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Perceptions of Second-hand Smoke Risks Predict Future Adolescent Smoking Initiation

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Abstract

Purpose—To directly test whether perceptions of second-hand smoke risks deter adolescent smoking initiation.

Methods—A longitudinal survey design was utilized in this study. Baseline surveys measuring perceptions of tobacco-related risks and smoking behaviors were administered to 395 high school students, with three follow-up assessments every 6 months.

Results—Perceptions of personal second-hand smoke risks and parental second-hand smoke risks significantly deterred adolescent smoking initiation. Perceptions of personal second-hand smoke risks reduced the odds of smoking by a factor of 0.63 (95% confidence interval [CI] = 0.42–0.94) for each quartile increase in perceptions of personal second-hand smoke risks. Adolescents who provided the highest estimates of risks for personal second-hand smoke were 0.25 as likely to smoke as adolescents who provided the lowest estimates of risk. Perceptions of parental second-hand smoke risks reduced the odds of smoking by a factor of 0.64 (95% CI = 0.43–0.93) for each quartile increase. Adolescents who perceived the highest estimates of risks associated with parental second-hand smoke were 0.26 as likely to smoke in the future compared to adolescents who provided the lowest estimates of risk. These effects are over three times as large as a smoking peer's influence on a nonsmoking adolescents' risk for smoking initiation, odds ratio [OR] = 1.18 (95% CI = 1.02–1.35).

Conclusions—Adolescent perceptions of risks of second-hand smoke are strongly associated with smoking initiation. Encouraging adolescents to express their objections to second-hand smoke, as well as encouraging parents to create smoke-free homes, may be powerful tobacco control strategies against adolescent smoking.

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Conflict of Interest

The authors report no conflicts of interest.

Keywords

Adolescent smoking; Second-hand smoke; Risk perception; Attitudes; Psychosocial risk factors; Decision making; Longitudinal study

Tobacco control programs have often considered creation of smoke-free environments and adolescent smoking prevention as two separate strategies to reduce or prevent adolescent smoking. Few studies have integrated these two strategies to determine whether risk communication of second-hand smoke dangers has an influence on adolescents. Cohort studies found that creating a smoke-free home reduces the odds that an adolescent will try cigarettes by about half [1]. Smoke-free homes also reduce the odds that an adolescent will escalate smoking [1].

In addition to smoke-free environments, perceptions of second-hand smoke dangers appear to be protective against adolescent smoking. Perceptions of greater risks from secondhand smoke have been previously associated with lower smoking initiation [2,3]. Research in health communication suggest that people weigh risks posed to others more heavily than risks posed to one's own self [4]. Findings from a national cross-sectional survey support this idea by demonstrating that nonsmoking adolescents were 1.47 times more likely to perceive second-hand smoke as dangerous, compared to smoking adolescents [2]. Moreover, the belief that second-hand smoke is dangerous doubled the odds that a smoking adolescent planned to quit or already quit smoking. This finding was supported by additional cross-sectional findings that nonsmoking adolescents perceived higher risks associated with secondhand smoke compared to smoking adolescents [3]. Unfortunately, because of the cross-sectional nature of these findings, it is unclear whether perceptions of risks associated with second-hand smoke predict future adolescent tobacco initiation.

Determining the extent to which second-hand smoke risk perceptions actually influence adolescent smoking is critical to the development of more effective adolescent tobacco prevention and intervention strategies. Specifically, it is important to understand what psychosocial factors influence adolescents' decisions to initiate smoking so that strategies can emphasize such themes when communicating health information to adolescents. Studies have determined that risk perceptions associated with one's own smoking are predictive of behavior. In particular, adolescents who believed long-term health risks were not likely to occur were three times more likely to initiate smoking, compared to adolescents who believed risks were very likely to occur [5]. This finding is consistent with several models of health behavior (e.g., Health Beliefs Model, Theory of Reasoned Action, and Theory of Planned Behavior) that posit that perceived susceptibility, severity, risks, and benefits associated with health-related behaviors underlie behavioral decision-making processes [6–10]. These beliefs about health risks posed by smoking may be influenced by a host of factors, including movies [11–15], the tobacco-industry [16–19], public health campaigns [18,20,21], psychosocial-personality factors [22–24], and peer/family influences [25–28]. Despite our growing knowledge about predictors of adolescent smoking initiation, what has yet to be tested is whether the influence of perceptions of tobacco-related risks on smoking behavior extends to perceived risks posed to other people.

