

Public and private domains of religiosity and adolescent smoking transitions

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Available online 19 January 2006

Abstract

We used data from a nationally representative sample of US adolescents in school grades 7 through 12 to explore the effects of public and private religiosity on initiation, escalation, and cessation of smoking. We found that adolescents' decisions to experiment with smoking are influenced by both their individual practice of their faith and by participation in a larger faith community. However, the effects of private and public religiosity are specific to different decision points on the smoking uptake process. Private religiosity was protective against initiation of regular smoking among nonsmokers. It also was protective against initiation of experimental smoking but only when the young person frequently attended religious services or a religious youth group. Although private religiosity appeared to discourage the uptake of smoking, it was unrelated to reduction or cessation once a young person has become addicted to cigarettes. In contrast, public religiosity did predict reduction and cessation of cigarette use among regular smokers. Taken together, these findings demonstrate that the domains in which religiosity are important extend beyond the individual and include religious institutions.

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Keywords: USA; Religiosity; Adolescents; Smoking uptake; Cessation; Transitions

Introduction

Religion is important to American adolescents. National survey data have consistently shown that more than 60% of US high school seniors agree that religion is important or very important to them (Bridges & Moore, 2002; Youniss, McLellan, & Yates, 1999). Nearly half report that they attend

religious services at least monthly (Bridges & Moore, 2002; Donahue & Benson, 1995), and approximately one-third attend religious services weekly (Johnston, Bachman, & O'Malley, 1999). A significant percentage of adolescents also reports praying frequently and participating in faith-based service projects (King & Furrow, 2004; Smith, Faris, Denton, & Regnerus, 2003). Despite the importance adolescents ascribe to their faith, relatively little scientific attention has been focused on the meaning of religiosity to this population or the role it plays in their decision making about health behaviors.

In recent years, increasing attention has focused on the role of faith as a tool for influencing

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individual health risk behaviors. This is reflected in the rhetoric and policies of the Bush Administration promoting religious institutions as partners in efforts to influence individual health risk behaviors (DiIulio, 2004). In addition, many religious organizations target adolescents in order to exert influence in their lives as adolescence and young adulthood is the life stage when religious conversion is most likely to take place (Smith et al., 2003). This increased attention on religion as a force for social change combined with an interest in engaging adolescents on the part of religious organizations further increases the relevance of research into the effects of religiosity on adolescent health risk behaviors.

This paper builds upon previous work we have done exploring the association between public and private domains of religiosity and various adolescent health outcomes (Nonnemaker, McNeely, & Blum, 2003). In that paper, we explored the possibility that the effects of public and private religiosity might vary by level of substance use. We did so by estimating the effects of public and private religiosity on the probability of being an experimental or a regular user. Our results were consistent with previous evidence that religiosity is associated with lower levels of involvement by adolescents in health risk behaviors, including substance use (Cochran & Akers, 1989; Miller, Davies, & Greenwald, 2000; Pacula et al., 2001; Wallace & Forman, 1998). In general, both public and private religiosity were protective against cigarette, alcohol, and marijuana use. On closer examination, it appeared that private religiosity was more protective against experimental substance use, whereas public religiosity was more protective against regular use and in particular against regular cigarette use.

However, we did not explicitly estimate the effects of public and private religiosity on initiation, escalation, or cessation of substance use. That is, we estimated the effect of public and private religiosity on the probability of being an experimental or regular substance user, but we did not estimate the effect of public and private religiosity on the transitions from one substance use stage to another. In this paper, we use data from two waves of the National Longitudinal Study of Adolescent Health (Add Health) to explore the relationships between public and private religiosity at wave I and subsequent transitions between levels of cigarette smoking. Specifically, we address three research questions: (1) does public religiosity predict initia-

tion, escalation, and cessation of smoking? (2) does private religiosity predict initiation, escalation, and cessation of smoking? (3) do public and private religiosity interact such that the effect of one on smoking behaviors depends on the level of the other?

Relationship of religiosity to adolescent cigarette smoking

Religiosity has been found to be protective against cigarette use among adolescents. Higher levels of religiosity have been associated with lower levels of cigarette use (Wallace & Forman, 1998), lower probability of progressing to established smoking from experimental smoking (Choi, Ahluwalia, Harris, & Okuyemi, 2002; Van den Bree, Whitmer, & Pickworth, 2004), and cessation of smoking (Van den Bree et al., 2004).

