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Perceived Enforcement of School Tobacco Policy and Adolescents' Cigarette Smoking

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Abstract

Objectives—School tobacco use policies are part of a comprehensive strategy for preventing or reducing adolescent cigarette smoking. This study examines the relationship between perceived tobacco policy enforcement at the school level and smoking behaviors among students.

Methods—21,281 middle and high school students of 255 schools in the 2006 Oregon Health Teens Survey. Multilevel logistic regression was conducted, using a school-level policy enforcement measure based on aggregated student reports, and individual-level characteristics (e.g., age, gender, cigarette smoking before age 12, personal beliefs about smoking) as predictors of past-30-day cigarette smoking behaviors (e.g., any smoking, daily smoking, heavy episodic smoking, smoking on school property).

Results—Higher levels of perceived enforcement of anti-smoking policy at the school level were inversely associated with the prevalence of past-30-day smoking behaviors, independent of individual-level predictors.

Conclusions—Stricter enforcement of school policies against tobacco use may help prevent or reduce adolescents' cigarette smoking on and outside of school property.

Keywords

Adolescents; Cigarette smoking behaviors; School tobacco policy; Prevention

Introduction

The adverse health effects of cigarette smoking are well documented (Bjartveit & Tverdal, 2005; Mucha et al., 2006; Peto et al., 1994). Since most habitual cigarette smokers initiate this behavior during adolescence (Fidler et al., 2006; Patton et al., 1998), a number of policy and educational strategies have been implemented to prevent or reduce smoking among youth, including school anti-smoking policies (Lantz et al., 2000).

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Conflict of Interest statement

The authors declare that there are no conflicts of interest

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Most schools in the US have rules against tobacco use on or near school property, penalties for violations of these rules, and varying degrees of policy enforcement. Research on the potential effects of school tobacco use policy on adolescents' smoking behavior has been limited and inconclusive (Evans-Whipp et al., 2004; Evans-Whipp et al., 2007; Lantz et al., 2000; Moore et al., 2001). Some studies show that simply having school policies against students' tobacco use only minimally affects students' smoking behaviors (Barnett et al., 2007; Clarke et al., 1994; Rosendahl et al., 2002). Punitiveness of the policy also does not seem to relate to students' smoking behavior. Results of a study in California found no relationship between school tobacco policies with punishment emphasis and severe consequences (i.e. number of consequences) and levels of self-reported smoking by adolescents (Pentz et al., 1989). Other studies, however, suggest that consistent enforcement may be related to anti-smoking policy effectiveness and to reduced smoking by students (Griesbach et al., 2002; Kumar et al., 2005; Lovato et al., 2007; Moore et al., 2001; Pentz et al., 1989; Tubman & Vento, 2001; Wakefield et al., 2000). For example, results from multilevel analysis of a national data in the U.S. indicated that, when school and student demographic characteristics were included, monitoring student behavior was significantly and negatively associated with daily cigarette use among middle school students but not high school students (Kumar et al., 2005). Results from multilevel analysis of data from Wales showed that schools that consistently enforced pupil anti-smoking policies had significantly lower daily and weekly smoking prevalence than schools with weaker enforcement. However, after adjustment for student-level variables, there was no longer an association between smoking policy enforcement and weekly smoking behaviors (Moore et al., 2001). Elsewhere, a study among high school students in the U.S. indicated that school smoking bans were related to a lower 30-day smoking prevalence only when the ban was strongly enforced (Wakefield et al., 2000), and a study from Canada showed significant relationships between students' perceptions of anti-smoking policy enforcement and tobacco use on school property (Lovato et al., 2007).

The majority of studies in this area have used school tobacco policy measures based on reports from school principals, teachers or other school staff rather than on students' perception of the policies and their enforcement (Bowen et al., 1995; Clarke et al., 1994; Darling et al., 2006; Moore et al., 2001; Pentz et al., 1989; Rosendahl et al., 2002). Because the effectiveness of a school's tobacco use policy may ultimately be contingent upon students' perception of the certainty of its enforcement, such an approach may underestimate the actual or potential effects of school anti-smoking policies. The few studies that have used students' perceptions to measure school anti-smoking policies and enforcement (Lovato et al., 2007; Wakefield et al., 2000), focused on individual- rather than school-level perception of anti-smoking policies. In this study we examine student perceptions at the aggregate (school) level, representing the schools' social environment in relation to enforcement of anti-smoking policies. A similar approach was used in a recent study of community level enforcement of minor in possession laws based on students' perceived enforcement of these laws (Dent et al., 2005).