The purpose of this study is to use longitudinal, prospective data collected over a 2-year period to test whether perceptions of second-hand smoke risks, like perceptions of active smoking risks, have a prospective relationship to adolescent smoking initiation [5]. The central hypothesis of this study is that adolescents who hold perceptions of high secondhand smoke risks will be less likely to smoke in the future, compared to adolescents who hold perceptions of low second-hand smoke risks, even when controlling for known predictors of

smoking initiation like perceptions of active smoking risks, peer smoking, and having parents who smoke.

Methods

Sample

All ninth-grade students from mandatory ninth-grade classes from two northern California public high schools (Schools A and B) were invited to take part in this study. Students from School A were first examined in Fall 2001, and students in School B were first examined 1 year later. Researchers visited each class in both schools, described the study, issued invitations to participate, and distributed study information, parental consent forms, and student assent forms to all students. Of the 790 students who received consent packets (302 from School A and 488 from School B), 418 (53%) returned completed consent forms (80% of eligible students from School A and 37% of eligible students from School B). Of these 418 students, 395 (95% of consenting students, 50% of all eligible students) completed a self-administered and supervised survey during a classroom period.

Every 6 months (Fall and Spring semesters), participants completed self-administered questionnaires during a regular class period at their school. Before each survey administration, the researchers provided instructions for completing the surveys, and remained available to answer questions during the survey administration. To compensate for their efforts in the study, after each survey administration, participants in School A received a movie gift certificate, whereas the administrators and teachers in School B received school supply money.

Questions on perceptions of second-hand smoke were added on the survey in Fall 2002, corresponding to wave 3 for School A ($n = 160$) and Wave 1 for School B ($n = 128$). These surveys were used as the baseline measurement for this study. Smoking behavior was assessed on all waves. Given the goal to examine the predictive relationship between perceptions of second-hand smoke risks and adolescent smoking initiation, this study (a) eliminated participants who reported smoking at baseline ($n = 46$) and (b) included data from Waves 3 to 6 for School A and Waves 1 to 4 for School B. In all, for both schools, four waves of data were included for analyses.

The survey was administered in accordance with a human subjects protocol approved by the university's Committee on Human Research.

Measures

Smoking behavior—Smoking initiation was defined as the first reported instance of smoking a whole cigarette. Smoking a whole cigarette was chosen over other smoking initiation measures like “ever puffing a cigarette, even a single puff” because the act of smoking a whole cigarette denotes a more serious attempt at smoking compared to “even a single puff.” Participants were always asked whether they had “ever smoked a whole cigarette” in their entire life. Responses during each wave were coded dichotomously as 0 = *no* and 1 = *yes, smoked a whole cigarette*. Responses were aggregated across the waves of data to compute a variable for smoking initiation, coded as 0 = *participant did not smoke a whole cigarette during the duration of the study* and 1 = *participant reported smoking a whole cigarette after baseline*.

Perceptions of second-hand smoke—Perceptions of secondhand smoke risks were assessed using conditional measures of perceptions methodology [29–37]. Perceptions are conditional on scenarios that couch potential consequences in specific hypothetical acts.

Specifically, at baseline, participants were presented different scenarios representing situations in which a nonsmoker might incur harm from a smoker's second-hand smoke. These scenarios were designed to encompass the various situations in which an adolescent might encounter second-hand smoke. These situations include harm to a child if a parent smokes, harm to a friend if another friend smokes, harm to one's self if their best friend smokes, and harm to one's best friend if the participant smokes. After the scenario, participants were presented with a list of five potential consequences that could occur as a result of second-hand smoke (Table 1). The consequences included getting asthma, developing lung cancer, having a heart attack, having a lot of trouble breathing, and starting to smoke. Respondents were asked to provide estimates of likelihood (0%–100%) that these consequences would occur as a result of the actions presented in the scenario. In all, participants provided 20 probability estimates for smoking-related outcomes.

Exposure to parents who smoke—Participants were asked whether their parents smoked (“Does your mother smoke cigarettes now” “Does your father smoke cigarettes now”) and coded as 0 = *neither parent smokes*; 1 = *at least one parent smokes*.

Exposure to friends who smokes—Participants were asked how many of their close friends had smoked at least one whole cigarette. Responses ranged from 0 to 20 friends who smoked at least one whole cigarette.

Perceptions of active smoking risks—To measure perceptions of risks associated with active smoking (i.e., risks to a smoker from actually smoking), participants were presented with scenarios similar to second-hand smoke scenarios, except scenarios asked participants to imagine they themselves smoked [31]. Following the scenarios, participants were asked to estimate the likelihood that 18 negative and positive consequences might occur (e.g., What is the chance that you will get lung cancer? What is the chance that you will look cool? What is the chance that you will smell like an ashtray?).