Wallace and Forman (1998) found that frequency of smoking in the past 30 days was linearly and inversely associated with frequency of religious attendance and importance of religion. Choi et al. (2002) used data from a longitudinal survey of adolescents in California to explore progression to established smoking. They included a measure of church attendance and found it to be protective against progression. Van den Bree et al. (2004) examined the association between a single index of religiosity (combining elements of public and private religiosity: church attendance, youth group attendance, importance of religion, and frequency of prayer) and the probability of transitions between smoking stages (initiation, escalation, and cessation). They found that, for boys only, religiosity was protective against progression to regular smoking and promoted cessation. Although this study also used Add Health to address a similar research question, there are several significant differences between this study and our study. First, they combined elements of public and private religiosity into a single religiosity construct. In our prior work, we found that a two-factor construct of public and private religiosity achieved a better model fit than a single factor religiosity construct. Second, because they used a single religiosity construct, they did not have the ability to explore the possibility of an interaction between public and private religiosity as we do in the present paper. Third, they based their measurement of smoking stages on responses to questions about ever trying cigarettes and ever smoking regularly. The Van den Bree et al.

measurement strategy appears to leave out potentially useful information on current smoking status to measure smoking stages. Our study builds on prior research by examining the joint influence of these religiosity variables on smoking and whether religiosity has more of an effect on one transition in the smoking uptake process (e.g., initiation) than another (e.g., escalation). We also examine the role of religiosity in quitting, an area that has only recently begun to be explored in adolescent samples.

Religiosity and adolescent cigarette smoking: theoretical considerations

Numerous theories have been proposed to explain the effects of religiosity on adolescent substance use, including smoking. Two of the most common theories are social control (Hirschi & Stark, 1969; Stark, Kent, & Doyle, 1982; Smith, 2003) and social support (Ellison, 1991). Originally conceptualized as an individual psychological process in which religious young people internalize control against deviant behavior (Hirschi & Stark, 1969), social control theory has been modified to incorporate a community or social network component (Wallace & Forman, 1998; Stark et al., 1982; Smith, 2003). Religious communities can be characterized by social closure, specifically, networks of relational ties in which parents know their children's peer group and the parents of their children's peers. These types of relational networks facilitate oversight of adolescent behavior as well as the internalization of adult norms regarding appropriate behaviors (Coleman, 1988). Social support theory suggests that rather than simply constraining deviant behavior, religious groups can also promote positive behaviors through peer and adult modeling (Smith, 2003; Wallace & Forman, 1998). In addition, there is an extensive literature delineating the positive effects of social support on stress and coping (Aneshensel, 1992), both of which are related to cigarette smoking (Koval, Pederson, & Chan, 2004). Wills, Yaeger, and Sandy (2003) provide empirical support for the hypothesis that religiosity buffers the impact of life stress on adolescent substance use.

Both of these theories—social control and social support—are reductionist in the sense that they treat religiosity as a social process that does not depend on any belief in or relationship with that which is divine. Other researchers of religiosity contend, as stated by Smith (2003), that “there is

something particularly *religious* in religion, which is not reducible to nonreligious explanations, and that these religious elements can exert ‘causal’ influence in forming cultural practices and motivating action” (pp. 19–20). For example, religiosity can provide a moral code that provides both clear directions on appropriate behavior and the cognitive and behavioral resources through a personal relationship with the divine to live by that moral code (Ellison, 1991; Smith, 2003). Lending support to this idea, Sussman, Dent, Severson, Burton, and Flay (1998) examined correlates of self-initiated cessation behavior among adolescents and found quitters had a stronger belief in the immorality of drug use than peers who continued to smoke. Evidence also suggests that religiousness in youths is associated with specific moral behaviors and attitudes, e.g., a positive association between religiosity and the presence of pro-social values and behavior (Donahue & Benson, 1995; King & Furrow, 2004).

Cigarette smoking is an addictive behavior with nicotine acting as the primary agent responsible for its addictiveness. In models of the development of dependence in adolescents, loss of autonomy over tobacco use is considered an important factor (DiFranza et al. 2000; O’Loughlin, Kishchuk, DiFranza, Tremblay, & Paradis, 2002). Spirituality has been incorporated as a key component of some types of recovery programs (e.g., 12-step programs) and is cited as an important element of these programs by participants (Green, Fullilove, & Fullilove, 1998). It is thought that a belief in and a relationship with a higher power offers strength and support to resist the temptations of continuing/relapsing to use of an addictive substance. For example, a relationship with a higher power is thought to help restore a sense of autonomy and enhances refusal self-efficacy. Such programs, by providing a “faith” community can offer participants an alternative set of acquaintances than were around the person while using substances. Thus, in the context of youth smoking, religiosity might act as a buffer against negative peer pressure. In addition, it might provide a moral structure that aids in avoiding behaviors that contribute to relapse.

