strength | 0.05 | 0.67 | 0.01 | |
| Characteristics | -1.13 | 2.65 | -0.06 | |
| Consistency | 0.60 | 0.44 | 0.17 | |
| Tobacco use prevention education | 9.63 | 3.87 | 0.31* | |
| Assistance to overcome tobacco addiction | -1.19 | 1.87 | -0.08 | |
| Model 3 | | | | |
| Perceptions of policy enforcement | | | | 0.23* |
| Students can be fined | 6.11 | 5.83 | 0.14 | |
| School has a clear set of rules | -1.06 | 15.76 | -0.01 | |
| Rules can be broken | 10.32 | 16.72 | 0.14 | |
| Prevalence of smoking where not allowed | 11.91 | 5.07 | 0.26* | |
| School smoking prevalence | 3.85 | 1.98 | 0.23* | |

**P* < 0.05.

finding is supported in research using social cognitive frameworks, where observational learning is a strong predictor of behavior [20, 21]. These types of modeled behaviors should be considered when policies are developed and enforced. Furthermore, teacher and staff smoking prevalence were not explored in this study but have the potential to impact student smoking through modeling mechanisms and should be included in future studies. There are reports to suggest that teacher smoking during school hours is associated with adolescent smoking [22]. If schools can reduce the visibility of tobacco use, both by students and teachers, it will likely have positive effects on controlling the prevalence of adolescent smoking behaviors. This is a potent area for developing awareness and influencing behavior.

None of the school policy intention or implementation subscales significantly predicted smoking prevalence off school property. This finding was expected since school policies likely have more

influence on smoking behaviors exhibited on school property. Alternatively, schools with written policies (intention) describing low prohibition, greater strength of enforcement and clearly established purpose and goals had higher smoking rates on school property. For administrator-reported implementation, low prohibition, greater consistency of enforcement and the absence of tobacco use prevention education were related to high smoking rates on school property. These results suggest that further work is needed to decipher the complex interrelationships among prohibition, enforcement, prevention education and school environment when examining smoking on school property. For example, if schools have designated smoking areas (i.e. smoking pit), the higher strength and consistency of enforcement of tobacco policies may be propagating tobacco use on school property but limiting smoking to specific areas. In this case, further research is needed to examine smoking on school

property and the possible covariance associated with designated smoking areas. Additionally, students' knowledge and understanding of their school policy is unknown and may interact with smoking behavior. It would be beneficial to assess students' recall and recognition of school-based tobacco policies and to control for these effects when examining smoking behavior.

Students' perceptions of policy enforcement were strongly predictive of smoking on school property. Specifically, in schools where punishment was not perceived a consequence of smoking, there were more students smoking on school grounds. This finding is consistent with previous research [5, 7] and highlights the importance of communicating the consequences of breaking the tobacco policy rules. We also found that schools where adolescents' perceived more student smokers had high smoking rates on school property. This finding may again illustrate the power of observational learning and highlights the importance of reducing the visibility and awareness of adolescent smoking behaviors at school.

There are a number of limitations associated with this study. First, the coding rubrics and surveys developed for this project need to be further tested for their reliability and validity. Also, confirmatory factor analyses are needed to examine the factor structure of tobacco policies. The cross-sectional design and relatively small sample of schools in this study preclude more advanced analyses and limit the power to detect statistical results. Future research should explore the longitudinal relationships among tobacco policies and characteristics of smoking behaviors during adolescence.

Despite its limitations, this study makes important contributions to research on school tobacco policies. The conceptualization of policies as intention and implementation, coupled with the development of a coding paradigm used to assess policies, begins to address the need for consistent definition and evaluation of tobacco policies. A cost-effective and practical approach to measure policy implementation reliably is a challenge. Developing student items for cross-validation with administrator reports may be one approach to

addressing this challenge. Future studies should continue to move beyond simple classification of smokers and non-smokers and examine conceptually plausible relationships between policy and different smoking behaviors. There are many more opportunities for intervention when we consider location and timing of tobacco use among student smokers at school. In conclusion, exploring the differences between policy intention and implementation highlights the need to further examine inconsistencies in the way tobacco policies are written and the strategies used to implement them. As practitioners, it is important to focus on bridging this gap to ensure consistent and clearly communicated tobacco use prohibition strategies.

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Conflict of interest statement

None declared.

