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SAN DIEGO STATE UNIVERSITY

Anti-Tobacco Socialization and Youth Smoking Initiation

A dissertation submitted in partial satisfaction of the requirements for the degree

Doctor of Philosophy

in

Public Health (Health Behavior)

by

Kristen Tracee Emory

Committee in charge:

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San Diego State University

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2013

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The Dissertation of Kristen Tracee Emory is approved, and it is acceptable in quality and form for a publication on microfilm and electronically:

Chair

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2013

DEDICATION

To my amazing parents, Keith and Sharon Emory; who have given, sacrificed, supported and loved so much in order to enable me to follow my dreams. I am so thankful to them for having been with me through all of my ups and downs. To my wonderful brother, Jason Emory, who is not only a sibling but also one of my best friends. My family is and always has been my inspiration for each step I take forward.

To my partner Kamal Adawi, for all of his love, kindness, and support. He has lived and breathed this dissertation project with me, for better and for worse. I am so grateful.

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I am so grateful to and humbled by you all.

EPIGRAPH

“Ancora imparo”

[English Translation: “Still I learn”]

— attributed to Michelangelo Buonarroti, at age 87

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ABSTRACT OF THE DISSERTATION

Anti-Tobacco Socialization and Youth Smoking Initiation

By

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Doctor of Philosophy in Public Health (Health Behavior)

University of California, San Diego, 2013
San Diego State University, 2013

Professor John Pierce, Chair

Objective: This three-study dissertation project explores the impact of tobacco-specific socialization on youth smoking initiation. The primary aims of this research were to investigate the influences of [1] parent and child agreement that their home was smoke-free home, [2] parent and child agreement about youth risk for smoking, and [3] child report of favorite pro- and anti- tobacco advertisements on youth smoking initiation, as tobacco marketing has been shown to undermine parenting.

Methods: In 2003, parents with an oldest child aged 10-13 were enrolled into a study exploring the influence of parenting on youth risk behaviors (N=1036). Parent and

child baseline surveys were completed in 2003-04, 960 youth reported being never smokers. Follow-up for baseline never smoking youth was completed in 2007-08 (N=704, 73.3%). For each study, participants with missing data were excluded ($\leq 5\%$). Studies employed descriptive statistics, chi-square analysis, and simple and multivariate logistic regression.

Results: Approximately 25% of youth reported smoking initiation in 2007-08. [1] The majority of dyads agreed their home was smoke-free. Overall, adolescents in dyads who did not agree their home was smoke free were 60% more likely to initiate smoking (OR=1.6, 95%C.I.:1.0-2.4). The effect was only significant in non-smoking households (OR=1.8, 95%C.I.: 1.1-3.2). [2] Adolescents reported youth smoking risk more frequently than did parents, both assessments were independent predictors of future smoking initiation (parent: OR=2.3, 95%C.I.:1.3-3.9; child: OR=2.0, 95%C.I.:1.3-3.0). Concordance that the child was at risk increased later initiation fourfold over concordance that the child was not at risk (OR=4.1, 95%C.I.: 2.0-8.5), however, any report of risk was predictive of future initiation. Evidence is provided for a youth anti-tobacco belief scale to predict dyad agreement. [3] Adolescents reported favorite tobacco industry (43%) and tobacco control (58%) advertisements, of these 30% reported both. Compared to having a favorite tobacco industry advertisement, having only a favorite tobacco control advertisement reduced initiation by 63% (OR: 0.37, 95%C.I.: 0.20-0.69). Those with a favorite advertisement from both sides appeared to have an initiation rate midway between.

Conclusions: The study results indicate that tobacco-related socialization occurring in pre- and early- adolescence may reduce the probability that youth will initiate smoking.

General Introduction:

Research Paper I, II and III (references included)

The Problem of Youth Smoking:

Preventing youth smoking is a major concern for parents and health professionals alike. (1) Tobacco use continues to be a leading cause of preventable death in the United States (US) and worldwide. (2) Because most smokers begin smoking prior to the age of 18 (88%) and virtually all begin prior to the age of 26 (99%), (3) the prevention of youth smoking initiation is key to reducing future smoking prevalence. Healthy People 2020 set the goal to reduce past 30-day cigarette consumption among adolescents from 19.5% to 16% by 2020. (1) The long-term health consequences of smoking are well established. In addition to lung cancer and other distal health impacts, youth smoking is associated with a variety of more proximal social, psychological and health concerns. These include co-morbid substance use, dental problems, asthma, depression, anxiety, anti-social behaviors, and poor school performance. (4) It is important to understand the modifiable factors that contribute to youth smoking in order to prevent it. Youth smoking initiation does not take place in a vacuum. Personal, environmental, and social factors all influence youth's tobacco-related beliefs and behaviors.

Theoretical Framework: Social Influences on Youth Smoking Initiation

Behavioral theories that take into account social contexts help provide a guiding framework for understanding how the social environment contributes to youth's tobacco-related behaviors.(5-7) Ecological perspectives are useful in conceptualizing the role tobacco-specific socialization plays in youth smoking. (5) Smoking initiation is a modifiable behavior that takes place in the context of individuals' personal and social experiences, within larger social and physical environments (Figure 0.1). The goal of this research is to explore potentially

modifiable predictors of youth smoking initiation. Thus the current research focuses on the individual (intrapersonal), relationship (interpersonal) and community levels. While the societal and institutional levels are important (as tobacco-related laws, policies and norms influence smoking behaviors), these are challenging to modify and beyond the scope of this research.

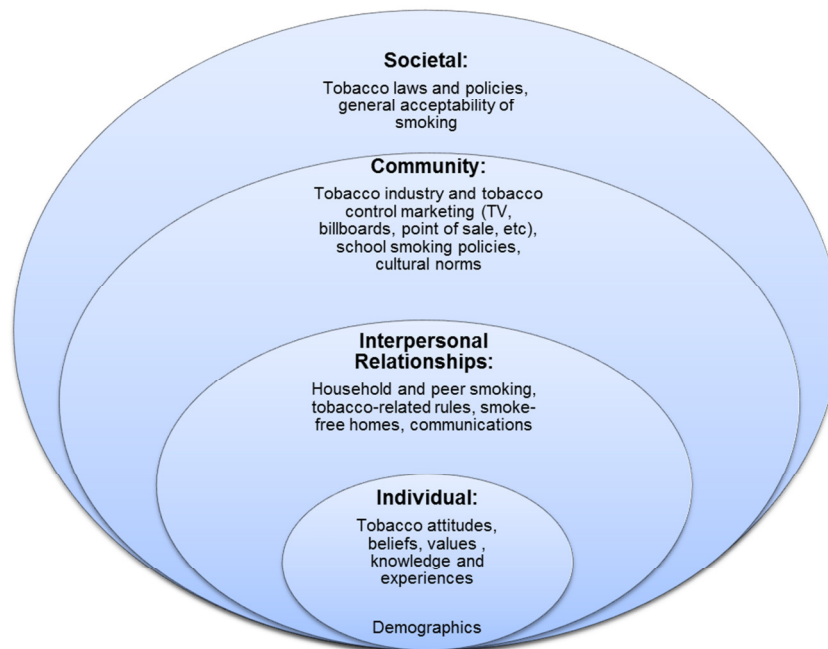


Figure 0.1 Ecological Model adapted for adolescent tobacco initiation

Social Cognitive Theory (SCT) adds an additional level of understanding to how social environments and individuals interact to facilitate behavior. SCT posits that human behavior is part of a dynamic process that is influenced by cognitive, behavioral and environmental factors (reciprocal determinism) (Figure 0.2). (6, 8) Youth do not simply react to external tobacco-related stimuli, rather there are cognitive decision making processes that influence their smoking behavior. While physical and social tobacco environments shape youth's tobacco-related thoughts

and behaviors, the youth also exert their own influence on the tobacco-related environment.

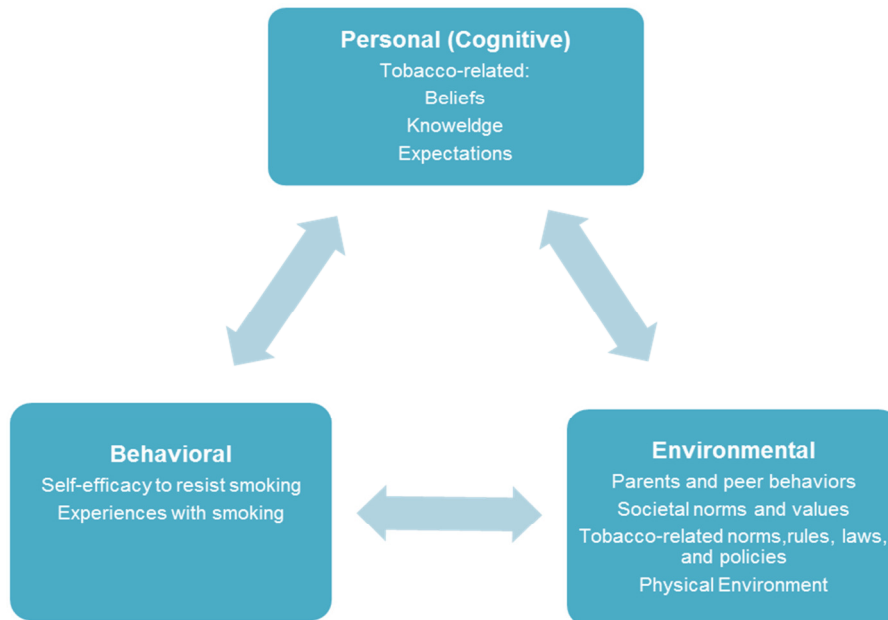


Figure 0.2 Reciprocal Determinism and Youth Smoking Initiation

A child's beliefs, knowledge and perceptions about tobacco use (desirability, harm, etc.), their previous experiences regarding smoking (their own or observations of others), as well as their tobacco-related environment (smoke-free homes, exposure to household or peer smokers, anti-tobacco laws or policies, societal norms regarding tobacco, etc.), work together to shape whether or not a youth initiates smoking.

Both personal experiences and observed behaviors can set expectations about smoking. (6, 7) These experiences can increase or decrease the likelihood of future smoking behavior by setting and reinforcing expectations about what happens when one smokes. While previous experience with smoking is a strong indicator of future smoking behavior, youth can learn about smoking by observing the behavior modeled by others. In fact, exposure to the smoking behavior of others is among the

most robust predictors of youth smoking initiation. (9-13) Parental influence is not limited to the simple modeling of smoking behavior. Parents can actively engage in protective parenting in an effort to shape youth's future tobacco-related beliefs and behaviors, even if they themselves model the undesirable behavior (smoking). When faced with the opportunity or social pressure to smoke having a strong anti-tobacco environment likely increase youths' self-efficacy to resist initiating smoking.

Tobacco-Related Parenting and Youth Smoking Initiation

A primary goal of this research is to provide insight as to what modifiable actions parents can take to reduce the probability that their child will initiate smoking, acknowledging that these actions take place in the larger social context. The family and the home environment are among the most important socialization agents for youth and the prevention of risk behavior. Protective parenting such as limit-setting, monitoring, communication, and the strength of the relationship between parent and child help reduce adolescent risk behaviors. (14-17) Tobacco-specific parenting may send a particularly strong message against youth smoking. Tobacco-specific parenting includes practices such as the establishment of smoke-free homes, holding discussions about tobacco, and communicating the desire that their child not smoke. (18, 19) These actions can be taken whether or not there are smokers in the household.

Tobacco-Related Socialization Outside of the Family Environment

There are a variety of important factors outside the home that are predictive of youth smoking. In particular, peer smoking and receptivity to tobacco advertisements are highly predictive of tobacco-related behaviors. Peer smoking is an established

predictor of youth smoking behavior, thus it is not specifically explored in this research. Rather, it is recognized as an important socializing factor and included as a covariate in each study.

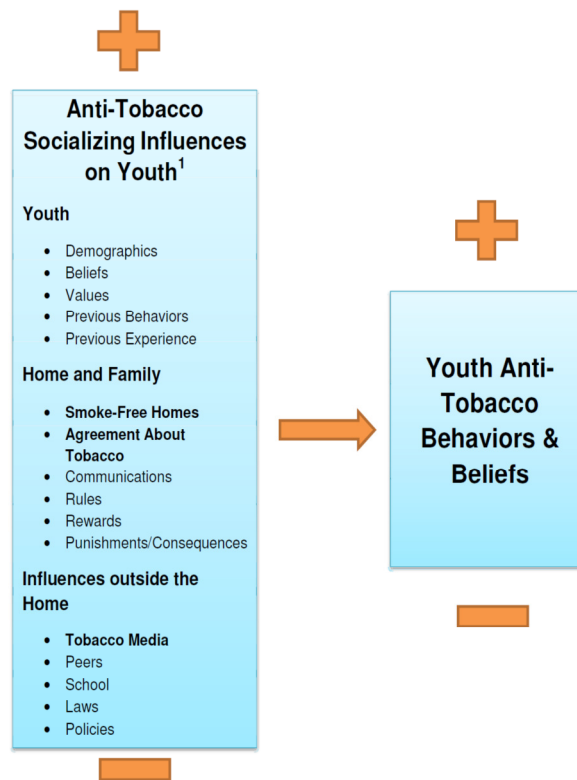


Figure 0.3 Anti-tobacco Socialization and Youth Smoking

¹Bolded sub-categories of the primary foci for the project

Tobacco-related marketing and media has also been shown to be predictive of smoking behavior. Tobacco messages may either reinforce or compete with tobacco-specific socialization that takes place in the home, (20) depending on the type (pro- or anti-tobacco) and likeability of the messages youth are exposed to. However, there are important gaps in the literature. For instance, despite tobacco-industry and tobacco-control campaigns exerting their own independent influence on youth smoking, little is known about the influence of the interplay between the two on youth smoking behavior. Figure 0.3 presents a map of the overarching theme of the

dissertation: anti-tobacco socialization's influence on youth tobacco-related beliefs and behaviors.

