Published in final edited form as:

J Child Adolesc Subst Abuse. 2011 July ; 20(3): 270–287. doi:10.1080/1067828X.2011.581969.

The Protective Influence of Family Bonding on Smoking Initiation in Adolescents by Racial/Ethnic and Age Subgroups

E. Melinda Mahabee-Gittens, M.D., M.S.¹, Jane C. Khoury, PhD.², Bin Huang, PhD.², Lorah D. Dorn, PhD.³, Robert T. Ammerman, PhD.⁴, and Judith S. Gordon, PhD.⁵

¹Division of Emergency Medicine, Cincinnati Children's Hospital Medical Center, University of Cincinnati College of Medicine, Cincinnati, OH.

²Center for Epidemiology and Biostatistics, Cincinnati Children's Hospital Medical Center, University of Cincinnati College of Medicine, Cincinnati, OH.

³Division of Adolescent Medicine, Cincinnati Children's Hospital Medical Center, University of Cincinnati College of Medicine, Cincinnati, OH.

⁴Division of Behavioral Medicine and Clinical Psychology, Cincinnati Children's Hospital Medical Center, University of Cincinnati College of Medicine, Cincinnati, OH.

⁵Dept. of Family & Community Medicine, University of Arizona, Tucson, AZ

Abstract

Using data from the National Longitudinal Study of Adolescent Health, this study examined the associations among family bonding factors and the initiation of smoking by race/ethnicity and age group among nonsmokers at Wave 1. Overall, 18% of the sample initiated smoking by Wave 2. For younger African American and Hispanic youth, high maternal satisfaction with the relationship was significantly protective of smoking initiation. For older Hispanics, high parental presence and high parent-family connectedness were protective against smoking initiation while lack of awareness about the adolescent's whereabouts was a risk factor for initiation in both younger and older Caucasians, and in the older Hispanics. Our results underscore the importance of maintaining high levels of family bonding with the adolescent throughout early and late adolescence in order to decrease tobacco initiation.

Keywords

Adolescence; Smoking initiation; Parental influence; Ethnicity; Race

BACKGROUND

Statistical estimates suggest that up to 6.3 million children younger than age 18 will die from a smoking related disease unless current adolescent tobacco initiation rates are reversed (U.S. General Accounting Office [GAO], 2003). Despite decreases in adolescent smoking rates over the past decade, recent studies report that 54.3% of high school students have ever smoked cigarettes and 23% are current smokers (Eaton, Kann, Kinchen, Ross, Hawkins, Harris, et al., 2006). There is concerning evidence that daily smoking among youth in their early and middle teens has stopped declining. In addition, there are differences among racial/ethnic groups in prevalence for cigarette smoking where Caucasians show the

Corresponding Author: E. Melinda Mahabee-Gittens, M.D., M.S.; Division of Emergency Medicine, ML 2008; Cincinnati Children's Hospital Medical Center; 3333 Burnet Avenue; Cincinnati, Ohio 45229-3039, Tel (513) 636-7966; Fax (513) 636-7967, melinda.mahabee-gittens@cchmc.org.

highest prevalence (25.9%), followed by Hispanics (22%), and African American youth (12.9%) (Johnston, O'Malley, Bachman, & Schulenberg, 2007). However, by adulthood, smoking in Caucasians and African Americans reach equivalent rates at 21.9% and 21.5%, respectively (Centers for Disease Control, Mariolis, Rock, Asman, Merritt, Malarcher, Husten, & Pechacek, 2006). Tobacco prevention efforts in youth have traditionally centered around school-based programs, changing peer influences, developing resistance skills, increasing taxation on tobacco or developing widespread media campaigns, all of which have been met with limited success (Wiehe, Garrison, Christakis, Ebel, & Rivara, 2005). Family influences have been found to be important to early preparation stages of smoking (Fleming, Kim, Harachi, & Catalano, 2002) and in an effort to develop innovative and effective tobacco prevention strategies, there has been increasing interest in examining the possible association between adolescent tobacco use and differences in parental style, parental rules about tobacco, and family bonding factors, such as family monitoring, rules, and low family conflict (Chassin, Presson, Rose, & Sherman, 2001; Sargent & Dalton, 2001; Resnick, Bearman, Blum, Bauman, Harris, Jones, et al., 1997; Kodl & Mermelstein, 2004). Research reveals that families with lower parental bonding have children who are more likely to smoke (Conrad, Flay, & Hill, 1992; Fleming, Kim, Harachi, & Catalano, 2002; Simons-Morton, 2002). There is also evidence that racial/ethnic differences in family bonding may explain differences in smoking uptake. Importantly, due to differences in study design, different levels of smoking behavior examined; sometimes with the inclusion of subjects who may have already experimented with cigarettes, and small sample sizes with ethnic diversity, there are inconsistencies in defining which family bonding factors are most protective against smoking uptake, in particular by race/ethnicity (Mermelstein, 1999; Kegler, McCormick, Crawford, Allen, Spigner, & Ureda, 2002; Nowlin & Colder, 2007; Griesler & Kandel, 1998). Additionally, it is posited that parental influence remains important as adolescents grow older (Sargent & Dalton, 2001; Simons-Morton, B.G., 2004; Simons-Morton, Chen, Abroms, & Haynie, 2004; Steinberg, Fletcher, & Darling, 1994; Chassin, Presson, Sherman, Montello, & McGrew, 1986), however, it is unclear which family bonding factors are most protective against smoking initiation or how these differences vary by both race/ethnicity and age.

The conceptual model guiding our research is derived from the social bonding theory (Gottfredson & Hirschi, 1990; Hirschi, 1969). The social bonding theory posits that adolescents with strong bonds to society are less likely to deviate from conventional behavior than are those with weak bonds. Hirschi specifies four elements of the social bond: attachment to conventional people, commitment to conventional activities, involvement in conventional activities, and belief in conventional rules of society. Attachment to family is considered the most important of all elements in the bond (Hirschi, 1969; Matsueda & Heimer, 1987). Specifically, parental attachment, especially attachment to the mother, has been found to have a direct effect on adolescent cigarette smoking initiation (Foshee & Bauman, 1994; Reimers, Pomrehn, Becker, & Lauer, 1990).