Statistical analysis

Prior to testing our main hypothesis, we conducted preliminary analyses to test whether there were significant differences between schools that may influence our main analyses. There were no significant differences between the two schools on gender, age, or smoking behavior. However, we did find that School B had fewer white/non-Hispanic students and lower levels of mother's education than School A. These preliminary analyses have been reported in previous articles on adolescent smoking behaviors [3,5,31,32].

Because preliminary analyses did uncover significant differences in demographic characteristics that may influence our results, we conducted bivariate analyses regressing smoking behavior on each perception of risk variable, as well as exposure to parents and friends who smoke. These results showed similar patterns of relationships between the two schools, suggesting that differences between these schools would have very minimal impact on our results. Given these results as well as limited power in analyzing the school separately, we combined the data across the schools into one dataset.

We conducted separate factor analyses using principle components extraction with Varimax rotation on the 20 second-hand smoke-related risk items and the 18 active smoking-related risk items. Using the factor scores derived from this analysis (discussed in the Results section), we created four perceptions of second-hand smoke risks variables: perceptions of personal second-hand smoke risks, perceptions of theoretical second-hand smoke risks, perceptions of parental second-hand smoke risks, and perceptions of behavioral modeling risks. We also created two additional variables related to active smoking risks: perceptions

of short-term active smoking risks and perceptions of long-term active smoking risks. Although a third factor relating to perceived benefits emerged from our factor analysis, only the two factors relating to active smoking risks were retained for analysis. Standardized factor scores that were derived from factor analyses (mean = 0.0, SD = 1.0) were coded into quartile scores, with 0 = *first quartile* and 3 = *fourth quartile*.

To address whether perceptions of second-hand smoke are predictive of future smoking initiation, participants who smoked a whole cigarette at the first assessment point were eliminated for analyses (n = 46). Analyses were conducted on 242 adolescents who had not smoked at the start of the study and completed the entire questionnaire for all waves of the study. Univariate (unadjusted odds ratios) and multivariate logistic regression (adjusted odds ratios) quantified the relationship between smoking initiation and main independent variables, perceptions of personal second-hand smoke risks, perceptions of theoretical secondhand smoke risks, perceptions of parental second-hand smoke risks, and perceptions of behavioral modeling risks. For the multivariate logistic regression, all perceptions of secondhand smoke risks were entered simultaneously, controlling for other covariates including perceptions of short-term active smoking risks, perceptions of long-term active smoking risks, exposure to parents who smoke, and having friends who smoked a whole cigarette. Logit plots were created to assess whether relationships between independent variables and the logit of future smoking were linear. Where plots noted a linear relationship, independent variables were treated as continuous variables. Perceptions of personal, theoretical, and parental second-hand smoke risks, perceptions of behavioral modeling risks, perceptions of short-term and long-term active risks, and having friends who smoked a cigarette were entered into the model as continuous variables. All calculations were conducted using SPSS 15.0.

Results

Demographics

The sample was gender balanced (44.6% male; 55.4% female) with an age range of 12 to 15 years (mean = 14 years, SD = 0.4 years). The sample was ethnically diverse, with 53.2% of the participants describing themselves as white/non-Hispanic, 14.7% as Hispanic or Latino, 25.6% as Asian/Pacific Islander, 5.2% as other or of mixed ethnicity.

Smoking initiation and covariates

In total, 35 (14.5%) adolescents smoked a whole cigarette in the course of the study. Fifteen adolescents smoked their first whole cigarette at the second wave, 3 at the third wave, and an additional 17 at the last wave. There may be several possible reasons the third time wave was marked with lower initiation rates. For example, data collection at the third time wave occurred when adolescents returned to school from summer recess when adolescents may experience less exposure to their peers compared to the school year. In contrast, data collection for the second and fourth time waves occurred in the middle of the school year when adolescents may be influenced by repeated exposure to peers during the school day.

Thirty-eight percent of the participants reported that at least one parent smoked cigarettes. The reported number of friends who smoked a whole cigarette ranged from 0 to 20 (mean = 1.13 friends, SD = 2.33); 59.1% reported having no friends who smoked a cigarette. Of those who reported having friends who smoked, 14.5% reported having only one friend who smoked, 12.8% reported two friends, 6.2% reported three friends, and 7.4% reported having four or more friends who smoked a whole cigarette.