Overview of the Three Studies

The overarching theme of this three-paper dissertation is the influence of tobacco-specific socialization as predictors of adolescent smoking initiation. This project examines data from the national Parenting Project (2003-2011), (21) to explore for the longitudinal influence of 1) parent and child agreement about smoke-free homes, 2) parent and child concordance about youth smoking risk, and 3) receptivity to pro- and anti-tobacco advertisements on adolescent smoking initiation. Each of the research papers relates to the overarching theme of tobacco-related socialization. The rationale and primary aims for each study are described as follows:

Research Study I: *Smoke-free homes, adult smoking and adolescent smoking initiation*

The establishment of formal rules against smoking reinforces general anti-tobacco sentiment by providing a strong statement about the unacceptability of smoking behavior to children. Indeed, there is cross-sectional evidence that a smoke-free home environment can curb adolescent smoking. Familial agreement about a completely smoke-free home may indicate the salience of the rule and thus be a stronger protective force against future smoking. The relationship between home-smoking restrictions and adolescent smoking is less clear when there are smokers in the household. This study explores whether or not parent and child agreement about a smoke-free home predicts future adolescent smoking initiation in the overall population, as well as stratified by household smoking.

Specific Aims:

1. To calculate and compare parent and child report of a smoke-free home.
2. To explore if adolescents are more likely to initiate smoking if the dyad does not agree their home is smoke-free, compared to dyads who agree that the home is smoke-free.
3. To examine if the hypothesized influence of smoke-free homes on adolescent smoking initiation differs by household smoking status.

Research Study II: *Parent and child assessment of youth smoking risk, youth smoking beliefs, and future smoking initiation*

In line with parenting theories about the importance of parental monitoring and child disclosure (14-16) in predicting risk behavior, parental overestimation of adolescent smoking has been found to be predictive of future smoking behavior. (22) Parent and child agreement about whether or not a child is at risk for smoking is likely a strong indicator of actual risk. Assessment of risk occurs within the context of individuals' lives and daily experiences, making it important to also understand which factors facilitate assessment of risk. This study investigates the relationship between parent and child agreement about youth smoking risk and future smoking initiation. Further, the study explores for predictors of dyad agreement that the child is not at-risk for smoking, including a youth anti-tobacco beliefs scale.

Specific Aims:

1. To calculate and compare parent and child report of pre-adolescent smoking risk.
2. To explore if parent and child report of child smoking risk are (a) independently and (b) jointly predictive of future smoking initiation.

3. To explore for associations with dyad agreement that a child is not at-risk for smoking, including youth anti-tobacco beliefs
4. To explore for the reliability of a youth anti-tobacco beliefs scale.

Research Study III: *Receptivity to tobacco marketing and youth smoking initiation*

Social and environmental influences outside of the home may compete with or reinforce tobacco-related parenting. Youth tobacco-related beliefs and behaviors are influenced by exposure to tobacco-related advertisements. Receptivity to tobacco industry advertisements increases the probability that youth will initiate smoking, while tobacco control advertisements are associated with reduced smoking. The joint influence of tobacco industry and tobacco control advertisements needs further exploration. The available research suggests both tobacco industry and tobacco control advertisements exert their own independent effect on smoking initiation, but has not yet demonstrated tobacco control's ability to ameliorate the harmful influence of tobacco industry marketing on youth smoking. (23, 24) This study explores the socializing influence of having both favorite tobacco industry and tobacco control advertisements on youth smoking initiation.

Specific Aims:

1. To calculate and compare prevalence of adolescents' favorite tobacco-industry and tobacco-control advertisements and to explore for associations with adolescent smoking initiation.
2. To explore if tobacco industry advertising continue to reach and appeal to adolescents, despite marketing restrictions put in place to protect youth.
3. To investigate the influence of having both favorite tobacco industry and tobacco-control advertisements on youth smoking initiation.

The following chapters explore tobacco-specific socialization strategies that may be particularly useful in preventing future smoking initiation. This research builds upon previously existing data on each of the three topics. The methodology for each study is explained in detail within the respective chapters. This research has been approved by the UCSD IRB.

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Research Paper I:

Smoke-free home, adult smoking and adolescent smoking initiation

ABSTRACT

Objective: To test effect of parent and child reporting of a smoke-free home on future initiation.

Methods: Random digit dialing identified a national sample of families (n=1036) with an oldest child aged 10-13 years. Parent child dyads completed a baseline questionnaire in 2003 that included reporting on a smoke-free home. Adolescents were re-surveyed for smoking status in 2007-08 (response rate 74%).

Results: While overall parent-child consensus was 80%, only 30% of smoking households agreed to be smoke-free. Among non-smoking households, lack of a smoke-free home increased initiation by 80% (OR=1.8, 95% CI=1.1-3.2). For smoking households a suggestive smaller effect failed to reach significance (OR=1.6, 95% CI=0.8-2.0, p=0.18). In non-smoking households, only adolescent report was necessary to identify this effect. However, in smoking households, an apparent lower initiation rate occurred only when both parent and child reported the home as smoke-free.

Conclusions: In non-smoking households, a smoke-free home is associated with reduced teenage initiation. In the minority of households that contain smokers, smoke-free homes are less common. Larger longitudinal studies are needed to identify whether parent-child consensus of a smoke-free home is associated with a decline in teenage smoking initiation.

INTRODUCTION:

Smoke-free homes are policies often voluntarily established to reduce the health consequences of secondhand smoke among children and non-smokers. (1) A smoke-free home may also reduce the probability that a child will initiate smoking in the future (2-14) and prevention of initiation is the most successful way to reduce long-term smoking prevalence (15). After 45 years of tobacco control programs in the United States (U.S.), smoking prevalence among high school seniors is still a high 19%, (16) emphasizing the need for new initiatives to prevent initiation.

Familial and peer norms are known to influence adolescent smoking behavior. (15) Exposure to smokers who model the behavior is among the most reliable predictors of future adolescent initiation. (17) Parental and household smoking has been strongly linked to increased smoking behavior. (18, 19) Smoking households contain at least one adult smoker, while non-smoking households have no adult household members who smoke. Smoke-free homes have a rule in place indicating no smoking is ever allowed inside, whether the household is smoking or non-smoking. Cross-sectional studies have noted associations between smoke-free homes and lower smoking prevalence in adolescents. However, it is possible this is confounded as non-smoking households report higher rates of smoke-free homes than smoking households. (20-22) It is not clear from the cross-sectional studies whether these observed lower initiation rates are due to the smoke-free homes themselves, lower rates of exposure to smokers in smoke-free homes, or a combination of the two. Using longitudinal data, Albers et al. (2008) noted that smoke-free homes were only associated with lower initiation rates in non-smoking households, not in smoking households. (23) Such a finding might reflect differential validity of self-reporting a smoke-free home between homes with and without

smokers, as discrepancies have been noted among different family members in smoking households, particularly when children were in the household. (24-27) Discordant reports were associated with higher cotinine levels among family members of smokers, than when there was parent and child concordance that the home was smoke-free. (24) In a Canadian study, Nowatzki et al. (2010) noted that adolescents were more likely to report fewer rules and more smoking behavior in the home than did parents. (26)

The current study reports data from a national longitudinal sample of United States (U.S.) parent and adolescent dyads and investigates concordance between parent and child reporting of a smoke-free home. We investigate the discrepancy in reporting of smoke-free homes by adolescents and the parent with most responsibility for care. In a stratified analysis, we test Albers' finding that smoke-free homes are more effective in preventing smoking initiation in non-smoking households.

METHODS:

Selection and Description of Participants:

Parent and adolescent pairs were interviewed and enrolled in a study of Parenting to Prevent Problem Behaviors. (28) Respondents to a 2003 national random-digit-dialed survey that oversampled for minority race-ethnicities were invited by letter to join a parenting study if they had an oldest child between 10 and 13 years of age (n=3079). We enrolled 1036 families in the study and selected the parent with the self-professed most responsibility for the child's upbringing. The resulting pre-teen sample closely reflected a similarly aged US national population on gender, race-ethnicity and education and slightly over-represented the national population on those living in two parent households. (28) The study consisted of parent and adolescent

baseline surveys conducted between May 2003 and October 2004, which were followed by annual adolescent surveys. The fifth teen survey was completed in 2007-2008 when the study adolescents were an average age of 15.7 years of age. (29). There were 704 adolescents who had never smoked at baseline who completed the year 5 survey (response rate = 73.3%). There were only 17 observations with key missing data and results from analyses run with and without these observations were stable, thus missing data were removed from the analyses, resulting in a final sample of 687.

Measures

Both parent and teen surveys collected standard information on demographics such as age, gender and race or ethnicity.

Smoking Status: Adolescent smoking status questions were the same on both baseline and year five surveys. A respondent was classified as a never smoker if s/he answered “no” to both the following questions: “Have you ever smoked a cigarette?” and “Have you ever tried or experimented with cigarette smoking, even a few puffs”. A positive response to either indicated that smoking had been initiated.

Susceptibility to Smoking: Never smokers were further categorized using a susceptibility to smoking index (30) that included a variable on curiosity about smoking. (31) Committed never smokers answered “definitely not” to all four questions regarding future smoking behavior: 1) “Do you think in the future you might experiment with cigarettes?”, 2) “If one of your best friends were to offer you a cigarette, would you smoke it?”, 3) “At any time during the next year do you think you will smoke a cigarette?” and 4) “Have you ever been curious about smoking a cigarette?”. All others were classified as susceptible to smoking. Exposure to other

Smokers: All adolescents were asked “Have any people that you live with now smoked cigarettes in the last year?” an affirmative response indicated a household smoker. Best friend smoking was assessed from the question “How many of your best friends smoke?” Responses other than “none” were categorized as having best friend smokers.

Smoke-free Home: Both the parent and child baseline surveys included the question “What are the rules about cigarette smoking in your household, if any? Would you say...a) No one can ever smoke inside your home, b) usually no one can smoke inside your home, c) adults can smoke but only in certain rooms, d) only children can’t smoke inside your home, e) there are no restrictions on smoking, f) there are no rules because no one smokes, or g) something else.” Responses indicating either a) or f) were used to classify the home as smoke-free.

Other variables used from the Baseline Parent Questionnaire: Participating parents were considered smokers if they self-reported having smoked in the past five years, else they were considered non-smokers. Single parent households were identified from the parent interview in response to the question. “Do you have a spouse or partner who lives with you?” Parents reported household income in \$10,000 intervals. Parent’s education was determined by the question “What is the highest grade of regular school or college you have completed?” Parents reported teen’s school performance from the question “How would you describe (child’s name’s) school performance? Would you say his/her grades have been...a) All A’s, b) mostly A’s, c) Mostly B’s, some C’s but never a D, d) some D’s but never an F, or e) some F’s”. For this analysis, grades were categorized as “at least mostly A’s”, “mostly B’s or C’s” and “some D’s or F’s”.

Statistical Analysis

Analyses were performed using SAS statistical software version, version 9.3. (32) Exploratory data analyses were undertaken using t-tests and Pearson chi-square as appropriate. Logistic regression was used to explore dyad agreement about the presence of a smoke-free home with future smoking experimentation, adjusting for demographics and known predictors of adolescent experimentation. A series of regressions were performed and data was systematically entered into each model to explore the impact of adding variables to the model. Given the a priori hypothesis, the analysis was also stratified by household smoking status.

RESULTS

Population Characteristics: In 2003-04, 960 self-reported non-smoking children were enrolled in the study. One-third of the sample was aged 10-11 years (Table 1.1). Oversampling was successful, resulting in one-third of respondents being from minority race/ethnicities, primarily African-American. One-fifth did not report residing in two parent homes; 43% of parents reported incomes \$50,000 and below, 36.4% lived in a household with a smoker, and 37.7% were categorized as susceptible to start smoking. The adult with most responsibility for the child was more likely to be female than male, and the mean age for parents was 40 years.