Methods

Study sample and survey methods

This study is based on data from 21,281 middle and high school students (primarily 8th and 11th graders) in 255 schools (127 middle schools and 128 high schools) who participated in the 2006 Oregon Health Teens Survey (OHT) and who provided complete data for all study variables. An average of 83.5 students (range: 2–431, *SD*=59.1) in each school provided information for the survey. We compared the study sample characteristics with a sub-sample of respondents (*n*=6,217) for which statewide sample weights were available. The demographic characteristics (male, white and age) as well as the prevalence of the smoking behaviors were similar, suggesting that the study sample was representative of Oregon 8th and 11th graders.

The OHT survey was administered in schools that were part of statewide random OHT sample or a CDC Youth Risk Behavior Survey sample. Surveys were administered by teachers or other school staff who were provided with a detailed protocol by NPC, an organization contracted by the Oregon Public Health Division. The survey took one class period to complete. Survey data were collected anonymously and institutional review board approval for analysis the OHT data was obtained prior to implementation of the study. The overall OHT response rate was 81.2%. Sample characteristics are provided in Table 1.

Measures

School tobacco policy enforcement—School tobacco policy and its enforcement were measured by the question: “Is there a rule against tobacco in your school?” The four possible responses were as follows: “There is no rule”, “There is a rule, but it isn’t enforced”, “There is a rule and it is sometimes enforced,” and “There is a rule and it is strictly enforced.” Since the majority of students at each school thought their school’s tobacco policy was strictly enforced, a categorical variable was created to classify schools with respect to strictness of policy enforcement. First, for each school we computed the percentage of students who perceived the rule against tobacco as strictly enforced. Then, by quartiles we compared schools with low level of strictly enforced anti-smoking policy (referent group) with schools with medium, medium-high and high levels of perceived enforcement (see Table 1 for cut off points for the levels of strictness of anti-smoking policy enforcement).

Smoking behaviors—Participants were asked about their frequency of cigarette smoking in the past 30 days (Seven possible responses ranged from “0 days” to “All 30 days”), the number of cigarettes they smoked per day on the days they smoked (seven possible responses ranged from “I did not smoke cigarettes during the past 30 days” to “More than 20 cigarettes per day”), their frequency of cigarette smoking on school property (seven possible responses ranged from “0 days” to “All 30 days”), and their likelihood of smoking a cigarette offered by a best friend (four possible responses ranged from “Definitely not” to “Definitely would”). Because these outcome variables had skewed distributions (see Table 1), five dichotomous variables were created: any cigarette smoking in the past 30 days (yes/no), daily smoking in the past 30 days (yes/no), heavy episodic smoking (i.e., smoking of more than one cigarette per day on the days he or she smoked) in the past 30 days (yes/no), any cigarette smoking on school property in the past 30 days (yes/no), and the student’s likelihood of smoking a cigarette offered by a best friend (yes/no).

Individual characteristics

Demographics: Students reported their gender, race/ethnicity, and age. Race/ethnicity was treated as a dichotomy (white vs. non-white) as the majority of respondents were white (see Table 1). Of the non-white group, 53.6% were Hispanics or Latinos, 16.6% Asians, 12.6% American-Indians or Alaska natives, 11.1% Black or African-American and 6.0% native Hawaiian or Pacific Islanders.

Onset of cigarette use: Each student was asked how old he or she was the first time he or she smoked a whole cigarette. This item was coded as a dichotomous variable indicating whether each respondent had initiated cigarette smoking before the age of 12.

Personal beliefs: Personal beliefs included (a) positive social expectancy, (b) perceived harm of heavy smoking, (c) perceived harm of passive smoking, (d) personal disapproval, and (e) perceived tobacco availability. To measure positive social expectancy students were asked “Do you think young people who smoke cigarettes have more friends?”, this item had a four-point response scale ranging from “Definitely not” to “Definitely yes.” Perceived harm of heavy smoking was measured by asking the students “How much do you think people risk harming

themselves (physically or in other ways) if they smoke one or more packs of cigarettes per day?" with a four-point response scale from "No risk" to "Great risk." To assess perceived harm of passive smoking, respondents were asked "Do you think the smoke from other people's cigarettes is harmful to you?" this question had a four-point response scale ranging from "Definitely not" to "Definitely yes." Personal disapproval was assessed by the question, "How wrong do you think it is for someone your age to smoke cigarettes?" with a four-point response scale ranging from "Not wrong at all" to "Very wrong." Finally, perceived tobacco availability was measured by asking the adolescents, "If you wanted to get some tobacco (for example, cigarettes or chewing tobacco), how easy would it be for you to get some?" with a four-point response scale ranging from "Very hard" to "Very easy." The correlations between these items were low to moderate ($r = -.03$ to $-.37$); we therefore treated each as a separate indicator.