All of the theories proposed for explaining the effects of religiosity on adolescent behaviors are consistent with social ecological models, which emphasize the importance of multiple layers of influence on adolescent behaviors (e.g., individual, family, peer, school, and church or religion)

(Bronfenbrenner, 1977; Jessor, 1992). We have discussed the utility of this type of model for examining risk and vulnerability in adolescents elsewhere (Blum, McNeely, & Nonnemaker, 2001). Within such a framework, it is easy to consider that religiosity would have both an individual domain and a social (contextual) domain. This consideration partly motivates our operationalization of religiosity as a two-dimensional construct consisting of public and private domains.

Using a social ecological model as a framework also suggests that, in addition to an individual and social domain of religiosity being important, the effects of these domains of religiosity might vary by level of cigarette use. This result could be generated by variation across levels of smoking in the relationship between social norms and smoking, social control and smoking, or moral codes and smoking. For example, daily smoking presents more opportunities to observe and thus regulate smoking than does occasional, experimental use.

In this paper, we also consider the possibility that public and private religiosities interact in affecting smoking behaviors. It is possible to argue on theoretical grounds that the interaction works both ways: (1) the effect of private religiosity on smoking behaviors depends on the level of public religiosity, and (2) the effect of public religiosity depends on the level of private religiosity. The motivation for the first hypothesis derives from Fowler's stage model of religious development during adolescence. Fowler (1981) proposed a stage model of faith development that spans from early childhood to adulthood. During adolescence, particularly early adolescence, adolescents directly integrate into their concept of faith the various messages, influences, and pieces of information they receive from the people who matter to them. Later in adolescence, adolescents examine and reconstruct these religious values received from family, peers, and their religious community. Thus, the effect of private religiosity on smoking behaviors may be stronger when the adolescent participates in religious activities that help form and reinforce religious beliefs.¹

The motivation for considering the second hypothesis—an interaction between public and

private religiosity such that the effect of public religiosity varies by the level of private religiosity—is based on the following logic. We have hypothesized that public religiosity affects behavior by acting as a form of social control or perhaps also because of its correlation with social support. It is plausible that both these mechanisms of affecting behavior are more effective for those adolescents with higher levels of private religiosity, for whom religion is a salient aspect of their life. If so, then religion as a social control agent—whether it be proscriptions against certain behaviors or the watchful eyes of members of a religious community—might be more effective. Likewise, adolescents with higher levels of private religiosity might be more likely to accept help from those in a religious community, thereby increasing social support, and increasing the apparent effectiveness of public religiosity.

Methods

Sample

Data for this study were drawn from the National Longitudinal Study of Adolescent Health (Add Health), a nationally representative longitudinal sample of American adolescents in grades 7 through 12 (Bearman, Jones, & Udry, 1997). The design of Add Health is grounded in a model of adolescent development that recognizes the multiple social contexts in which adolescents live their lives. Information that can be used to study the relationships between these multiple social contexts, adolescent health-related behaviors, and outcomes is collected. Add Health was launched in spring 1994 as an in-school survey of adolescents from grades 7 through 12 in 132 schools in 80 communities. Approximately 90,000 students participated (77% of eligible students) in the in-school survey. In 1995, a random sample of adolescents who had been eligible for the school survey were invited to participate in an in-home interview (wave I), and overall 20,745 (77% of those invited to participate) completed the interview. The in-home sample includes a core sample as well as oversamples of certain subpopulations. The sample of in-home adolescents was interviewed again 1 year later, in 1996, with 14,738 completing the second in-home interview (wave II). Those adolescents in grade 12 at wave I ($n = 3292$) were not interviewed at wave II. The wave II response rate was 88%.

¹The stage model also suggests a potential interaction between age and public and private religiosity such that public religiosity is more important at younger ages and private religiosity has more influence on smoking behaviors at older ages. The authors found no evidence for this hypothesis (findings not shown).

For the present analysis, we used data from waves I and II of the Add Health in-home sample with sampling weights ($n = 13,750$). Those adolescents who reported no religious affiliation at wave I ($n = 1867$) were excluded from the analysis because they were not asked to answer the religiosity questions. An additional 176 respondents who did not answer the religiosity questions at wave I were excluded. The sample size is therefore 11,707. The weighted sample is roughly representative of adolescents enrolled in grades 7 through 11 in the United States in 1995. The average age is 15.0 years, and the sample has equal numbers of males (50.2%) and females (49.8%). Approximately two-thirds of the sample is non-Hispanic White; another 15% is African American, and 12% is Hispanic. The remainder is composed of those of other racial/ethnic backgrounds. Fifty-seven percent live with both biological parents, 29.2% live with a single parent, 9.5% live in step families, and the remainder lives in other family structures.