To further advance the field, a better understanding regarding which family bonding factors may protect against tobacco initiation among specific racial/ethnic groups of adolescent never smokers is needed. Such factors may be modifiable and thus lend themselves to tailoring culturally responsive prevention and intervention strategies that parallel national trends in tobacco prevalence rates (Ellickson, Orlando, Tucker, & Klein, 2004; Kandel, Kiros, Schaffran, & Hu, 2004). Therefore, the purpose of this study was to examine which family bonding factors, individually and in combination, serve as protective influences against smoking initiation among Caucasian, African American, and Hispanic youth during early adolescence (ages 12–14 years) and later adolescence (ages 15–17). To reduce questions regarding the direction of effects, we used longitudinal data to investigate the influence of key parent-child bonding factors (measured at Wave 1 on the initiation of

adolescents' smoking initiation, during a follow-up period. This procedure assures that the relationship dynamics precede smoking initiation, rather than being a result of them. Specifically, this model was examined using 2 waves of data from the National Longitudinal Study on Adolescent Health (Add Health), a nationally representative sample of U.S. adolescents in grades 7 through 11. The relationship between initiation of smoking and family bonding was examined in models that also account for other key socioeconomic determinants of smoking initiation. Our primary hypothesis was that high levels of family bonding will result in decreased adolescent smoking initiation, and that the influence of family bonding will differ by both race/ethnicity and age group.

METHODS

This study is based on data from The National Longitudinal Study of Adolescent Health (Add Health), which has been described in detail elsewhere (Resnick, Bearman, et al., 1997; Bearman, Jones, & Udry, 2007). Briefly, Add Health was developed to examine the associations among health-related behaviors, social contexts, and physical environments in developing youth. Incorporating systematic sampling methods and implicit stratification into the Add Health study design ensured this sample is representative of U.S. schools with respect to region of country, urbanicity, school size, school type, and ethnicity. The data for the current study were drawn from the Wave 1 in-home survey (1995) and Wave 2 surveys (1996). The total in-home Wave 1 sample consisted of the 20,745 adolescents. At Wave 2, 14,738 adolescents completed the in-home interviews. The mean interval between the Wave 1 and Wave 2 interviews was 11.0 months (95% confidence interval: 7.6–14.3 months). A parent of each adolescent respondent, preferably the mother residing with the adolescent, was asked to complete a separate in-home questionnaire at Wave 1 (n=17,125). Extensive precautions were taken to maintain confidentiality and guard against deductive disclosure of participants' identities (Resnick, Bearman, et al., 1997; Bearman, Jones, & Udry, 2007).

Study Design

The sample for this study consisted of members of the core in-home sample reporting that they were in the 7th through 11th grades at Wave 1 (n=16,830), were 11–17 years old at Wave 1 (n=16,056), were self-identified as Caucasian non-Hispanic; African American non-Hispanic; or Hispanic (n=14,871), had a female parent or guardian who answered the Wave 1 in-home survey (n=11,844), were categorized as a never smoker at Wave 1 (n=5,251), responded to the query regarding their smoking status at Wave 2 (n=4,371) and had sample weights at Wave 2 (n=4,061). This subsample represents 19.6% of the original Wave 1 sample. Restricting the study sample to students who had not initiated smoking at Wave 1 creates a more homogeneous, lower-smoking susceptible risk group than the full core adolescent sample. This is demonstrated by ethnic specific survival models that were completed on the racial/ethnic groups analyzed for this study (Kandel, Kiros, Schaffran, & Hu, 2004). Hazards of smoking initiation peaked earlier for Caucasian and African American youths (at 17 years) than for Hispanic youths (at 18 years). At all ages, minority youths, especially African American youths, were less likely to start smoking than Caucasian youth. By limiting our study sample to nonsmokers at Wave 1, the highest-risk students- especially Caucasians- who had started smoking prior to Wave 1 were excluded from these analyses.

Variables Included in the Analyses

All of the variables described below were derived from items on the in-home interviews of adolescents and their resident and/or biological mother/guardian. Some variables were derived from single items, whereas others were derived from groups of items. Participants who answered at least 75% of the items that composed a multi-item scale were included in

the analysis of that variable. For participants with incomplete responses, the ratings for unanswered items in a multi-item scale were imputed from the mean rating of their answered items in the scale according to scale derivation guidelines (Sieving, Beuhring, Resnick, Bearinger, Shew, Ireland, et al., 2001). The study variables and their assigned categories are described below.

Sociodemographic and Tobacco Variables Characteristics—The adolescent's age was calculated from the date of interview and the date of birth. Racial/ethnic identity was determined by 3 self-report items: Hispanic identity (yes/no), racial/ethnic identity (check all that apply), and primary racial/ethnic identity if more than 1 race/ethnicity was marked. The response was categorized as Caucasian non-Hispanic, African American non-Hispanic, Hispanic, Asian/Pacific Islander, or other. Three racial/ethnic categories were included in the analyses: Caucasian, non-Hispanic; Hispanic; and African American, non-Hispanic (Blum, Beuhring, Shew, Bearinger, Sieving, & Resnick, 2000). Given the low sample sizes that met our inclusion criteria, other race/ethnicities were not evaluated.

Poverty status was determined by the parental response to the question: "Are you receiving public assistance, such as welfare?" Parental education was determined from the parent's response to the questions, "How far did you go in school?" and, "How far did your partner/spouse go in school?" The higher of the two answers was defined as parental education. Parent work status was determined by the question: "Do you work outside of the home?" Family structure was defined as 1-or 2-parent households on the basis of the adolescent report (Sieving, Beuhring, et al., 2001).

Parental smoking status was determined from the parent's response to the Wave 1 question: "Do you smoke?: yes/no?" Peer smoking was assessed by the adolescent's response to the question: "Of your three best friends, how many smoke at least one cigarette a day?"

The presence of smokers in the home was assessed by the adolescent's response to: "Are there smokers in your home?" Access to cigarettes was determined by the adolescent's response to: "Are cigarettes easily available to you in your home?"

Family Bonding Variables

The AddHealth dataset includes six measures that pertained to family bonding that were included in the analyses and scored according to Add Health methodological procedures (Sieving, Beuhring, et al., 2001). Some important measures of family bonding that have been shown to affect onset of smoking initiation were not evaluated in the AddHealth study such as: parental supportiveness, parental monitoring of specific adolescent activities and friendships, parental acceptance, or behavioral control, (Chassin, Presson, Sherman, Montello, & McGrew, 1986; Chassin, Presson, Rose, & Sherman, 2001; Stanton, et al, 2000). Thus, our analysis was limited by the confines of the measures used. Although the scores provided a continuous measure, the distributions were extremely skewed, thus, for analysis purposes; family connectedness and parental presence were categorized into tertiles, and all other variables were dichotomized.