Parents' disapproval: Participants were asked "How wrong do your parents feel it would be for you to smoke cigarettes", with a four-point scale ranging from "Not wrong at all" to "Very wrong."

Social models: Students were asked how many of their best friends smoked cigarettes during the 12 months preceding the survey. This variable was treated as a dichotomy indicating whether the student had at least one best friend who smoked cigarettes during the 12 months preceding the survey. Also, students were asked if someone living in their house smoked cigarettes and if during the 12 months preceding the survey, they had seen teachers, staff or other adults smoking on school property. Both of these variables were treated as a dichotomy indicating whether someone (other than the student) smoked cigarettes in the home and whether during the 12 months preceding the survey the student had seen teachers, staff or other adults smoking on school property.

Data analysis

We used multilevel logistic regression analyses to evaluate the independent relation of school tobacco policy on cigarette smoking beyond other individual characteristics. Analyses were conducted with HLM version 6.04 software to adjust for clustering of observations within schools (Raudenbush et al., 2004). Intraclass correlations (i.e., the proportion of variance in smoking behaviors that is between schools) were .03, .02, .007 and .03 for frequency of cigarette smoking in the past 30 days, number of cigarettes smoked per day in the past 30 days, frequency of cigarette smoking on school property in the past 30 days and the likelihood of smoking cigarette offered by a best friend, respectively. Gender, race, age, whether smoking was initiated before age 12, perception of the strictness of tobacco policy enforcement, social modeling, personal beliefs and parents' disapproval variables were included as student-level predictors in each model. The school-level model included dummy variables representing the level of strictness of anti-smoking policy enforcement, with the lowest level serving as the referent category. We also included school type (middle school vs. high school) as a school-level covariate. Group-mean centering was applied to all student-level predictors, such that analysis results reflect comparisons of individual observations relative to the mean observation for each school, and parameter estimates (odds ratios) indicate within-school variance attributable to student-level predictors (Raudenbush and Bryk, 2002).

Results

School tobacco policy enforcement

As shown in Table 1, prevalence rates for the smoking behaviors decreased with higher levels of school-level anti-smoking policy enforcement. Multi-level logistic regression analyses were conducted to determine whether those relationships would persist when adjusting for student-level predictors. Adjusted odds ratios and 95% confidence intervals (Table 2) indicate

significant inverse relationships between high and medium-high levels of school anti-smoking policy enforcement and the prevalence of four of the smoking behaviors. Controlling for individual-level beliefs, social models, and demographic characteristics, the prevalence of past-30-day smoking, daily smoking, smoking at school, and smoking a cigarette offered by a friend was lower at schools with higher levels of perceived anti-smoking policy enforcement. Interestingly, positive relationships were observed between student-level perception of policy enforcement and most of the smoking behaviors. Significant positive relationships were also found between school type (high school vs. middle school) and the prevalence of smoking behaviors. In additional analyses we explored the possibility that age or school type might moderate the relations between school policies and smoking. With one exception (likelihood of smoking cigarette offered by a best friend by age), these interactions were not statistically significant. Since there was no consistent pattern, these interactions were not included in the final models.

Individual characteristics—The results also indicate that being male was inversely related with some cigarette smoking behaviors, while white race/ethnicity was positively related to some cigarette smoking behaviors. Age was positively related to daily smoking but inversely related to smoking on school property. Cigarette smoking before age 12 was positively associated with all five smoking behaviors.

Turning to the students' personal beliefs, positive social expectancy was positively related to cigarette smoking behaviors except daily smoking (Table 2). Perceived harm of heavy smoking was inversely related to any past-30-day smoking and the likelihood of smoking a cigarette offered by a best friend, but unrelated to the other smoking behaviors. In contrast, perceived harm of passive smoking was inversely related to past-30-day cigarette smoking, heavy episodic smoking, smoking on school property, and the likelihood of smoking a cigarette offered by a best friend. None of these personal beliefs were related to daily smoking in the past 30 days. Personal disapproval and perceived parents' disapproval were negatively related to all of the smoking behaviors and perceived tobacco availability was positively related to each behavior.

Positive relationships were observed between all cigarette smoking behaviors and exposure to social models who smoked cigarettes (i.e., best friends, family member and teachers, staff or other adults in school). The odds ratios for smoking by best friends were consistently larger than odds ratios for smoking by family members or school teachers/staff.