Perceptions of risks: factor analysis

The factor analysis on the 20 estimates of likelihood of second-hand smoke consequences yielded four components with eigenvalues greater than 1 (Table 2). These four components explained 74% of the variability in the probability estimates. Varimax rotation showed that the first component accounted for 51% of the variance and loaded on probability estimates concerning second-hand smoke health risks posed to the participant or the participant's best friend (perceptions of personal second-hand smoke risks). The second component accounted for 9% of the variance and heavily loaded on probability estimates concerning health risks posed on a hypothetical friend because of their friend's smoking (perceptions of theoretical second-hand smoke risks). The third component accounted for 8% of the variance and loaded on risk estimates relating to risks posed by a parent's smoking on their child (perceptions of parental second-hand smoke risks). The last component accounted for 6% of the variance and loaded on risk estimates relating to the risk of the nonsmoker beginning to smoke because they are exposed to smokers (perceptions of behavioral modeling risks).

The factor analysis of the 18 potential active smoking risks revealed three components. The first component accounted for 38% of the variance and loaded on probability estimates concerning short-term risks associated with smoking, such as getting into trouble, smelling like an ashtray, getting a cough, having trouble breathing, getting colds, having bad breath, and having friends become upset (perceptions of short-term active smoking risks). The second component accounted for 15% of the variance and heavily loaded on probability estimates concerning long-term risks associated with smoking, including getting lung cancer, having a heart attack, getting a chronic cough, having chronic trouble breathing, and getting wrinkles (perceptions of long-term active smoking risks). The third component accounted for 8% of the variance and loaded on risk estimates relating to benefits associated with smoking (looking cool, feeling relaxed, becoming more popular, looking grown-up, and becoming thinner). Because the aim of the study was to test the relationship between perceptions of second-hand smoke risks on smoking initiation controlling for perceptions of active smoking risks, the third component related to active smoking benefits was not used in further analyses.

Perceptions of second-hand smoke risks predicts smoking initiation

Two types of perceptions of second-hand smoke risks predicted future smoking initiation: perceptions of personal second-hand smoke risks and perceptions of parental second-hand smoke risks (Table 3). Adolescents were significantly less likely to smoke a whole cigarette if they believed their smoking would harm their friend or their friend's smoking could harm them. The unadjusted odds of smoking a whole cigarette at future waves decreased by a factor of 0.65 (95% confidence interval [CI] = 0.47–0.91) for each quartile increase in perceptions of personal second-hand smoke risks. In multivariate analyses, perceptions of personal second-hand smoke risks remained essentially unchanged and significant, with an adjusted odds ratio of 0.63 (95% CI = 0.42–0.94). Accordingly, adolescents in the second, third, and fourth quartile of perceptions of personal second-hand smoke risks are 0.63, 0.39, and 0.25 times as likely to smoke, compared to adolescents in the first quartile.

Perception of parental second-hand smoke risks was also a significant predictor of future smoking initiation. Adolescents were less likely to start smoking if they believed a child could be harmed by a parent's smoke. The unadjusted odds of smoking a whole cigarette decreased by a factor of 0.63 (0.44–0.88) for each quartile increase in perceptions of parental second-hand smoke risks. When controlling for other perceptions and additional covariates, the adjusted odds of smoking a whole cigarette decreased by a factor of 0.64 (95% CI = 0.43–0.93) for each quartile increase in perceptions of parental second-hand smoke risks. Compared to the first quartile, adolescents in the second, third, and fourth

quartiles of perceptions of parental second-hand smoke risks were 0.64, 0.41, and 0.26 times as likely to smoke a whole cigarette in subsequent waves of data.

In addition to perceptions of personal second-hand smoke risks and perceptions of parental second-hand smoke risks, exposure to friends who smoked a whole cigarette was significantly related to smoking a whole cigarette at later waves in both univariate and multivariate analyses (Table 3). The adjusted odds of smoking a whole cigarette increased by a factor of 1.18 (95% CI = 1.02–1.35) for each friend who smoked a whole cigarette.

Discussion

Because previous studies on perceptions of second-hand smoke were based on cross-sectional analyses of data, it remained unclear whether perceptions influenced smoking behavior or if behaviors changed perceptions. To be more specific, although there was some indication that adolescents who smoke perceived lower second-hand smoke risks, it was plausible that adolescent smokers lowered their perceptions as a result of smoking. The current study is the first to use prospective, longitudinal data to demonstrate that perceptions of second-hand smoke risks deter adolescent smoking initiation.