Measurement

Public religiosity was measured as the mean of responses to two questions about behavior in the past 12 months: “How often did you attend religious services?” and, “Many churches, synagogues, and other places of worship have special activities for teens—such as youth groups, Bible classes, or choir. How often did you attend such religious activities?” Responses ranged from once a week or more (4) to never (1). Similarly, private religiosity was measured as the mean of responses to two questions: “How important is religion to you?” (responses ranged from very important [4] to not important at all [1]) and, “How often do you pray?” (responses ranged from at least once a day [5] to never [1]).

The results of a confirmatory factor analysis supported the hypothesis that public and private religiosity are two separate factors in this dataset, and tests of factorial invariance demonstrated that the two-factor model is an acceptable fit across the 11 denominations that included sufficient numbers of students to perform the test. Public and private religiosity are moderately correlated ($r = .51$), indicating, not surprisingly, that adolescents who attend religious activities are also more likely to think religion is important to them and to pray frequently. The mean of public religiosity is 2.6 (s.d. = 1.02, range = 1–4), and the mean of private religiosity is 3.1 (s.d. = .92, range = 0–5).

Cigarette smoking was defined as a three-category variable based on the number of days students reported smoking cigarettes during the previous 30 days. The smoking categorizations are motivated by models of the smoking uptake process (see Mayhew, Flay, & Mott, 2000, for a review). Although there is some difference in terminology and stage definitions, all of these models assume that developmental stages of smoking onset exist. We have adopted the stage concept of smoking onset and have defined the stages based on prior work and the items available for measuring smoking behavior in Add Health. No cigarette use was defined as not having smoked in the past 30 days. Experimental smoking was defined as having smoked on 1–19 days, and regular smoking was defined as having smoked on 20–30 days of the previous 30 days. Nearly three quarters (74%) of the respondents reported not smoking in the 30 days prior to wave I, 14% reported experimental smoking, and 12% reported smoking regularly.

Several observed characteristics of adolescents and their families may be associated with both their level of religiosity and smoking. We included as controls those variables that might plausibly be exogenous to smoking. We controlled for respondent's age, gender, race/ethnicity, family structure (two-parent biological family, single-parent family, step family, and other family type), the number of people living in the household, and income. Income is a six-category variable (under \$10,000; \$11,000–\$20,000; \$21,000–\$40,000; \$41,000–\$60,000; \$61,000–\$80,000; and over \$80,000). Since parental report of income was used, and 14.7% of adolescents did not have a parental survey, each adolescent missing parental report of income was assigned the median income of other adolescents of the same race/ethnicity, family structure, region of the country, and urbanicity. A dummy variable was included for missing data on income. In addition, two dummy variables were included for whether the adolescent reports appearing older or younger than his or her peers. Also included is the adolescent's score on the Add Health Picture Vocabulary Test, an abbreviated version of the Peabody Picture Vocabulary Test. All scores were standardized with a mean of 100 and a standard deviation of 15. In addition, we controlled for religious denomination. Religious denomination was assigned based on the response to the question, “What is your religion?” Respondents could select from among 27 religious denominations. For the analysis, all denominations with more than 400

respondents were included as control variables. Specifically, six denomination dummy variables were included in the models (Lutheran, Methodist, Pentecostal, Baptist, Catholic, and other non-Christian religions), with the reference category being other Christian religions. Several categorizations of affiliation were tested in the analysis, and the results did not change appreciably across model specifications.

Analytic strategy

We used multinomial logistic regression to examine the relationship between public and private religiosity and cigarette smoking. The dependent variable in these models is a categorical variable representing the level of cigarette use at wave II, where the levels are no use, experimental use, and regular use. We estimated three models, one for each level of use at wave I. First, we modeled the effect of religiosity on the probability that an adolescent who did not smoke at wave I would transition to either experimental or regular smoking by wave II. Second, we examined the effect of religiosity on the probability that an experimental user at wave I would either quit use or transition to regular use by wave II. Finally, we examined the effect of religiosity on the probability that a regular smoker at wave I would either decrease to experimental use or quit smoking altogether by wave II.

To test for interactions between public and private religiosity, we estimated the multinomial logistic regression models with interaction terms. To reduce the potential problems of multicollinearity that can occur when interaction terms are included in a model, the religiosity variables were centered around their means. Analyses were done in Stata 8.0 using sampling weights and adjusting for the complex sample design (StataCorp., 2003). All tests of significance were adjusted for the complex sample design using Stata svy (survey) estimators

(StataCorp., 2003). In addition, tests of the effects of religiosity were adjusted for multiple tests using a Bonferoni adjustment available for tests in Stata (StataCorp., 2003). We only discuss results significant at $p < .05$.