Seventy-one percent of this population (N=687, 71.6%) completed the 2007-08 survey without missing data for the variables of interest. Of this sample, 68.0% were from non-smoking households (N=467); the remaining 32.0% were from smoking households (N=220). Adolescents in this study were significantly more likely to come from non-smoking households (68.0%) with participating parents who were

non-smokers (73.1%). They were more likely to be white (66.7%) and to come from two-parent households (80.1%) with higher incomes.

[Table 1.1]

Concordance of Reporting of a Smoke-Free Home: The majority of parent and adolescent dyads agreed their home was smoke-free (63.9%), 18.2% agreed their home was not smoke-free, and the remaining 17.9% provided discordant reports (Figure 1.1). Among dyads with discordant reports (n=123), a higher percentage of parents reported a smoke-free home (56.9%) compared to adolescents (43.1%). As expected, a much higher percentage of smoke-free homes were reported in non-smoking households (79.9%), compared to smoking households (30.0%) (Table 1.2). In both instances a concordant report that the home was either (1) smoke-free or (2) not smoke-free was approximately 80%. However, there were differences in the distribution of reports. In homes without smokers, concordant reporting that the home was smoke-free made up nearly all of the concordance (79.9%), while only 3.0% agreed that the home was not smoke-free. The inverse was true for homes with smokers, with 50.5% agreeing the home was not smoke-free and only 30.0% agreeing the home was smoke-free. Discordant reports ranged from 17.2% in non-smoking households to 19.5% in smoking households. In both instances, slightly more parents (9.9%-10.9%, respectively) reported a smoke-free home than did adolescents (7.3%-8.6%, respectively).

[Figure 1.1]

[Table 1.2]

Predicting Adolescent Longitudinal Initiation: By 2007-08, 25.6% of adolescents reported having initiated smoking. Table 1.3 presents the adjusted logistic regression predicting smoking initiation. Adolescents from dyads where either or both the parent or the adolescent did not report a smoke-free home were more likely to initiate smoking (OR=1.6, 95%C.I.:1.0-2.4), compared to those who agreed there was a smoke-free home. Although only 8.7% of children at baseline reported a best friend who smoked, this was strongly associated with later initiation (OR=4.6, 95% C.I.: 2.6-8.2). School performance was strongly and directionally associated with smoking; adolescents receiving mostly B's and C's (OR=1.8, 95%C.I.:1.2-2.6) or some D's and F's (OR=7.0, 95%C.I.:3.3-15.0) were more likely to have initiated smoking, compared to those receiving mostly A grades. No other adolescent (gender, race/ethnicity, baseline age) or household (household smoking, income the number of parents in the household) variables were significant predictors in the fully adjusted analysis. Analysis stratified by household smoking (data not presented) revealed the smoke-free home variable was only significant in non-smoking households (OR=1.8, 95%C.I.:1.1-3.2). Other significant results for homes without smokers include peer smoking (OR=7.5, 95%C.I.: 3.34-16.8), receiving B or C (OR=1.9, 95%C.I.:1.1-3.1) or D or F (OR=8.7, 95%C.I.: 2.8-26.8) grades, and being in a single-parent household (OR=2.2, 95%C.I.: 1.2-4.2). In homes with smokers, only best friend smoking (OR=2.7, 95%C.I.:1.1-6.3) and receiving D or F grades (OR=5.3, 95%C.I.:1.9-15.0) were significantly associated with increased adolescent smoking in homes with smokers, compared to the reference group. Smoke-free homes was suggestive of an effect, but did not reach significance (OR=1.4, 95%C.I.: 0.7-2.7)

[Table 1.3]

Smoking Initiation by Household Smoking and Smoke-Free Home Categories:

When dyads agreed that smoking was allowed in the home, the teen initiation rate over the next five years was over 35%, regardless of household smoking (Figure 1.2). A similar initiation rate was observed when there was discordant reporting and the child indicated that the home was not smoke-free, regardless of household smoking or when there was concordance that the smoking was allowed in the home.

For households without smokers, the child's report that the home was smoke-free appeared sufficient to reduce the adolescent initiation rate to approximately 20% ($p < 0.05$). However, in households with smokers, parent corroboration of adolescent report of a smoke-free home appeared necessary to reduce initiation (30.3%). However, the low sample size of smokers in this category meant that this 25% estimated reduction did not reach statistical significance.

[Figure 1.2]

Our results confirm previous findings that suggest adolescents from smoking households report both a higher prevalence of smoking (33-35) and a lower prevalence of smoke-free homes compared to those in non-smoking households.

DISCUSSION

In this longitudinal study, we confirm an 80% concordance rate between parent and child reporting of rules for smoking in the house. (24) When the parent and child were discordant in their reporting, each appeared to have equal probability of reporting the home as smoke-free. Concordance of reporting of a smoke-free home during the pre-teen years was associated with a significantly lower rate of smoking initiation over the next five years, which confirms the effectiveness of smoke-free homes reported from cross-sectional studies. (4-13, 36) However, when the child

indicated that smoking was allowed in the house, even when household adults did not smoke, the probability that the teen would start smoking appeared to double. While this appears to conflict with previous research, (33-35) most studies, including ours, are underpowered to investigate this hypothesis given the much lower rate of reporting that smoking was allowed in the home in non-smoking households.

As in other studies, households with non-smokers were much more likely to report having a smoke-free home. (20-22, 22) In these households, it was sufficient for the teen alone to report the household as smoke-free in order to achieve the lower initiation rate. As in previous studies, households with smokers were not very prevalent in this study, and we did not have the power to identify an apparent 25% reduction in initiation with a smoke-free home as statistically significant. Not only did this effect size appear smaller than that observed for smoke-free homes in non-smoking households, it also appeared to only occur when there was concordance between the child and the parent reporting the home to be smoke-free.

It could be expected that the impact of smoke-free homes on future initiation rates would be lower in households with smokers. First of all, it is likely that households with smokers will have a higher tolerance of smoking than non-smoking households and this will factor into tobacco-specific parenting practices. Cigarettes with which to experiment with are much more available and accessible when there are adult smokers in the house. Further, it is highly likely that children will either observe or smell smoking by adult family members, particularly parents. Smokers with smoke-free homes frequently step outside to smoke, and in some instances, smoking outside can be a positive social occasion. Sometimes it might be on the boundaries of the house leading to discrepancies on whether the behavior was inside or outside. Another study noted that discrepant reporting of smoking rules by parents

and teens was associated with teens being susceptible to smoking. (26) This was not the case in our study as we measured smoking rules while the majority of our sample was in the pre-teen years, prior to many becoming susceptible to smoke. Future studies are needed to explore further adolescents' perceptions of parental smoking behavior and household smoking rules in the homes of smokers.

The smoking initiation rate in this study was 25% lower than that reported in the 2011 national school-based Monitoring the Future study (16). However, our study used telephone interviewing in the home and estimates from studies using this mode are known to result in estimates that are lower by this amount than school-based studies. (37) The composition of our sample is another reason why our initiation rate was lower. Although we started with a nationally represented sample, parents were asked to volunteer for a parenting intervention aimed at reducing child problem behaviors. Families with smokers in the household were less likely to participate initially as well as more likely to drop-out of this study. Not only is this expected to reduce the initiation rate, it also meant that our sample size of households with smokers was not sufficient to identify the apparent smoke-free home effect as statistically significant.

Major strengths of the current study include its longitudinal design and the fact that the sample was drawn from a national probability sample of the United States. While the study compares parent and adolescent dyad report of smoke-free homes, data was not obtained from more than one parent. However, concordance between parental reports of home bans has been reported to have increased between 1995-2007, suggesting one parent's report may be sufficiently reliable. (27) It is possible that discrepant reporting by teens and the parent with most say over the upbringing of the child occurred because the child lived in two separate households as part of a

joint custody agreement between parents. We had information on children with multiple homes in our study, but including it in the models did not explain the discrepancy.

In summary, this study confirmed that smoke-free homes are associated with reduced adolescent initiation. However, given the small sample size of parents who smoke, it was not able to test the size of the effect among smoking households. Of particular concern is the effect of discrepant reporting of smoking rules between parent and child from smoking households. As studies of teens always require informed consent from parents, this result emphasizes the importance of querying the parent on the smoking rules in the home.

This study points to the need for obtaining information on household smoking rules from both parents and adolescents. There are implications for families and tobacco control professionals: smoke-free homes are an effective, little-to-no-cost method to prevent future smoking initiation. Parents, health professionals and counter tobacco public health campaigns should promote the implementation of completely smoke-free homes. Parents can take an active role in reducing their children's risk for smoking by creating a strong and consistent anti-tobacco environment, including establishing a smoke-free home. Establishing smoke-free homes protects young people against future smoking. The relationship between smoke-free homes and adolescent smoking is unclear in smoking households and needs to be tested in a large national sample.

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This chapter is currently being prepared for submission for publication in peer-reviewed journal. The dissertation author is the primary author for this paper. Co-authors for all three papers include: Vera, LE; Ojeda, N; Elder, JP; Usita, P; Messer, KM; Pierce, JP.

Tables

Table 1.1 Comparisons of adolescent never smokers (NS) in 2003-04 (N=960), retained in 2007-08 (N=687), and not retained (N=273)

Baseline Adolescent Variables		All NS at Baseline (N=960) %	Retained Sample (N=687) %	NS Not Retained (N=273) %	P-value
Gender	Male	50.0	49.5	51.3	
	Female	50.0	50.5	48.7	
Age	10-11	30.0	31.4	26.4	
	12-13	70.0	68.6	73.6	
Ethnicity or Race	White	62.0	66.7	50.2	****
	Other	38.0	33.3	49.8	
Adolescent Baseline Smoking Status	Committed Never	62.3	63.3	59.7	
	Susceptible	37.7	36.7	40.3	
Household Smoking (N=958)	No Smokers	63.6	68.0	52.4	****
	≥1 Household Smoker	36.4	32.0	47.6	
Baseline Parent Variables		All NS at Baseline (N=960) %	Retained Sample (N=687) %	NS Not Retained (N=273) %	P-value
Gender	Male	18.5	17.2	22.0	
	Female	81.5	82.8	78.0	
Parent Age (years)	<30	5.1	3.6	8.8	
	30-45	76.6	78.8	71.1	
	46+	18.3	17.6	20.2	
Household	Two Parents	75.7	80.1	64.8	****
	One Parent/Other	24.3	19.9	35.2	
Household Income	<\$20,000	10.5	6.7	20.6	****
	20,000-50,000	32.5	31.2	35.9	
	50,001-100,000	41.1	42.9	36.3	
	>\$100,000	15.9	19.2	7.3	
Parent self-reported Past Five Year Smoking	Parent smokes	31.5	26.9	42.9	****
	Parent is a non- smoker	68.5	73.1	57.1	

*p<0.05, **p<0.01, ***p<0.001, ****p<0.0001

Table 1.2 Parent and youth report of smoke-free homes by household smoking (N=687)

Dyad Report of Smoke-Free Home Prevalence	Households with Smokers (N=220)		No Household Smokers (N=467)	
	N	%	N	%
Agree Complete SFH	66	30.0	373	79.9
Adolescent Only	19	8.6	34	7.3
Parent Only	24	10.9	46	9.9
Agree No Complete Ban	111	50.5	14	3.0
TOTAL	220	100.0	467	100.0

Chi-Square value=243.9363, df=3, p<0.0001

Table 1.3 Adjusted Logistic Regression 2003-2004 Variables Predicting Adolescent Experimentation in 2007-2008 , among Baseline Never Smokers (N=687)^{1,2}

2003-2004 Variables	Response	Initiators/Total (180/687)	Initiation 26.2%	OR	95% CI
Parent reported adolescent grades					
	A's (ref)	74/394	18.8	1	-
	B's and C's	80/254	31.5	1.8**	(1.2-2.6)
	D's and F's	26/39	66.7	7.0****	(3.3-15.0)
Peer smoking					
	No Peers Smoke (ref)	144/627	23.0	1	-
	All Other responses	36/60	60.0	4.6****	(2.6-8.2)
Parent and Adolescent concordance about smoke-free homes (SFH)					
	Agree SFH (ref)	89/439	20.3	1	-
	Does not agree SFH	91/248	36.7	1.6*	(1.0-2.4)

Hosmer and Lemeshow Goodness of Fit Chi Square= 7.4582, df=8, p-value=0.4881

¹Adolescent report unless otherwise noted

²Model adjusts for child age, gender, race or ethnicity, household income, and households smoking

