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Classroom Norms and Individual Smoking Behavior in Middle School

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Abstract

Objectives—To investigate whether smoking prevalence in grade-level networks influences individual smoking, suggesting that peers are important social multipliers in teen smoking.

Methods—We measured gender-specific, grade-level recent and life-time smoking among urban middle-school students who participated in Project Northland Chicago in a longitudinal cohort design.

Results—Within schools, grade-level recent smoking had comparable effects on girls' and boys' individual-level smoking. Grade-level lifetime smoking had a greater effect on girls' smoking.

Conclusion—Interventions can target middle school classes and schools broadly, without making the identification of friendship networks a concern.

Keywords

social norms; smoking; middle school; gender

Cigarette smoking is the leading cause of death in the United States;¹ these deaths are both premature and preventable.^{2,3} Most adult smokers begin to smoke in adolescence.^{4,5} By eighth grade, more than a quarter of US students have tried cigarettes, and by the end of high school, the percent who have tried smoking increases to more than half.^{6,7} In fact, every day nearly 5500 youth under age 18 try cigarettes for the first time, and almost 3000 more become daily smokers.^{3,8} Tobacco use also increases after school transitions, for example, the transition from middle to high school.^{8–10} The pattern for initiation of cigarette use is the same as that seen for other drugs (alcohol and marijuana): use begins gradually in elementary and middle school, accelerates in late middle and high school, continues to increase during young adulthood, and gradually stabilizes or decreases in middle adulthood.⁸

Given the addictive nature of smoking, the focus of public health efforts has been to prevent smoking among children.^{11–13} Recent research on health behaviors and peer influence, particularly in the area of obesity, has offered a hopeful sign: perhaps peer group effects,¹⁴ which partly cause poor health behavior, can also improve health behavior. If influential persons within peer groups change behavior, this may lead others in the peer group to improve behavior, even if they themselves are not a direct target of the intervention. The ripple effects of changes in health behaviors carrying over to others is known as a *social multiplier*.¹⁵ The existence of social multipliers means that scarce prevention resources could conceivably be concentrated on smokers or potential smokers rather than spreading resources more thinly across all children, who may or may not be at specific risk for smoking.

Peer influence may be the most significant social risk factor in adolescent experimentation with drugs such as tobacco; it is more powerful than parental influence.^{16–18} Keefe¹⁹ showed that as youth age, parental influence on substance use decreases, but peer influence remains strong and consistent. The result that peers are more influential than parents in predicting adolescent substance use, and cigarette use in particular, is well replicated.^{19–21} Peers have also been shown to have a greater influence on adolescent substance use than antismoking information from the media,²⁶ which makes sense intuitively because peers are more proximal or immediate.^{16,23} This influence of peer smoking on the individual is robust, whether the adolescent is in middle or high school and whether he or she is a trier or an experimenter.¹⁶ Interestingly, peer smoking seems to change middle school students' strong intentions *not* to smoke more than it increases levels of smoking intentions.²⁴

There are several reasons that peer effects have a strong effect on adolescent smoking. First, adolescents tend to spend most of their time interacting with peers and tend to disengage from parents.^{25,26} Second, cigarette use has been found to represent a symbol of identification with a particular peer group, moreso than alcohol and marijuana.⁸ Third, repeated exposure to nicotine may lead adolescents to develop a more favorable sense of the tobacco smell, or addiction to nicotine via chemical reactions, which increases desire for cigarettes.^{3,27} Fourth, there is evidence for a “false consensus effect” in which adolescents overestimate peer acceptance for smoking as a social norm.^{28–30} Finally, in terms of self-selection, adolescents may choose to associate with their peers because this increases cigarette availability.²¹

Distal (Wider) Peer Group Effects

Although many have examined the effects of peer groups of known friends on health behavior,^{14,15} wider networks can also have effects. Wider social networks are distal in that friendship is not required, such as with classmates. From the perspective of prevention, wider networks free the researcher from the task of identifying the complex friendship “matrix” needed to leverage effects through social multipliers. There are studies showing that wide networks influence health behavior among youths. Subconsciously, adolescents may place themselves in the distribution of behaviors that they can observe. For example, Brown et al³¹ showed that obese schoolchildren who are in schools where the other obese children weigh more are less likely to believe that they are obese. Others have found that peer effects need not be for close-knit groups. One study by Duan et al⁸ showed that the influence of peer use of each of 3 substances (cigarettes, alcohol, and marijuana) increased across the adolescent years, but that peer proximity did not matter. In a related vein, another study showed that low-risk sixth- and seventh-grade students, defined as those with no family or friends who smoke, experienced significantly greater risk if they attended an elementary school with relatively high prevalence of smoking among senior students—again emphasizing the impact of distal peers.¹⁹ Likewise, researchers who examine tight