Results

We consider first the stability of adolescent smoking over time. Table 1 shows the pattern of initiation and escalation of smoking, as well as the pattern of reduction and cessation over the 1-year period between the two waves of data collection. The cells report the proportion of adolescents in a given level of smoking at wave I that is in each smoking category at wave II. The first row in the table shows that the vast majority (81%) of respondents who were nonsmokers at wave I did not smoke at wave II. Fifteen percent of nonsmokers at wave I transitioned into experimental smoking, and 5% transitioned into smoking regularly by wave II.

There was less stability in smoking behavior among the 14% of the sample who smoked experimentally at wave I. Approximately one-third stopped smoking by wave II, and another 29% increased cigarette use to become regular smokers. Among the 12% of the sample who smoked regularly at wave I, the vast majority (78%) also smoked regularly 1 year later. Only 11% of regular smokers at wave I reported quitting by wave II.

Table 2 presents results for the models estimating the effects of public and private religiosity on smoking transitions. Each column in the table contains the results of a multinomial logistic regression that models the transition from a given status at wave I (e.g., nonsmoking) into an alternative status at wave II (e.g., experimental smoking). Two models are presented for each transition. The first contains the main effects of

Table 1
Proportion of respondents who initiate, escalate, reduce, and cease cigarette use between wave I and wave II: National Longitudinal Study of Adolescent Health

Wave I	Wave II			Row total	Unweighted (N)
	Never	Experimental	Regular		
<i>Cigarette use</i>					
Never	.81	.15	.05	1.0	10,069
Experimental	.34	.37	.29	1.0	1790
Regular	.11	.11	.78	1.0	1545

Table 2

Weighted multinomial logit coefficients for the effect of public and private religiosity on initiation, reduction, and cessation of cigarette smoking, National Longitudinal Study of Adolescent Health, waves I and II

	None to experimental		None to regular		Regular to experimental		Regular to none	
	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2	Model 1	Model 3
<i>Religiosity</i>								
Public	.015	.031	-.081	-.077	.302*	.289*	.315*	.336*
Private	-.069	-.129	-.294**	-.343**	.090	.056	.014	.070
Public × private		-.132**		-.086		-.080		.107
<i>Demographic characteristics</i>								
Age	.021	.022	.061	.062	-.100	-.100	-.153	-.152
Female	-.089	-.076	-.015	-.010	-.451	-.448	-.686**	-.689**
Black ^a	-.464**	-.473**	-2.416**	-2.421**	1.196*	1.179*	.728	.742
Hispanic ^a	-.042	-.051	-.599	-.604*	1.117**	1.112**	.273	.274
Other race/ethnicity ^a	-.539*	-.532*	.188	.192	-.384	-.340	.166	.098
Step family ^b	.281*	.277*	.393	.390	-.935*	-.922*	.223	.206
Single biological parent ^b	.152	.146	.422*	.418*	-.182	-.171	.371	.368
Other family structure ^b	-.001	-.002	.518	.517	.470	.488	.358	.342
Household size	-.011	-.011	-.044	-.043	-.044	-.042	-.016	-.018
Income	.031	.033	-.144	-.143	.366**	.364**	.216	.219
Teen older than most	.174	.178	.573**	.574**	-.614	-.604*	-.171	-.180
Teen younger than most	.172	.175	-.239	-.235	.030	.020*	1.269**	1.299**
Modified PPVT	.000	.000	-.005	-.005	-.024*	-.024*	-.020	-.0193
<i>Denomination</i>								
Catholic	-.017	-.035	-.050	-.064	-.631*	-.625	-.042	-.048
Lutheran	.155	.150	-.080	-.083	-.121	-.116	-.814	-.827
Methodist	.128	.119	-.082	-.088	.132	.161	-.374	-.404
Pentecostal	-.306	-.292	-.135	-.119	-.148	-.152	-1.496*	-1.498*
Baptist	-.152	-.146	.243	.246	-.2542	-.238	-.259	-.280
Other denomination	-.501*	-.511*	-.539	-.545	-.693	-.695	-.471	-.454
Constant	-1.966**	-1.904**	-2.520**	-2.494**	1.799	1.831	2.134	2.04
Wald F-statistic	4.36**	4.28**			1.88**	1.77**		
N	8068	8068			1124	1124		

*Significant at $p < .05$.

**Significant at $p < .01$.

^aReferent group is White, non-Hispanic.