This study demonstrates that communicating the risks associated with second-hand smoke may be an effective part of adolescent smoking prevention strategies. Adolescents who held perceptions of high personal and parental second-hand smoke risks were significantly less likely to smoke a whole cigarette later. These two perceptions of second-hand smoke were significant predictors of future smoking initiation, even when controlling for other known predictors of adolescents smoking, including perceptions of short-term and long-term smoking risks, having friends who smoke, and having parents who smoke [5,31,38,39]. Adolescents who reported the highest estimates of risks for personal second-hand smoke were 0.25 as likely to smoke compared to adolescents who provided the lowest estimates of risk. Likewise, adolescents who perceived the highest estimates of risks associated with parental second-hand smoke were 0.26 as likely to smoke in the future compared to adolescents who provided the lowest estimates of risk. These effects are over three times as large as a smoking peer's influence on a nonsmoking adolescents' risk for smoking initiation (a 1.18 increased odds of smoking for each friend who smokes).

There are two potential reasons why perceptions of personal and parental second-hand smoke risks were significant predictors of smoking initiation, whereas perceptions of theoretical second-hand smoke risks and behavioral modeling risks were not. First, it is possible that personal risks and parental risks represent tangible and realistic risks in an adolescent's life compared to theoretical or modeling risks. Second, our results may reflect the effectiveness of public health messages regarding second-hand smoke. Specifically, public health messages regarding second-hand smoke are usually geared toward harm that one's smoking may pose to family members and friends. Our findings that perceptions of personal and parental second-hand smoke risks deter adolescent smoking may be linked to public health efforts to communicate second-hand smoke risks.

In addition to the implications for adolescent tobacco prevention strategy, these findings also contribute to theoretical models of adolescent risk behaviors. The results expand the scope of the Health Beliefs Model to include risks not only to one's own body and well-being, but also the concern for risks posed upon people within one's social environment. Decisions to not smoke are, in part, driven by the social costs of smoking (i.e., putting other people at risk).

The finding that perceptions of second-hand smoke risks deter future smoking initiation is a stronger deterrent than perceptions of active smoking risks may indicate that perceptions of

second-hand smoke risks are more important than perceived risks of active smoking in the decision-making process underlying smoking initiation. Perceptions of second-hand smoke risks were stronger predictors of smoking initiation than having a friend who smokes. This fact suggests that increasing perceptions of second-hand smoke risks may be an effective strategy to counter the influence of peers who smoke. It is likely that clean indoor air campaigns may effectively communicate second-hand smoke risks to adolescents, and thus, serve as a preventative strategy against adolescent smoking initiation. Previous studies have shown that adolescents living in communities with smoke-free workplaces have lower smoking rates, even though most adolescents are not in the workforce [40]. The current study explains and extends that finding by demonstrating that the increase in perceptions of secondhand smoke risks that accompany creating smoke-free policies deters adolescent smoking.

Limitations

Given that this study was based on adolescents in two schools in California, with one school yielding lower participation rates, caution is certainly needed when interpreting the generalizability of the findings. It is possible that differences in incentive structures between the two schools contributed to unequal participation rates. Further, the sample size is relatively small. As such, the size of the sample did not provide sufficient statistical power to include demographic variables such as gender, race/ethnicity, and socioeconomic status. Because previous research demonstrates that smoking behavior varies by these demographic distinctions, future studies may wish to explore how the relationship between perceptions of second-hand smoke risks and smoking initiation might vary by demographic groups. In addition, it is plausible that other factors may influence perceptions of second-hand smoke risks, such as personality characteristics relating to sensation seeking, curiosity, and risk-taking propensity. It is also possible that adolescents have experience with health ramifications related to smoking or second-hand smoke. These experiences may be firsthand or acquired vicariously through friends or family. These experiences might play an important role on the saliency of perceptions within adolescents' decision-making process. In this regard, future studies may wish to elaborate on the current results by focusing not only on the relationship between perceptions of second-hand smoke risks and smoking initiation, but also on factors that might increase perceptions of risks or strengthen the relationship between perceptions and behavior.

Although these results should be replicated with a larger, national sample of data, the relationship between perceptions of second-hand smoke and smoking initiation are strong. Despite these limitations, the results of this study provide evidence that perceptions of second-hand smoke risks may be strong, effective deterrents against adolescent smoking initiation.

Conclusions

Perceptions of second-hand smoke risks deter adolescent smoking initiation. Tobacco control efforts to prevent and reduce adolescent smoking should consider incorporating messages regarding second-hand smoke risks to one's self, as well as to other nonsmokers. Encouraging adolescents to express their objections to second-hand smoke, as well as encouraging parents to create smoke-free homes, may be powerful tobacco control strategies against adolescent smoking.

