DO ADOLESCENT PEER SMOKING NETWORKS MATTER FOR ADULTS' SMOKING BEHAVIOR?

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ABSTRACT

Kaitlin Shartle: Do Adolescent Peer Smoking Networks Matter for Adults' Smoking Behavior?
(Under the direction of Robert A. Hummer)

Adolescent peers have been shown play an influential role in the initiation of smoking during adolescence. However, there has been limited literature examining whether adolescent peer smoking networks are associated with longer term patterns of smoking. This study uses data from the National Longitudinal Study of Adolescent to Adult Health to examine whether age-based trajectories of daily smoking from adolescence to young adulthood are associated with adolescent peer smoking networks and how these associations differ by gender. Findings using multilevel growth curve models indicate that individuals who have more friends who smoke during adolescence are more likely to be daily smokers. This relationship stays consistent as individuals age. Further analysis shows that these results differ by gender, whereby adolescent peer smoking networks are more strongly associated with smoking in women than men. These findings suggest that adolescent peer smoking networks can have lasting impacts on regular smoking into adulthood.

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LIST OF ABBREVIATIONS

Add Health	National Longitudinal Study of Adolescent to Adult Health
SES	Socioeconomic Status
SIENA Models	Stochastic Actor-Based Models
U.S. DHHS	United States Department of Health and Human Services

INTRODUCTION

Although cigarette smoking has decreased in recent decades, around 37.8 million adults in the United States currently smoke (Jamal et al. 2016). Smoking accounts for more than 480,000 deaths every year, and is considered the leading cause of preventable disease and death in the United States (Lariscy et al. 2018; U.S. DHHS 2014). The severe health consequences of smoking coupled with nicotine addictiveness necessitates continued attention to why people begin and continue to smoke. Fortunately, individuals who quit smoking before the age of 40 reduce their risk of death related to smoking by about 90 percent (Jha et al. 2013). Therefore, it is important that researchers continue to better understand trajectories of smoking, particularly as individuals transition from adolescence into adulthood.

The majority of daily smokers in adulthood (87 percent) had their first cigarette before the age of 18 (U.S. DHHS 2014), making adolescence a pivotal starting point with regard to smoking trajectories. During adolescence, peers are important socializing agents as adolescents are establishing independence from their parents (Furstenberg 2000). This makes peers key influencers in the initiation of smoking. Although scholars have shown that peers impact smoking during adolescence (e.g. Haas & Schaefer 2014; Fletcher 2010; Ali and Dwyer 2009; Alexander et al. 2001), little research has examined whether adolescent peer smoking networks impact smoking beyond adolescence. The few scholars who have examined this association have used varying methods, each with their own set of drawbacks (Pollard et al. 2010; Ali and Dwyer 2009; Abroms et al. 2005). In addition, most of this research has used small samples with short follow-up periods.

Results finding lasting impacts of adolescent peer smoking networks would provide evidence for a sensitive period model, which posits that exposures during adolescence are more strongly associated with later life health risks than other time periods (Ben-Shlomo & Kuh 2002). However, the impact of adolescent peers on smoking may decrease over the life course as factors during adulthood become more prominent. By examining trajectories of smoking, we can better understand how adolescent peer smoking networks are associated with smoking as individuals age. Findings from such work can help better tailor anti-smoking campaigns.

In addition, literature on this topic tends to assume that the association between adolescent peer smoking networks and smoking behavior operates similarly for everyone. However, this may not be the case. For example, the association between adolescent peer smoking networks and smoking behavior may differ by gender. Previous literature has found conflicting evidence regarding gender differences in the association between adolescent peer networks and health behavior (Bruening et al. 2015; Hsieh & Lin 2017; Erickson, Crosnoe, Dombusch 2000; Duncan et al. 2005). Thus, this thesis examines the association between adolescent peer smoking networks and smoking trajectories from adolescence to young adulthood as well as how this association differs by gender.

LITERATURE REVIEW

Although a majority of daily smokers begin smoking during adolescence (U.S. DHHS 2014), individuals follow different trajectories of smoking throughout their lives. Literature has found that, on average, smoking prevalence increases incrementally throughout adolescence (Simons-Morton & Chen 2006; Ennett et al. 2006). There is a particularly steep increase in smoking prevalence during the transition to adulthood, when individuals are in their late teens or early 20s (Daw, Margolis, and Wright 2017). However, by young adulthood, around the mid-20s, smoking prevalence starts to plateau and, in some cases, begins to slowly decline with increasing age (Daw et al. 2017; Bernat 2008).

It is important to identify factors that lead to differences in smoking trajectories, particularly trajectories involving continued and increased smoking. Studies have shown that numerous individual, social, and contextual factors are associated with the likelihood of smoking during adolescence. Some of these factors include older age, being white, having parents who do not have a college degree, having parents who smoke, having no college plans, and experiencing highly stressful events (Johnston et al. 2019; Gentzke 2019; Lawrence, Pampel & Mollborn 2014; Maralini 2013; Vuolo & Staff 2013; Finkelstein, Kubzansky & Goodman 2006). Although these factors contribute to smoking initiation and can impact smoking trajectories, this thesis focuses specifically on adolescent peer smoking networks due to the critical role peers play in establishing norms and behaviors during adolescence (Furstenberg et al. 2000).

During adolescence, individuals are establishing independence from their parents, exploring new lifestyles, and developing friendships (Furstenberg et al. 2000). At this stage of the life

course, peers are particularly influential on their friends' health behavior. For example, literature has found that although parents' smoking status was a significant predictor of smoking initiation in preadolescence (ages 11-12), by adolescence (ages 13-14) friends, rather than parents, were the main source of influence for smoking initiation (Vitaro et al. 2004). Key studies of adolescent peer networks have shown the importance of these networks for smoking behavior (Powell, Tauras, & Ross 2005; Ennett et al. 2008; Kreager & Haynie 2011).

Most work on adolescent peer networks and health behavior has used data from the National Longitudinal Study of Adolescent to Adult Health (Add Health), which was the first study at the national level to measure adolescent peer networks. Literature using Add Health has shown that peers impact smoking behavior. In particular, individuals who are friends with others who smoke are more likely to smoke during adolescence (Haas & Schaefer 2014). Estimates suggest that a ten percent increase in the smoking rate of adolescent peers increases the likelihood of an individual smoking by three to five percent during adolescence (Fletcher 2010; Ali and Dwyer 2009). Additional research suggests that if half of an adolescent's peer network are smokers, then the adolescent is twice as likely to be a smoker compared to adolescents who belong to a network of nonsmokers (Alexander et al. 2001).

Adolescent peer networks have the ability to affect health behaviors not only short-term but also long-term, with effects extending throughout adolescence and across the life course (Umberson, Crosnoe & Reczek 2010; Umberson & Montez 2010). For example, Soloski, Kale, and Durtschi (2016) find that the number of alcohol-using friends during adolescence is predictive of binge drinking during both adolescence and adulthood. However, other research suggests that there might not be a strong effect of adolescent peer networks on health behaviors into adulthood. Hahm et al. (2012) found that adolescents who were friends with alcohol-using

peers during adolescence were 10 times more likely to initiate binge drinking earlier. Although these results were strong and significant during adolescence, they decreased significantly later in life. The effect of alcohol-using peers on binge drinking decreased by 50 percent in the transition to adulthood and 90 percent in young adulthood.

The current analysis most closely builds off research by Ali and Dwyer (2009), Abroms et al. (2005), and Pollard et al. (2010), who all examined the longitudinal effects of adolescent peer smoking networks on individual smoking behavior. Using Add Health, Ali and Dwyer (2009) find that the percentage of friends who smoke during adolescence has a lasting impact on the smoking status of individuals in the transition to adulthood. In fact, having at least 25 percent of friends who smoke during adolescence increases the probability of an individual smoking in the transition to adulthood by 3 percent. Although this study provides key information on how adolescent peer smoking networks impact smoking in the transition to adulthood, the authors do not discuss the impact of adolescent peer smoking networks on smoking trajectories. Examining trajectories provides insight into how smoking is changing over the life course rather than investigating a single stage in the life course.

Abroms et al. (2005) investigates smoking behavior by examining adolescents between 6th and 9th grade in seven middle schools in Maryland. The authors identify six distinct smoking trajectories, including the latent classes of never smokers, intenders, delayed users, escalators, early experimenters, and early users. The authors find that having any friends who smoke is associated with an increased likelihood of being in the intender, delayed escalator, early experimenter, or early user classes compared to never smokers. Although this research identifies an association between adolescent peer smoking networks and smoking trajectories, it is based on a limited sample and a limited observation period.

Pollard et al. (2010) extends this research by examining the longitudinal effects of adolescent peer smoking networks on smoking behavior into adulthood using Add Health. The authors use similar methods as Abroms et al. (2005) by identifying latent classes of smoking trajectories. Pollard et al. (2010) found evidence for a six-class model of smoking trajectories, with latent classes of never smokers, steady lows, delayed increasers, early increasers, decreasers, and steady highs. Similar to Abroms et al. (2005), Pollard et al. (2010) finds that an individual's perception of their friends' smoking status is associated with higher odds of belonging to one of the smoking classes compared to belonging to the never smoker class. In addition, the authors found that adolescents who were in a smoking group, which was defined as a group consisting of at least one smoker and where 50 percent or more friendship ties were directed to members of the same group, were at an increased risk for belonging to a higher smoking trajectory group (delayed increasers, early increasers, or steady highs).

Although this study used a larger sample compared to Abroms et al. (2005), Pollard et al. (2010) only analyzed the two largest saturated schools in Add Health; thus, the study was not nationally representative. Second, Pollard et al. (2010) measured adolescent peer smoking networks as the respondent's perception of their best friend's smoking behavior and by being a member in a smoking group. However, friends' self-reported smoking behavior may be a better measure of adolescent peer smoking networks than the respondent's perceptions of their friends' smoking behavior. In addition, it is important to extend the measurement of adolescent peer smoking networks to include all of the respondents' nominated friends instead of just best friends to get the full effect of these networks. There may also be a dose response in the number of friends who smoke, whereby having more friends who smoke is associated with higher probabilities of smoking. Collapsing the measurement of adolescent peer smoking networks into

a dichotomous measure of belonging to a smoking group does not facilitate the understanding of this dose response. Lastly, these studies, as well as other studies on health behavior trajectories, assume that social networks impact everyone the same way, when this may not be the case. In this thesis, I build on previous literature by analyzing whether adolescent peer smoking networks are associated with smoking trajectories and whether this association differs by gender.

CONCEPTUAL MODEL AND HYPOTHESES

Figure 1 shows the conceptual model for this thesis. In this model, adolescent peer smoking networks are associated with smoking trajectories and this association is modified by gender. The association between adolescent peer smoking networks and smoking trajectories extends beyond adolescence and into young adulthood.

Key concepts from my conceptual model include smoking trajectories and adolescent peer smoking networks. Smoking trajectories, my main dependent variable, captures individual changes in the likelihood of daily smoking as individuals age. My next key term, adolescent peer smoking networks, refers to the number of people who smoke within each respondents' friendship network. Embedded within my conceptual model are three questions. First, are adolescent peer smoking networks associated with trajectories of smoking from adolescence to young adulthood? Second, does the association between adolescent peer smoking networks and smoking trajectories differ by gender? Third, are same-sex or opposite-sex smoking friends more strongly associated with smoking trajectories? In the following sections, I discuss theoretical arguments and mechanisms for my conceptual model. In addition, I present hypotheses based on my conceptual model to guide my analysis.