Family connectedness—The family connectedness scale score was derived from 13 items (Cronbach's $\alpha = 0.83$). Each item was rated on a scale of 1 (low connectedness) to 5 (high connectedness). The ratings of 3 items were averaged. The 10 remaining items were divided into 4 subgroups, and the highest rating within each subgroup was selected to represent the subgroup of items. The 5 resulting ratings were summed to yield a scale score with a potential range of 5 (low connectedness) to 25 (high connectedness) (Resnick, Bearman, et al., 1997; Sieving, Beuhring, et al., 2001).

Parental Presence—The parental presence score reflected frequency of a parent's presence at home at discrete times during the course of a day and consists of 6 items that measure the frequency of mother or father's presence before and after school, at bedtime, and at evening meals. These 4 indicators are averaged to create a composite score. The parental presence score has a potential range of 4 (low presence) to 22 (high presence).

Parent-Adolescent Activities—The parent-adolescent activities composite score reflected the number of shared parent-child activities within the past 4 weeks. The measure is based on items in which adolescents reported presence or absence of parental involvement in up to 10 listed activities such as going shopping, playing a sport, or going to a movie; with both resident and nonresident biologic parents. This score has a potential range of 0 (low parent-adolescent activities) to 20 (high parent-adolescent activities) (Sieving, Beuhring, et al., 2001).

Maternal Satisfaction—Maternal satisfaction with the relationship with her adolescent was rated on a 5-point Likert-type scale. A higher rating reflected lower satisfaction (Slap, Goodman, & Huang, 2001).

Parental awareness—The parental awareness measure indicated whether the teen reported lying to parents about his/her whereabouts three or more times in the past year (Manlove, Ryan, & Franzetta, 2007). A higher rating reflected a greater lack of parental awareness regarding the teen's whereabouts.

Parent-Adolescent Communication—Parent-adolescent communication is a four-item summative index derived from the adolescent's report of whether she/he discussed the specific topics with a residential parent in the past four weeks. If an adolescent had two residential parents, we took the average of each parent's communication index (Manlove, Ryan, & Franzetta, 2007).

Study Outcome

The outcome variable for this study was adolescent smoking status at Wave 2. Each adolescent in the study sample was categorized as a nonsmoker at Wave 1 or Wave 2 if they reported "no" to the question: "Have you ever tried smoking, even one or two puffs?" They were categorized as a smoker at Wave 2 if they reported "yes" (Sieving, Beuhring, et al., 2001). Thus, experimenters who may have only tried smoking one or two puffs were considered smokers.

Data Analysis

Each case in the sample was assigned a weight based on the sampling design so that the sample is nationally representative of all adolescents in grades 7 through 11. The sample weights were used in all analyses (Resnick, Bearman, et al., 1997). Data are being reported as raw number and weighted percentage or weighted mean and associated standard error, as appropriate. SAS/STAT V9.1 (SAS Institute, 2003) survey programs were used for analysis to account for the survey design and ensure the use of the appropriate standard errors.

Chi-square analysis was used for bivariate comparisons of race/ethnicity and parental smoking status to family bonding variables. Multiple logistic regression analyses was used to assess the associations among family bonding variables and the initiation of smoking at Wave 2, including the main effects for each family bonding variable, ethnicity, family bonding $\times$ ethnicity interaction terms, and covariates. The interaction terms were constructed to assess whether associations among family bonding variables and adolescent initiation of smoking varied across ethnic groups. There was a statistically significant two-way

interaction ($P < 0.05$) for age and parent-family connectedness, for race/ethnicity and parental presence, and race/ethnicity and lack of parental awareness. The only three-way interaction that approached significance was race, age, and maternal satisfaction ($p = 0.051$). Being the largest racial/ethnic group in the sample, Caucasians were used as the reference group. In order to examine which family bonding influences had the strongest associations with initiation of smoking for a particular racial/ethnic group, separate logistic regression analyses were run for each ethnic group to assess the unique effects of each independent variable while controlling for the demographic and tobacco-related covariates of gender, age, poverty, parental education, family structure, parental smoker, smokers in the home, peer smoking, and access to cigarettes.

Variables that were associated with smoking initiation for all adolescents at $p < 0.10$ were entered into the initial logistic regression model to identify factors independently associated with smoking initiation. Variables that were associated with the log odds of smoking initiation at $p < .05$ were retained in the model. The effect, on the beta coefficient for the independent variable of interest, of removing a variable from the model at each step was examined. Once the potential final model was attained, the effect of replacing the individual covariates was also examined. It was decided to include the same covariates in all the adjusted models, for uniformity. After finding the most parsimonious model for each independent variable of interest, the other covariates were entered back into the model. The effect on the independent variable of interest was examined, and this methodology had no impact on interpretation of the analysis. All covariates that were retained in the final model had a p -value < 0.10 in any individual model, except for gender which was $p > 0.15$. The covariates used in all final models were gender, poverty, family structure, parental smoker, smokers in the home, and peer smoking. Dummy variables were created for parental family connectedness and parental presences using the highest tertile (high family connectedness and high parental presence) as the comparison group. The adjusted odds ratios, 95% confidence intervals, and significance levels, are reported.

RESULTS

Sample Characteristics

Of the 11 844 dyads surveyed, 4061 met our inclusion criteria and comprised our analytic sample. Of the sample that was excluded, smokers differed from nonsmokers in wave 1 by age and racial distribution, but not gender, which is consistent with the literature (Griesler & Kandel, 1998; Kandel, Kiros, Schaffran, & Hu, 2004). There was a larger percentage of excluded nonsmokers in the younger, 12–14 year old category compared to smokers in this age group (54.2% versus 37.4%, $p < 0.001$). Race/ethnicity distribution for nonsmokers versus smokers was as follows: African American- 17.3% versus 12.8%, Hispanic- 13.1% versus 11.0%, and Caucasian- 69.6% versus 76.1%, $p < 0.0001$. There were 48.5% male nonsmokers and 47.8% male smokers ($p = 0.66$).