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References

1. Bernat DH, Erickson DJ, Windome R, Perry CL, Forester JL. Adult smoking trajectories: results from a population-based cohort study. *J Adolesc Health*. 2008; 43(4):334–340. [PubMed: 18809130]
2. Glantz S, Jamieson P. Attitudes toward secondhand smoke, smoking, and quitting among young people. *Pediatrics*. 2000; 106(6):E82. [PubMed: 11099625]
3. Halpern-Felsher B, Rubinstein M. Clear the air: adolescents' perceptions of the risks associated with secondhand smoke. *Prev Med*. 2005; 41(1):16–22. [PubMed: 15916988]
4. Romer, D.; Jamieson, P. The role of perceived risk in starting and stopping smoking. In: Slovic, P., editor. *Smoking: Risk, Perception and Policy*. Thousand Oaks, CA: Sage Publications; 2001. p. 64–80.
5. Song AV, Morrell HER, Cornell JL, et al. Perceptions of tobacco-related risk and benefit predict adolescent tobacco initiation. *Am J Public Health*. 2009; 99(3):487–492. [PubMed: 19106420]
6. Prochaska J, DiClemente C. Stages and processes of self-change of smoking: toward an integrative model of change. *J Consult Clin Psychol*. 1983; 51(3):390–395. [PubMed: 6863699]
7. Prochaska J, DiClemente C, Norcross J. In search of how people change. *Am Psychol*. 1992; 47(9): 1102–1114. [PubMed: 1329589]
8. Rosenstock I. The health belief model and preventive health behavior. *Health Educ Monogr*. 1974; 2(4):354–386.
9. Becker M. The health belief model and personal health behavior. *Health Educ Monogr*. 1974; 2:236–473.
10. Ajzen I. The theory of planned behaviour. *Organ Behav Hum Decision Process*. 1991; 50(2):179–211.
11. Charlesworth A, Glantz SA. Smoking in the movies increases adolescent smoking: a review. *Pediatrics*. 2005; 116(6):1516–1528. [PubMed: 16322180]
12. Sargent JD, Stoolmiller M, Worth KA, et al. Exposure to smoking depictions in movies: its association with established adolescent smoking. *Arch Pediatr Adolesc Med*. 2007; 161(9):849–856. [PubMed: 17768284]
13. Song AV, Ling PM, Neilands TB, Glantz SA. Smoking in movies and increased smoking among young adults. *Am J Prev Med*. 2007; 33(5):396–403. [PubMed: 17950405]
14. Titus-Ernstoff L, Dalton MA, Adachi-Mejia AM, Longacre MR, Beach ML. Longitudinal study of viewing smoking in movies and initiation of smoking by children. *Pediatrics*. 2008; 121(1):15–21. [PubMed: 18166552]
15. Wills TA, Sargent JD, Stoolmiller M, Gibbons FX, Gerrard M. Movie smoking exposure and smoking onset: a longitudinal study of mediation processes in a representative sample of U.S. adolescents. *Psychol Addict Behav*. 2008; 22(2):269–277. [PubMed: 18540724]
16. Evans N, Farkas A, Gilpin E, Berry C, Pierce JP. Influence of tobacco marketing and exposure to smokers on adolescent susceptibility to smoking. *J Natl Cancer Inst*. 1995; 87(20):1538–1545. [PubMed: 7563188]
17. Pierce JP, Gilpin E, Burns DM, et al. Does tobacco advertising target young people to start smoking? Evidence from California. *JAMA*. 1991; 266(22):3154–3158. [PubMed: 1956103]
18. Weiss JW, Cen S, Schuster DV, et al. Longitudinal effects of protobacco and anti-tobacco messages on adolescent smoking susceptibility. *Nicotine Tob Res*. 2006; 8(3):455–465. [PubMed: 16801303]
19. Wakefield M, Terry-McElrath Y, Emery S, et al. Effect of televised, tobacco company-funded smoking prevention advertising on youth smoking-related beliefs, intentions, and behavior. *Am J Public Health*. 2006; 96(12):2154–2160. [PubMed: 17077405]