Life Course Perspective

A life course perspective suggests that conditions throughout one's lifespan can affect health (Elder, Johnson, & Crosnoe 2003). One key principle of life course is timing. This principle suggests that health is shaped by the stage at which particular events occur in the life course.

Adolescence, for example, is a sensitive period in the life course, when exposures can have adverse or protective effects on development and later life health than other time periods (Kuh, Ben-Shlomo & Susser 2004; Ben-Shlomo & Kuh 2002). It is also at this stage that individuals begin to have greater autonomy over their health and health behavior due to their increasing independence (Furstenberg 2000).

While the principle of timing focuses our attention on adolescence as the starting point for smoking, a life course framework also highlights the importance of trajectories, which are dynamic descriptors of health over the life course (Elder et al. 2003). Trajectories measure intraindividual stability and change in relationship to social and historical context (George 2009; Elder et al. 2003; Elder 1998). In context of this thesis, trajectories capture age-related changes in smoking within a cohort of individuals from adolescence to young adulthood.

The cohort I am analyzing was born between 1974 and 1983 and were in middle school or high school during the 1994-1995 school year. When examining cohorts, it is important to understand the historical context that individuals are living in (Elder et al. 2003). Although cigarette smoking declined from 1977 to 1991 for all age groups, smoking prevalence increased among adolescents from 1992-2001 before rapidly decreasing afterwards (Johnston et al. 2019; Pampel & Aguilar 2008). For example, in 1995 about 22 percent of 12^{th} graders used cigarettes daily compared to about 19 percent in 1990 and 14 percent in 2005. The increase in adolescent smoking at the time the Add Health cohort were adolescents provides an interesting perspective into how smoking is changing within individuals over time in a particular cohort.

It is important to examine not only how smoking is changing within a cohort over time, but also factors that may lead individuals to differ in their trajectories of smoking. Social factors, particularly those occurring early in the life course, can play integral roles in channeling people

into different trajectories of smoking. In this thesis, I examine adolescent peer smoking networks and their association with smoking trajectories.

Adolescent Peer Smoking Networks

Previous research has established adolescent peers as significant influencers on smoking during adolescence (Haas & Schaefer 2014; Fletcher 2010; Ali and Dwyer 2009; Alexander et al. 2001) as well as beyond (Pollard et al. 2010; Abroms et al. 2005; Ali and Dwyer 2009). This literature leads me to hypothesize that there will be a positive association between adolescent peer smoking networks and smoking trajectories, whereby an increase in the number of adolescent friends who smoke is associated with higher probabilities of smoking compared to those with fewer friends who smoke.

Mechanisms linking adolescent peer smoking networks to smoking across the life course include social influence and social comparison; behavioral guidance, purpose, and meaning; and belonging and companionship (Thoits 2011; Hoffman et al. 2006). Although I am not testing these mechanisms against each other, they provide a framework for how my conceptual model may be operating. Through social influence from others, social comparison to others, and behavioral guidance from others, adolescents determine what are normalized and accepted behaviors through the observation of their peers. Sharing routine activities, such as classes or afterschool activities, lends an environment in which close observation of peers occurs.

These mechanisms relate to social learning theory, which posits that individuals imitate the behavior of others (Akers 1979). These behaviors are then reinforced by groups, such as peer networks. When a behavior is viewed positively among peers, individuals are more likely to engage in that behavior. Meanwhile, when a behavior is associated with negative views,

individuals may attempt to stay away or stop engaging in that behavior. Social learning theory is also related to the mechanisms of belonging and companionship; that is, individuals may adopt the behavior of others in order to feel accepted (Brechwald & Prinstein 2011). These mechanisms of socialization may cause imprinting effects of normalized behaviors and beliefs. Imprinting is when an individual continues to hold the normalized behaviors and beliefs established earlier in the life course into adulthood. This imprinting effect can be particularly important because nicotine is highly addictive; thus, smoking initiation during adolescence may set the trajectory path of smoking throughout the life course.

Although I have primarily focused my discussion on peer influences, the effect of adolescent peer smoking networks on smoking trajectories may be due to homophily (also called selection) as well. Homophily is the principle that individuals choose friends who are similar to themselves in terms of sociodemographic, behavioral, and intrapersonal characteristics (McPherson, Smith-Lovin, & Cook 2001). For example, adolescents are more likely to be friends with others who are of similar race/ethnicity and SES as themselves (Moody 2001; McPherson et al. 2001; Bettie 2003). This high level of homophily leads to homogeneous peer networks which can impact individuals' attitudes and behaviors. For example, Daw et al. (2015) found that there is homophily in smoking, drinking, television watching, and exercising such that peers who have similar behaviors were more likely to be friends.

Overall, peer influence and selection can both play a role in smoking during adolescence (Hall & Valente 2007). For instance, Ragan (2016) finds that although adolescents changed their beliefs on smoking in order to be more similar to their friends, adolescents also chose friends who held similar beliefs on smoking. Recent literature on selection and influence uses stochastic actor-based models (also called SIENA models) and similarly find that both selection and

influence are associated with smoking behavior (Schaefer, Haas & Bishop 2012; Schaefer, adams & Haas 2013; adams & Schaefer 2016). However, these models require complete longitudinal network data. Currently, there are no data sets which have complete network data from adolescence to young adulthood. In addition, although SIENA models have been thought to produce more conservative estimates of peer influence because of their ability to account for network complexities of estimating influence, a recent article by Ragan et al. (2019) finds that SIENA models produce similar or larger estimates of peer influence compared to conventional regression methods. Therefore, SIENA models may not be any better than conventional regression methods in analyzing adolescent peer smoking networks. In my analysis I address selection by controlling for an array of observed confounders while recognizing that selection and influence can have bi-directional impacts on smoking.

Modification by Gender

Previous literature often assumes that adolescent peer networks impact socio-demographic groups the same way (Pollard et al. 2010; Soloski et al. 2016; Hahm et al. 2012), which may not be the case. Smoking prevalence differs by gender, both during adolescence as well as over the life course (Jamal et al. 2016). Therefore, the association between adolescent peer smoking networks and smoking trajectories may also differ by gender.

Current literature provides conflicting evidence to the role that gender plays in the association between adolescent peer networks and health behaviors. Research on peer influence by gender finds that females are more sensitive to peer influence than males with regard to delinquency, weight status, smoking, and GPA (McMillan, Felmlee & Osgood 2018; Bruening et al. 2015; Hsieh & Lin 2017). Conversely, other research finds that peer influence is significant

for males but not females with regard to substance use and binge drinking (Brechwald & Prinstein 2011; Erickson, Crosnoe, Dombusch 2000; Duncan et al. 2005). In addition, literature on alcohol-use has found that while same-sex friends influence each other's drinking behavior mutually, there are mixed effects for opposite-sex friends (Gaughan 2006). Male friends are more likely to influence female friends' drinking behavior than female friends. Meanwhile, female friends did not have any effect on their male friends' drinking behavior. However, other literature has found that the gender composition of friends may not influence drinking behaviors at all (Deutsch, Steinley, & Slutske 2014).

These findings lead me to examine if the association between adolescent peer smoking networks and smoking trajectories differs by gender. I hypothesize that the association between adolescent peer smoking networks and smoking trajectories will be modified by gender, whereby adolescent peer smoking networks will be more important for women than men.
These findings could be due to gender differences in friendship dynamics among males and females. For example, during youth and adolescence females tend to engage in small dyadic friendships while male have more expansive networks (Perry and Pauletti 2001; Rose & Rudolph 2006). In addition, during adolescence closeness in female networks is defined by emotional investment while for males it is defined by sharing similar activities (Rose & Rudolph 2006). These differing friendship dynamics could contribute to differences in the association between adolescent peer smoking networks and smoking trajectories.

The association between adolescent peer smoking networks and smoking trajectories may differ not only the gender of the individual by also by the gender of their friends. This leads me to ask whether same-sex or opposite-sex smoking friends are more strongly associated with smoking trajectories. I hypothesize that having more same-sex friends who smoke will be more

strongly associated with smoking trajectories than having opposite-sex friends who smoke. This could be related to social learning theory, where peers may be more likely to imitate the behavior of people who are most similar to themselves (Akers 1979).

In summary, my conceptual model describes how adolescent peer smoking networks are associated with smoking trajectories and how this association differs by gender. My hypotheses are based on this conceptualization.

Hypothesis 1: There will be a positive association between adolescent peer smoking networks and smoking trajectories, whereby an increase in the number of adolescent friends who smoke will be associated with higher probabilities of smoking as individuals age compared to those with fewer friends who smoke.

Hypothesis 2: The association between adolescence peer smoking networks and smoking trajectories will be modified by gender, whereby adolescent peer smoking networks will be more important for women than men.

Hypothesis 3: Having more same-sex friends who smoke will be more strongly associated with smoking trajectories than having opposite-sex friends who smoke.

DATA AND METHODS

Data and Analytic Sample

To test my hypotheses, I use the National Longitudinal Study of Adolescent to Adult Health (Add Health; Harris et al. 2009). The initial sample included individuals from 80 high schools and 52 feeder schools (schools with a 7th grade) representative of the United States in terms of region of country, urbanicity, size, school type, and ethnicity. This led to a nationally representative sample of 132 middle schools, junior high, and high schools totaling 90,118 students during the 1994-1995 school year. Of the initial 90,000 respondents, a baseline sample of 20,745 adolescents were interviewed for the Wave I in-home survey.

A follow-up in-home survey (Wave II) was conducted a year later in 1996 which included 14,738 respondents. Six years later, Wave III was conducted, which included a total of 15,197 respondents aged 18-26. Another follow-up (Wave IV) was conducted in 2008-09 when respondents were 24-32 years old; that wave yielded 15,701 respondents.

My analytic sample includes individuals with non-missing data on daily smoking, the number of adolescent friends who smoke, and controls. Table 1 shows the percent missing for all variables included in my models. All variables are below five percent missingness except for daily smoking at Waves II-IV, the number of adolescent friends who smoke, the number nominated of friends, and homophily measures. The high percentage of missing data on daily smoking for Waves II, III, and IV is mostly due to attrition. Meanwhile, the high percentage of missing data on the networks measures is a result of multiple factors. First, several schools that were selected for the in-school survey did not allow researchers to come into the school.

Therefore, students in these schools did not complete the in-school survey, but were sampled for the in-home surveys. Likewise, some students did not attend school the day of the in-school survey, but were still sampled for the in-home surveys. Since the network measures used in the analysis were collected during the in-school survey, these respondents are missing data on these network measures. Lastly, about 20 percent of respondents in the in-school survey did nominate any friends. These respondents were excluded from the analysis.

These restrictions lead to a total of 12,730 adolescents who participated in the Wave I in-home survey and who nominated at least one friend from their school or sister school during the in-school survey. Of these 12,730 adolescents, 12,304 have data on at least one of their nominated friends' smoking behavior. From these 12,304 respondents, I arrive at a final analytic sample of 7,827 respondents (4,403 women and 3,424 men) due to missingness in my outcome variable and the rest of my control variables.

Add Health is well-suited for this study for several reasons. First, the sample contains data from large networks from the in-school survey which allows for data on smoking behavior of friends. Second, it includes a large and representative longitudinal sample of adolescents in the United States. This allows for analysis of the association between adolescence peer smoking networks and smoking trajectories. Third, it includes individual-level indicators of smoking and covariates.