Comparative statistics for sociodemographic and tobacco variables by race/ethnicity for the overall sample are presented in Table 1. Bivariate association of the independent variables with smoking initiation by race/ethnicity and age group are presented in Table 2. The Wave 1 study sample of 4,061 never-smoking adolescents was between 12 and 17 years of age (mean 14.4 yrs, se 0.1) and the majority were female (51.5%). Most participants were non-Hispanic Caucasian (69.6%), and 52.7% of parents had received education beyond high school. More African Americans (20.2%) and Hispanics (16.0%) were on public assistance than Caucasians (6.4%), ($p < 0.0001$). Overall, 18.4% of the sample (20.0% of 12–14 year olds and 16.6% of 15–17 year olds) initiated smoking during the 12 months preceding the Wave 2 survey. Among older Hispanic and African American adolescents only, there was a

statistically significant difference in the incidence of smoking initiation at Wave 2 ($p=0.02$; 22% of Hispanic 15–17 year olds vs. 13.8% of African American 15–17 year olds).

Family Bonding

Chi square analysis of family bonding variables at Wave 1 and the onset of smoking by Wave 2 were run by both race/ethnicity and age group. Family bonding variables associated with smoking initiation were: high maternal dissatisfaction with the adolescent-parent relationship in younger African American and Hispanic adolescents, low parental presence in older Hispanics; high parental lack of awareness regarding their teen's whereabouts in both older and younger Caucasian adolescents, as well as low parent-family connectedness in younger Caucasians (see Table 2).

Logistic regression analyses were run by race/ethnicity by younger (age 12–14) and older (age 15–17) age group for family bonding variables to determine which variables were protective factors at Wave 1 for not initiating smoking by Wave 2. Odds ratios with 95% confidence intervals (CI) values are presented in Table 3 for the final adjusted logistic models. Several family bonding factors significantly reduced the odds of initiating smoking, however, there was no cross-cutting family bonding variable that was uniformly protective against smoking initiation for each of the 6 groups of adolescents. However, for both younger African American and Hispanic youth, maternal satisfaction with their relationship with their adolescent was significantly protective. For older Hispanics, high parental presence and high parent-family connectedness were protective against smoking initiation. Lack of parental awareness about the adolescent's whereabouts was a risk factor for smoking initiation in both younger and older Caucasians, and in the older Hispanics. When all family bonding variables were put into the final model with the same covariates as noted above, our results were identical to those obtained when modeling each of the family bonding variables separately, with the addition of high parent-adolescent activities being protective against smoking initiation in older Hispanics, and a slight reduction in the effect of parental awareness.

Discussion

This study contributes further evidence to the growing body of literature supporting of strong parenting practices and high levels of strong family bonding characteristics as protective factors for smoking initiation. In this nationally representative sample of African American, Hispanic, and Caucasian youth, specific family bonding variables emerged as protective factors against initiating smoking over a one-year interval by race/ethnicity, and substratification by age group.

Prior studies have examined racial/ethnic differences in predictors of smoking initiation not analyzed in this study. In past studies, it has been demonstrated that stronger religious ties, greater parental disapproval of smoking, attachment, normative prescriptions against smoking, parent-child closeness, monitoring, social norms, and rejection of media influences are more important protective factors in African Americans than Caucasians (Mermelstein, 1999; Chassin, Presson, Todd, Rose, & Sherman, 1998), while factors such as maternal smoking, peer smoking and approval for smoking pose greater risk for smoking initiation among Caucasians than minorities such as African Americans (Griesler, Kandel, & Davies, 2002; Clark, Scarisbrick-Hauser, Gautam, & Wirk, 1999; Catalano, Morrison, Wells, Gillmore, Iritani, & Hawkins, 1992). Stronger family attachment, communication, and parental respect has been shown to be protective against smoking initiation in Hispanics compared to Caucasians (Headen, Bauman, Deane, & Koch, 1991; Hunter, Croft, Vizelberg, & Berenson, 1987).

The present analysis demonstrates that smoking initiation is more common among adolescents who have lower levels of family bonding compared to those who have higher levels of family bonding and supports our primary hypothesis that higher levels of family bonding will result in decreased adolescent smoking initiation. Although we were able to delineate specific measures of family bonding that were protective against smoking initiation in different race/ethnicity and age groups, we were not able to identify a cross-cutting set of protective factors that was uniformly protective in all subgroups nor a set of protective factors that was uniformly protective within individual subgroups. Nevertheless, we found that for both younger African American and Hispanic youth, maternal satisfaction with their relationship with their adolescent was significantly protective. To our knowledge, this has not been previously described in the literature as it relates to smoking; however, *adolescent* satisfaction with their relationship with their mothers has been shown to be important in predicting adolescent sexual risk behavior in the AddHealth dataset (Sussman, Dent, Flay, Hansen, & Johnson, 1987). For older Hispanics, high parental presence and high parent-family connectedness were protective against smoking initiation, which supports the literature that states that parental influence remains important even in older adolescents (Sargent & Dalton, 2001; Simons-Morton, 2004; Simons-Morton, Chen, et al., 2004; Steinberg, Fletcher, et al., 1994; Chassin, Presson, Sherman, et al., 1986) and the literature that emphasizes the important role that family plays in preventing smoking in Hispanic adolescents (Headen, Bauman, et al., 1991; Hunter, Croft, et al., 1987; Cowdery, Fitzhugh, & Wang, 1997). Lack of parental awareness about the adolescent's whereabouts was a risk factor for smoking initiation in younger Caucasians, and in older Hispanics and Caucasians. Low parental monitoring and lack of awareness of their adolescent's activities has been associated with increased adolescent risk behavior including smoking initiation and progression, alcohol use, substance/drug use, sexual risk behaviors, and violent behaviors (Simons-Morton, 2002; Simons-Morton, Chen, et al., 2004; Unger, Shakib, Gallaher, Ritt-Olson, Mouttapa, Palmer, et al., 2006; Freeberg & Stein, 1996). These factors identified as uniquely or more strongly associated with initiating smoking in different racial/ethnic and age groups require additional study, as they may have implications for the development of appropriate smoking prevention strategies for African American, Hispanic, and Caucasian youth.