*p<0.05, **p<0.01, ***p<0.001, ****<0.0001

CI, confidence Interval; OR, odds ratio

Figures

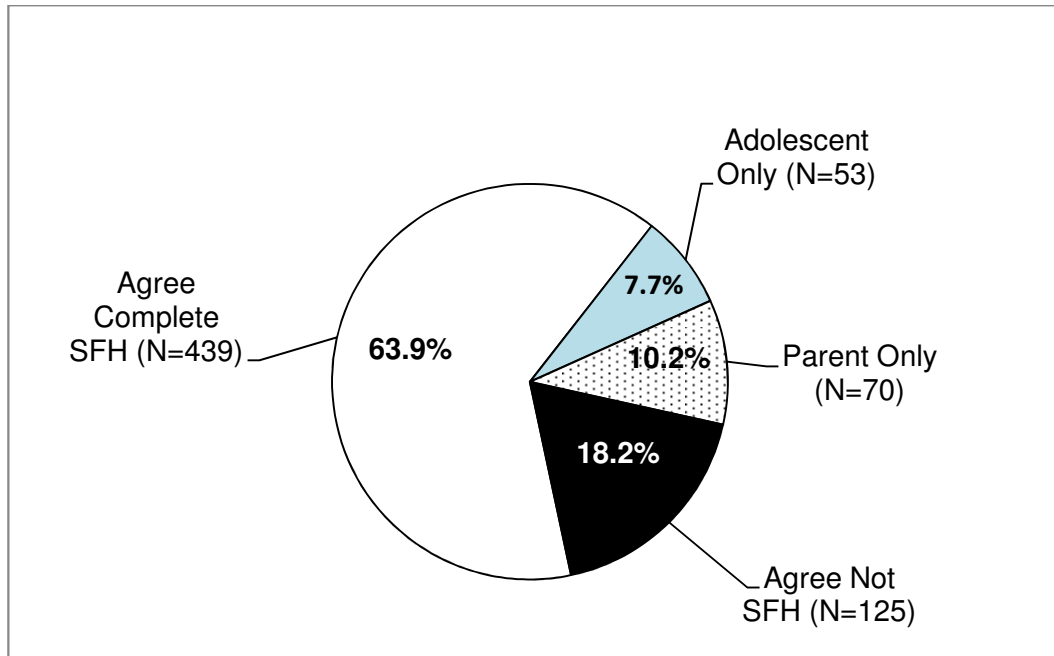


Figure 1.1 Parent and adolescent concordant and discordant report of a smoke-free home (SFH) (N=687)

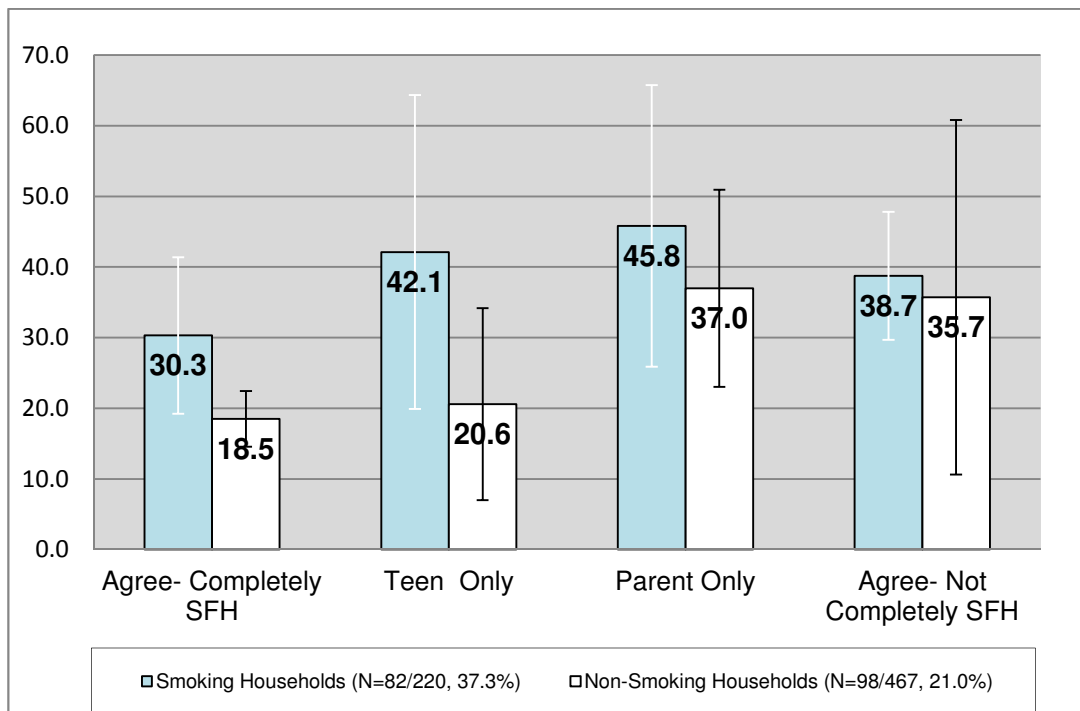


Figure 1.2 Adolescent smoking initiation by 2007-08 and dyad report of smoke-free home (SFH) by household smoking (N=687)

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Research Paper II:

Parent and child assessment youth smoking risk, anti-tobacco beliefs and longitudinal smoking initiation

ABSTRACT

Objective: To test the influence of parent and child concordance of youth smoking risk on future initiation.

Methods: A national sample of families with an oldest child aged 10-13 years (n=1036) were identified using random digit dialing. Dyads completed baseline questionnaires in 2003 including questions on general and tobacco-specific parenting. Adolescents reported smoking status in 2007-08 (response rate 74%). Multivariate regression explores associations with later smoking initiation.

Results: At baseline, 57.6% of dyads were concordant that the child was not at-risk to smoke and 6.8% that the child was at-risk. For discordant reports, more adolescents reported risk (29.9%) than did parents (5.6%) and both were independent predictors of future smoking initiation (parent: OR=2.3, 95%CI:1.3-3.9; child: OR=2.0, 95%CI:1.3-3.0). Concordance that the child was at risk increased later initiation fourfold over concordance that the child was not at risk (OR=4.1, 95%CI: 2.0-8.5), however, any report of risk was predictive of future initiation. Concordance that child was at risk at baseline was strongly associated with the self-reported anti-tobacco beliefs scale ($\alpha=0.53$). A linear relationship was observed between the number of anti-tobacco beliefs and agreement youth were not-at risk (OR=1.5, 95%CI:1.2-1.8). In a sensitivity analysis adolescents reporting ≥ 3 anti-tobacco beliefs were twice as likely to agree with their parents that they were not at-risk (OR=2.0, 95%CI:1.3-3.2).

Conclusion: Parents belief that their child is not at-risk for smoking reduces future smoking initiation, particularly when parents and children are in agreement. There is preliminary evidence for a youth anti-smoking belief scale, validation studies are needed.

INTRODUCTION:

Preventing non-smoking youth from ever initiating is a major public health concern. (1) Youth who self-report being susceptible to using tobacco are more likely to initiate smoking compared to those who are committed to never smoking. (2, 3) There is some evidence that parent evaluation of their child's risk for future smoking has added predictive power over and above the child's self report. (4) Even when a child reported smoking, a parent belief that they had not smoked was associated with a lower smoking rate two years later. (4, 5) Clarification about the relationship between parent and child concordance and discordance about adolescent smoking risk and future smoking behavior is needed.

If agreement that a child is not at-risk for smoking is protective against future smoking, it would be important to understand the factors that facilitate dyad agreement. Youth's anti-tobacco beliefs as well as tobacco-specific and general protective parenting practices (6) may increase parent and child agreement that a child is not at-risk for smoking; setting a protective stage against future smoking. Predictors of parent and child agreement may mitigate the need for both parent and child report in health studies, as these studies are costly, challenging from a cohort maintenance perspective, and time-consuming.

This study builds upon Yang et al.'s (2006) (4) work by seeking to confirm relationships found between parent and child concordant and discordant report of youth smoking risk and future smoking initiation in a longitudinal national sample of non-smoking children and their parents. Secondary analysis explores for evidence of a youth anti-tobacco beliefs scale and examines associations with concordant report of dyad youth smoking risk assessment.

METHODS:

Selection and Description of Participants:

Respondents to a 2003 national random-digit-dialed survey, oversampled for African Americans, with an oldest child between the ages of nine and 13 were enrolled in a National Cancer Institute (NCI) funded project (N=1036). (7) Eligible respondents to a random survey of the US population were sent letters inviting them to participate in a longitudinal study focusing on the influence of parenting and early socialization on adolescent problem behavior, the protocol for which has been published. (7) The resulting sample closely reflected a similarly aged pre-teens in the US national population on gender, race-ethnicity and education (N=1036). The study asked for volunteers willing to commit to a relatively intensive contact schedule over multiple years and it appears this was not too attractive to parents with teens who were likely to be at the higher end of the risk continuum. Parent and child completed baseline surveys between May 2003 and October 2004, followed by five additional adolescent surveys, at approximately one year intervals. A 2007-08 youth follow-up survey was funded by the American Legacy Foundation (2007-2008) when adolescents were an average age of 15.7 years. Participants received small incentives for completing each survey. Approximately 73.3% of baseline never smokers completed the fifth survey (N=704). The 31 respondents with missing data were minimal (<5%) and excluded from the analysis. In this paper, we consider the 673 adolescents baseline never smokers and their corresponding parents with complete data for the variables of interest for the baseline and 2007-08 surveys.

Measures:

Smoking Status: Standard questions about youth smoking were asked of all youth. A “no” to both “Have you ever smoked a cigarette?” and “Have you ever tried or

experimented with cigarette smoking, even a few puffs” indicated never smokers.

Smoking initiation was indicated by an affirmative response. (6, 8, 9)

Adolescent Risk for Smoking: Committed never smoker answered “Definitely not” to all four questions regarding future smoking behavior: 1) “Do you think in the future you might experiment with cigarettes?”, 2) “If one of your best friends were to offer you a cigarette, would you smoke it?”, 3) “At any time during the next year do you think you will smoke a cigarette?” and 4) “Have you ever been curious about smoking a cigarette?”; else adolescents were considered susceptible to smoking (at-risk).

Parent report of adolescent risk was assessed with the question “As far as you know, has your child ever smoked a cigarette?” (6) Parent belief that the child was not at-risk was determined by the “confident child hasn’t smoked” response and all other responses were considered “at-risk” for smoking.

Concordance about Youth Smoking Risk: Parent and youth (dyad) report of child smoking risk were cross-classified. Dyads were considered to agree the child was not at risk if the adolescent was a committed never smoker and the parent was confident that their child has not smoked, else they were considered at-risk. The at-risk group was further classified into three categories: (1) dyad agreement that the child is at-risk, (2) parent only and (3) child only report of risk.

Exposure to other Smokers: An affirmative response to the question “Have any people that you live with now smoked cigarettes in the last year?” indicated household smoking, else the household was considered a non-smoking household. (9) Parents and adolescents responded to the question “What are the rules about cigarette smoking in your household, if any?” Responses were dichotomized as completely smoke-free or not smoke-free. (6) Peer smoking was explored with the question “How many of your best friends smoke?” Responses other than “none”

indicated peer smoking. (6) Adolescents indicated the presence or absence of a rule against smoking on school property. Exposure in the home was further assessed by exploring home smoking restrictions.

Adolescent Tobacco-Related Beliefs: Adolescents either agreed or disagreed to the following questions: (1) “I strongly dislike being around people who are smoking”, (2) “Seeing someone smoking turns me off”, (3) “I could put up with smoking if I really liked a person”, (4) “I personally don’t mind being around people who are smoking”, (6) Items 3 and 4 were reverse coded and all items were summed into a single scale, which is discussed in the results.

Anti-Tobacco Parenting Practices: Adolescent’s responded to the question “If your parents found you smoking, how would they react?” Responses were dichotomized into: 1) have a strong reaction and tell to stop and 2) less strong reactions. (6) Youth responded yes or no to a series of questions regarding whether or not their parents had: discussed tobacco in the last year, had consequences for smoking, rewards for not smoking, and if their parents would mind if child smokes when older. (6) Responses were summed into a scale, however, limited evidence was found for a scale ($\alpha=0.29$), thus individual items were included in the model.

Tobacco-Receptivity: Adolescents self-reported favorite tobacco-brand as well as their willingness to use a promotional item. (10-12)

General Parenting: Adolescents’ self-reported closeness with both parents. A response of extremely close indicated the highest level of closeness, while all other responses were considered less close. (13) Limit setting was assessed using a series of questions from Steinberg’s Strictness/Supervision Scale regarding the latest time allowed out during school nights and on weekends. (14, 15) Responses were dichotomized into less than 14 hours a week or 14 or more hours a week of

unsupervised free time. Unsupervised free time was also dichotomized into being allowed out before 10 pm or 10 pm or later on school nights. Parents responded yes or no to a series of questions about their child's Internet and media use, including access in the home, access in child's bedroom, parental monitoring of certain internet sites and limits on the number of hours a child can engage with media during their free time.

Additional Variables: Parents and adolescents responded to standard demographic questions. Single parent households were identified from the parent interview in response to the question. "Do you have a spouse or partner who lives with you?" (6) If the parent reported no spouse or identified the spouse as not being a biological or adoptive parent of the adolescent, parents were then asked if the child has "another parent who lives elsewhere?" in order to identify the existence of a second home. Household income was requested in \$10,000 intervals. (6) Parental care-giver's education was determined by the question "What is the highest grade of regular school or college you have completed?" (6) Parents reported youths school performance which was dichotomized into All/Mostly A's, B's and C's, or D's or F's. (6)

Statistical Analysis:

Analyses were performed with SAS statistical software version, version 9.3 (16). Descriptive statistics explore all data. T-tests assess significant differences for continuous and Pearson chi-square assess categorical variables. Simple and multivariate logistic regression explore for relationships between baseline data and adolescent smoking experimentation at survey five.