Measures

My main outcome variable is daily smoking, which is measured in all four waves as self-reported cigarette smoking in the past 30 days. Respondents were coded as daily smokers if they smoked at least one cigarette every day in the past 30 days, and 0 otherwise. Those who

responded “not applicable” were coded as not daily smokers, while those who responded “don’t know” were coded as missing. Daily smokers are a particularly interesting group to study due to the long-term health consequences that are associated with regular smoking. Therefore, it important to study social factors which contribute to daily smoking as individuals age. Ancillary analyses were also conducted with smoking coded as 1 if the respondent smoked any day in the past 30 days, and 0 otherwise.

My main predictor variable is adolescent peer smoking networks, which is measured by the number of adolescent friends who smoke. In the in-school survey, respondents were asked to select up to five male and five female friends from a roster of students in their own school and corresponding sister school. This led to the potential to nominate ten friends. In addition to investigating the total number of adolescent friends who smoke, I also separately examine the number of adolescent male and female friends who smoke. This separate analysis explores whether the gender of friends who smoke is associated with smoking trajectories. A friend was coded as missing if the respondent nominated a friend who didn’t go to their school or sister school or if the respondent nominated someone from their school that was not on the roster list. Using the in-school survey allows me to develop a more holistic measure of friendship networks because not everyone from the in-school survey was selected to take the Wave I in-home survey.

Adolescent friend smoking was measured in the in-school survey by asking, “During the past twelve months, how often did you smoke cigarettes?” with responses ranging from never, once or twice, once a month or less, two or three days a month, once or twice a week, three to five days a week, or nearly every day. Those with multiple responses were coded as missing. This variable was then recoded into a dichotomous variable, with 1 representing those who smoked two or three days a month or more and 0 representing non-smokers and those who smoked less

than two or three days a month. I chose this cutoff to reflect adolescent friends who may be more consistent smokers, leading to the potential for social learning. Ancillary analyses are conducted on additional cutoff points of friends' smoking. The number of adolescent friends who smoke was calculated by adding up the dichotomous measure of friends' self-reported smoking by the friends the respondent nominated.

Another main variable in my models is age. Age is measured in years in all four waves and is used as the metric of time for smoking trajectories. In my models, age is divided by 10 to help with convergence.

Lastly, to best understand the relationship between adolescent peer smoking networks and smoking trajectories, confounders need to be taken into account. All confounders were taken from the Wave I in-home survey except for the number of nominated friends and homophily measures, which were taken from the in-school survey. I selected these confounders based on controls from previous studies (Fletcher 2010; Pollard 2010). All respondents who answered refused or don't know to the control questions were coded as missing.

Background factors include race/ethnicity, parental SES, and whether or not parents have ever smoked. Race/ethnicity was coded into four groups: non-Hispanic white, non-Hispanic black, Hispanic, and other. Parental SES was measured by parental education, which was coded into four categories: less than a high school degree, high school degree, some college, and college degree or more. Data on parental education was taken from parents' self-reports with missing data filled in based on reports from the child. The highest level of education between the two parents, or the education level of one parent if only one was reported, is taken to create a measure of parental SES. Lastly, whether or not parents have ever smoked was a dichotomous report from the child of whether their residential mother or residential father has ever smoked.

Missing values were filled in based on parents' response to the question "Do you smoke?" during the parent interview of the Wave I in-home survey.

Other confounders include the importance of religion, state cigarette tax, the number of nominated friends, and homophily measures. Religion may influence beliefs regarding smoking and lead to the selection of friends (Bahr & Hoffmann 2008). The importance of religion was measured by asking respondents how important religion is in their life. Categories include very important, fairly important, fairly unimportant, and not important at all. Those who responded that they did not have a religion were coded as religion not being important at all to them. Meanwhile, state cigarette tax may lead to differences in smoking prevalence among respondents and their friends; areas with a higher cigarette tax may deter adolescents from using cigarettes. State cigarette tax is measured as the state tax per cigarette pack in cents in the state which the respondent lived during Wave I. Additionally, it is important to control for the number of friends that each respondent nominates because the number of friends who smoke in a network is a function of how many people are in the network. The number of nominated friends was calculated by adding up the total number of friends the respondent nominated in their school or sister school. The nominated friends had to attend the respondents' school or sister school and had to have data on self-reported smoking in the in-school survey to be counted.

Lastly, homophily measures were used to account for selection of friends with similar characteristics. These measures were calculated as the percentage of friends similar to respondent in terms of gender, race, parental SES, and grade. Race was collapsed to a dichotomous measure of white and non-white because of the small number of Hispanic and other races in the analytic sample.

Analysis

I use multilevel growth curve models to examine the association between adolescent peer smoking networks and smoking trajectories. These models examine repeated measures (level 1) nested within a person (level 2), where age is the level 1 unit and persons are the level 2 unit (Hox & Stoel 2005). Multilevel growth curve models are well-suited for my analysis because of their ability to estimate interindividual differences in intraindividual change by estimating intercepts and slopes for every individual (Hox & Stoel 2005). In addition, these models allow for the inclusion of subjects who completed at least two waves of the survey to address attrition, which is common in longitudinal data collection. In particular, these models have the ability to include high school seniors in Wave I who were systematically excluded from the Wave II sample of Add Health.

Linear probability models are used to account for the dichotomous measurement of smoking. These models allow for easy interpretation of the coefficients within the model and between gender-stratified models (Breen, Karlson & Holm 2018). I used robust standard errors to account for heteroskedastic errors. Models were estimated using the "meglm" command in Stata Version 14.2 (StataCorp 2015) in order to account for the complex survey design of Add Health. All models were run using Add Health's multilevel weights. The level 1 model for person *i* at time *t* is specified as follows:

(Equation 1)

$$Daily\ Smoking_{it} = \beta_{0i} + \beta_{1i}\, age_{it} + \beta_{2i}\, age^2_{it} + \varepsilon_{it}$$

In Equation 1, the coefficient β_{0i} represents the intercept. β_{1i} is the linear change in the probability of daily smoking with age while β_{2i} is the quadradic change in the probability of daily

smoking with age. Lastly, ε_{it} represents the random within-individual error term, which is assumed to be normally distributed with a mean of 0 and a variance of σ^2. In the level 2 model, I include time-invariant covariates associated with individuals. The level 2 models are specified as follows:

(Equation 2)

$\beta_{0i} = \gamma_{00} + \gamma_{01}$ no. friends who smoke$_i$ + $\Sigma\gamma_0 Z_i + \mu_{0i}$

(Equation 3)

$\beta_{1i} = \gamma_{10} + \gamma_{11}$ no. friends who smoke$_i$ + μ_{1i}

(Equation 4)

$\beta_{2i} = \gamma_{20} + \gamma_{21}$ no. friends who smoke$_i$

Equation 2 models the intercept as a function of the number of adolescent friends who smoke and time invariant controls ($\Sigma\gamma_0 Z_i$). These time-invariant control variables include the number of nominated friends, homophily measures, race/ethnicity, parental SES, parents ever smoked, importance of religion, and state cigarette tax. Equations 1 and 2 estimate an intercept model to examine the association between the number of adolescent friends who smoke and the probability of daily smoking at any given age.

In Equations 3 and 4, I allow the linear growth of daily smoking (β_{1i}) and the quadratic growth of daily smoking (β_{2i}) to vary by the number of adolescent friends who smoke. By including Equations 3 and 4, I am able to estimate a trajectory model to examine rates of change in daily smoking. This allows me to test my first hypothesis: there will be a positive association between adolescent peer smoking networks and smoking trajectories, whereby an increase in the

number of friends who smoke will be associated with higher probabilities of smoking as individuals age compared to those with fewer friends who smoke.

To test my second hypothesis of whether the association between adolescent peer smoking networks and smoking trajectories are modified by gender, I add an interaction term between the number of friends who smoke and gender to the intercept model as seen in Equation 5.

(Equation 5)

$\beta_{0i} = \gamma_{00} + \gamma_{01}$ no. friends who smoke$_i$ + γ_{02} gender$_i$ + γ_{03} no. friends who smoke x gender$_i$ + $\Sigma\gamma_0 Z_i + \mu_{0i}$

Lastly, to test my third hypothesis of whether having more same-sex friends who smoke will be more strongly associated with smoking trajectories than having opposite-sex friends who smoke I separate out the total number of friends who smoke (from Equations 2-4 of the level 2 models) into female friends and male friends who smoke as shown in Equations 6-8. These models are also stratified by gender.

(Equation 6)

$\beta_{0i} = \gamma_{00} + \gamma_{01}$ no. female friends who smoke$_i$ + γ_{02} no. male friends who smoke$_i$ + $\Sigma\gamma_0 Z_i + \mu_{0i}$

(Equation 7)

$\beta_{1i} = \gamma_{10} + \gamma_{11}$ no. female friends who smoke$_i$ + γ_{12} no. male friends who smoke$_i$ + μ_{1i}

(Equation 8)

$\beta_{2i} = \gamma_{20} + \gamma_{21}$ no. female friends who smoke$_i$ + γ_{22} no. male friends who smoke$_i$

RESULTS

Descriptive Statistics

Weighted frequencies distributions by gender are presented in Table 2. During adolescence, eight percent of females are daily smokers compared to six percent of males. While the prevalence of daily smoking increases for both males and females with age, a steeper increase is observed in males, with 27 percent of males being daily smokers in young adulthood compared to 22 percent of females. Respondents range in age from 11 to 34, corresponding to the four waves of the Add Health survey.

My main predictor variable, the number of adolescent friends who smoke, ranges from 0 to 8; it averages 1 for both adolescent females and males. Examining male and female friends separately, women have more female friends who smoke, while men have more male friends who smoke. Respondents nominated an average of 6 to 7 friends, with women nominating slightly more friends than men. Exploring measures of homophily, a majority of people have friends who are in the same grade (75 percent) and are the same race (77 percent) as themselves. These percentages are slightly less for gender (64 percent) and parental SES (43 percent).

As for controls, the respondents are mostly non-Hispanic white followed by non-Hispanic black, Hispanic, and other, with more non-Hispanic black women than men. About 8 percent of respondents have parents with less than a high school degree, followed by 27 percent with a high school degree, 32 percent with some college, and 33 percent with a college degree or higher. However, more women have parents with a high school degree or less while more men have parents with a college degree or higher. On average about 66 percent of respondents' parents

have ever smoked. Religion is fairly or very important to a majority of the sample. Lastly, state cigarette tax in cents ranges from 3 to 75 cents, with an average of 30 cents.

Age Trajectories of Daily Smoking

Table 3 displays results from multilevel models estimating the relationship between adolescent peer smoking networks and daily smoking from adolescence to young adulthood, controlling for other variables. These models are stratified by gender because results indicate that the association between the number of adolescent friends who smoke and daily smoking differs by gender (Table 4). The coefficients from the intercept model indicate the likelihood of being a daily smoker at any given age within my sample (11-34). In these models, the linear growth rate intercept is positive while the quadratic growth rate intercept is negative, indicating that there is an inverse U-shape in trajectories of daily smoking. The intercept model demonstrates that each one person increase in the number of adolescent friends who smoke is associated with a 4.2 percentage point increase in the likelihood of being a daily smoker in females and a 3.5 percentage point increase of being a daily smoker in males. For both males and females, being white and less religious are associated with higher probabilities of daily smoking. Meanwhile, those who nominated more friends and have parents with higher SES have lower probabilities of daily smoking. Having a parent who has ever smoked is only associated with higher probabilities of daily smoking in females. Lastly, the effect sizes for homophily measures and state cigarette tax are either insignificant or very modest.