References

1. Alexander C, Piazza M, Mekos D *et al.* Peers, schools, and adolescent cigarette smoking. *J Adolesc Health* 2001; **29**: 22–30.
2. Lantz PM, Jacobson PD, Warner KE *et al.* Investing in youth tobacco control: a review of smoking prevention and control strategies. *Tob Control* 2000; **9**: 47–63.

3. Pentz MA, Sussman S, Newman T. The conflict between least harm and no-use tobacco policy for youth: ethical and policy implications. *Addiction* 1997; **92**: 1165–73.
4. Wakefield MA, Chaloupka FJ, Kaufman NJ *et al.* Effect of restrictions on smoking at home, at school, and in public places on teenage smoking: cross sectional study. *Br Med J* 2000; **321**: 333–7.
5. Griesbach D, Inchley J, Currie C. More than words? The status and impact of smoking policies in Scottish schools. *Health Promot Int* 2002; **17**: 31–41.
6. Moore L, Roberts C, Tudor-Smith C. School smoking policies and smoking prevalence among adolescents: multilevel analysis of cross-sectional data from Wales. *Tob Control* 2001; **10**: 117–23.
7. Pentz MA, Brannon BR, Charlin VL *et al.* The power of policy: the relationship of smoking policy to adolescent smoking. *Am J Public Health* 1989; **79**: 857–62.
8. Reitsma A, Manske S. Smoking in Ontario schools: does policy make a difference? *Can J Public Health* 2004; **95**: 214–8.
9. Charlton A, While D. Smoking prevalence among 16–19 year olds related to staff and student smoking policies in sixth forms and further education. *Health Educ J* 1994; **53**: 28–39.
10. Clark V, White V, Hill D *et al.* School structural and policy variables associated with student smoking. *Tob Control* 1994; **3**: 339–46.
11. Darling H, Reeder AI, Williams S *et al.* Is there a relation between school smoking policies and youth cigarette smoking knowledge and behaviors? *Health Educ Res* 2006; **21**: 108–15.
12. Ross JG, Einhaus KE, Hohenemser LK *et al.* School policies prohibiting tobacco use, alcohol and other drug use, and violence. *J Sch Health* 1995; **65**: 333–9.
13. Stephens YD, English G. A statewide school tobacco policy review: process, results, and implications. *J Sch Health* 2002; **72**: 334–8.
14. Health Canada. *Canadian Tobacco Use Monitoring Survey (CTUMS) Annual Results, 2004*. Available at: <http://www.statcan.ca/cgi-bin/imdb/p2SV.pl?Function=getSurvey&SDDS=4440&lang=en&db=IMDB&dbg=f&adm=8&dis=2> Accessed: June 21, 2004.
15. Campbell HS, Santi S, Tuttle C *et al.* *Refinement of Coding Scheme for Municipal Bylaws Restricting Smoking in Indoor Places*. Report submitted to the Canadian Tobacco Control Initiative, 2002.
16. Darling H, Reeder AI. Use of tobacco products to advertise music events in Dunedin, New Zealand. *Tob Control* 2003; **13**: 243.
17. Bogden JF, Vega-Matos CA. *Fit Healthy and Ready to Learn (Part 1)*. Alexandria, VA: National Association of State Boards of Education, 2000.
18. Center for Chronic Disease Prevention and Health Promotion. *School Health Index for Physical Activity and Healthy Eating: A Self-Assessment and Planning Guide—Tobacco Modifications Supplement*. Atlanta, GA: National Center for Chronic Disease Prevention and Health Promotion, 2000.
19. Cameron R, Manske S, Brown KS *et al.* Integrating public health policy, practice, evaluation, surveillance, and research using local data collection and feedback systems: the example of the School Health Action Planning and Evaluation System (SHAPES). *Am J Public Health*, in press.
20. Bandura A. *Self-Efficacy: The Exercise of Control*. New York, NY: W. H. Freeman, 1997.
21. Leatherdale ST, Manske S. The relationship between student smoking in the school environment and smoking onset in elementary school students. *Cancer Epidemiol Biomarkers Prev* 2005; **14**: 1762–5.
22. Poulsen LH, Osler M, Roberts C *et al.* Exposure to teachers smoking and adolescent smoking behaviour: analysis of cross-sectional data from Denmark. *Tob Control* 2002; **11**: 246–51.

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