It is important to note that the study population intentionally was limited to adolescents who were living with their mothers or female legal guardians as most studies that have examined smoking in the context of parental-child relationships have examined only responses by female caregivers (Griesler & Kandel, 1998; Griesler, Kandel, & Davies, 2002). The adolescents in this study, however, gave responses on pertaining to both female and male caregivers. In addition, we examined predictors of ever smoking which was defined as experimenting with cigarettes or being a current or former smoker. We selected this outcome variable based on the importance of identifying onset of experimentation, and because even sporadic experimentation with cigarettes has been shown to increase the likelihood of becoming a regular smoker as an adult by a factor of 16, compared with adolescents who have never tried even a puff of cigarette smoke (Borawski, Ievers-Landis, Lovegreen, & Trapl, 2003).

There are several limitations to this study which should be considered when interpreting these data. First, the lack of a longer interval between the Wave 1 and Wave 2 interviews and the small ethnic and age subsample sizes reduced statistical power to detect factors associated with smoking initiation in our study. Small subsample sizes among African American and Hispanic youth may account for the greater number of significant risk and protective factors found for Caucasian youth than for African American and Hispanic youth. Second, we were not able to test whether these same factors predict timing of smoking initiation among adolescents who experimented with or became regular smokers prior to the

time of Wave 1 interviews. The mean age of our study sample was 14.4 years; thus these data were collected at an age when a large proportion of the sample had already begun smoking at baseline. This raises questions regarding the generalizability of the results given that, in large part, they reflect data from a subset of adolescents who remained never smokers until relatively late in adolescence. Nevertheless, these data were drawn from a nationally representative sample, so that these concerns may be overstated. Third, these data are correlational in nature, thus limiting the extent to which conclusions regarding causation may be drawn. Although we interpret these data as partially consistent with a bidirectional causal model, we acknowledge that in the absence of experimental manipulation we cannot exclude the possibility of unobserved confounding. Relatedly, although the AddHealth dataset permits the examination of smoking and family bonding relationships in a large, longitudinal sample with a broad set of potential covariates, important aspects of family bonding that have been shown to affect onset of smoking initiation were not measured. For example, there are no measures of parental supportiveness, parental monitoring of specific adolescent activities and friendships, parental acceptance, or behavioral control, all of which are protective parenting practices (Chassin, Presson, Sherman, Montello, & McGrew, 1986; Chassin, Presson, Rose, & Sherman, 2001; Stanton, et al, 2000). In addition, the dataset does not contain specific measures of parental antismoking socialization (e.g., frequency, type, and quality of explicit antismoking messages, negative parental attitudes toward smoking, and punishment for smoking) all of which have been associated with decreased initiation (Andersen et al., 2004; Chassin et al., 1998; Harakeh et al, 2004; Henricksen & Jackson, 1998; Jackson 1997; Jackson & Henricksen, 1997; Sargent & Dalton, 2001). Therefore, variables such as these remain key targets for the future study of smoking initiation among adolescent youths. Nevertheless, given the paucity of published research on ethnic-specific protective factors against tobacco initiation by younger and older adolescent age groups, we believe that our study carries substantial value and provides important information for researchers and clinicians involved in developing smoking prevention interventions among racial/ethnically diverse populations. Finally, these data are based entirely on self-report, although the original Add Health study design strived as far as possible to minimize bias by ensuring appropriate confidentiality. It would have been desirable to have had biochemical validation of smoking status. Nevertheless, similar measures have been employed in studies of this kind, and there is evidence that self-report data collected appropriately are broadly reliable and valid.

Despite these limitations, there are a number of clinical practice and public health implications of the findings of this study for the prevention of adolescent smoking initiation. First, health care providers can educate parents early on about the importance of changing modifiable risk factors for smoking initiation such as encouraging parents to spend time with their children at home and to help adolescents in daily activities, to try to communicate more effectively with their adolescent so that they feel understood and cared for, and to be aware of their outside activities. Health care professionals have a responsibility to inquire about family interactions and connectedness and they should educate parents and other caretakers about the importance of such factors in potentially preventing not only tobacco use but other substance use and sexual risk behaviors.

Conclusion

The findings underscore the importance of family bonding as defined by high parent family connectedness, high parental presence, high parental awareness of their adolescent's whereabouts, and maternal satisfaction with their relationship with their adolescent in protecting against smoking initiation. As we did not find any one uniform measure that decreased the likelihood of smoking initiation in all racial/ethnic and age subgroups, it is important to continue to emphasize to parents the importance of maintaining high levels

bonding with their adolescent throughout early and late adolescence in order to decrease tobacco initiation. Future studies should focus on developing and testing new measures that will further delineate which key aspects of family bonding should be emphasized in parental tobacco prevention interventions.

Acknowledgments

This research uses data from Add Health, a program project designed by J. Richard Udry, Peter S. Bearman, and Kathleen Mullan Harris, and funded by a grant P01-HD31921 from the National Institute of Child Health and Human Development, with cooperative funding from 17 other agencies. Special acknowledgment is due Ronald R. Rindfuss and Barbara Entwisle for assistance in the original design. Persons interested in obtaining data files from Add Health should contact Add Health, Carolina Population Center, 123 W. Franklin Street, Chapel Hill, NC 27516-2524 (addhealth@unc.edu).

This work was supported by grant K23CA117864 to the first author from the National Cancer Institute/National Institutes of Health.