In the trajectory models, the number of adolescent friends who smoke is interacted with age and age-squared. As demonstrated by adjusted predictions at representative values in Figure 2, daily smoking increases as individuals transition into adulthood, then declines thereafter. Figure

2 also indicates there is a large gap in the predicted probability of daily smoking during adolescence by the number of adolescent friends who smoke. Having more adolescent friends who smoke is associated with a greater likelihood of daily smoking during adolescence. As individuals age, this gap does not go away. For example, females who did not have any adolescent friends who smoked have a 20 percent probability of being a daily smoker at age 28 (mean age at Wave IV) compared to a 25 percent probability for those with one adolescent smoking friend, and a 44 percent probability for those with five adolescent smoking friends. In addition, the gap in daily smoking probability during adolescence by the number of adolescent friends who smoke is wider for females than males. However, men have a steeper trajectory of smoking probability across the early portion of the adult life course than women. Men have both larger increases in smoking probabilities during adolescence and the transition to adulthood and larger decreases in smoking probabilities during young adulthood than females.

Table 5 includes analyses for the intercept and trajectory models separating out the number of adolescent friends who smoke by gender. For women, having more female friends who smoke is associated with a higher probability of daily smoking compared to having male friends who smoke. Meanwhile, male and female friends impact men's probability of daily smoking similarly. For women, the gap in daily smoking probability by the number of female friends who smoke narrows during the transition to adulthood, then widens by young adulthood. This is due to the more curvilinear trajectory of probabilities of daily smoking for those with fewer female friends who smoke, compared to those with more female friends who smoke. This could be due to the increased likelihood of risk-taking during the transition to adulthood that narrows smoking probabilities between those with differing numbers of adolescent friends who smoke. As for male friends, there is no difference in the predicted probabilities of smoking by the number of

male friends who smoke during early adolescence for females (Figure 3). However, a gap emerges during later adolescence and the transition to adulthood, then converges again in young adulthood. Figure 4 shows that smoking trajectories for men by the gender of their smoking friends are similar to women. However, the difference in the predicted probabilities of daily smoking by the number of female friends who smoke is narrower for men than women.

Ancillary Analyses

To further explore the association between the number of adolescent friends who smoke and smoking trajectories, I changed the cut-off points for smoking for respondents and nominated friends. I changed the respondents' cut off point for smoking from smoking every day to smoking at all in the past 30 days. Table 6 shows that the association between the number adolescent friends who smoke and smoking at any given age is stronger when using any smoking in the past 30 days as the outcome compared to using daily smoking as the outcome.

For example, a one person increase in the number of adolescent friends who smoke is associated with a 7.6 percentage point increase in the probability of any smoking in the past 30 days for women, and a 6.1 percentage point increased probability for men. This compares to a 4.2 percentage point increase in the probability of daily smoking for females and a 3.5 percentage point increase in daily smoking for males. The association between the number of adolescent friends who smoke and gender is similar whether smoking is measured as any smoking in the past 30 days or daily smoking. However, the trajectories of any smoking in the past 30 days and daily smoking by the number of adolescent friends who smoke differs. In the daily smoking models, the disparity in smoking likelihood by the number of adolescent friends who smoke does not go away, while in the any smoking in the past 30 days models, this gap

closes by young adulthood. These findings raise important questions which I elaborate on in my Discussion section below.

I also ran analyses changing the cut off points for adolescent friends' smoking (Table 7). Nominated friends were asked how often they smoke in the past 12 months: once or twice, once a month or less, two or three days a month, once or twice a week, three to five days a week, or nearly every day. Results demonstrate that having more friends who smoke more frequently is associated with higher likelihoods of daily smoking. In addition, the association between the number of adolescent friends who smoke and daily smoking is higher for females than males in all models. The difference in trajectories of daily smoking by the number of adolescent friends who smoke does not narrow as individuals age. These results are similar to the results for my main analyses with the cutoff point of friends smoking at two or three days a month.

Sensitivity Analyses

Sensitivity analyses were conducted by interacting all variables in my model with age and age-squared and comparing results from linear probability models to models using a logistic regression approach. When interacting all variables in my model with age and age-squared, the results changed minimally (Table 8). In addition, the linear and quadradic growth rate for the number of friends who smoke is still not significant, which is consistent with my main model.

Table 9 shows results using logistic regression models instead of linear probability models. It should be noted that the logistic regression models are run on a different sample size than the linear probability models and do not include weights due to nonconvergence. However, results from the logistic regression models indicate that for every one unit increase in the number of adolescent friends who smoke, the odds of daily smoking increases by 2.38 for females and 2.13

for males. Although the logistic regression models and linear probability models have different interpretations, both show a significant association between the number of adolescent friends who smoke and daily smoking. In addition, the linear and quadratic growth in the logistic regression models is similar to the linear probability models. Although the gap in daily smoking probabilities by the number of adolescent friends who smoke does not close in the logistic regression models, there is a little more curvilinearity in smoking trajectories in the logistic regression models than in the linear probability models.

DISCUSSION

Research has widely documented the association between adolescent peer smoking networks and smoking during adolescence. However, few studies have examined this relationship as individuals age. In addition, no studies have examined how this association may differ by gender. This study expands on previous literature by examining how adolescent peer smoking networks are associated with trajectories of smoking from adolescence to young adulthood and how this association differs by gender.

Results from multilevel linear probability models demonstrate that there is a positive association between the number of adolescent friends who smoke and smoking behavior. This finding supports for my first hypothesis: there will be a positive association between adolescent peer smoking networks and smoking trajectories, whereby an increase in the number of adolescent friends who smoke will be associated with higher probabilities of smoking as individuals age compared to those with fewer friends who smoke. However, the findings also suggest that differences in smoking probability by the number of adolescent friends who smoke is largely driven by differences in the intercept of smoking probabilities rather than the slope. During adolescence, those who have more friends who smoke are more likely to smoke. This gap in smoking probability persists as individuals age. These findings suggest that adolescent peer smoking networks still matter for smoking into young adulthood.

Socialization mechanisms could be playing a role in the continued association between adolescent peer smoking networks and daily smoking in young adulthood (Thoits 2011; Hoffman et al. 2006; Akers 1979). During adolescence, individuals determine what are normalized and

accepted behaviors through the observation of their peers. These normalized beliefs can continue throughout adulthood, especially due to the addictiveness of smoking. Once a person starts smoking, it is hard to stop. However, these findings could also be attributed to selection. For example, people who smoke during adolescence may be more likely to be friends with others who smoke. In addition, individuals may choose friends both during adolescence and adulthood who are similar to themselves on other characteristics which may be related to smoking probabilities.

Ancillary analyses show that changing the measurement of respondent smoking from daily smoking to any smoking in the past 30 days leads to differences in the association between adolescent peer smoking networks and smoking trajectories. These results suggest that while adolescent peer smoking networks still matter for probabilities of daily smoking during young adulthood, adolescent peer smoking networks do not matter for probabilities of any smoking in the past 30 days during young adulthood. This could be due to the addictiveness of smoking. Daily smokers may have a harder time quitting smoking than low frequency smokers. It may also be easier for individuals to cross the threshold between non-smoking and smoking rather than moving from a low frequency of smoking to daily smoking. Low frequency smokers may be impacted more by structural and/or social factors during young adulthood that move them from non-smokers to smokers. There could also be fundamental differences between daily smokers and low frequency smokers to begin with. Daily smokers may have higher propensities to smoke or may be more likely to stay friends with those who smoke than low frequency smokers.

In addition, results indicate that there are gender differences in the association between adolescent peer smoking networks and smoking probabilities. Adolescent peer smoking networks exhibit a stronger association with smoking probabilities for females than males. This

supports my hypothesis that the association between adolescent peer smoking networks and smoking trajectories will be modified by gender with adolescent peer smoking networks being more impactful for women than men. These findings build on previous literature related to the role of gender in the association between adolescent peer networks and health behaviors. Although my research aligns with previous literature that suggests that peers may be more impactful for females than males (Bruening et al. 2015; Hsieh & Lin 2017), other research suggests the opposite (Brechwald & Prinstein 2011; Erickson, Crosnoe, Dombusch 2000; Duncan et al. 2005). These conflicting findings may be related to specific health behaviors, where women or men could be more impacted by adolescent peer networks depending on the health behavior examined. In addition, in adolescent female networks, closeness is more often defined by emotional investment in small dyadic groups (Perry and Pauletti 2001; Rose & Rudolph 2006). Therefore, females may be more concerned about fitting into their social networks, which pressures them into adopting the behavior of their friends.

Lastly, I find support for my hypothesis that having more same-sex friends who smoke is more strongly associated with smoking trajectories than having opposite-sex friends who smoke. However, the difference in smoking probabilities by same-sex and opposite-sex friends is mostly due to differences in the intercept than the slope. In addition, same-sex friends impact smoking probabilities more so for women than men. This could be related to both homophily and social learning. Through social learning individuals imitate and learn norms and behaviors from their peers (Akers 1979). My descriptive statistics (Table 2) indicate that adolescents are more likely to be friends with peers of their same-sex. Having more same-sex friends can lead to increased social learning from this group. This is supported by the homophily principle, whereby people

choose friends who are similar to themselves. Individuals may also be more likely to imitate the behavior of people who are similar to themselves.

Implications

These findings have implications for both anti-smoking campaigns as well as future research. Lasting associations between adolescent peer smoking networks and smoking behavior signal the continued need to focus anti-smoking campaigns towards adolescents. Smoking initiation during adolescence should be of particular focus in order to prevent cascading effects of smoking. These campaigns should focus on peer groups in addition to individuals. Interventions focused on groups, called segmentation interventions, aim to change established norms and processes that can only be modified through whole group changes (Valente 2012). These interventions would be particularly impactful if socialization is the mechanism behind the association between adolescent peer smoking networks and smoking behavior.

Although I have proposed mechanisms for my results, these mechanisms cannot be tested with my data. Therefore, it is important for future research to investigate the mechanisms behind the association between adolescent peer smoking networks and smoking trajectories in order to determine strategies and policies to decrease smoking. My findings suggest a particular need to determine why differences in smoking probabilities by adolescent peer smoking networks persist in young adulthood when examining daily smoking but converge when examining any smoking within the past 30 days. Mechanisms behind these differences could provide key insights into smoking across the life course. In addition, future research should aim to disentangle the effects of selection and influence, investigate other sub-group differences in smoking trajectories as well as explore factors beyond adolescence that may be impacting smoking trajectories.

Lastly, these findings could relate to the recent increase in e-cigarettes (also called vaping) among adolescents. E-cigarette use has more than tripled in middle and high school students since 2011 (U.S. DHHS 2016). Although e-cigarettes may be less harmful than conventional cigarettes, they can still be damaging for health. In fact, individuals who smoke e-cigarettes are four times more likely to smoke conventional cigarettes (Berry et al. 2019). E-cigarettes seem to be following a similar trend to conventional cigarette smoking. Therefore, this study can be informative on how adolescent peer smoking networks may impact e-cigarette smoking during adolescence as well as the potential trajectory of e-cigarette use as individuals age.