Discussion

Results of this study suggest that stricter enforcement of anti-smoking policies by schools may help to prevent or reduce cigarette smoking among adolescents. Inverse relationships were observed between school-level perception of anti-smoking policy enforcement and prevalence of smoking behaviors, but positive relationships were found between these behaviors and student-level perceptions of whether the anti-smoking policy is strictly enforced in their schools. The positive relationships between these variables at the student level may reflect greater awareness of a school's tobacco policy among youth who smoke cigarettes (i.e., students who smoke cigarettes may learn that a school's tobacco policy is strictly enforced through direct experience with violation of this policy). In contrast, the inverse relationships between these variables at the school level may reflect the actual effect of anti-smoking policy enforcement, or a mechanism through which policy enforcement affects smoking behavior in the general student population.

By focusing on students' perceptions of policy enforcement, rather than on reports from school personnel (Bowen et al., 1995; Darling et al., 2006; Moore et al., 2001; Pentz et al., 1989;

Rosendahl et al., 2002) this study provides another perspective on the potential for school policy effects on adolescent smoking. Thus, while almost all schools have some type of tobacco control policy, increasing the consistency and visibility of its enforcement may be particularly effective in preventing and controlling cigarette smoking among adolescents.

Our findings also suggest that students' perception of school anti-smoking policy enforcement not only relates to cigarette smoking on school property, but may also influence the likelihood of cigarette smoking in other settings and social contexts. The social nature of cigarette smoking among adolescents (Biglan et al., 1995; Boyle et al., 1997; Robinson et al., 2006), together with the idea that schools are a central arena for peer group interactions (Dishion et al., 1999; Stattin & Magnusson, 1996), may help to explain this broader influence of perceived school policy enforcement.

Study limitations

The results of this study should be considered in light of several limitations. The cross-sectional design limited our ability to make directional inferences about relationships between school policy enforcement, adolescent cigarette smoking, and other study variables. Moreover, the observed relationship between stricter policy enforcement and lower rates of smoking may be attributable to community norms against youth smoking. That is, communities with stricter norms may be more likely to implement school anti-smoking policies and have lower rates of youth smoking. Longitudinal research or intervention trials investigating changes in policies and youth smoking would help better answer these questions. In addition, our self-report survey measures may have been limited by recall and social desirability biases. It is also possible that different conclusions would be drawn from objective measures of enforcement activities. Future studies should therefore examine the extent to which more objective measures of anti-smoking policy and enforcement (e.g., student suspensions for smoking on school property) are related to student perceptions of enforcement and smoking behavior.

Conclusion

Our findings suggest that consistent and visible enforcement of anti-smoking policies by schools may prevent or reduce adolescents' cigarette smoking. School boards and administrators should establish and promote the enforcement of such policies.

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Table 1

2006 Oregon Health Teens Survey: Sample characteristics by level of school anti-smoking policy enforcement, percent or mean (SD)

Variable	Low Level	Medium Level	Medium-High Level	High Level
School level (N=255)				
Strictness of anti-smoking policy enforcement ^a	45.1 (11.4)	66.5 (4.5)	77.4 (2.1)	85.9 (4.6)
	14.5-58.3	58.5-73.2	73.4-81.0	81.0-100
Middle schools (N=127)	1.6	17.3	40.2	40.9
High Schools (N=128)	47.7	33.6	9.4	9.4
Student level (N=21,281)				
Male (%)	48.1	48.7	47.7	48.2
White (%)	83.0	81.4	77.7	79.5
Age (%)				
12-14	4.9	32.6	90.2	92.0
15-16	34.2	27.1	4.9	5.2
17-18	60.9	40.2	5.0	2.8
Tobacco smoking behaviors (%)				
Initiation of cigarette smoking before age 12	6.9	7.9	8.4	7.9
Any cigarette smoking, past 30 days	16.0	14.3	8.1	7.7
Daily smoking, past 30 days	3.1	3.1	1.3	0.8
Heavy episodic smoking, past 30 days	8.7	7.7	3.7	3.5
Smoking cigarettes on school property, past 30 days	4.1	3.3	1.5	1.3
Likelihood of smoking a cigarette offered by a best friend	16.1	16.0	11.7	11.0
Personal beliefs ^b				
Positive social expectancy	1.8 (.7)	1.8 (.7)	1.8 (.7)	1.7 (.7)
Perceived harm of heavy cigarettes smoking	3.5 (.7)	3.5 (.8)	3.4 (.8)	3.4 (.8)
Perceived harm of passive smoking	3.7 (.6)	3.7 (.7)	3.7 (.7)	3.7 (.7)
Personal disapproval of cigarette smoking	3.2 (.9)	3.3 (.9)	3.5 (.8)	3.5 (.7)
Perceived tobacco availability	3.3 (1.0)	3.1 (1.2)	2.5 (1.3)	2.4 (1.3)
Parents' disapproval of cigarette smoking	3.7 (.6)	3.7 (.6)	3.8 (.5)	3.8 (.5)
Social models (%)				
Have at least on best friend who smoked cigarettes, past 12 months	43.1	37.6	24.1	21.8
Someone living in home smokes cigarette	32.2	36.0	35.0	36.0