RESULTS:

Population Characteristics: In 2003-04, adolescent never smokers and their corresponding parent completed baseline surveys (N=673). Half of pre-adolescents were female. Two thirds were age 12-13 (68.5%) and one third 10-11 years. One-third reported minority backgrounds (33.4%). Nearly two-thirds of adolescents self-reported as committed never smokers (63.3%). One-third of the households contained smokers. Just over half of parents reported that their children received mostly A grades (54.5%), while 36.3% received mainly B's or C's and 5.6% received some D's or F's; a further 3.6% were homeschooled or not enrolled. Participating parents were overwhelmingly female (82.8%) and the majority were between the ages of 30-45 (78.8%). Nearly 80% were members of two-parent households (79.9%). One quarter of participating parents (28.2%) reported being smokers. Household income ranged between less than \$20,000 (6.7%), \$20,000-50,000 (31.4%), \$50,001-100,000 (42.9%) and \$100,000+ (19%).

Parent and Child Independent Report of Youth Smoking Risk: Overall, 426 (63.3%) adolescents reported being committed never smokers (not at-risk) and 247 reported being susceptible or at-risk to smoke (36.7%). Compared to the child's self-report, parents were less likely to report their child was at-risk for smoking (n=84, 12.5%) and more likely to report the child was not at-risk (e.g. would definitely not smoke) (n=589, 87.5%) ($p < 0.001$).

Table 2.1 presents a fully-adjusted logistic regression model predicting later adolescent smoking initiation. At baseline, both parent report that child was at risk (OR=2.3, 95% C.I.:1.3-3.9) and child self-reported susceptibility (OR=2.0, 95% C.I.:1.3-3.0) were independently associated with a twofold increase in smoking

initiation in 2007-08. Although few children reported having smoking best friends at baseline, those who did were by four times more likely to initiate by follow-up (OR=4.0, 95%C.I.:2.2-7.4). School performance at baseline was also strongly associated with later initiation. Compared to those whose parents reported that they received mostly A grades, those reported to have D's and F's grades were six-fold more likely to initiate by follow-up (OR=6.4, 95%C.I.: 2.8-14.4) whereas those reported to receive B's and C's were seventy percent more likely to initiate OR=1.7, 95%C.I.:1.1-2.5). Being allowed out later than ten on school nights doubled initiation by follow-up (OR=2.0, 95%C.I.:1.3-3.3). Parents who questioned child about peers who smoked was associated with a 30% reduction in initiation (OR=0.7, 95%C.I.: 0.4-1.0).

[Table 2.1]

Combined Dyad Assessment of Adolescent Baseline Smoking Risk: Parent and child report of youth risk for smoking is presented in Table 2.2 Over half of parents and children agreed that the youth was not at-risk for smoking (N=388, 57.6%). In contrast, only 6.8% (N=46) agreed the adolescent was at-risk. Thus, for 35.5% (N=239) of the sample, the dyads report was discordant. When disagreement occurred, adolescents more frequently reported risk (29.9%, N=201), compared to the parent (5.6%, N=38).

[Table 2.2]

Joint Parent and Adolescent Smoking Risk Measure: Adolescent initiation by follow-up was lowest when dyads at baseline agreed the child was not at-risk for smoking (16.5%), compared to each of the other dyad risk categories (Figure 2.1).

Initiation was highest among those who agreed the child was at-risk (56.5%) which was four times higher in the adjusted analysis (OR=4.1, 95%CI: 2.0-8.5). When the parent but not the child report risk at baseline, the probability of initiation increased threefold (OR=2.7, 95%CI:1.2-5.7). When the adolescent but not the parent reported risk the probability of initiation increased twofold (OR=2.1, 95%CI=1.3-3.3).

[Figure 2.1]

Reliability of Youth Anti-Tobacco Related Beliefs Items: The youth anti-tobacco related beliefs scale consisted of four items ($\alpha=0.53$). Individual total item correlation coefficients ranged from 0.26-0.39. Table 2.3 presents the inter-item correlations. All items were significantly and positively correlated with one another, ranging from 0.14 and 0.30. The medium sized correlations suggest these items are tapping into shared aspects of what is labeled smoking beliefs.

[Table 2.3]

Youth Anti-tobacco Beliefs and Dyad Agreement that the Child is Not At-Risk

for Smoking: There were 639 dyads with complete data for all of the predictors of dyad agreement (5% missing). A one unit increase in the youth anti-tobacco belief scale was associated with a 50% increase in concordance that the child was not at-risk for smoking (OR=1.5, 95%CI:1.2-1.8), adjusting for covariates (Table 2.4). A sensitivity analysis indicated when adolescents reported at least three of the four anti-tobacco beliefs (81.7%), dyads were even more likely to agree that the child was not at-risk for smoking (OR=2.0, 95%CI:1.3-3.2), compared to dyads where the adolescent reported fewer than three anti-tobacco beliefs (18.3%), adjusting for covariates. Other variables associated with reported risk included: Families without home smoking restrictions were 40% less likely to agree the child was not at-risk

(OR=0.6, 95%C.I.:0.4-0.9); When parenting did not include limiting free time to less than 14 hours a week dyads were 30% less likely to agree the child was not-at risk for smoking (OR=0.7, 95%C.I.:0.5-1.0). When parents offering child a reward for not smoking, dyads were more likely to agree that child was not at risk (OR=1.7, 95%C.I.:1.0-2.9).

[Table 2.4]

DISCUSSION:

In this longitudinal study we confirm the hypothesis that both parent and child reporting of child's risk for future smoking offer independent information on the probability of future initiation. The evidence is particularly strong when parents and children are in agreement. As expected, smoking initiation was lowest when dyads agreed that the child was at minimum-risk for smoking, and highest among dyads concurred that the child was at-risk. However, over one-third of parent and adolescent dyads were not in agreement about youth smoking risk and this was associated with a probability of initiation that was in-between that of the two concordant groups. Parents appeared to have a bias toward reporting that the child was at low risk and it may be that was associated with actions that reduced adolescent probability of initiating, even when the teen reported being susceptible. When the parent reported the child was at risk, the probability of initiation was much higher. There is some evidence to suggest that parents may use the child's expressed tobacco beliefs when making a judgment of the child's smoking risk.

This study agrees with previous work indicating that parents are likely to underestimate their child's risk behaviors, compared to the child's own report. (4, 5, 17, 18) Our study observed that only 18.6% of parents of susceptible youth identified them as being at-risk for smoking (Table 2), about half the rate that was previously

found by Kodl et al. (2004) who found that 36% of parents of regular smokers identified them as such. (5)

These results expand upon the findings of Yang et al.'s (2006) where parent-child concordance that child was not a smoker was associated with half the smoking prevalence two years later than when the parent reported the child as a possible smoker. (4) In our study, committed never smokers whose parents reported that they were at-risk for smoking were 2.7 times more likely to initiate smoking by the end of the study, in comparison to adolescents in dyads who agreed the child was not at-risk. However, our results signify that parent's indication of youth smoking risk was predictive of four times increased smoking initiation when the child was susceptible to smoking and over twice as much future initiation when the child was a committed never smoker, compared to dyads who were in agreement that the child was not at-risk for smoking.

As agreement that the child is not at-risk for smoking is predictive of less of long-term smoking initiation in this national population, measuring and variables associated with concordance could open new avenues for intervention studies. A variety of anti-tobacco socializations were associated with agreement the child was not at-risk for smoking. Youth's anti-tobacco beliefs appeared particularly useful in assessing agreement about risk. There was a linear relationship between the number of anti-tobacco beliefs a youth reported and agreeing that the child was not at-risk for smoking. A one unit increase in the scale was associated with 50% more agreement that the child was not at-risk by 50%. These results were even stronger when adolescents reported at least three anti-tobacco beliefs, doubling the odds of agreeing the child was not at risk compared to those reporting fewer than three. It appears the more anti-tobacco beliefs a youth reported, the stronger the observed

relationship with risk agreement. It is likely that these beliefs were implicated in the effect of the California Tobacco Control Programs in reducing adolescent initiation. (19, 20) Having smoke-free homes and rewards for not smoking were associated with higher levels of agreement the child was not at-risk and increased unsupervised free time was associated with decreased risk agreement. The hypothesis that more is better (in terms of quantity, consistency and variety of sources) in youth's anti-tobacco beliefs, can applied to anti-tobacco socialization in general: The greater number of anti-tobacco socialization/messages from a variety of different reliable sources a child is exposed to and interacts with, the more salient the impact on smoking beliefs and behaviors. In contrast, when tobacco-related socialization is conflicting, the ambiguity may increase youth's risk for smoking.

While in this study anti-tobacco-related beliefs were predictive of dyad agreement that a child was not at-risk for smoking, the measure was not associated with increased smoking initiation when included in the multivariate model (OR=1.1 95%C.I.:0.8-2.0). Instead, the inclusion of youth's anti-tobacco beliefs in the model increases the strength of the association between agreement the child was at-risk and adolescent smoking initiation (OR=4.3, 95%C.I.:2.0-9.2). No evidence was found for an interaction or confounding between youth anti-tobacco beliefs and dyad agreement the child was not at-risk and future smoking initiation. It is plausible that youth's anti-tobacco beliefs provide additional information which parents use in their assessments about children's risk for tobacco. If youth's anti-tobacco beliefs (or other youth report) can account for dyad agreement about smoking risk, then parent report may not be needed to predict increased risk. However, the current study was unable to demonstrate a suitable substitute for parent and child agreement. Larger longitudinal studies assessing both parents and teens are necessary to help

determine which, if any, youth-reported anti-tobacco socializations, beliefs or practices are enough to get at adolescent susceptibility so that only one reporter (most likely the child) is enough.

Tobacco-specific and general protective parenting may support and reinforce one another; working together to create an environment that is protective against smoking initiation. It is probable that the number and diversity of anti-tobacco and generally protective socialization that occurs impacts youth's tobacco related beliefs and behaviors. Parent's belief about their child's risk for smoking may be in itself predictive of future smoking, resulting in a sort of self-fulfilling prophecy, where expectations are set by parents, internalized and then acted upon by youth. (21)

This study was part of a longitudinal study consisting of parent and adolescent dyads with an oldest child between the age of 10 and 13 at baseline. We observed lower rates of initiation compared to other national samples. (22) Youth who completed the study were likely already at decreased risk for smoking compared to the general U.S. population thus not necessarily generalizable. However, significant results were still observed. Major strength of the project include: the longitudinal design, national sample, high retention rate over five surveys. Due to the comprehensiveness of the study, we were able to test for a variety of tobacco-related attitudes, practices and beliefs. This including testing for reliability and efficacy of a youth anti-tobacco beliefs scale which was associated with parent and child agreement about youth risk for smoking. In conclusion, there is longitudinal evidence that parent's assessment of youth smoking risk predicts future smoking behavior, particularly when parents and children are in agreement that the youth is not-at risk for smoking. Increasing concordance appears to be an important tool to reduce future smoking initiation. There is support for the reliability and efficacy of a youth anti-

tobacco belief scale, to predict parent and adolescent concordance that a child is not at-risk for smoking. Further, a number of anti-tobacco and generally protective parenting practices appear to increase concordance that a child is not at-risk for smoking. Public health campaigns and parents should focus on increasing anti-tobacco related socialization, including parent and child agreement about an adolescents' risk for future smoking in an effort to prevent future smoking behaviors. There is a need for longitudinal studies of parent and child dyads.

Implications and Contribution: This study provides evidence that parent and adolescent concordance that an adolescent is not at-risk for smoking is protective against future initiation. We provide evidence for the reliability and efficacy of an anti-tobacco beliefs scale that is predictive of concordant report of smoking risk.

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Tables

Table 2.1 Adjusted Logistic Regression Model Baseline Variables Predicting Adolescent Initiation in 2007-08, Among Baseline Never Smokers ¹

2003-2004 Variables	Adolescent Initiation by 2007-08			
	Initiators/Total 172/673	Initiated 25.6%	OR	95% CI
School Performance				
All or Mostly A's (ref)	69/391	17.7	1	-
Mostly B's or C's	78/244	32.0	1.7*	(1.1-2.5)
Some D's or F's	25/38	65.8	6.4****	(2.8-14.4)
Best Friend Smoking				
No Best Friends Smoke (ref)	136/613	22.2	1	-
All Other responses	36/60	60.0	4.0****	(2.2-7.4)
How late can adolescent stay out on school nights				
Prior to 10 pm	124/549	22.6	1	-
10 pm or later	48/124	38.7	2.0**	(1.3-3.3)
Parents Ask if Friends Smoke When they are Together				
Parents ask (ref)	77/232	33.2	1	-
Parents do not ask	95/441	21.5	0.7*	(0.4-1.0)
Youth Reported Susceptibility Risk				
Committed Never	79/426	18.5	1	-
Susceptible Never	93/247	37.7	2.0**	(1.3-3.0)
Parent Estimation of Adolescent Baseline Smoking				
Child has Definitely Not Smoked/Not at-Risk	131/589	22.2	1	-
Believes Child is at Risk	41/84	48.8	2.3**	(1.3-3.9)

Hosmer and Lemeshow Goodness of Fit Chi Square=3.7137, df=8, p-value= 0.8820

*p<0.05, **p<0.01, ***p<0.001, ****<0.0001

¹Model adjusts for demographics, consequences for smoking, parents reaction to smoking, household smoking, parent and child agreement smoke-free homes.