^bReferent group is two-parent biologic or adopted family.

public and private religiosity, and the second adds the interaction term. All religiosity variables in the models are centered around their mean.

The first and third columns of Table 2 show the main effects for public and private religiosity for smoking initiation. Higher levels of private religiosity at wave I are associated with a lower probability of initiating regular smoking but not experimental smoking. For each one-unit increase in private religiosity, adolescents are .74 [$e^{-.294}$] times as likely to initiate regular smoking relative to remaining a nonsmoker. The second and fourth columns in the table, labeled Model 2, contain an interaction between public and private religiosity. The negative interaction term for the model

predicting the transition from not smoking to experimental smoking (column 2) indicates that as public religiosity increases, so does the protective effect of private religiosity. When the value of public religiosity is one standard deviation below the mean, the relative risk ratio for private religiosity is .71 [$e^{-.129-.132(1.58)}$], whereas when the value of public religiosity is one standard deviation above the mean, the protective effect of private religiosity on the initiation of experimental smoking increases substantially (RRR = .54 [$e^{-.129-.132(3.62)}$]). Similarly, as private religiosity increases, so does the protective effect of public religiosity. When the value of private religiosity is one standard deviation below the mean, the relative risk ratio for public

religiosity is .73 [$e^{-.031-.132(2.18)}$]. In contrast, when the value of private religiosity is one standard deviation above the mean, the relative risk ratio for public religiosity is .61 [$e^{-.031-.132(4)}$]. The interaction term for the model predicting the transition from not smoking to regular smoking is not statistically significant, indicating that the protective effect of private religiosity does not depend on the level of public religiosity.

Neither public nor private religiosity is associated with the transition from experimental smoking to regular smoking or with the transition from experimental smoking to cessation. There is also no evidence of an interaction between public and private religiosity for either of these transitions. In fact, the Wald F -test for the full model was not statistically significant ($F [42,85] = 1.14; p = .303$), indicating that together the variables in the model do not improve the fit over a fully unsaturated model.

The probability that regular smokers reduce or cease smoking between waves I and II is modeled in the last two sets of columns in Table 2. Public religiosity predicts both reduction to occasional smoking and complete cessation. The relative risk ratios are substantial. For each one-unit increase in public religiosity, the probability of reduction increases by 37% (RRR = 1.37), and the probability of cessation increases by 35% (RRR = 1.35). These associations are not affected by inclusion of an interaction term, suggesting that the effect of public religiosity on reduction or cessation is independent of the level of private religiosity.

Of the background characteristics considered in this analysis, race/ethnicity is most extensively associated with smoking transitions. On average, African American adolescents who do not smoke are less likely than White and Hispanic adolescents to initiate experimental or regular smoking. African American adolescents are also more likely to reduce smoking once they are a regular smoker. Girls are half as likely as boys (RRR = .50 [$e^{-.686}$]) to quit smoking once they are regular smokers, but there are no gender differences for the other transitions. Appearing older than most teens their age is associated with an increased probability of initiating regular smoking. Appearing younger than most does not protect against initiating regular cigarette use, but it is positively associated with quitting once regular use has begun. These effects exist despite the lack of an overall age effect on cigarette use, when modeled as transitions over a 1-year period.

Discussion

In our prior cross-sectional research, we found that private religiosity was more strongly associated with experimental smoking whereas public religiosity was more strongly associated with regular smoking (Nonnemaker et al., 2003). This result implied that private religiosity was more protective against initiating smoking and that public religiosity had a stronger role in either smoking escalation, smoking cessation, or both. In this study, we explicitly examined the effects of public and private religiosity, as well as their interaction, on initiation, escalation, and cessation of smoking. The results from this study are consistent with expectations from our previous work.

Private religiosity was found to be protective against initiation of regular smoking among non-smokers. Private religiosity may provide moral directives regarding smoking that make adolescents disinterested in smoking or enable them to exert self-control and not smoke even when the possibility is intriguing. Private religiosity also was protective against initiation of experimental smoking but only when the young person frequently attended religious services or a religious youth group. Given that experimentation with cigarettes is such a normative adolescent behavior (about 58% of adolescents have ever tried smoking cigarettes (Centers for Disease Control and Prevention (CDC), 2004)), it is not surprising that private religiosity has less influence on experimental smoking. Personal commitment to one's faith may need to be reinforced by frequent participation in a religious community to compete with the normative adolescent culture of experimentation with cigarettes.