Limitations

Although this study provides key insights in the association between adolescent peer smoking networks and smoking trajectories, this research is limited in multiple ways. First, there are no available measures of social networks later in life which could be affecting trajectories of smoking. Second, I do not examine the social, economic, behavioral, and contextual factors beyond adolescence that may be influencing smoking trajectories. These include the college and workplace environment, later life SES, parenthood, etc. Third, there are limitations to using linear probability models. Critics of linear probability models argue that these models may produce bias estimates due to heteroskedasticity and predicted probabilities not bounded by 0 and 1 (Breen, Karlson & Holm 2018). However, I account for heteroskedasticity by using robust standard errors. In addition, although some of my predicted probabilities are below 0, the results from the linear probability models are similar, if not more conservative, to results using logistic regression.

Fourth is the issue of missing data on daily smoking and adolescent peer smoking networks. About 27 percent of respondents are missing data on daily smoking for Waves II, III, or IV. This larger percentage of missing data is due to attrition. In addition, about 40 percent of respondents are missing data on the number of adolescent friends who smoke because they did not take the in-school survey, did not nominate any friends in the in-school survey, or because there was not any data on the smoking behavior of the friends whom they nominated. In addition, adolescents were only allowed to nominate friends in their school or sister school, therefore excluding any friends outside of their school or sister school. Table 10 displays descriptive statistics of daily smoking and my controls in the full sample of Add Health. The full sample has a higher prevalence of daily smoking in adolescence; moreover, the full sample is slightly older, on average, is less white and has more parents with less than a high school degree. However, the overall descriptive statistics between the full sample and my analytic sample are very similar.

Finally, this thesis does not completely sort out the differences between selection and influence. Selection could confound the estimates of peer influence because peers tend to choose friends who are similar to themselves. This relates to the reflection problem, which happens when inferring average behavior of a group from the individuals that make up that group (Manski 1993). When examining the average behavior of a group, it is difficult to separate endogenous, exogenous/contextual, and correlated effects. For example, although I am looking at endogenous effects of adolescent peer smoking networks, this could be confounded by contextual and correlated effects, such as shared environments, characteristics, etc. Lastly, the issue of selection also includes the "unfriending problem" whereby people are more likely to stop being friends with those who are less similar to themselves (Noel & Nyhan 2011; Kandel

1978). Therefore, some nominated friends may have only been friends with the respondent for a short amount of time; thus, they may be less influential for setting smoking trajectories.

Conclusion

In sum, this study builds on previous literature examining how adolescent peer smoking networks are associated with the smoking trajectories of individuals as they age. This study extends previous literature by examining multilevel growth curve models of smoking probabilities, analyzing a large nationally representative longitudinal sample, and examining differences by gender. My results suggest that adolescent peer smoking networks have a lasting impact on daily smoking into young adulthood. In addition, adolescent peer smoking networks are more strongly associated with smoking in women than men. Further, the smoking behavior of same-sex friends is more strongly associated with respondents' smoking than smoking in opposite-sex friends, especially for females. These findings have important implications for both anti-smoking campaigns and future research. These include focusing on smoking initiation within adolescent peer networks, disentangling selection and influence, examining mechanisms, and exploring results for other sub-groups.

Figure 1. Conceptual Framework of the Association Between Adolescent Peer Smoking Networks and Smoking Trajectories Modified by Gender

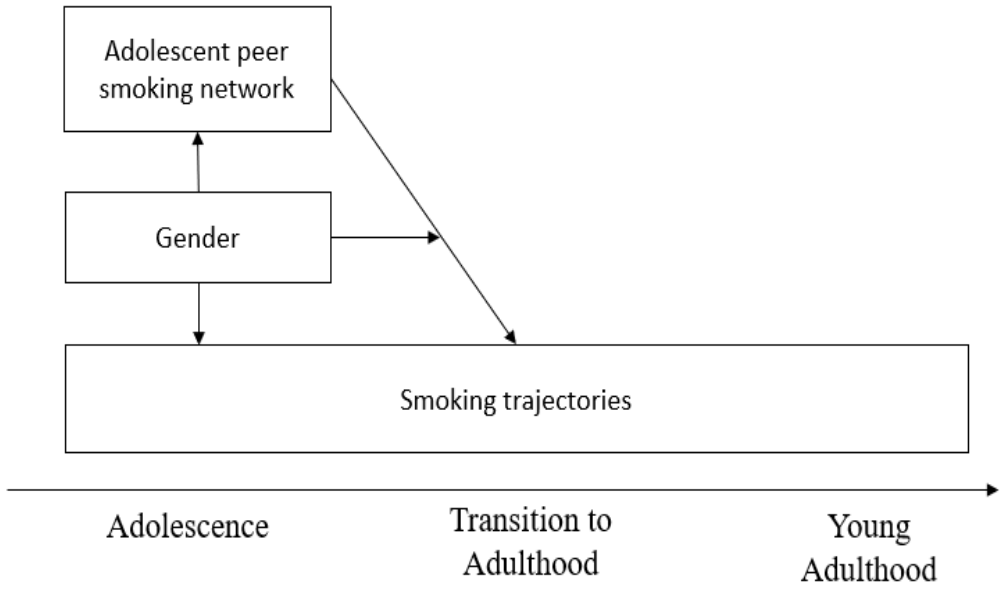

Table 1. Missing values of daily smoking, the number of friends who smoke, and controls

Variable	Number Missing	Percent Missing
Daily Smoker		
Wave I	392	1.89%
Wave II	6,191	29.84%
Wave III	5,740	27.67%
Wave IV	5,181	24.97%
Age		
Wave I	1	0.005%
Wave II	1	0.005%
Wave III	1	0.005%
Wave IV	1	0.005%
Gender	2	0.01%
Number of friends who smoke	8,441	40.69%
Number of nominated friends	8,015	38.64%
Friends percent similar in gender	8,342	40.21%
Friends percent similar in race	8,378	40.39%
Friends percent similar in grade	8,494	40.94%
Friends percent similar in parental SES	10,267	49.49%
Race	54	0.26%
Parental SES	388	1.87%
Parent ever smoked	232	1.12%
Importance of religion	433	2.09%
State cigarette tax	123	0.59%

Source: National Longitudinal Study of Adolescent to Adult Health

Table 2. Weighted descriptive statistics of daily smoking, number of adolescent friends who smoke, and controls in Add Health

	Females	**Males**		
Variable	M (SD)	M (SD)	Min	Max
Daily Smoker (%)				
Wave I	0.08	0.06	0	1
Wave II	0.11	0.10	0	1
Wave III	0.21	0.26	0	1
Wave IV	0.22	0.27	0	1
Age				
Wave I	15.02 (1.65)	15.14 (1.68)	11	21
Wave II	15.66 (1.52)	15.82 (1.55)	11	21
Wave III	21.35 (1.67)	21.51 (1.71)	18	27
Wave IV	27.89 (1.68)	28.07 (1.71)	24	34
Number of friends who smoke	1.04 (1.35)	1.00 (1.32)	0	8
Number of female friends who smoke	0.58 (0.93)	0.42 (0.80)	0	5
Number of male friends who smoke	0.46 (0.78)	0.57 (0.88)	0	5
Number of nominated friends	6.66 (2.61)	6.50 (2.78)	1	10
Friends percent similar in gender	65.12 (23.55)	62.21 (26.60)	0	100
Friends percent similar in race	78.60 (25.58)	76.98 (27.37)	0	100
Friends percent similar in grade	75.04 (28.44)	75.37 (29.97)	0	100
Friends percent similar in parental SES	43.64 (31.91)	43.36 (33.80)	0	100
Race/Ethnicity (%)				
Non-Hispanic white	0.69	0.76	0	1
Non-Hispanic black	0.20	0.13	0	1
Hispanic	0.07	0.08	0	1
Other	0.03	0.04	0	1
Parental SES (%)				
Less than high school degree	0.09	0.08	0	1
High school degree	0.28	0.24	0	1
Some college	0.32	0.32	0	1
College degree or higher	0.31	0.36	0	1
Parent ever smoked (%)	0.66	0.67	0	1
Importance of Religion (%)				
Very important	0.47	0.40	0	1
Fairly important	0.34	0.38	0	1
Fairly unimportant	0.06	0.07	0	1
Not important at all	0.13	0.15	0	1
State tax per cigarette tax (in cents)	30.59 (18.01)	29.79 (18.40)	3	75

Source: Waves I-IV and In-school sample of the National Longitudinal Study of Adolescent to Adult Health (N = 7,827)

Table 3. Weighted multilevel linear probability models of daily smoking, the number of adolescent friends who smoke, and controls

	Intercept Model		Trajectory Model	
	Females	Males	Females	Males
Fixed Effects				
Intercept	0.212***	0.238***	0.219***	0.245***
	(0.028)	(0.035)	(0.028)	(0.036)
Number of friends who smoke	0.042***	0.035***	0.045***	0.036***
	(0.005)	(0.004)	(0.006)	(0.005)
Number of nominated friends	-0.014***	-0.013***	-0.014***	-0.013***
	(0.002)	(0.003)	(0.002)	(0.003)
Friends percent similar in gender	-0.0007**	0.0004	-0.001**	0.0004
	(0.0002)	(0.0003)	(0.0002)	(0.0003)
Friends percent similar in race	0.00001	-0.0002	-0.0002	-0.0002
	(0.0002)	(0.0002)	(0.0002)	(0.0002)
Friends percent similar in grade	-0.0004***	-0.0007***	-0.0004**	-0.001***
	(0.0001)	(0.0002)	(0.0001)	(0.0002)
Friends percent similar in parental SES	0.0001	-0.0002	-0.0002	-0.0003
	(0.0001)	(0.0002)	(0.0001)	(0.0002)
Race (ref. = non-Hispanic white)				
Non-Hispanic black	-0.103***	-0.084***	-0.101***	-0.085***
	(0.0123)	(0.016)	(0.013)	(0.016)
Hispanic	-0.085***	-0.073**	-0.090***	-0.076**
	(0.017)	(0.024)	(0.017)	(0.024)
Other	-0.095***	-0.062**	-0.098***	-0.064***
	(0.016)	(0.018)	(0.016)	(0.017)
Parental SES (ref. = high school degree)				
Less than high school degree	0.057**	-0.035	0.055**	-0.038
	(0.017)	(0.029)	(0.017)	(0.029)
Some college	-0.026	-0.013	-0.026	-0.021
	(0.016)	(0.016)	(0.016)	(0.016)
College degree or higher	-0.077***	-0.027*	-0.076***	-0.035**
	(0.016)	(0.013)	(0.016)	(0.013)
Parent ever smoked	0.081***	0.022	0.074***	0.017
	(0.008)	(0.012)	(0.009)	(0.011)
Importance of religion (ref. = very important)				
Fairly important	0.001	0.058***	0.005	0.062***
	(0.018)	(0.016)	(0.018)	(0.016)
Fairly unimportant	0.030	0.046*	0.023	0.047**