CI=confidence Interval; OR=odds ratio

Table 2.2 Parent and Adolescent Report of Adolescent Risk for Smoking Beliefs (N=673)

Adolescent Variables	Parent Variable				Adolescent Report Totals	
	Youth is Not At-Risk		Youth is At-Risk		N	%
	N	%	N	%		
Non-Susceptible	388	57.6	38	5.7	426	63.3
Susceptible	201	29.9	46	6.8	247	36.7
Parent Report Total:	589	87.5	84	12.5	673	100.0

*Pearson Chi Square analysis indicates there are significant differences in Parent and Child Report of Home Smoking Restrictions at baseline, among baseline adolescent never smokers ($p < 0.001$)

Table 2.3 Correlation Matrix for the Youth Anti-Tobacco Beliefs Scale Items

#	Item	1	2	3	4
1	I strongly dislike being around people who are smoking	---			
2	Seeing someone smoking turns me off	0.27****	---		
3	I could put up with smoking if I really liked a person ¹	0.14***	0.15***	---	
4	When I'm older, my parents won't mind if I smoke ¹	0.30****	0.24****	0.26****	---

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$, **** $p < 0.0001$

Table 2.4 Associations with parent and child concordance that the child was not at-risk for smoking in 2003-04 (N=639, Missing Responses=34)¹

Youth Reported Variables	Agree No Risk/ Total 366/639	Percent (%) 57.0	OR	CI
Home Smoking Restrictions				
Complete (ref)	264/408	64.7	1	-
All Other responses**	102/231	44.2	0.6	(0.4-0.9)
Unsupervised Free Time During the Week				
<14 Hours a week	250/407	61.4	1	-
≥14 Hours a week†	116/232	50.0	0.7	(0.5-1.0)
Close Mom				
Close (ref)	343/594	57.7	1	-
Not close	23/45	51.1	0.9	(0.5-1.8)
Close Dad				
Close (ref)	310/518	59.9	1	-
Not Close	56/121	46.3	0.8	(0.5-1.2)
Parent report of child's Internet access in bedroom				
No Access in bedroom (ref)	262/424	61.8	1	-
Access in bedroom	31/63	49.2	1.5	(0.8-2.7)
No Access in home	73/152	48.0	0.9	(0.5-1.7)
Parents have discussed tobacco use				
Not Discussed	118/192	61.5	1	-
Discussed	248/447	55.5	0.7	(0.5-1.1)
Parents have a reward for not smoking				
No reward	309/550	56.2	1	-
reward†	57/89	64.0	1.7	(1.0-2.9)
Parents have consequences for smoking				
No consequences	135/226	59.7	1	-
Consequences	231/413	55.9	0.8	(0.5-1.1)
Parent Reaction to smoking				
Less strong (ref)	17/41	41.7	1	-
Strongly Against	349/598	58.4	1.41	(0.7-2.9)
Youth Anti-Tobacco Beliefs****				
Number of Anti-Tobacco Beliefs (0-4)	Mean	33	1.5	(1.2-1.8)

Hosmer and Lemeshow Goodness of Fit Chi Square=6.8359, df=8, p-value=0.5544

¹Model adjusting for demographics, school performance, as well as best friend and household smoking.

OR=odds ratio, CI=Confidence Interval

†p<0.1, *p<0.05, **p<0.01, ***p<0.001, ****<0.0001

Figures

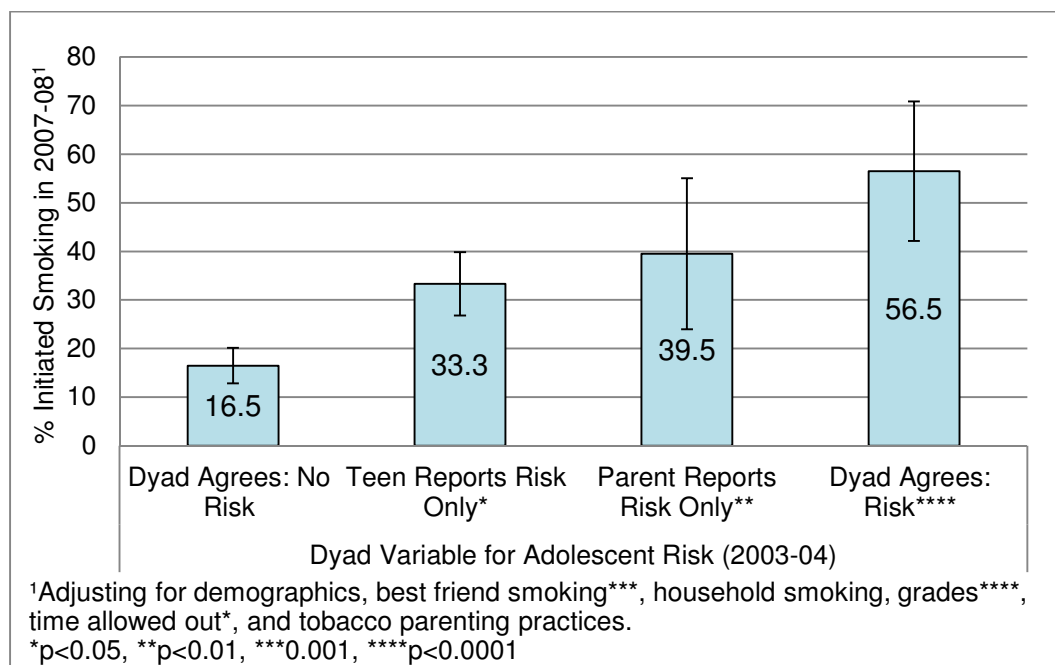


Figure 2.1 Parent and child agreement about child smoking risk in 2003-04 and adolescent smoking initiation in 2007-08 (N=673)

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Research Paper III:

Favorite tobacco control and tobacco industry advertisements and adolescent
smoking initiation

ABSTRACT

Background: Tobacco industry marketing is associated with increased adolescent smoking, while counter-tobacco advertising has been associated with reduced smoking. As these campaigns compete for influence, there is a need to understand their inter-relationship on youth smoking.

Methods: This study reports data from a national population of families (n=1036) with an oldest child aged 10-13 years, identified by random digit dialing. Parent child dyads completed a baseline questionnaire in 2003. Adolescents were re-surveyed in 2007-08 (response rate 74%). Adjusted logistic regression explores associations between favorite tobacco industry and tobacco control advertising and adolescent smoking initiation.

Results: Favorite tobacco industry advertising was associated with a 55% increase in later smoking initiation. Over 60% of adolescents who reported a favorite cigarette advertisement at age 10-13 years did so again 4 years later. In 2007-08, 58% of adolescents reported a favorite tobacco control advertisement and 43.3% reported a favorite cigarette advertisement. Thirty percent reported both favorite tobacco industry and tobacco control advertisements. Compared to having only a favorite tobacco industry advertisement, having only a favorite tobacco control advertisement reduced initiation by 63% (OR: 0.4, 95%C.I.: 0.2-0.7). Those with a favorite advertisement from both sides appeared to have an initiation rate midway between.

Conclusions: One third of this national sample was receptive to both tobacco industry and tobacco control advertising. Receptivity to tobacco control advertising appeared to ameliorate the promotion of initiation from the tobacco industry advertising. A larger longitudinal study is needed to confirm this finding.

INTRODUCTION:

There is a substantial body of evidence from which the National Cancer Institute has concluded that tobacco industry marketing is causally associated with increases in youth smoking. (1, 2) Restrictions in marketing and the conduct of large scale tobacco control media campaigns, such as those which occurred in California in the 1990s, have been associated with a major reduction in youth initiation. (3, 4) To date, no one has explored the comparative influence on population initiation of receptivity to tobacco industry or tobacco control advertising.

Despite restrictions on tobacco advertising included in the 1998 Master Settlement Agreement (MSA) following attorneys general legal action against the major tobacco companies, (1, 5) the tobacco industry was able to change their marketing practices (6) and continue to reach and appeal to adolescents, particularly through magazines with high youth readership, (7-9) as well as point-of-purchase sale promotions and price discounting. (10)

From advertising placement data, Wakefield et al. (2012) noted that tobacco industry advertising often appeared to be targeted to counterbalance a strong tobacco control campaign. (11) Few studies have investigated how the effect of competing media campaigns works to influence future smoking behavior. Two separate studies have noted that the competing campaigns seem to have independent effects on smoking cognitions, (12, 13) but neither identified that the tobacco control messages effectively countered tobacco brand advertising. Evans et al. (1995) noted the importance of affect in teen response to tobacco advertising (14) and follow-up studies have shown that teens reporting a favorite cigarette advertisement have consistently been associated with later smoking. (8, 15, 16)

However, a similar measure has not yet been investigated for receptivity to tobacco control advertising. In this study we use a multi-wave longitudinal study of a national sample of United States adolescents to explore how receptivity to pro and con tobacco advertising may influence later smoking behavior. We hypothesize that adolescents who have a favorite tobacco control message but decline to nominate a favorite cigarette advertisement will be least likely to start smoking in the future. Conversely, those with a favorite cigarette advertisement but no favorite tobacco control advertisement will be most likely to initiate smoking. Should the impact of the receptivity be independent, then we would predict that teens who have both a favorite cigarette advertisement as well as a favorite tobacco control advertisement would have a later initiation rate that is equidistant between these earlier two measures. Finally, we hypothesize that those who have neither a favorite antismoking advertisement nor a favorite cigarette advertisement will have a higher initiation rate than those who are receptive to tobacco control but lower than those who are only receptive to cigarette advertising.

METHODS:

Selection and Description of Participants:

In 2003, a random digit dialed national probability sample, oversampled for African Americans, identified families with an oldest child aged 10-13 years. Letters were sent to parents inviting them to participate in a parenting study, the protocol for which is published elsewhere. (17) In 2003-04, baseline surveys were completed with both the child and the parent who self-identified as having most responsibility for the child (N=1036). The resulting sample closely reflected a similarly aged U.S. national population on gender, race-ethnicity and education and slightly over-represented

youth living in two-parent households. Multiple surveys were completed during the study including an adolescent survey in 2007-08. The study sample includes all children who were never smokers at baseline who had complete data at follow-up. Response rate to this follow-up was 73% and a further 2% had key data that was missing from one of the surveys. Thus the population for analysis was 688 and mean age was 15.7 years.

Measures

Receptivity to Tobacco Related Media: Following previous research (8,14,15) at each survey adolescents responded to “What is the brand of your favorite cigarette advertisement?” Responses were categorized into a binary variable where receptive adolescents were those who nominated a cigarette brand. A similar strategy was used to determine receptivity to tobacco control advertising in the 2007-8 survey starting with the question “What is your favorite ad against smoking?” (18) For 2007-8, we classified respondents into the following four categories 1) those with only a favorite tobacco industry cigarette advertisement, 2) those with only a favorite tobacco control advertisement, or 3) those who reported both a favorite tobacco control and tobacco industry brand advertisement and finally 4) those without any favorite advertisement relating to tobacco.

Smoking Status: Standard questions used in national surveys were used to elicit adolescent smoking status on each survey. (18) Never smokers responded negatively to the following two questions: “Have you ever smoked a cigarette?” and “Have you ever tried or experimented with cigarette smoking, even a few puffs?” An affirmative response to either question indicated that smoking had been initiated.

Exposure to other Smokers: Peer group smoking was assessed on the adolescent questionnaire from the question “How many of your best friends smoke?” Responses other than “none” were considered to have best friends who smoke. Smoking in the household was determined by a positive response on the parent baseline questionnaire to the following question “Have any people that you live with now smoked cigarettes in the last year?” (18, 19)

Smoke-free Homes: At baseline, parents were asked “What are the rules about cigarette smoking in your household, if any? Would you say...a) no one can ever smoke inside your home, b) usually no one can smoke inside your home, c) adults can smoke but only in certain rooms, d) only children can’t smoke inside your home, e) there are no restrictions on smoking, f) there are no rules because no one smokes, or g) something else.” Responses of a) or f) indicated the home was smoke-free. (18)

Other Variables: Standard questions regarding age and gender were asked of all participants. Household income was requested in \$10,000 intervals from the parent. (18) Parental caregiver’s education was determined by the question “What is the highest grade of regular school or college you have completed?” (18) School performance was assessed by parental response to the question “How would you describe (child’s name’s) school performance? Would you say his/her grades have been...a) All A’s, b) mostly A’s, c) Mostly B’s, some C’s but never a D, d) some D’s but never an F, or e) some F’s”. (18)

Statistical Analysis

All analyses were performed using SAS statistical software version 9.3 (20). Exploratory data analysis was undertaken using t-tests and Pearson chi-square as appropriate. Longitudinal and cross-sectional logistic regression explores the

relationship between recall of favorite tobacco advertisements and adolescent cigarette experimentation at survey five, adjusting for covariates at the parent and adolescent baseline surveys.