Variable	Low Level	Medium Level	Medium-High Level	High Level
Seeing teachers, staff or other adults smoking on school property, past 12 months	13.7	10.1	8.1	9.5
<i>a</i> mean (SD) of aggregate percentage values and cut off points (min-max)				
<i>b</i> mean (SD) of 1–4-point response scale				

2006 Oregon Health Teen Survey: Results of multi-level analyses, adjusted odds ratio (95% confidence interval)

Table 2

Predictors:	Any cigarette smoking	Daily smoking	Heavy episodic smoking	Smoking on school property	Likelihood of smoking cigarette offered by a best friend
School level:					
Strictness of anti-smoking policy enforcement (low is referent group)					
High	.62(.44,.89)*	.46(.26,.80)*	.70(.46,1.07)	.34(.19,.59)**	.70(.52,.95)*
Medium-high	.66(.47,.93)*	.78(.48,1.29)	.75(.50,1.11)	.38(.23,.65)*	.80(.59,1.08)
Medium	1.02(.78,1.34)	1.26(.89,1.79)	1.09(.81,1.47)	.78(.54,1.13)	1.10(.88,1.39)
School type (High school)	2.34(1.78,3.07)**	3.52(2.32,5.36)**	3.83(2.77,5.30)**	1.78(1.16,2.74)*	1.32(1.04,1.67)*
Student level:					
Male	.73(.65,.81)**	.92(.74,1.14)	.76(.66,.88)**	.85(.70,1.03)	.66(.60,.73)**
White	1.20(1.04,1.40)*	1.44(1.10,1.97)*	1.43(1.17,1.74)**	.83(.65,1.07)	.98(.86,1.12)
Age	1.01(.94,1.10)	1.19(1.03,1.38)*	1.06(.96,1.17)	.85(.74,.98)*	.94(.87,1.01)
Cigarette smoking before age 12	2.75(2.38,3.18)**	3.67(2.89,4.65)**	3.08(2.60,3.64)**	2.56(2.05,3.20)**	2.60(2.26,2.99)**
Perceived enforcement of school anti-smoking policy	1.49(1.33,1.68)**	1.52(1.20,1.91)**	1.52(1.30,1.77)**	.94(.77,1.15)	1.29(1.15,1.44)**
Positive social expectancy	1.22(1.13,1.31)**	1.07(.93,1.24)	1.32(1.20,1.46)**	1.32(1.16,1.50)**	1.41(1.32,1.52)**
Perceived harm of heavy smoking	.92(.86,.99)*	.92(.81,1.06)	.94(.86,1.03)	1.02(.91,1.15)	.90(.85,.96)*
Perceived harm of passive smoking	.80(.74,.87)**	.98(.85,1.13)	.85(.78,.94)**	.77(.68,.87)**	.76(.71,.81)**
Personal disapproval	.41(.38,.44)**	.47(.41,.54)**	.43(.40,.47)**	.47(.42,.53)**	.35(.33,.37)**
Perceived availability	1.42(1.33,1.53)**	1.33(1.11,1.59)*	1.53(1.37,1.72)**	1.42(1.21,1.67)**	1.45(1.36,1.54)**
Parents disapproval	.79(.74,.86)**	.55(.49,.62)**	.69(.63,.75)**	.76(.68,.85)**	.86(.80,.92)**
Having at least one best friend who smokes cigarettes	6.74(5.89,7.70)**	4.32(3.11,5.98)**	6.31(5.15,7.74)**	7.04(5.12,9.71)**	4.02(3.60,4.51)**
Someone living in home smokes cigarettes	1.36(1.22,1.52)**	1.90(1.51,2.39)**	1.42(1.23,1.65)**	1.02(.83,1.25)	1.12(1.01,1.25)*
Seeing teachers, staff or other Adults smoking on school property	1.36(1.17,1.58)**	1.61(1.23,2.11)**	1.37(1.13,1.65)*	2.11(1.68,2.66)**	1.31(1.13,1.51)**

** p≤.001;

$p \leq .05$
*