(nondistal) social network models have shown that known friends often share neighborhood contextual effects such as healthy food, low crime, good food access, etc. When neighborhood contextual effects are controlled for, the effects of close social networks fall dramatically.³²

There are many theories of behavioral modeling, but one that applies to wider networks is Festinger's^{33,34} social comparison theory. Social comparison theory emphasizes the social comparative process—evaluation of the self through comparison with others—which pressures individuals toward uniformity with others. According to social comparison theory, humans tend to cease comparison with others who are very divergent and to engage in more comparison when a factor has importance and relevance to the self. Additionally, a generality of similarity schema suggests that people who are alike in one way also tend to be alike in other ways, and any similarity between the observer and the observed should increase imitation.³⁵

The Current Study

In this paper, we examine whether grade-level smoking prevalence within schools is associated with individual smoking. We examine gender-specific recent (past month) and lifetime smoking behaviors among middle school students in large urban schools who participated in the Project Northland Chicago alcohol prevention intervention (PNC), following students across the 3 middle school years with a unique design: longitudinally, in cohorts within large, urban schools in Chicago, over a period of 3 years, spring of 2003, spring of 2004, spring of 2005. The middle school years are a time of heightened risk for cigarette experimentation and use—a time of transition and searching for one's social identity,^{8–10} a time when such cigarette experimentation and use can set the adolescent up for a trajectory of cigarette-related addiction, disease, and premature death.^{1–3,5}

The purpose of this paper is to demonstrate that social multipliers in the school smoking context exist, focusing on wider networks. Although some literature on youth smoking and peer groups has mainly focused on peer groups of known friends,^{8,21,28,36} from a practical standpoint, identifying friendship connections, which are needed to incubate social multipliers among intervention subjects, is complex. We hypothesize that concentrating on classes and schools, rather than friendship networks, is sufficient to incubate social multipliers.

METHODS

Participants

We used data from the Project Northland Chicago (PNC), a longitudinal, group-randomized controlled trial of alcohol prevention among students in grades 6 through 8.^{37–39} In addition to data on drinking behaviors, PNC also contains data on participants' smoking behaviors, used here. Participating students were from 61 public schools that were selected from a list of all Chicago public schools (CPS) that included grades 5 through 8, had low mobility rates (less than 25%), and were larger in size (at least 30 students per grade). Schools were similar in composition in terms of race (84% ethnic-minority youth in PNC schools, 91% in CPS), socioeconomic status (80% low income in PNC schools, 85% in CPS), math test score norm (49% in PNC schools, 43% in CPS), and reading test score norm (42% in PNC schools, 43% in CPS). Students completed self-report questionnaires, with response rates ranging from 91% to 96% each year. Parents of these students also were asked to complete a self-administered questionnaire in the fall of 2002 (70% response rate). In the current study, we used student data from 3 time points (end of sixth grade in spring 2003, end of seventh grade

in spring 2004, and end of eighth grade in spring 2005). We obtained IRB approval for use of these data from the UTHealth Committee for the Protection of Human Subjects.

Measures

Smoking in past month—Smoking in the past month was measured with a dichotomous (0/1) item marking student self-report of smoking in the past month.

Smoking in lifetime—Smoking in one's lifetime was measured with a dichotomous (0/1) item marking student self-report of smoking in one's lifetime.

Demographic variables—Language spoken at home was measured with a variable marking whether English, Spanish, or another language was the language typically spoken at home. Note that language spoken at home may not be entirely time invariant over these grades, especially for immigrant families.

School prevalence of smoking—School smoking prevalence, by grade, is the variable of interest. We hypothesize that greater smoking by grade and school will lead to greater risk of individual smoking. Note that we excluded each individual's smoking status when calculating the smoking prevalence by school/grade. This helps mitigate the “reflection problem,” which occurs when aggregate data measures are influenced by the individual in question.^{40,41}

Eligibility for free/reduced lunch—Eligibility for free/reduced lunch, which is not entirely, time-invariant, was gathered from PNC records.