Although private religiosity may discourage the uptake of smoking, it appears to be unrelated to reduction or cessation of smoking once a young person has become addicted to cigarettes. In contrast, public religiosity does predict reduction and cessation of cigarette use among regular smokers. The mechanisms through which public religiosity influences reduction and cessation of smoking among adolescents could be multiple, including social control and social support. It is likely that multiple mechanisms interact to promote cessation directly and indirectly. This finding adds to the limited recent literature that documents a positive association between participation in a faith community and smoking cessation among adolescents.

Interestingly, neither public nor private religiosity predicted transitions from experimental smoking to either regular smoking or to nonsmoking. Experimental smoking was the least stable of the three smoking categories; just 37% of adolescents who reported experimental smoking at wave I remained experimental smokers. Our measurement of experimental smoking includes a relatively broad spectrum of smoking behavior: from smoking one cigarette on 1 day to smoking several cigarettes per day on up to 19 days. Moreover, experimental smoking was assessed for the 30-day period prior to each interview, rather than over the entire interval between surveys. Although we based our categorization of smoking on the smoking uptake literature, more refined measurement of smoking trajectories might be needed to understand the role of risk and protective factors for transitioning from experimental smoking into either addictive behavior or quitting.²

Even with improved measurement, it is plausible that religiosity and other psychosocial predictors have little influence on the progression from experimental to regular smoking due to the addiction process. As we have found, for some, religiosity prevents smoking initiation (whether due to religiosity per se or due to some unobserved factor that determines both religiosity and smoking behavior). However, once smoking experimentation starts, both biological and psychological aspects of addiction quickly come into play and the social influences on smoking become less important (DiFranza et al.,

2000; O’Loughlin et al., 2002; Pomerleau, Collins, Shiffman, & Pomerleau, 1993). At this stage of the process—progression from experimentation to addiction—biological and physiological processes may be the major determinants of smoking behavior. Eventually, adolescents who smoke regularly become aware that addiction has started and some will develop regret and a desire to quit (Institute of Medicine, 1994). At this time, some may seek support from faith and/or from a faith community and thus religiosity might have an effect on cessation. Also, as smoking becomes more regular, it is more observable. There are more opportunities for those around the adolescent to observe smoking behavior or signs of smoking behavior (e.g., smell of smoke). This is another way for a faith community to become involved in promoting cessation through a social control function.

DeHaven, Hunter, Wilder, Walton, and Berry (2004) review the evidence for effectiveness of faith-based organizations (FBOs). Only two studies reviewed were focused on smoking. These studies were both cessation interventions and provide mixed evidence: one study found a significant increase in readiness to change while the other found no significant change in quit rates. Overall, DeHaven et al. conclude that, although there is some evidence that FBO health programs can produce positive effects, there is also a lack of information on which to base assessments of effectiveness of such programs. Clearly, more research is needed concerning the role and effectiveness of FBOs in youth tobacco control efforts (both prevention and promotion of cessation). Our results suggest that such efforts might be effective.

Taken together, this pattern of results suggests that adolescents’ decisions to experiment with smoking (i.e., to start down the pathway of the smoking uptake process) are influenced by both their individual practice of their faith and by participation in the larger faith community. However, the effects of the two domains of religiosity are specific to different decision points regarding smoking. Private religiosity appears to be a more effective deterrent whereas public religiosity may promote smoking cessation. This pattern of specificity suggests that understanding the behavioral consequences of religiosity is a complex task.

Two lines of inquiry are suggested by these results. First, the mechanisms through which religiosity affect smoking need to be elaborated and tested. Smith (2003) and Regnerus (2003) have

²Although there has been research into the measurement of the smoking uptake process, there remains ambiguity in defining smoking stages, including ambiguity regarding where to establish meaningful cut-points on a smoking uptake continuum (see Mayhew et al., 2000). Prior measurement work has used a measure of lifetime cigarettes smoked to distinguish established from nonestablished smokers (100+ lifetime cigarettes smoked defines established smokers). Unfortunately, Add Health does not have this measure of smoking history. In our work, we have used days smoked in the past 30 days, as opposed to cigarettes smoked per day, as the most appropriate measure of the process by which adolescents develop a smoking habit. A measure like cigarettes per day would be useful to make distinctions among those smokers who have already established a habit (i.e., more regular smokers) but is less useful for understanding the uptake process. Nonetheless, our measurement strategy results in a heterogeneous group of experimental smokers that includes established intermittent smokers as well as those who tried a cigarette in the past 30 days but perhaps will not smoke again. It is possible that further subdivisions of the experimental smoking group would yield a more homogeneous group of adolescents. Unfortunately, the literature provides little guidance in this area. Clearly, additional research is needed into measurement of the smoking uptake process.

elaborated several theoretical mechanisms, as we have in this paper, but, in general, competing hypotheses have not been tested in the literature. Second, it is necessary to identify the conditions under which these relationships operate. It is reasonable to expect, for example, that the relationship between public religiosity and smoking cessation depends on the information communicated and the values and behaviors modeled during religious services and youth groups.