References

- Andersen MR, Leroux BG, Bricker JB, Rajan KB, Peterson AV Jr. Antismoking parenting practices are associated with reduced rates of adolescent smoking. *Archives of Pediatrics & Adolescent Medicine*. 2004; 158(4):348–352. [PubMed: 15066874]
- Bearman, PS.; Jones, J.; Udry, JR. The national longitudinal study of adolescent health: Research design. 2007. Available at: <http://www.cpc.unc.edu/projects/addhealth/design.html>.
- Blum RW, Beuhring T, Shew ML, Bearinger LH, Sieving RE, Resnick MD. The effects of race/ethnicity, income, and family structure on adolescent risk behaviors. *American Journal of Public Health*. 2000; 90(12):1879–1884. [PubMed: 11111260]
- Borawski EA, Ievers-Landis CE, Lovegreen LD, Trapl ES. Parental monitoring, negotiated unsupervised time, and parental trust: the role of perceived parenting practices in adolescent health risk behaviors. *Journal of Adolescent Health*. 2003; 33(2):60–70. [PubMed: 12890596]
- Catalano RF, Morrison DM, Wells EA, Gillmore MR, Iritani B, Hawkins JD. Ethnic differences in family factors related to early drug initiation. *Journal of Studies on Alcohol*. 1992; 53(3):208–217. [PubMed: 1285743]
- Mariolis P, Rock VJ, Asman K, Merritt R, Malarcher A, Husten C, Pechacek T. Centers for Disease Control. Tobacco use among adults - United States, 2005. *Morbidity and Mortality Weekly Report*. 2006; 55(42):1145–1148. [PubMed: 17065979]
- Chassin L, Presson CC, Rose JS, Sherman SJ. From adolescence to adulthood: Age-related changes in beliefs about cigarette smoking in a midwestern community sample. *Health Psychology*. 2001; 20(5):377–386. [PubMed: 11570652]
- Chassin L, Presson CC, Sherman SJ, Montello D, McGrew J. Changes in peer and parent influence during adolescence: Longitudinal versus cross-sectional perspectives on smoking initiation. *Developmental Psychology*. 1986; 22(3):327–334.
- Chassin L, Presson CC, Todd M, Rose JS, Sherman SJ. Maternal socialization of adolescent smoking: the intergenerational transmission of parenting and smoking. *Developmental Psychology*. 1998; 34(6):1189–1201. [PubMed: 9823504]
- Clark PI, Scarisbrick-Hauser A, Gautam SP, Wirk SJ. Anti-tobacco socialization in homes of African-American and white parents, and smoking and nonsmoking parents. *Journal of Adolescent Health*. 1999; 24(5):329–339. [PubMed: 10331839]
- Conrad KM, Flay BR, Hill D. Why children start smoking cigarettes: predictors of onset. *British Journal of Addiction*. 1992; 87(12):1711–1724. [PubMed: 1490085]
- Cowdery JE, Fitzhugh EC, Wang MQ. Sociobehavioral influences on smoking initiation of Hispanic adolescents. *Journal of Adolescent Health*. 1997; 20(1):46–50. [PubMed: 9007658]
- Eaton DK, Kann L, Kinchen S, Ross J, Hawkins J, Harris WA, et al. Youth risk behavior surveillance - United States, 2005. *Morbidity and Mortality Weekly Report Surveillance Summaries*. 2006; 55(5):1–108. [PubMed: 16760893]

- Ellickson PL, Orlando M, Tucker JS, Klein DJ. From adolescence to young adulthood: Racial/ethnic disparities in smoking. *American Journal of Public Health*. 2004; 94(2):293–299. [PubMed: 14759945]
- Fleming CB, Kim H, Harachi TW, Catalano RF. Family processes for children in early elementary school as predictors of smoking initiation. *Journal of Adolescent Health*. 2002; 30(3):184–189. [PubMed: 11869925]
- Foshee V, Bauman KE. Parental Attachment and Adolescent Cigarette Smoking Initiation. *Journal of Adolescent Research*. 1994; 9(1):88.
- Freeberg AL, Stein CH. Felt obligation towards parents in Mexican-American and Anglo-American young adults. *Journal of Social and Personal Relationships*. 1996; 13(3):457–471.
- Gottfredson, MR.; Hirschi, T. *A General Theory of Crime*. Stanford, CA: Stanford University Press; 1990.
- Griesler PC, Kandel DB. Ethnic differences in correlates of adolescent cigarette smoking. *Journal of Adolescent Health*. 1998; 23(3):167–180. [PubMed: 9730360]
- Griesler PC, Kandel DB, Davies M. Ethnic differences in predictors of initiation and persistence of adolescent cigarette smoking in the National Longitudinal Survey of Youth. *Nicotine & Tobacco Research*. 2002; 4(1):79–93. [PubMed: 11906684]
- Harakeh Z, Scholte RH, Vermulst AA, de Vries H, Engels RC. Parental factors and adolescents' smoking behavior: an extension of the theory of planned behavior. *Preventive Medicine*. 2004; 39(5):951–961. [PubMed: 15475029]
- Headen SW, Bauman KE, Deane GD, Koch GG. Are the correlates of cigarette smoking initiation different for black and white adolescents? *American Journal of Public Health*. 1991; 81(7):854–858. [PubMed: 2053660]
- Henriksen L, Jackson C. Anti-smoking socialization: Relationship to parent and child smoking status. *Health Communication*. 1998; 10:87–101. [PubMed: 16370991]
- Hirschi, T. *Causes of Delinquency*. Berkeley: University of California Press; 1969.
- Hunter SM, Croft JB, Vizelberg IA, Berenson GS. Psychosocial influences on cigarette smoking among youth in a southern community: The Bogalusa Heart Study. *Morbidity and Mortality Weekly Report*. 1987; 36(Sup4):17S–23S. [PubMed: 3116392]
- Jackson C. Initial and experimental stages of tobacco and alcohol use during late childhood: Relation to peer, parent, and personal risk factors. *Addictive Behaviors*. 1997; 22:685–698. [PubMed: 9347070]
- Jackson C, Henriksen L. Do as I say: parent smoking antismoking socialization, and smoking onset among children. *Addict Behav*. 1997; 22:107–114. [PubMed: 9022876]
- Johnston, LD.; O'Malley, PM.; Bachman, JG.; Schulenberg, JE. *Overview of key findings 2006: monitoring the future: national results on adolescent drug use*. Bethesda, MD: National Institute on Drug Abuse, US Dept of Health and Human Services, Public Health Services, National Institutes of Health, 2007; 2007. NIH Publication No. 07-6202
- Kandel DB, Kiros GE, Schaffran C, Hu MC. Racial/ethnic differences in cigarette smoking initiation and progression to daily smoking: A multilevel analysis. *American Journal of Public Health*. 2004; 94(1):128–135. [PubMed: 14713710]
- Kegler MC, McCormick L, Crawford M, Allen P, Spigner C, Ureda J. An exploration of family influences on smoking among ethnically diverse adolescents. *Health Education & Behavior*. 2002; 29(4):473–490. [PubMed: 12137240]
- Kodl MM, Mermelstein R. Beyond modeling: Parenting practices, parental smoking history, and adolescent cigarette smoking. *Addictive Behaviors*. 2004; 29(1):17–32. [PubMed: 14667418]
- Manlove JS, Ryan S, Franzetta K. Risk and protective factors associated with the transition to a first sexual relationship with an older partner. *Journal of Adolescent Health*. 2007; 40(2):135–143. [PubMed: 17259053]
- Matsueda R, Heimer K. Race, Family Structure, and Delinquency: A Test of Differential Association and Social Control Theories. *American Sociological Review*. 1987; 52(6):826–840.
- Mermelstein R. Explanations of ethnic and gender differences in youth smoking: A multi-site, qualitative investigation. The Tobacco Control Network Writing Group. *Nicotine & Tobacco Research*. 1999; 1(1):S91–S98. [PubMed: 11072411]