In preparing the data for analysis, we created dummy variables 7th and 8th (0/1), marking membership in each of these grades (with sixth grade as the omitted variable). We then ran the 6 longitudinal fixed-effects logistic regression models in STATA using the xtlogit command, with dummy variables 7th and 8th among the predictors in the models.

Analysis

First, we determined average grade- and school-level smoking behaviors, by gender, in terms of smoking in the past month and smoking ever in one's lifetime. Then, we estimated longitudinal logistic regression models predicting a binary outcome indicating smoking in order to determine the effect of grade- and school-level average smoking behaviors on the smoking behaviors of individual middle school students.⁴² We estimated models for girls, boys, and both genders combined; and for both past-month smoking and lifetime smoking. Thus, we estimated 6 longitudinal logistic regression models in all.

Models were estimated using a fixed-effects logit in STATA 10 using the xtlogit command.^{42,43} The advantage of fixed-effects modeling is that time-invariant differences across students that are difficult to observe, such as tendencies to succumb to peer pressure or poor parental support from home, are “differenced out.” One disadvantage is that fixed-effects models are limited to time-varying independent variables. This means that time-invariant independent variables, such as race and gender, cannot be included. Thus, we included as control variables only those individual characteristics that vary across time: speaking Spanish at home (1=yes, 0=no), speaking another language at home (1=yes, 0=no), eligibility for free/reduced lunch (1=yes, 0=no), being in grade 7 (1=yes, 0=no), and being in grade 8 (1=yes, 0=no). We overcame the issue of controlling for gender by estimating the models separately by gender and then combining the data.

RESULTS

In the sixth grade, the sample was 50.6% male, 42.7% African American, and 28.2% Hispanic (Table 1). Across the grades, 13% to 15% of the sample reported speaking Spanish at home, and 5% to 6% reported speaking another language at home. Frequencies of smoking in the past month and ever in one's lifetime increased across the middle school years for both genders, and boys were consistently more likely to report smoking in the past month and ever in one's life, compared to girls.

Table 2 shows the results of the fixed-effects model estimation for girls, boys, and both genders combined. In the first set of regressions, the dependent variable was smoking in the past month predicted from school-level smoking in the past month (by grade and gender; 1=yes, 0=no). We found that school-level smoking in the past month (by grade and gender) was a significant predictor of individual-level smoking in the past month for both girls and boys. Specifically, among girls, controlling for the other variables in the model, as school-level report of smoking in the past month (by grade, among girls) increased by 10%, the chance of girls reporting having smoked in the past month increased by 0.36%. Among boys, controlling for the other variables in the model, as school-level report of smoking in the past month (by grade, among boys) increased by 10%, the chance of boys reporting having smoked in the past month increased by 0.16%.

In the second set of regressions, the dependent variable was smoking in one's life predicted from school-level smoking in one's life (by grade and gender; 1=yes, 0=no). We found that school-level smoking in one's life (by grade and gender) was a significant predictor of individual-level smoking in one's life for both girls and boys. The magnitude of the effect was much lower than for smoking in the past month. This makes sense because lifetime smoking could have occurred in other grades or schools. Specifically, among girls, controlling for the other variables in the model, as school-level report of smoking in one's life (by grade, among girls) increased by 10%, the chance of girls reporting having smoked in their life increased by 0.07%. Similarly, among boys, controlling for the other variables in the model, as school-level report of smoking in one's life (by grade, among boys) increased by 10%, the chance of boys reporting having smoked in their life increased by 0.07%.

DISCUSSION

In this study, we investigated how the smoking behaviors of middle-school-aged girls and boys are affected by the smoking behaviors of their peers. Specifically, using a longitudinal design, we assessed how the average smoking behaviors of one's same-sex school peers (in the past month and ever in life) affect the recent and lifetime smoking behaviors of these students. We found that smoking prevalence increased across the middle school years—this is consistent with previous reports of age relating positively to higher rates of smoking⁷ and that many new persons under age 18 initiate smoking each year.¹ We also found the effect of school-level (all classrooms in the target grade) smoking on individual smoking to hold for both boys and girls. In fact, the magnitude of the effect is higher for girls than boys when examining the effects of school-level lifetime smoking prevalence on lifetime smoking. This is in line with previous research showing that the odds of a female student being a regular smoker increase as prevalence of smoking among school peers increases, regardless of her close friends' smoking behavior whereas odds of a male student becoming a regular smoker are moderated by the number of close friends who smoke.⁴⁴

Our results build onto the findings of Leatherdale and colleagues. Many of Leatherdale et al's studies^{44–46} have focused on the significant effect of the smoking behaviors of *older* students in schools on those of younger students. However, our study focuses on how

smoking behaviors spread among students *within the same grade*, given that students are more likely to spend time with and observe their same-grade peers. Additionally, a major contribution of this study is its longitudinal design, given that causal relationships cannot be determined from cross-sectional data, as used by Leatherdale and colleagues. Our study is similar to those of Leatherdale et al in that we are focusing on distal networks—in their case across grades and in our case within grades.