20. Niederdeppe J, Farrelly MC, Haviland ML. Confirming “truth”: more evidence of a successful tobacco countermarketing campaign in Florida. *Am J Public Health*. 2004; 94(2):255–257. [PubMed: 14759936]
21. Farrelly MC, Davis KC, Haviland ML, Messeri P, Healton CG. Evidence of a dose–response relationship between “truth” antismoking ads and youth smoking prevalence. *Am J Public Health*. 2005; 95(3):425–431. [PubMed: 15727971]
22. Martin CA, Kelly TH, Rayens MK, et al. Sensation seeking, puberty, and nicotine, alcohol, and marijuana use in adolescence. *J Am Acad Child Adolesc Psychiatry*. 2002; 41(12):1495–1502. [PubMed: 12447037]
23. Lejuez CW, Aklin W, Bornoalova M, Moolchan ET. Differences in risk-taking propensity across inner-city adolescent ever- and never-smokers. *Nicotine Tob Res*. 2005; 7(1):71–79. [PubMed: 15804679]
24. Pierce JP, Distefan JM, Kaplan RM, Gilpin EA. The role of curiosity in smoking initiation. *Addict Behav*. 2005; 30(4):685–696. [PubMed: 15833574]
25. Forrester K, Biglan A, Severson HH, Smolkowski K. Predictors of smoking onset over two years. *Nicotine Tob Res*. 2007; 9(12):1259–1267. [PubMed: 18058344]
26. Bricker JB, Peterson AV, Robyn Andersen M, Leroux BG, Bharat Rajan K, Sarason IG. Close friends’, parents’, and older siblings’ smoking: reevaluating their influence on children’s smoking. *Nicotine Tob Res*. 2006; 8(2):217–226. [PubMed: 16766414]
27. Tercyak KP. Brief report: social risk factors predict cigarette smoking progression among adolescents with asthma. *J Pediatr Psychol*. 2006; 31(3):246–251. [PubMed: 16524960]
28. Bricker JB, Peterson AV Jr, Andersen MR, Rajan KB, Leroux BG, Sarason IG. Childhood friends who smoke: do they influence adolescents to make smoking transitions? *Addict Behav*. 2006; 31(5):889–900. [PubMed: 16099595]
29. Halpern-Felsher BL, Millstein SG, Ellen JM, Adler NE, Tschann JM, Biehl M. The role of behavioral experience in judging risks. *Health Psychol*. 2001; 20(2):120–126. [PubMed: 11315729]
30. Biehl M, Halpern-Felsher BL. Adolescents’ and adults’ understanding of probability expressions. *J Adolesc Health*. 2001; 28(1):30–35. [PubMed: 11137903]
31. Halpern-Felsher BL, Biehl M, Kropp RY, Rubinstein ML. Perceived risks and benefits of smoking: differences among adolescents with different smoking experiences and intentions. *Prev Med*. 2004; 39(3):559–567. [PubMed: 15313096]
32. Kropp RY, Halpern-Felsher BL. Adolescents’ beliefs about the risks involved in smoking “light” cigarettes. *Pediatrics*. 2004; 114(4):e445–e451. [PubMed: 15466070]
33. Millstein SG, Halpern-Felsher BL. Perceptions of risk and vulnerability. *J Adolesc Health*. 2002; 31(1 Suppl):10–27. [PubMed: 12093608]
34. de Bruin WB, Parker AM, Fischhoff B. Can adolescents predict significant life events? *J Adolesc Health*. 2007; 41(2):208–210. [PubMed: 17659227]
35. Dalgleish T, Moradi A, Taghavi R, Neshat-Doost H, Yule W, Canterbury R. Judgements about emotional events in children and adolescents with post-traumatic stress disorder and controls. *J Child Psychol Psychiatry*. 2000; 41(8):981–988. [PubMed: 11099115]
36. Dalgleish T, Taghavi R, Neshat-Doost H, Moradi A, Yule W, Canterbury R. Information processing in clinically depressed and anxious children and adolescents. *J Child Psychol Psychiatry*. 1997; 38(5):535–541. [PubMed: 9255697]
37. Fischhoff B, Parker AM, Bruine de Brun W, et al. Teen expectations for significant life events. *Public Opin Q*. 2000; 64:189–205. [PubMed: 10984333]
38. Jamieson, P.; Romer, D. What do young people think they know about the risks of smoking. In: Slovic, P., editor. *Smoking: Risk, Perception and Policy*. Thousand Oaks CA: Sage Publications; 2001. p. 51–63.
39. Flay B, Hu F, Siddiqui O, et al. Differential influence of parental smoking and friends’ smoking on adolescent initiation and escalation and smoking. *J Health Soc Behav*. 1994; 35(3):248–265. [PubMed: 7983337]
40. Fichtenberg CM, Glantz SA. Effect of smoke-free workplaces on smoking behaviour: systematic review. *Br Med J*. 2002; 325(7357):188. [PubMed: 12142305]