	(0.029)	(0.018)	(0.030)	(0.018)
Not important at all	0.067**	0.044*	0.061**	0.045**
	(0.019)	(0.017)	(0.019)	(0.017)
State cigarette tax	0.0003	-0.001*	0.0004	-0.001*
	(0.0004)	(0.0004)	(0.0004)	(0.0004)
Linear Growth Rate				
Intercept (age/10)	0.276***	0.412***	0.273***	0.409***
	(0.020)	(0.0211)	(0.025)	(0.029)
Number of friends who smoke			0.003	0.005
			(0.017)	(0.020)
Quadratic Growth Rate				
Intercept (age/10)	-0.143***	-0.223***	-0.141***	-0.222***
	(0.016)	(0.019)	(0.020)	(0.028)
Number of friends who smoke			-0.002	-0.001
			(0.013)	(0.016)
Random Effects				
Variance of age	0.083	0.102	0.082	0.101
	(0.006)	(0.006)	(0.006)	(0.006)
Variance of constant	0.051	0.056	0.051	0.056
	(0.004)	(0.004)	(0.004)	(0.004)
Observations	15,953	12,128	15,953	12,128
Number of groups	4,403	3,424	4,403	3,424

Source: National Longitudinal Study of Adolescent to Adult Health (N = 7,827)
*** p<0.001, ** p<0.01, * p<0.05

Table 4. Weighted interaction between gender and the number of adolescent friends who smoke

Fixed Effects	
Intercept	0.206***
	(0.024)
Number of friends who smoke	0.050***
	(0.005)
Gender (Male)	0.029***
	(0.007)
Gender x Friends Smoke	-0.0174***
	(0.004)
Number of nominated friends	-0.013***
	(0.002)
Friends percent similar in gender	-0.0003
	(0.0001)
Friends percent similar in race	0.0001
	(0.0001)
Friends percent similar in grade	-0.001***
	(0.0001)
Friends percent similar in parental SES	-0.0002*
	(0.0001)
Race (ref. = non-Hispanic white)	
Non-Hispanic black	-0.098***
	(0.013)
Hispanic	-0.076***
	(0.016)
Other	-0.087***
	(0.012)
Parental SES (ref. = high school degree)	
Less than high school degree	0.036*
	(0.016)
Some college	-0.024
	(0.014)
College degree or higher	-0.052***
	(0.011)
Parent ever smoked	0.053***
	(0.005)
Importance of religion (ref. = very important)	
Fairly important	0.031**
	(0.011)
Fairly unimportant	0.034*

	(0.016)
Not important at all	0.055***
	(0.011)
State cigarette tax	-0.0002
	(0.0003)
Linear Growth Rate	
Intercept (age/10)	0.336***
	(0.016)
Quadratic Growth Rate	
Intercept (age/10)	-0.178***
	(0.013)
Random Effects	
Variance of age	0.091
	(0.004)
Variance of constant	0.054
	(0.004)
Observations	28,081
Number of groups	7,827

Source: National Longitudinal Study of Adolescent to Adult Health (N = 7,827)

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

Figure 2. Predicted Probabilities of Daily Smoking by the Number of Adolscent Smoking Friends

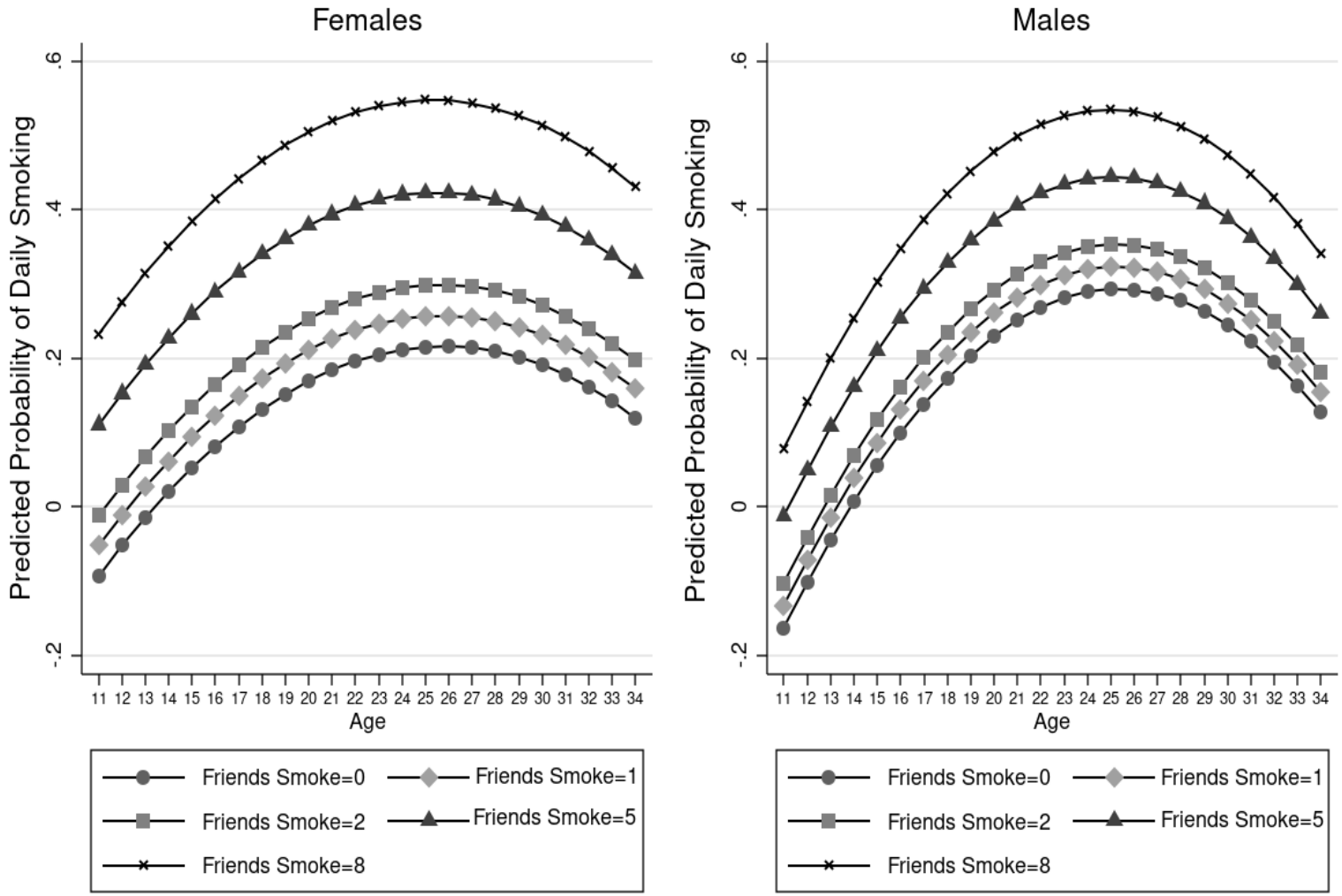

Table 5. Weighted multilevel linear probability models of daily smoking, the number of adolescent male and female friends who smoke, and controls

	Intercept Model		Trajectory Model	
	Females	Males	Females	Males
Fixed Effects				
Intercept	0.222***	0.224***	0.212***	0.225***
	(0.026)	(0.037)	(0.026)	(0.038)
Number of female friends who smoke	0.053***	0.036***	0.061***	0.038***
	(0.007)	(0.006)	(0.010)	(0.008)
Number of male friends who smoke	0.030***	0.036***	0.028**	0.033***
	(0.008)	(0.005)	(0.010)	(0.007)
Number of nominated friends	-0.014***	-0.013***	-0.013***	-0.013***
	(0.003)	(0.003)	(0.003)	(0.003)
Friends percent similar in gender	-0.001***	0.0003	-0.001***	0.0003
	(0.0002)	(0.0003)	(0.0002)	(0.0003)
Friends percent similar in race	0.0001	-0.00002	0.0001	0.0001
	(0.0002)	(0.0002)	(0.0002)	(0.0002)
Friends percent similar in grade	-0.0004***	-0.001**	-0.0004**	-0.001**
	(0.0001)	(0.0002)	(0.0001)	(0.0002)
Friends percent similar in parental SES	0.00004	-0.0004*	0.000002	-0.0004
	(0.0001)	(0.0002)	(0.0001)	(0.0002)
Race (ref. = non-Hispanic white)				
Non-Hispanic black	-0.106***	-0.082***	-0.101***	-0.082***
	(0.013)	(0.015)	(0.013)	(0.016)
Hispanic	-0.088***	-0.071**	-0.084***	-0.072**
	(0.017)	(0.024)	(0.017)	(0.025)
Other	-0.099***	-0.062***	-0.101***	-0.062***
	(0.016)	(0.017)	(0.016)	(0.017)
Parental SES (ref. = high school degree)				
Less than high school degree	0.053**	-0.038	0.058**	-0.037
	(0.017)	(0.027)	(0.017)	(0.027)
Some college	-0.027	-0.032	-0.029	-0.033
	(0.015)	(0.017)	(0.015)	(0.017)
College degree or higher	-0.070***	-0.036**	-0.068***	-0.037**
	(0.016)	(0.013)	(0.016)	(0.013)
Parent ever smoked	0.079***	0.022*	0.077***	0.023*
	(0.007)	(0.011)	(0.008)	(0.011)
Importance of religion (ref. = very important)				
Fairly important	0.005	0.065***	0.009	0.065***
	(0.018)	(0.015)	(0.018)	(0.016)

Fairly unimportant	0.021	0.052**	0.027	0.052**
	(0.021)	(0.018)	(0.022)	(0.018)
Not important at all	0.067***	0.046**	0.064**	0.047**
	(0.019)	(0.016)	(0.019)	(0.017)
State cigarette tax	0.0002	-0.001*	0.0003	-0.0007
	(0.0004)	(0.0004)	(0.0004)	(0.0004)
Linear Growth Rate				
Intercept (age/10)	0.276***	0.412***	0.271***	0.406***
	(0.020)	(0.021)	(0.025)	(0.029)
Number of female friends who smoke			-0.049	-0.040
			(0.026)	(0.036)
Number of male friends who smoke			0.070**	0.041
			(0.024)	(0.033)
Quadratic Growth Rate				
Intercept (age/10)	-0.143***	-0.223***	-0.140***	-0.220***
	(0.016)	(0.019)	(0.020)	(0.028)
Number of female friends who smoke			0.035	0.033
			(0.019)	(0.029)
Number of male friends who smoke			-0.049*	-0.032
			(0.020)	(0.025)
Random Effects				
Variance of age	0.082	0.101	0.083	0.101
	(0.005)	(0.006)	(0.005)	(0.006)
Variance of constant	0.052	0.056	0.052	0.056
	(0.004)	(0.004)	(0.004)	(0.004)
Observations	15,953	12,128	15,953	12,128
Number of groups	4,403	3,424	4,403	3,424

Source: National Longitudinal Study of Adolescent to Adult Health (N = 7,827)

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

Figure 3. Predicted Probabilities of Daily Smoking
by the Number of Adolscent Female and Male Smoking Friends