- Nowlin PR, Colder CR. The role of ethnicity and neighborhood poverty on the relationship between parenting and adolescent cigarette use. *Nicotine & Tobacco Research*. 2007; 9(5):545–556. [PubMed: 17454711]
- Reimers TM, Pomrehn PR, Becker SL, Lauer RM. Risk factors for adolescent cigarette smoking. The Muscatine study. *Am J Dis Child*. 1990; 144(11):1265–1272. [PubMed: 2239869]
- Resnick MD, Bearman PS, Blum RW, Bauman KE, Harris KM, Jones J, et al. Protecting adolescents from harm: Findings from the national longitudinal study on adolescent health. *Journal of the American Medical Association*. 1997; 278(10):823–832. [PubMed: 9293990]
- Sargent JD, Dalton M. Does parental disapproval of smoking prevent adolescents from becoming established smokers? *Pediatrics*. 2001; 108(6):1256–1262. [PubMed: 11731645]
- Sieving RE, Beuhring T, Resnick MD, Bearinger LH, Shew M, Ireland M, et al. Development of adolescent self-report measures from the National Longitudinal Study of Adolescent Health. *Journal of Adolescent Health*. 2001; 28(1):73–81. [PubMed: 11137909]
- Simons-Morton B, Chen R, Abroms L, Haynie DL. Latent growth curve analyses of peer and parent influences on smoking progression among early adolescents. *Health Psychology*. 2004; 23(6):612–621. [PubMed: 15546229]
- Simons-Morton BG. Prospective analysis of peer and parent influences on smoking initiation among early adolescents. *Prevention Science*. 2002; 3(4):275–283. [PubMed: 12465590]
- Simons-Morton BG. The protective effect of parental expectations against early adolescent smoking initiation. *Health Education & Behavior*. 2004; 19(5):561–569.
- Slap G, Goodman E, Huang B. Adoption as a risk factor for attempted suicide during adolescence. *Pediatrics*. 2001; 108(2):E30. [PubMed: 11483840]
- Stanton BF, Xiaoming L, Galbraith J, Cornick G, Feigelman S, Kaljee L, et al. Parental underestimates of adolescent risk behavior: a randomized, controlled trial of a parental monitoring intervention. *Journal of Adolesc Health*. 2000; 26(1):18–26.
- Steinberg L, Fletcher A, Darling N. Parental monitoring and peer influences on adolescent substance use. *Pediatrics*. 1994; 93(6 Pt 2):1060–1064. [PubMed: 8197008]
- Sussman S, Dent CW, Flay BR, Hansen WB, Johnson CA. Psychosocial predictors of cigarette smoking onset by white, black, Hispanic, and Asian adolescents in Southern California. *Morbidity and Mortality Weekly Report*. 1987; 36(Sup4):11S–16S. [PubMed: 3116391]
- U.S. General Accounting Office (GAO). [Accessed September 9, 2007] CDC's April 2002 Report on Smoking: Estimates of Selected Health Consequences of Cigarette Smoking Were Reasonable. 2003. Letter to U.S. Rep. Richard Burr, July 16, 2003. Available at: <http://www.gao.gov/new.items/d03942r.pdf>.
- Unger JB, Shakib S, Gallaher P, Ritt-Olson A, Mouttapa M, Palmer PH, et al. Cultural/interpersonal values and smoking in an ethnically diverse sample of Southern California adolescents. *Journal of Cultural Diversity*. 2006; 13(1):55–63. [PubMed: 16696546]
- Wiehe SE, Garrison MM, Christakis DA, Ebel BE, Rivara FP. A systematic review of school-based smoking prevention trials with long-term follow-up. *Journal of Adolescent Health*. 2005; 36(3):162–169. [PubMed: 15737770]
- Foshee V, Bauman KE. Parental Attachment and Adolescent Cigarette Smoking Initiation. *Journal of Adolescent Research*. 1994; 9(1):88.
- Gottfredson, MR.; Hirschi, T. *A General Theory of Crime*. Stanford, CA: Stanford University Press; 1990.
- Griesler PC, Kandel DB. Ethnic differences in correlates of adolescent cigarette smoking. *J Adolesc Health*. 1998; 23(3):167–180. [PubMed: 9730360]
- Hirschi, T. *Causes of Delinquency*. Berkeley: University of California Press; 1969.
- Kandel DB, Kiros GE, Schaffran C, Hu MC. Racial/ethnic differences in cigarette smoking initiation and progression to daily smoking: a multilevel analysis. *Am J Public Health*. 2004; 94(1):128–135. [PubMed: 14713710]
- Matsueda R, Heimer K. Race, Family Structure, and Delinquency: A Test of Differential Association and Social Control Theories. *American Sociological Review*. 1987; 52(6):826–840.

Reimers TM, Pomrehn PR, Becker SL, Lauer RM. Risk factors for adolescent cigarette smoking. The Muscatine study. *Am J Dis Child*. 1990; 144(11):1265–1272. [PubMed: 2239869]

TABLE 1

Comparison of Socioeconomic and Tobacco Variables by Race/Ethnicity

Characteristic	African American <i>n</i> /(%)	Hispanic <i>n</i> /(%)	Caucasian <i>n</i> /(%)	P
Age 12–14 years	465 (49.0)	234 (49.8)	1121 (56.4)	0.48
Parent highest education				<0.0001
-Less than H.S. ¹	147 (18.7)	323 (49.5)	159 (7.2)	
-Completed H.S.	292 (36.3)	148 (18.5)	732 (34.3)	
-Beyond H.S.	637 (45.0)	211 (32.0)	1378 (58.5)	
Poverty ²	159 (20.2)	107 (16.0)	120 (6.4)	<0.0001
Family structure, % Two-Parent	543 (46.4)	494 (72.5)	1872 (81.2)	<0.0001
Parental Smokers	251 (28.0)	132 (19.4)	563 (27.0)	0.05
Smokers in the home	401 (43.5)	248 (37.0)	840 (39.4)	0.19
Access to cigarettes	191 (20.2)	144 (19.5)	529 (24.0)	0.13

¹ H.S.: High School² Poverty: Defined as answering “yes” to the question: “Are you receiving public assistance, such as welfare?”