The relationship between religiosity and smoking may also depend on race/ethnicity and may help explain large racial/ethnic differences in the prevalence of smoking among adolescents. The evidence in this regard is mixed and merits more exploration. Flint, Yamada, and Novotney (1998) found that inclusion of church attendance in their model did not reduce Black–White differences in smoking uptake. However, Griesler and Kandel (1998) found that a measure of maternal importance of religious training was protective against smoking for Whites but not Blacks. Wallace, Brown, Bachman, and LaViest (2003) found that race differences in abstinence from substance use were substantially reduced when race differences in religiosity were controlled. They also found that highly religious White youth were more likely than highly religious Black youth to abstain from alcohol and marijuana.

It is also possible that the effects of religiosity on smoking vary by gender. Like race/ethnicity, it has been suggested that gender might be an important moderator of the relationship between religiosity and substance use. The rationale for this idea is that females tend to be more religious while males tend to abuse substances more. It has been hypothesized that these important gender differences might be related to gender differences in sensation seeking or risk taking, with males being more likely to take risks (Miller & Stark, 2002). One study of American adolescents found that girls reported only slightly higher levels of religiosity than boys (Smith et al., 2003). The evidence is limited in terms of smoking specifically. As noted previously, the study by Van den Bree et al. (2004) found that religiosity was protective against progression to regular smoking and promoted cessation only for boys. Forthun, Bell, Peek, and Sun (1999) found no evidence for gender differences in the effects of religiosity on substance use using data from a sample of US adolescents. More in-depth study of these contingent relationships could inform both faith-based and secular efforts to prevent smoking among adolescents.

The affiliations measured in Add Health included such diverse subgroups (even before the denominations were collapsed into the broad categories used in this analysis) that variation within religious denomination is likely to be as great or greater than the variation between religious denominations on characteristics of the denomination related to smoking, such as the proscriptiveness of smoking (Matthews et al., 1999). This is a limitation of this study, since no conclusions can be drawn regarding the general lack of statistical associations between religious denominations and smoking. An additional limitation of this study is the measurement of smoking transitions, as alluded to above. Cigarette use in the past 30 days was measured at yearly intervals, and thus we did not have a detailed picture of the dynamics of progression and cessation processes that might have occurred at a finer level of focus. We therefore could not incorporate multiple events into our modeling, a limitation particularly relevant to modeling cessation since individuals typically try to quit multiple times before finally succeeding (Rigotti, 2002; United States Department of Health and Human Services (USDHHS), 1990). As discussed above, our category of experimental smokers is heterogeneous, including a relatively broad spectrum of smoking behavior: from smoking one cigarette on one day to smoking several cigarettes per day on up to 19 days. Consequently, we may have misclassified categories of smokers, thereby biasing our estimates of the effects of religiosity. An additional limitation of our study derives from the potential influence of attrition on our results. We found that adolescents who were regular smokers at wave I were significantly more likely to be lost to follow-up (even after accounting for those lost to follow-up because they were 12th graders at wave I). In addition, those lost to follow-up reported slightly higher levels of public religiosity at wave I (the magnitude of the difference is small and it is doubtful that such a small difference is meaningful). There was no difference in the wave I level of private religiosity among those lost to follow-up. This relationship between smoking, public religiosity, and attrition could result in a bias such that we might overstate the association between religiosity and cessation. It should be noted that such a bias is limited by the relatively high response rate at wave II (88%) and the weighting procedure used which to some extent accounts for attrition. A final caveat is that our analysis necessarily simplifies complex relationships between

constructs. Religiosity is treated as exogenous to smoking, whereas the interplay between these domains is likely dynamic: adolescents may adjust their religious commitment and practice to be in alignment with their substance use. For example, Benda (1997) found that while alcohol use determined religiosity, the reverse was not true.

In conclusion, this research demonstrates that the two most frequently conceptualized domains of religiosity—public and private religiosity—are associated with adolescent health behavior in ways that are simultaneously unique and contingent upon one another. This finding demonstrates the utility of a social ecological approach, which emphasizes the importance of multiple layers of influence on adolescent behaviors. This finding also lends support to the contention others have made (e.g., Regnerus, 2003; Smith, 2003) that the domains in which religiosity is important extend beyond the individual to include families, peers, schools, community, and religious institutions.

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