Females

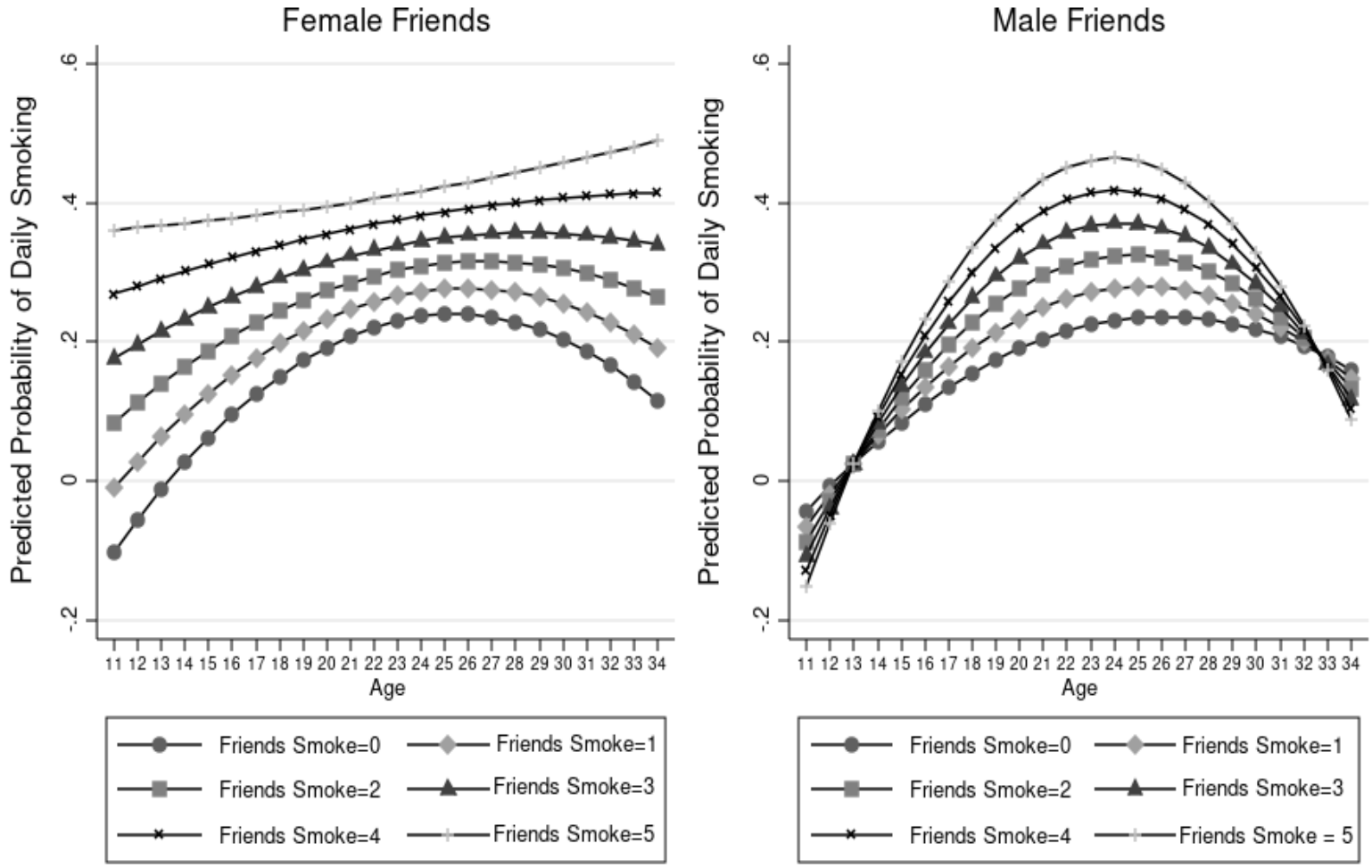

Figure 4. Predicted Probabilities of Daily Smoking
by the Number of Adolscent Female and Male Smoking Friends
Males

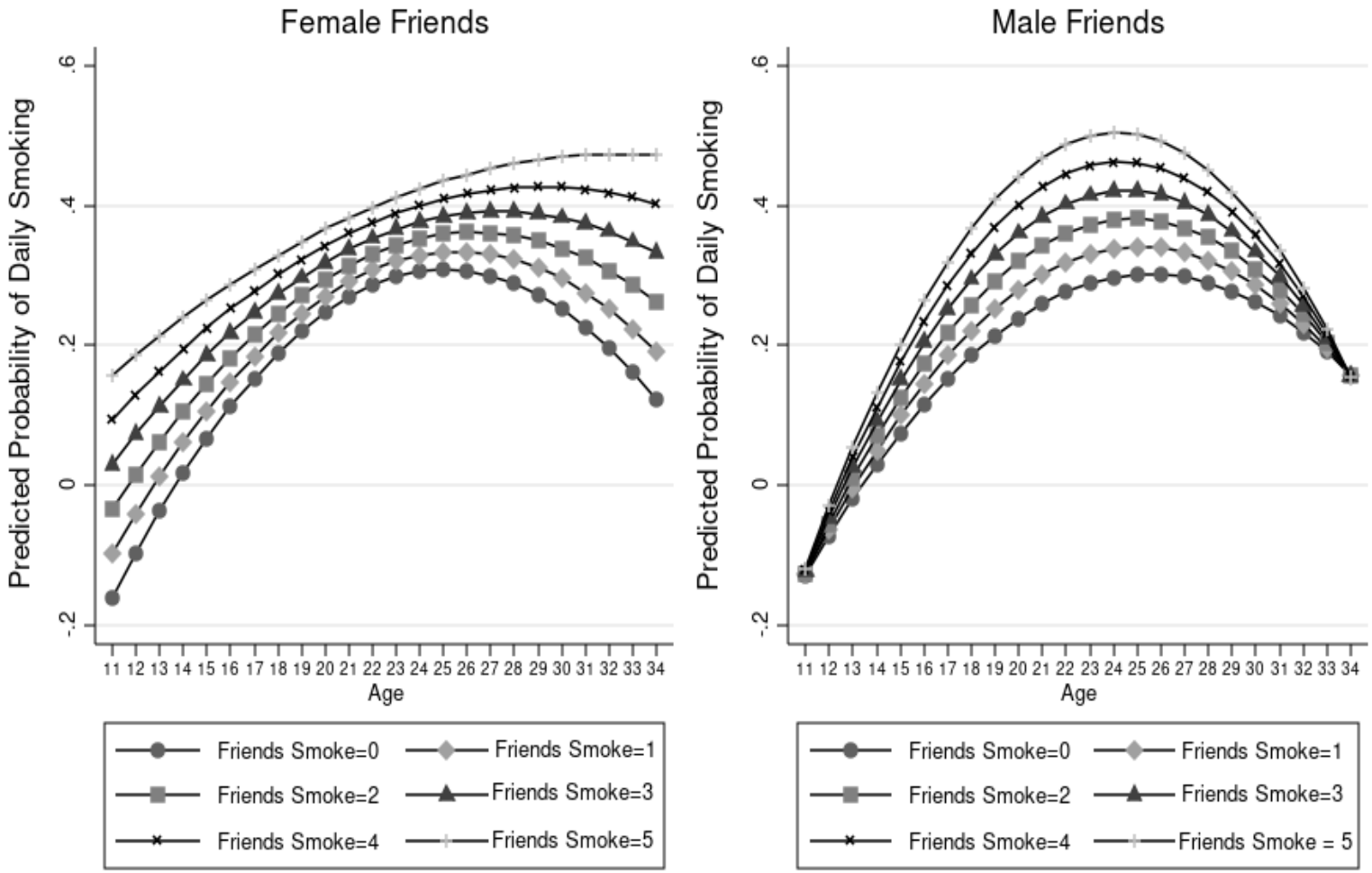

Table 6. Weighted multilevel linear probability models of smoking in the past 30 days and the number adolescent friends who smoke

	Intercept Model		Trajectory Model	
	Females	Males	Females	Males
Fixed Effects				
Intercept	0.323***	0.443***	0.314***	0.412***
	(0.042)	(0.046)	(0.042)	(0.045)
Number of friends who smoke	0.076***	0.061***	0.086***	0.080***
	(0.004)	(0.005)	(0.006)	(0.006)
Number of nominated friends	-0.011***	-0.014***	-0.010**	-0.015***
	(0.003)	(0.003)	(0.003)	(0.003)
Friends percent similar in gender	-0.001*	-0.0004	-0.001	-0.0002
	(0.0003)	(0.0002)	(0.0003)	(0.0002)
Friends percent similar in race	-0.001**	-0.00004	-0.001**	-0.00001
	(0.0002)	(0.0003)	(0.0002)	(0.0003)
Friends percent similar in grade	-0.0002	-0.001***	-0.0002	-0.001***
	(0.0002)	(0.0002)	(0.0002)	(0.0002)
Friends percent similar in parental SES	-0.0001	-0.0004	-0.0001	-0.0002
	(0.0002)	(0.0003)	(0.0002)	(0.0003)
Race (ref. = non-Hispanic white)				
Non-Hispanic black	-0.125***	-0.060**	-0.135***	-0.060**
	(0.018)	(0.020)	(0.018)	(0.021)
Hispanic	-0.078**	-0.053*	-0.082***	-0.058*
	(0.022)	(0.027)	(0.022)	(0.025)
Other	-0.084**	-0.108***	-0.088**	-0.106***
	(0.028)	(0.020)	(0.029)	(0.019)
Parental SES (ref. = high school degree)				
Less than high school degree	0.022	-0.045	0.017	-0.054
	(0.024)	(0.037)	(0.025)	(0.038)
Some college	-0.002	-0.011	-0.007	-0.022
	(0.019)	(0.030)	(0.020)	(0.029)
College degree or higher	-0.092***	-0.051**	-0.094***	-0.053***
	(0.015)	(0.015)	(0.015)	(0.015)
Parent ever smoked	0.085***	0.056**	0.083***	0.045*
	(0.011)	(0.019)	(0.011)	(0.019)
Importance of religion (ref. = very important)				
Fairly important	0.041	0.066**	0.041	0.068**
	(0.021)	(0.020)	(0.022)	(0.020)
Fairly unimportant	0.099***	0.108***	0.096**	0.116***
	(0.027)	(0.019)	(0.027)	(0.022)

Not important at all	0.167***	0.103***	0.171***	0.092***
	(0.018)	(0.020)	(0.018)	(0.020)
State cigarette tax	0.0003	-0.002***	0.0002	-0.002**
	(0.001)	(0.0004)	(0.001)	(0.0004)
Linear Growth Rate				
Intercept (age/10)	0.140***	0.280***	0.218***	0.379***
	(0.025)	(0.032)	(0.026)	(0.037)
Number of friends who smoke				
			(0.018)	(0.025)
Quadratic Growth Rate				
Intercept (age/10)	-0.086***	-0.144***	-0.124***	-0.189***
	(0.017)	(0.025)	(0.019)	(0.031)
Number of friends who smoke				
			(0.012)	(0.018)
Random Effects				
Variance of age	0.125	0.168	0.123	0.165
	(0.007)	(0.006)	(0.006)	(0.006)
Variance of constant	0.089	0.092	0.089	0.092
	(0.004)	(0.004)	(0.004)	(0.004)
Observations	15,953	12,128	15,953	12,128
Number of groups	4,403	3,424	4,403	3,424

Source: National Longitudinal Study of Adolescent to Adult Health (N = 7,827)
*** p<0.001, ** p<0.01, * p<0.05

Table 7. Weighted multilevel linear probability models of daily smoking with different smoking cutoffs for friends smoking behavior