Table 1**Scenarios and estimated risks for second-hand smoke**

Scenarios
<p>Ashley^a is a 9th grader.^b She smokes 1 pack of cigarettes each day. She often smokes in front of her best friend Gina, but Gina doesn't smoke. What is the chance that Gina (the nonsmoker) will get ___ from Ashley's smoke?</p> <p>Imagine YOU are in the 9th grade.^b You smoke 1 pack of cigarettes each day. You often smoke in front of your best friend, but your best friend doesn't smoke. What is the chance your best friend (the nonsmoker) will get ___ from your smoking?</p> <p>Imagine YOUR BEST FRIEND is in the 9th grade.^b She smokes 1 pack of cigarettes each day. She often smokes in front of you, but you don't smoke. What is the chance that you (the nonsmoker) will get ___ from your best friend's smoking?</p> <p>Beth^a is 35 years old. Beth has a 14-year-old daughter, Mary. Beth smokes 1 pack of cigarettes each day. She smokes in the house. What is the chance Mary (the nonsmoker) will get ___ from Beth's smoking?</p>
Potential risks ^c
<p>...asthma ___?</p> <p>...lung cancer ___?</p> <p>...have a heart attack ___?</p> <p>...have a lot of trouble breathing ___?</p> <p>...start smoking ___?</p>

^a Names used in scenarios varied according to the participants' gender so that females read scenarios with female characters and males read scenarios with male characters.

^b Because participants in School A were in the 10th grade, scenarios were amended accordingly.

^c All five potential risks were presented after each scenario.

Table 2

Factor analysis using principle components extraction (Varimax Rotation) on estimates of secondhand smoke risks

	Rotated factor loadings ^a			
	1 ^b	2 ^c	3 ^d	4 ^e
You get lung cancer from a friend's smoke	0.84			
You have a heart attack from a friend's smoke	0.82			
Your friend has a heart attack from your smoke	0.81			
You get asthma from a friend's smoke	0.81			
Your friend gets lung cancer from your smoke	0.80			
Your friend gets asthma from your smoke	0.78			
You have trouble breathing from a friend's smoke	0.73			
Your friend has trouble breathing from your smoke	0.70			
Person gets lung cancer from a friend's smoke		0.85		
Person has a heart attack from a friend's smoke		0.84		
Person gets asthma from a friend's smoke		0.75		
Person has trouble breathing from a friend's smoke		0.67		
Child has trouble breathing from parent's smoke			0.80	
Child gets asthma from parent's smoke			0.78	
Child gets lung cancer from parent's smoke			0.76	
Child has a heart attack from parent's smoke		0.41	0.70	
Child begins to smoke because parent smokes			0.52	0.45
Your friend begins to smoke because you smoke				0.80
You begin to smoke because your friend smokes				0.75
Person begins to smoke because their friend smokes		0.42		0.68

^aFactor loadings less than .40 are not reported.

^bFactor 1 = perceptions of personal second-hand smoke risks.

^cFactor 2 = perceptions of theoretical second-hand smoke risks.

^dFactor 3 = perceptions of parental second-hand smoke risks.

^eFactor 4 = perceptions of behavioral modeling risks.

Table 3

Predictors of future tobacco initiation (ever smoking a whole cigarette)

	Unadjusted odds ratios (95% CI) [*]	Adjusted odds ratios (95% CI) ^{*,a}
Personal second-hand smoke risks ^b	0.65 (0.47–0.91)	0.63 (0.42–0.94)
Theoretical second-hand smoke risks ^b	0.90 (0.65–1.25)	1.06 (0.72–1.56)
Parental second-hand smoke risks ^b	0.63 (0.44–0.88)	0.64 (0.43–0.93)
Behavioral modeling risks ^b	1.14 (0.83–1.57)	1.19 (0.84–1.69)
Short-term active smoking risks ^b	0.71 (0.51–1.00)	0.92 (0.62–1.36)
Long-term active smoking risks ^b	0.84 (0.61–1.17)	1.04 (0.71–1.51)
Exposure to friends who smoked ^c	1.20 (1.05–1.36)	1.18 (1.02–1.35)
Exposure to parents who smoke ^d	2.18 (1.06–4.49)	2.09 (0.96–4.58)

CI = confidence interval.

^{*} Significant ($p < .05$) odds ratios are in bold.^a Adjusted odds ratios represent a the full model that includes all eight independent variables.^b Units correspond to quartiles coded as 0 = 1st quartile and 3 = 4th quartile.^c Units correspond to one friend who smokes. Responses ranged from 0–20 friends who smoke.^d Dichotomously coded as 0 = *neither parent smokes* and 1 = *at least one parent smokes*.