RESULTS

Population Characteristics: Table 3.1 presents baseline characteristics for adolescent baseline never initiators who completed the fifth survey, as well as corresponding parents (N=688 dyads). Half were female (50.4%). The majority of adolescents were between the ages of 12 and 13 (68.5%) at baseline. Just over one-third of adolescent never smokers were susceptible to smoking at baseline (36.8%). The majority of adolescents were white (66.7%) and came from non-smoking households (68%). Half of parents reported their child received mostly A grades (53.8%), 37% reported B's and C's and only a small proportion received D's or F's (5.7%) or were homeschooled/not enrolled (3.5%). For most dyads the participating parent was: female (82.9%) and a high school graduate (76.9%) with 80% living with a partner (80.1%). Combined household income was generally between 20,000 and 100,000 per year (74.1%).

[Table 3.1]

Baseline Predictors of Adolescent Smoking Initiation: Overall, 25.4% (N=175) of adolescents reported initiating smoking by 2007-08. Baseline variables associated with initiation (Table 3.2) included: best friend smoking (OR=4.5, 95%C.I.: 2.5-8.2), home smoking restrictions (OR=1.6, 95%C.I.:1.0-2.4), less than high school educated parent (OR=1.6, 95%C.I.:1.0-2.5). School performance was also a major variable. Compared to students who received A grades, those with a grade of B or C were

87% more likely to initiate (OR=1.9 95%C.I.: 1.2-2.8) and those with D or F grades were seven times more likely to start smoking (OR=7.6, 95%C.I.: 3.5-16.4).

Controlling for all these variables, children who reported having a favorite cigarette advertisement were 55% more likely to have started to smoke by 2007-8. (OR=1.6, 95%C.I.:1.0-2.3)

[Table 3.2]

Stability of having a favorite Cigarette Advertisement: Two-thirds of adolescents (62.3%) who reported having a favorite cigarette advertisement in 2003-04 also reported that they had a favorite cigarette advertisement in 2007-08. After adjusting for covariates, they were over three times more likely to report a favorite cigarette brand in 2007-8 than those who did not report a favorite brand at baseline (OR=3.2, 95%C.I.:2.3-4.5) (Table 3.3).

[Table 3.3]

Distribution of Tobacco-related advertising preferences: In 2007-08, 43.1% of adolescents reported a favorite tobacco industry ad and 57.3% reported having a favorite tobacco control ad (Figure 3.1). Only 13.2% reported only having a favorite tobacco industry ad. There were 28% who had only a favorite tobacco advertisement, 30% who reported both a favorite cigarette industry advertisement and a favorite tobacco control advertisement, and 29% who did not have a favorite advertisement from either side.

[Figure 3.1]

We report the relationship of this combined variable to current smoking status (figure 3.2). Of those who nominated only a favorite cigarette advertisement, 40% had already initiated smoking. At the other extreme, 17% of those who only recalled a tobacco control advertisement had started to smoke. Among those who did not nominate any tobacco-related favorite, only 23% had started to smoke. Whereas 29% had started to smoke from the group who had both a favorite cigarette advertisement and a favorite tobacco control advertisement. Adjusted for covariates, compared to the 13% who only had a favorite cigarette advertisement, those who had only a favorite tobacco control advertisement were much less likely to have started to smoke (OR: 0.4, 95%C.I.: 0.2-0.7). For adolescents with both a favorite cigarette advertisement and a favorite tobacco control advertisement, initiation rates were approximately midway between those who only reported a tobacco industry and those who only reported a tobacco control advertisement (OR=0.7, 95%C.I.: 0.4-1.2), although this did not reach statistical significance. Adolescents reporting neither a favorite cigarette or tobacco control ad were about 50% less likely to initiate smoking than those with only a favorite cigarette advertisement (OR=0.5, 95%C.I.:0.3-0.9).

[Figure 3.2]

DISCUSSION

This study provides evidence for a four-level comparative measure of pro- and anti-tobacco ad receptivity (no favorite ad, cigarette ad only, tobacco control ad only, and both pro- and anti-tobacco). Using this measure, we confirm the hypotheses that (1) adolescents who nominated only a cigarette advertisement are most likely to initiate smoking, while (2) those solely nominating a favorite tobacco control advertisement are least likely to initiate smoking, in our national sample. Further, we

support the hypothesis that youth in our population who reported both a favorite tobacco control and favorite cigarette advertisement have intermediate initiation rates compared to those reporting only favorite cigarette or tobacco control ads. Similarly, adolescents with no favorite tobacco advertisement reported smoking initiation at lower rates than those with a favorite cigarette advertisement, but higher than those with a favorite tobacco control advertisement.

In the US, decreases in adolescent smoking prevalence and increased anti-tobacco sentiment have been observed in locations with strong tobacco control programs.(1) The California Tobacco Control Program was among the first and most successful and has been associated with decreases in youth smoking prevalence compared to the rest of the US. (3, 4) Similarly, Florida's and the national Truth® campaign are associated with increased anti-tobacco sentiment (21) and reduced youth smoking prevalence. (22, 23) Two studies exploring the joint influence of cigarette and tobacco control advertising both concluded that while tobacco control advertising has an independent impact on youth behavior, there was not evidence to support a mitigating influence on tobacco industry advertising. (12, 13) Our study builds upon these findings by demonstrating the efficacy of tobacco control messages to minimize the harmful influence of cigarette message on increased smoking initiation.

Although cigarette advertisements in the mass media have been banned since 1971 with further restrictions put in place by the 1998 Master Settlement Agreement (MSA), (1, 5) the tobacco industry has amended advertising techniques in a way that continues to reach young people; (6) particularly through magazines (7, 8), point of sale ads (24) and likely through the internet and social media. (25, 26) Our results confirm cigarette advertising persists in reaching and appealing to adolescents, and

continues to be associated with increased smoking behaviors, in the years post-MSA. Further, having a favorite cigarette advertisement appears to remain stable over time, indicating a lasting influence once adolescents are receptive.

There are major implications for public health tobacco control campaigns. Tobacco control advertising should focus on determining the ads that are appealing to young people, as most smokers initiate smoking prior to the age of 18 and virtually all initiate prior to the age of 26. (19) Youth targeted tobacco control ads, such as ads attacking the tobacco industry as being manipulative (27, 28) may be particularly effective in targeting young people. Of particular interest will be exploring how both tobacco control and tobacco industry ads reach and appeal to young people in an increasingly technological environment. As technology continues to develop so does advertising techniques. The tobacco industry is known for innovative approaches to marketing, particularly in targeting young potential future smokers. Once these factors are better understood tobacco control advertisements can be better tailored to appeal to young people, optimizing tobacco control advertising funds.

Major strengths of the study include its longitudinal design and sample drawn from a national probability sample of the US. Households without smokers enrolled in the study at higher rates than homes with smokers and adolescent participants reported less smoking behavior compared to other national studies. (29) Stringent study enrollment requirements resulted in a generally low-risk population of adolescents that may not be generalizable to the entire U.S. Population. However, significant effects were still observed between tobacco-related ad preferences and adolescent smoking behavior in this low-risk population. Part of the primary measure, unaided recall of a favorite tobacco control advertisement was only assessed at the fifth survey, thus longitudinal analysis of this variable was not possible.

In summary, there is evidence that receptivity to both tobacco control and cigarette advertisements are associated with adolescent smoking initiation. Having a favorite tobacco control advertisement appears to reduce the harmful influence of cigarette marketing on adolescent smoking initiation. These results should be confirmed in a longitudinal study with a larger sample.

What the Paper Adds: This paper provides evidence that adolescents continue to be receptive to cigarette marketing, that receptivity is relatively stable over time and continues to be associated with increased smoking initiation. Further, we provide evidence that tobacco control messages can actually reduce the harmful influence of cigarette marketing on smoking initiation. Exploring both cigarette and tobacco control advertising is important when assessing the influence of tobacco advertising receptivity on youth smoking behaviors, as failing to account for both may lead to imprecise conclusions.

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This chapter is currently being prepared for submission for publication in peer-reviewed journal. The dissertation author is the primary author for this paper. Co-authors for all three papers include: Vera, LE; Ojeda, N; Elder, JP; Usita, P; Messer, KM; Pierce, JP.

Tables

Table 3.1 Characteristics of 2003-04 youth never initiators (N=688)

Youth Report		N	(%)
Gender	Female	347	(50.4)
	Male	341	(49.6)
Age	10-11	217	(31.5)
	12-13	471	(68.5)
Baseline Susceptibility	Non-Susceptible Never Smoker	435	(63.2)
	Susceptible Never Smoker	253	(36.8)
Ethnic or Racial Group	White	459	(66.7)
	Other group	229	(33.3)
Household Smoking	1+ Adults Smoker	220	(32.0)
	No Adult Smokers	468	(68.0)
Grades	Mostly A's	370	(53.8)
	B's and C's	255	(37.0)
	D's or F's	39	(5.7)
	Not Enrolled	24	(3.5)
Parent Report		N	%
Parent Gender	Male	118	(17.2)
	Female	570	82.85
Household	Dual Parent Household	551	(80.1)
	Single Parent Household	137	(19.9)
Parent Education	High School Graduate	529	(76.9)
	Less than High School	159	(23.1)
Household Income	<20,000	46	(6.7)
	20,000-50,000	214	(31.1)
	50,001-100,00	296	(43.0)
	>100,000	132	(19.2)
Region	Northeast	108	(15.7)
	Midwest	167	(24.3)
	South	278	(40.4)
	West	135	(19.6)

Table 3.2 Longitudinal adjusted logistic regression, 2003-04 variables predicting 2007-08 adolescent smoking initiation (N=688, initiators n=175)¹

2003-2004 Adolescent Report Variables	Child age 10-13	Adolescent Initiation in 2007-2008			
		Initiators /Total 175/688	Initiated 25.4%	OR (Odds Ratio)	95% Confidence Interval
Home Smoking Restrictions					
	Complete (ref)	86/440	19.6	1	-
	All Other responses	89/248	35.9	1.6*	(1.0-2.4)
Household Smokers					
	No HH Smokers (ref)	94/468	20.1	1	-
	All Other responses	81/220	36.8	1.4	(0.9-2.2)
Best Friend Smoking					
	No Best Friends Smoke (ref)	139/628	22.1	1	-
	Has Smoking Best Friends	36/60	60.0	4.5***	(2.5-8.2)
Favorite Type of Tobacco Industry Advertisement (Ad)					
	No Cigarette Ad (ref)	100/465	21.5	1	-
	Tobacco Industry Ad	75/223	33.6	1.6*	(1.0-2.3)

Hosmer and Lemeshow Goodness of Fit Chi Square=3.4436, df=8, p-value=0.9035
¹Model adjusts for child gender, child age, child ethnicity, household income, parent education* and school performance****.