TABLE 2

Proportion of Youth Initiating Smoking by Race/Ethnicity, Age Group, and Family Bonding Characteristics¹

	Smoking Initiation ²					
	African American [†]		Hispanic		Caucasian [†]	
	12–14 yo	15–17 yo	12–14 yo	15–17 yo	12–14 yo	15–17 yo
	n (%)		n (%)		n (%)	
Total	63 (18.4)	72 (13.8)	49 (22.8)	72 (22.2)	215 (19.8)	201 (16.3)
Parental Family Connectedness						
Low	p=0.16	p=0.32	p=0.45	p=0.06	p=0.03	p=0.66
Med	13 (22.7)	25 (10.5)	14 (30.5)	32 (32.6)	52 (25.0)	64 (16.4)
High	21 (20.3)	26 (13.5)	18 (21.3)	20 (17.2)	82 (22.1)	75 (15.0)
	29 (15.0)	21 (17.8)	17 (19.5)	20 (18.3)	81 (16.1)	62 (17.6)
Parental Presence						
Low	p=0.86	p=0.60	p=0.11	p=0.0001	p=0.30	p=0.19
Med	16 (20.2)	30 (13.4)	11 (40.3)	29 (44.0)	37 (24.0)	47 (21.0)
High	21 (17.1)	28 (16.8)	15 (22.6)	19 (18.7)	77 (21.6)	77 (16.4)
	26 (18.9)	14 (11.6)	23 (18.7)	22 (14.8)	101 (17.9)	76 (14.0)
Parent-Adolescent Activities						
Low	p=0.98	p=0.63	p=0.76	p=0.48	p=0.07	p=0.23
Med	26 (18.4)	32 (14.9)	23 (21.9)	41 (20.1)	96 (23.6)	82 (18.4)
High	37 (18.5)	40 (12.9)	26 (23.8)	31 (24.4)	119 (17.3)	119 (14.8)
Maternal Satisfaction ³						
No	p=0.004	p=0.79	p=0.04	p=0.93	p=0.54	p=0.08
Yes	36 (26.0)	35 (13.4)	23 (31.5)	35 (22.4)	91 (21.0)	100 (18.8)
	27 (11.7)	37 (14.2)	26 (16.8)	38 (21.9)	124 (19.0)	102 (14.1)
Lack of Parental Awareness						
No	p=0.29	p=0.97	p=0.05	p=0.07	p=0.0004	p=0.001
Yes	55 (17.6)	59 (13.6)	38 (21.0)	53 (19.2)	187 (18.6)	152 (14.6)
	7 (26.3)	12 (13.4)	11 (40.7)	19 (34.8)	28 (39.9)	50 (27.4)
Parental Communication						
No	p=0.11	p=0.54	p=0.94	p=0.07	p=0.71	p=0.41
Yes	16 (13.7)	35 (15.3)	16 (23.2)	21 (16.0)	68 (20.6)	86 (14.9)
	47 (20.6)	37 (12.8)	33 (22.7)	51 (24.9)	147 (19.5)	115 (17.33)

¹ Each cell contains the raw number and weighted percentage of initiators

² At the Time 2 interview.

³ Maternal satisfaction = maternal satisfaction with the mother-adolescent relationship

TABLE 3

Odds Ratios for Family Bonding Variables Preventing Smoking Initiation by Race/Ethnicity and Age Group (Reported at Time 2)¹ - Adjusted Analysis from the final model

Time 1 Family Bonding Variables ²	12–14 year olds			15–17 year olds		
	African American OR(95% CI)	Hispanic OR(95% CI)	Caucasian OR(95% CI)	African American OR(95% CI)	Hispanic OR(95% CI)	Caucasian OR (95% CI)
Parent-family connectedness: High vs. Low Medium vs. Low	0.72 (0.40, 1.31) 0.99 (0.51, 1.93)	0.78 (0.24, 2.52) 1.05 (0.30, 3.65)	0.66 (0.42, 1.02) 0.94 (0.60, 1.45)	1.53 (0.60, 3.90) 1.06 (0.43, 2.65)	0.32 (0.14, 0.73) 0.31 (0.11, 0.89)	1.19 (0.76, 1.84) 1.05 (0.68, 1.62)
Parental presence High vs. Low Medium vs. Low	1.08 (0.53, 2.23) 0.86 (0.44, 1.71)	0.42 (0.11, 1.54) 0.52 (0.15, 1.83)	0.83 (0.44, 1.55) 1.07 (0.61, 1.89)	0.78 (0.28, 2.17) 1.23 (0.52, 2.91)	0.15[‡] (0.07, 0.34) 0.24[‡] (0.12, 0.51)	0.71 (0.39, 1.28) 0.87 (0.51, 1.50)
Parent-adolescent activities: High vs. Low	0.94 (0.59, 1.51)	1.16 (0.59, 2.28)	0.75 (0.49, 1.14)	0.81 (0.41, 1.58)	1.97 (0.83, 4.66)	0.88 (0.58, 1.34)
Maternal satisfaction with mother-adolescent relationship	0.40 (0.19, 0.85)	0.41 (0.20, 0.86)	0.97 (0.64, 1.47)	1.00 (0.53, 1.88)	0.74 (0.42, 1.30)	0.74 (0.50, 1.12)
Lack of Parental Awareness	1.54 (0.51, 4.66)	2.58 (0.72, 9.29)	2.78[‡] (1.48, 5.22)	0.70 (0.34, 1.41)	3.79[§] (1.58, 9.11)	2.05[§] (1.22, 3.42)
Parental communication	1.71 (0.93, 3.14)	1.08 (0.42, 2.76)	0.95 (0.64, 1.40)	0.78 (0.37, 1.64)	1.15 (0.59, 2.26)	1.19 (0.79, 1.80)

¹The odds ratios have been adjusted for gender, age, poverty status, and family structure.

²Parent-Family connectedness and Parental presence were analyzed as tertiles and all other variables were dichotomized for analysis.

[‡] $P < .001$;

[§] $P < .01$;

^{||} $P < .05$.