Further, our results show that the social multipliers, referred to in the obesity context by Christakis and Fowler,¹⁵ need not depend on known friends. From the perspective of designing health interventions, creating a database of known friends would be cumbersome. However, our results show that social multipliers in smoking onset can arise within a class or school. Focusing intervention resources on schools and classrooms with high prevalence should be more effective in promoting smoking prevention than spreading resources across all schools/classrooms due to these social multipliers. Further, resources may be added to address cessation among current smokers because they have a significant influence on group behavior.

Limitations of this study include that smoking behaviors were self-reported. Research has shown that validity of adolescent self-reported smoking, compared to biological measures, depends on factors including specificity of the question (eg, if the respondent inhaled), whether the respondent has recently quit, and whether the respondent believes that his or her self-report will be followed up with a biological assessment.^{47,48} However, several studies have shown that confidential surveys in schools, such as those used in PNC, generally have valid self-reports of smoking.^{49,50} Other limitations include that our design precluded consideration of race/ethnicity (though analyses can be done with these data for African American and Hispanic subgroups); smoking measures were only one item; and controls for other contextual factors were not considered.

Future studies should focus on which smoking prevention and intervention attempts are most effective, given that knowledge of friendship connections in schools seems unnecessary. In other words, this study shows that researchers should aim for class- and schoolwide prevention and intervention, rather than making social networks among friends a concern. Such interventions may be simpler but broader in their design than those implied by a social network perspective. Future research should also address how interventions may differ by gender, given that females may be more strongly affected by peer smoking behaviors.

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Table 1

Demographics and Descriptive Statistics

Variable	% Yes by Grade Level		
	6th grade	7th grade	8th grade
Race			
African American	42.70	-	-
Hispanic	28.17	-	-
White or Asian	17.77	-	-
Gender (male)	50.57	-	-
Speak Spanish at Home	14.61	12.59	12.73
Speak Other Language at Home	5.78	5.11	5.37
Free or Reduced Lunch	66.33	69.65	72.88
Smoked in Past Month, boys	3.89	7.33	10.03
Smoked in Past Month, Girls	2.92	6.30	8.77
Smoked Ever in Life, Boys	18.63	25.00	30.00
Smoked Ever in Life, Girls	13.64	22.95	28.62

Note.

N=5812

Percentages for race and gender reflect self-reported demographics in the sixth grade.

Table 2

Results from Xtlogit Models

	Boys		Girls		Both Genders	
	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.
Predicting Past-Month Smoking With Past-Month Smoking						
Smoked in past month, by class and gender	0.19 ***	0.03	0.19 ***	0.03	0.19 ***	0.02
Spanish language at home (1=yes, 0=no)	0.36	0.54	-0.03	0.61	0.26	0.40
Other language at home (1=yes, 0=no)	0.02	0.78	0.09	0.97	-0.01	0.61
Free/reduced lunch	0.06	0.16	-0.53	0.28	-0.09	0.13
7th grade	0.40	0.24	0.25	0.26	0.35 *	0.17
8th grade	0.44	0.28	0.49	0.28	0.49 *	0.20
Predicting Ever Smoking with Ever Smoking						
Ever smoked, by class and gender	0.08 ***	0.01	0.10 ***	0.01	0.09 ***	0.01
Spanish language at home (1=yes, 0=no)	0.13	0.42	-0.83	0.48	-0.31	0.31
Other language at home (1=yes, 0=no)	0.13	0.45	0.62	0.64	0.29	0.37
Free/reduced lunch	-0.25 *	0.12	-0.13	0.16	-0.20 *	0.10
7th grade	0.42 **	0.15	0.44 *	0.19	0.43 ***	0.12
8th grade	0.56 **	0.19	0.71 **	0.23	0.61 ***	0.14

Note.

N=5812;

*
P<.05.**
P<.01.***
P<.001