*p<0.05, **p<0.01, ***p<0.001, ****<0.0001

Table 3.3 Stability of Favorite Cigarette Advertisement (Ad)

2003-04 Favorite Cigarette Ad	2007-08 Favorite Cigarette Ad				2003-04 Totals
	No Cigarette Ad		Cigarette Ad		
	N	(%)	N	(%)	
No Cigarette Ad	306	(65.8)	159	(34.2)	465 (67.6)
Cigarette Ad	84	(37.7)	139	(62.3)	223 (32.4)
2007-08 Totals	390	(56.7)	298	(43.3)	688 (100.0)

Chi-Square 48.6027, df=1, p<0.0001

Figures

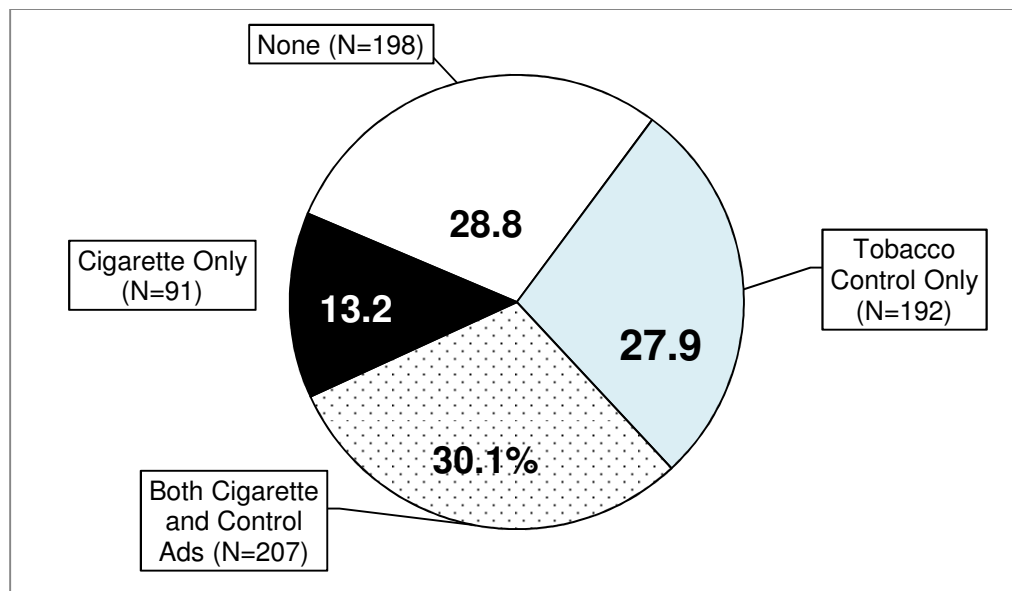


Figure 3.1 Prevalence of adolescent self-reported favorite tobacco-related advertisement, 2007-08 (N=688)

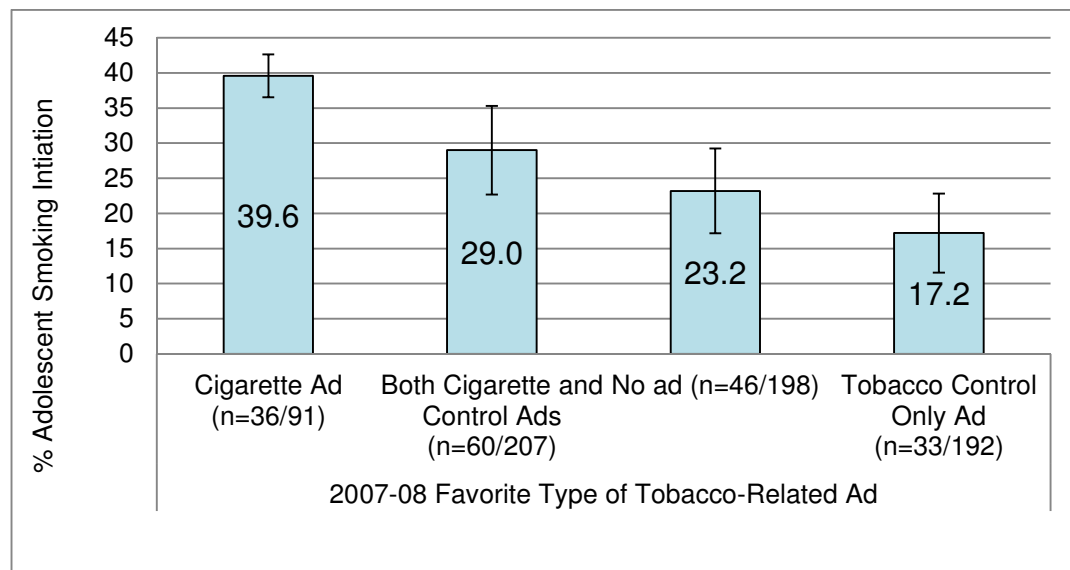


Figure 3.2 Adolescent smoking initiation by favorite tobacco-related advertisement (ad) in 2007-08 (N=688)

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General Discussion:
Research Paper I, II and III

GENERAL DISCUSSION

Understanding the predictors of youth behavior is essential to preventing and reducing future smoking prevalence and related health problems. There are many potential factors that go into youths' decisions to smoke. Understanding which factors are protective against smoking initiation can help reduce the likelihood that a child will initiate smoking.

This three-paper dissertation explores three potentially modifiable factors occurring in pre-adolescence that are hypothesized to be particularly impactful on smoking initiation: 1) parent and child agreement about smoke-free homes, 2) parent and child belief about adolescents smoking risk, and 3) receptivity to tobacco-related advertising. Each of the three studies presented provides evidence that tobacco-related socialization in pre- and early-adolescence influences whether or not a child will initiate smoking in the future.

Summary of the Three Studies:

Study One provides longitudinal evidence that smoke-free homes not only protect non-smokers from second hand smoke, but also reduce the probability of future smoking initiation. This study builds upon a largely cross-sectional evidence base, (1, 2) by confirming the hypothesis in a national sample. Further, the study provides evidence that parent and child concordance about whether or not their home was smoke-free is important. In the total population, agreement that the home was smoke-free protected against future smoking initiation. However, differences were observed by household smoking. In non-smoking households the majority of dyads agreed the home was smoke-free (80%), however this was not the case in smoking households (30%). While half of dyads in smoking households agreed the home was

not smoke free, only 3.0% of non-smoking households agreed the home was not smoke-free. In non-smoking households, not agreeing the home was smoke-free was predictive of an 80% increase in smoking initiation. The evidence was suggestive of an effect in smoking households, but to a lesser extent (40% more initiation).

Adolescent report of a smoke-free home appeared enough to protect against future smoking in homes without smokers. However, when there was a smoker in the household, parent report corroborating youth report was necessary to see reductions in smoking initiation. There is a need for further exploration in homes with smokers. The formal establishment of smoke-free homes appears to be an important tool in preventing youth smoking initiation. Larger national studies are needed to confirm the increased protective relationship between parent and child agreement about a smoke-free home and reduced smoking initiation.

Study Two provides support for the theory that parents' belief that their child is not at-risk for smoking reduces future smoking behavior, particularly when parents and children are in agreement. This study builds upon Yang et al.'s (2006) work exploring the influences of parent over- and underestimation of youth smoking on future smoking behaviors. (3) Our study found that most dyads agreed that the child was not at risk for smoking, while very few (<7%) agreed the child was at-risk. While parents were less likely than their child to report the youth is at-risk for smoking, parent report was highly predictive of future smoking initiation. In a measure including all four risk categories (agree: not at-risk, agree: at-risk, parent only report of risk, child only report of risk), agreement that the child was at-risk was associated with four times more initiation, parent only report was associated with nearly three times more initiation and child report only was associated with twice as much initiation, compared to dyads who agreed the child was not at-risk. Our results suggest parents appear to

be perceptive about their child's risk for smoking early on, and that this perception of risk is associated with future behavior. The evidence is particularly strong when parents and children are in agreement about risk status. Confirmation of these findings in a large, longitudinal and national sample is needed.

Because agreement that a child is not at-risk for smoking appears highly protective against future smoking, secondary analysis explored for factors that are associated with agreement. In doing so, we explored the reliability of a youth tobacco-related beliefs scale, which was highly predictive of agreement that the child was not at-risk for smoking. However, the youth's anti-tobacco beliefs scale was not directly associated with future youth smoking in our sample. It may be that youth's anti-tobacco beliefs early on are communicated to parents, influencing parent's beliefs about their child's risk, thus setting expectations about smoking that youth later fulfill. It is also possible that this is a result of youth's anti-tobacco beliefs change over time, and what is reported early on may not represent future beliefs which then influence the likelihood of initiation. This measure may be useful in predicting a variety of tobacco-related behaviors. The effect of anti-tobacco beliefs may be additive. The more anti-tobacco beliefs a youth reported, the stronger the association with agreement. This supports the theory that the frequency and number of sources of anti-tobacco socialization increases (or decreases) their protective strength. If anti-tobacco socialization is occurring and being reinforced by a variety of sources, the impact may be more salient. Further exploration is needed.

Study Three increases the scientific knowledge by being the first to provide population level evidence that tobacco control campaigns can help minimize the impact of tobacco industry marketing on youth smoking initiation. The study builds upon Pierce et al.'s (2010) examination of tobacco advertising and youth smoking. (4)

This study concurred with a large body of evidence indicating receptivity to tobacco industry advertising is associated with increased smoking initiation, while tobacco control advertising is associated with reduced smoking. (5) This research expands upon these findings by being the first population-level study to successfully demonstrate that having a favorite tobacco control advertisement actually reduces the harmful influence on adolescent smoking initiation. Other studies assessing the relationship concluded that while each exerted an independent effect, tobacco control advertisements did not appear to mitigate the relationship between tobacco industry ads and adolescent smoking. (6,7) Confirmation in large-scale longitudinal population-level studies is necessary. While this study explored youth's unaided recall of favorite tobacco control and industry advertisements, it did not specifically address exposure to tobacco related advertisements or content of the ads. Both of these components may influence whether or not adolescents recall any or a favorite tobacco-related ad. (8,9) Of particular interest for future study is the content and mode of delivery of advertisements.

What this Project Adds as a Whole: Anti-Tobacco Socialization and Youth Smoking Initiation

Protective parenting is a key component to reducing risk behaviors when children are young, and the current study suggest that the influence of socialization taking place early on (Pre- and early-adolescents) persists as children age. While there is a plethora of data on adolescent tobacco-related behaviors, there is only limited data examining concordance between parent and child report of tobacco-related behaviors and longitudinal smoking outcomes. The current research helps to fill some of those gaps. The evidence for tobacco socialization seems particularly

strong when parents and children are in agreement. In line with reciprocal determinism, evidence is presented that youth's anti-tobacco beliefs exert their own influences on the tobacco-related environment, which in turn helps shape both parent and youth beliefs and behaviors. Taken together, these results suggest that consistency in anti-tobacco socializations matter.

It is likely that the frequency and consistency of anti-tobacco related socialization that a child is exposed to and interacts with discourage youth from smoking. This study demonstrates tobacco-specific parenting continues to exert influence on youth behaviors, even as children age and competing influences such as peers and media increase.

Implications for Parents and Public Health

There are a variety of tobacco-specific social influences that can help reduce a child's risk for smoking initiation. Parents can play an important role in preventing future tobacco use by participating in anti-tobacco parenting practices, such as the establishment of smoke-free homes and holding a strong belief that their child is not at-risk for smoking. Further, parents can make an effort to limit their children's exposure to pro-tobacco messages and increase their exposure to anti-tobacco messages. Tobacco control can help reinforce anti-tobacco socialization that takes place in the home. Public health and tobacco control professionals should focus on developing campaign strategies that reach and appeal to adolescents. Specific targets for interventions supported by this research include increasing the prevalence of anti-tobacco parenting practices such as smoke-free homes as well as parent and child communications about smoking. It may be important to tailor interventions based on household smoking status.

Public health interventions and mass media campaigns that are appealing to youth may be particularly impactful in preventing future smoking. Determining which messages are most appealing to young people should be a central concern. Further, the mode of delivery may be an important consideration. Social media and mobile technologies have become an increasingly important component of the social environment, particularly for young people. (10) Further, there is evidence that the tobacco industry markets to youth on-line. (11-14) It is essential tobacco control also have an on-line presence. (15,16) Future tobacco prevention research and interventions tailored to youth should incorporate and study social and mobile media components.

Project Strengths and Limitations

This study had a high retention rate from 2003-04 to 2007-08 (73%). Sample sizes differed slightly for each of the projects due to missing responses. Despite the Parenting Project consisting of a generally low-risk sample, due in part to stringent follow-up requirements, this project observed significant protective effects for anti-tobacco socialization that takes place when children are young, against future smoking initiation. All adjusted analyses included peer smoking and school performance in the models, two factors strongly associated with youth smoking, and continued to demonstrate an effect for anti-tobacco socialization (including parenting) to reduce youth smoking initiation. However, we did not explore the influence of tobacco-related parenting occurring in mid- or late-adolescence. Thus we can only make conclusions about tobacco-specific parenting that takes place early on and before the child has initiated smoking. The influence of tobacco-specific socialization occurring in mid- and late adolescence may differ from that in pre- and early-

adolescence. While parent and child agreement about smoke-free homes appears to protect youth against future smoking, differences were observed when stratified by household smoking status. It is possible that household smoking reduces the strength of anti-tobacco parenting practices against smoking initiation. It is also possible, like many other studies, lack of power to detect differences for households with smokers resulted in null findings for this group. There is a need for large-scale longitudinal validation studies.

Conclusions

In summary, anti-tobacco socialization reduce a child's risk for future smoking. Parents can take an active role by not only participating in generally protective parenting practices, but taking one step further and engaging in anti-tobacco parenting practices. It is likely consistent anti-tobacco socialization from a variety of sources (e.g. parents, media, peers) reinforces youth anti-tobacco sentiment and protect youth against future smoking. This project found that 1) parent and child agreement about smoke-free homes and 2) parent and child agreement that a child is not at-risk for smoking were longitudinally protective against future smoking. Further, 3) tobacco control advertisements continue to reach and appeal to adolescents, increasing the likelihood of initiation. In contrast, we present evidence that tobacco control messages can help prevent smoking initiation, even if the adolescent is also receptive to tobacco industry advertising. However, longitudinal confirmation is needed. Preventing youth from ever initiating smoking will help reduce future smoking prevalence and related health problems. Parents and tobacco control can complement one another by each exerting their own influence to increase anti-tobacco socialization in an effort to curb youth smoking initiation.

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