	Intercept Model		Trajectory Model	
	Females	Males	Females	Males
Fixed Effects				
Once or twice	0.035***	0.030***	0.033***	0.031***
	(0.003)	(0.004)	(0.004)	(0.004)
Linear Growth Rate				
Once or twice			0.029*	0.014
			(0.011)	(0.017)
Quadratic Growth Rate				
Once or twice			-0.019*	-0.013
			(0.009)	(0.014)
Fixed Effects				
Once a month or less	0.040***	0.031***	0.039***	0.030***
	(0.005)	(0.004)	(0.006)	(0.006)
Linear Growth Rate				
Once a month or less			0.010	0.004
			(0.015)	(0.019)
Quadratic Growth Rate				
Once a month or less			-0.007	-0.003
			(0.011)	(0.015)
Fixed Effects				
Once or twice a week	0.054***	0.039***	0.055***	0.040***
	(0.006)	(0.003)	(0.007)	(0.005)
Linear Growth Rate				
Once or twice a week			0.009	0.005
			(0.018)	(0.024)
Quadratic Growth Rate				
Once or twice a week			-0.009	-0.006
			(0.013)	(0.018)
Fixed Effects				
3-5 days a week	0.060***	0.047***	0.063***	0.049***
	(0.006)	(0.004)	(0.008)	(0.007)
Linear Growth Rate				
3-5 days a week			-0.007	-0.004
			(0.021)	(0.028)
Quadratic Growth Rate				
3-5 days a week			-0.0002	0.001
			(0.015)	(0.022)

Fixed Effects				
Nearly every day	0.060***	0.046***	0.066***	0.051***
	(0.008)	(0.005)	(0.011)	(0.008)
Linear Growth Rate				
Nearly every day			-0.004	-0.029
			(0.026)	(0.031)
Quadratic Growth Rate				
Nearly every day			-0.004	0.015
			(0.019)	(0.022)

Source: National Longitudinal Study of Adolescent to Adult Health (N = 7,827)
Notes: Results include controls
Each cutoff point was run in a different analysis
*** p<0.001, ** p<0.01, * p<0.05

Table 8. Weighted multilevel linear probability models of daily smoking and the number of friends who smoke with linear and quadratic growth for all variables

	Trajectory Model	
	Females	Males
Fixed Effects		
Intercept	0.208***	0.205***
	(0.039)	(0.042)
Number of friends who smoke	0.045***	0.033***
	(0.006)	(0.005)
Number of nominated friends	-0.010***	-0.007**
	(0.003)	(0.003)
Friends percent similar in gender	-0.0002	0.0004
	(0.0002)	(0.0003)
Friends percent similar in race	-0.0001	-0.0002
	(0.0002)	(0.0002)
Friends percent similar in grade	-0.0004*	-0.001**
	(0.0002)	(0.0002)
Friends percent similar in parental SES	-0.0002	-0.0002
	(0.0002)	(0.0002)
Race (ref. = non-Hispanic white)		
Non-Hispanic black	-0.096***	-0.065***
	(0.011)	(0.016)
Hispanic	-0.064***	-0.057**
	(0.016)	(0.024)
Other	-0.089***	-0.039**
	(0.017)	(0.018)
Parental SES (ref. = high school degree)		
Less than high school degree	0.008	-0.033
	(0.019)	(0.025)
Some college	-0.045*	-0.023
	(0.017)	(0.016)
College degree or higher	-0.068***	-0.041*
	(0.017)	(0.012)
Parent ever smoked	0.061***	0.017
	(0.008)	(0.011)
Importance of religion (ref. = very important)		
Fairly important	0.009	0.058**
	(0.018)	(0.016)
Fairly unimportant	0.035	0.061**
	(0.022)	(0.023)

Not important at all	0.076***	0.039*
	(0.018)	(0.019)
State cigarette tax	0.0002	-0.001
	(0.0004)	(0.001)
Linear Growth Rate		
Intercept	0.416**	0.516**
	(0.136)	(0.146)
Number of friends who smoke	-0.028	-0.003
	(0.018)	(0.022)
Number of nominated friends	0.009	-0.010
	(0.007)	(0.010)
Friends percent similar in gender	-0.00001	0.001
	(0.0008)	(0.001)
Friends percent similar in race	-0.002	0.001
	(0.001)	(0.001)
Friends percent similar in grade	-0.001	-0.0001
	(0.001)	(0.001)
Friends percent similar in parental SES	0.0002	0.001
	(0.001)	(0.001)
Race (ref. = non-Hispanic white)		
Non-Hispanic black	-0.191***	-0.165*
	(0.042)	(0.067)
Hispanic	-0.093	-0.116
	(0.072)	(0.096)
Other	-0.043	-0.235*
	(0.127)	(0.102)
Parental SES (ref. = high school degree)		
Less than high school degree	0.079	-0.090
	(0.081)	(0.136)
Some college	0.038	-0.149
	(0.049)	(0.079)
College degree or higher	-0.080	-0.087
	(0.047)	(0.074)
Parent ever smoked	0.128**	0.081
	(0.040)	(0.053)
Importance of religion (ref. = very important)		
Fairly important	0.030	0.092
	(0.044)	(0.062)
Fairly unimportant	0.003	-0.001
	(0.080)	(0.110)
Not important at all	0.035	0.119

	(0.066)	(0.095)
State cigarette tax	-0.0005	-0.003*
	(0.002)	(0.001)
Quadratic Growth Rate		
Intercept	-0.232*	-0.230
	(0.114)	(0.121)
Number of friends who smoke	0.022	0.008
	(0.014)	(0.018)
Number of nominated friends	-0.012	0.003
	(0.006)	(0.008)
Friends percent similar in gender	-0.0004	-0.0004
	(0.001)	(0.001)
Friends percent similar in race	0.002*	-0.001
	(0.001)	(0.0010)
Friends percent similar in grade	0.001	-0.001
	(0.001)	(0.0010)
Friends percent similar in parental SES	-0.00001	-0.001
	(0.001)	(0.001)
Race (ref. = non-Hispanic white)		
Non-Hispanic black	0.154***	0.144*
	(0.035)	(0.059)
Hispanic	0.023	0.126
	(0.065)	(0.071)
Other	0.034	0.173
	(0.116)	(0.092)
Parental SES (ref. = high school degree)		
Less than high school degree	0.020	0.045
	(0.071)	(0.109)
Some college	0.003	0.119
	(0.043)	(0.063)
College degree or higher	0.033	0.061
	(0.041)	(0.059)
Parent ever smoked	-0.045	-0.061
	(0.033)	(0.049)
Importance of religion (ref. = very important)		
Fairly important	-0.044	-0.036
	(0.040)	(0.055)
Fairly unimportant	-0.061	0.024
	(0.070)	(0.090)
Not important at all	-0.030	-0.033
	(0.053)	(0.073)

State cigarette tax	0.0006	0.002
	(0.001)	(0.001)
Random Effects		
Variance of age	0.080	0.100
	(0.005)	(0.006)
Variance of constant	0.052	0.058
	(0.004)	(0.004)
Observations	15,953	12,128
Number of groups	4,403	3,424

Source: National Longitudinal Study of Adolescent to Adult Health (N = 7,827)

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

Table 9. Odds ratios for multilevel logit models of daily smoking, the number of adolescent friends who smoke, and controls

	Intercept Model		Trajectory Model
	Females	Males	Females
Fixed Effects			
Intercept	0.057***	0.040***	0.045***
	(0.027)	(0.018)	(0.026)
Number of friends who smoke	2.382***	2.133***	2.592***
	(0.137)	(0.126)	(0.241)
Number of nominated friends	0.772***	0.802***	0.768***
	(0.026)	(0.026)	(0.026)
Friends percent similar in gender	1.000	0.997	1.000
	(0.003)	(0.003)	(0.003)
Friends percent similar in race	0.989***	0.995	0.988***
	(0.003)	(0.003)	(0.003)
Friends percent similar in grade	0.993**	0.994**	0.993**
	(0.002)	(0.002)	(0.002)
Friends percent similar in parental SES	1.000	0.999	1.000
	(0.002)	(0.002)	(0.002)
Race (ref. = non-Hispanic white)			
Non-Hispanic black	0.111***	0.257***	0.106***
	(0.024)	(0.060)	(0.024)
Hispanic	0.155***	0.192***	0.140***
	(0.040)	(0.053)	(0.040)
Other	0.226***	0.313***	0.215***
	(0.070)	(0.102)	(0.068)
Parental SES (ref. = high school degree)			
Less than high school degree	0.779	0.810	0.789
	(0.187)	(0.240)	(0.194)
Some college	0.742	0.810	0.738
	(0.129)	(0.156)	(0.132)
College degree or higher	0.379***	0.555**	0.363***
	(0.071)	(0.105)	(0.072)
Parent ever smoked	3.700***	2.740***	3.844***
	(0.595)	(0.452)	(0.659)
Importance of religion (ref. = very important)			
Fairly important	1.542**	1.744**	1.543**
	(0.234)	(0.291)	(0.240)
Fairly unimportant	1.491	2.142**	1.469
	(0.422)	(0.605)	(0.424)
Not important at all	3.166***	2.496***	3.239***

	(0.636)	(0.541)	(0.666)
State cigarette tax	0.993	0.994	0.993
	(0.004)	(0.004)	(0.004)
Linear Growth Rate			
Intercept (age/10)	45.158***	154.024***	207.629***
	(24.305)	(81.109)	(227.721)
Number of friends who smoke			0.456**
			(0.113)
Quadratic Growth Rate			
Intercept (age/10)	0.050***	0.019***	0.016***
	(0.014)	(0.006)	(0.008)
Number of friends who smoke			1.903***
			(0.261)
Random Effects			
Variance of age	7.944	13.258	8.261
	(1.377)	(2.889)	(1.497)
Variance of constant	6.718	6.209	7.681
	(1.202)	(0.804)	(2.145)
Observations	18,212	14,723	18,212
Number of groups	5,441	4,624	5,441

Source: National Longitudinal Study of Adolescent to Adult Health (N = 10,065)
Notes: Male trajectory model did not converge
*** p<0.001, ** p<0.01, * p<0.05

Table 10. Weighted descriptive statistics of daily smoking and controls in the full sample of Add Health

	Females	**Males**		
Variable	M (SD)	M (SD)	Min	Max
Daily Smoker (%)				
Wave I	0.10	0.10	0	1
Wave II	0.13	0.13	0	1
Wave III	0.22	0.26	0	1
Wave IV	0.22	0.27	0	1
Age				
Wave I	15.25 (1.74)	15.45 (1.78)	11	21
Wave II	16.18 (1.77)	16.28 (1.81)	11	23
Wave III	21.56 (1.76)	21.76 (1.81)	17	28
Wave IV	28.13 (1.77)	28.37 (1.82)	24	34
Race/Ethnicity (%)				
Non-Hispanic white	0.66	0.68	0	1
Non-Hispanic black	0.20	0.17	0	1
Hispanic	0.11	0.11	0	1
Other	0.03	0.04	0	1
Parental SES (%)				
Less than high school degree	0.12	0.11		
High school degree	0.27	0.27	0	1
Some college	0.11	0.11	0	1
College degree or higher	0.30	0.31	0	1
Parent ever smoked (%)	0.66	0.66	0	1
Importance of Religion (%)				
Very important	0.46	0.38	0	1
Fairly important	0.34	0.38	0	1
Fairly unimportant	0.06	0.07	0	1
Not important at all	0.14	0.17	0	1
State tax per cigarette tax (in cents)	32.37 (18.21)	31.47 (18.32)	3	75

Source: Waves I-IV and In-school sample of the National Longitudinal Study of Adolescent to Adult Health (N= 20,745)

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