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LIFE COURSE TRANSITIONS IN EARLY ADULTHOOD AND SES DISPARITIES IN TOBACCO USE

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Abstract

A huge literature has documented adult socioeconomic disparities in smoking but says less about how these disparities emerge over the life course. Building on findings that smoking among adolescents differs only modestly by parental SES, we utilize a life course perspective on social differentiation to help explain the widening disparities in smoking in young adulthood. Our theory suggests that achieved socioeconomic status and the nature and timing of adult role transitions affect age-based trajectories of smoking and widen disparities in adult smoking. The analyses use data from the National Longitudinal Study of Adolescent Health, which follows a representative national sample over four waves from ages 11–17 in 1994/95 to 26–34 in 2007/08. The results show divergent age trajectories in smoking by parental education and that achieved socioeconomic status and life course roles in young adulthood account in good part for differences in the age trajectories. The findings demonstrate the value of the life course perspective in understanding processes of increasing stratification in health behavior and health during the transition to adulthood.

Life Course Changes and Smoking

The life course perspective offers two insightful themes concerning age-based trajectories of social behavior. On one hand, childhood conditions and experiences have enduring influences on adult conditions and experiences, thus creating some coherency and meaning in the life course (Elder 1974). In specifying the nature of these linkages, theories of cumulative advantage argue that favorable conditions during childhood become a resource leading to future gains. The steady, incremental accumulation of advantages does more than maintain inequality over the life course – it also widens the difference in relative positions between individuals and groups. The perspective has enormous importance in understanding the maintenance of socioeconomic inequality both within and across generations (DiPrete and Eirich 2006; Willson, Shuey, and Elder 2007) but extends to health inequality as well (Lacey et al. 2010; Staff et al. 2010). For example, studies show that family socioeconomic status (SES) and living arrangements during childhood affect men's mortality as adults (Hayward and Gorman 2004). The perspective emphasizes the 'long arm of childhood,' whereby early life course experiences launch social and health trajectories into motion (Umberson, Crosnoe, and Reczek 2010).

On the other hand, another life course theme emphasizes how events, experiences, and changes during young adulthood can redirect trajectories from those established earlier in

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life. This perspective is illustrated most prominently in literature on criminal desistance over the life course. Sampson and Laub (1993) and Laub and Sampson (2003) emphasize that development of strong marital bonds and attachment to meaningful work can redirect criminal trajectories established early in life for the better. The same may apply to health. For example, network ties to non-smokers of normal weight during adulthood encourage quitting and weight control (Christakis and Fowler 2007, 2008). These types of changes imply that life course forces in young adulthood can diverge from pathways set in childhood.

We argue that both types of influences have the potential to shape life course changes in one key component of adult health – cigarette smoking. Family SES can shape long-term patterns of smoking (and other unhealthy behaviors), but achieved SES and adult roles can have both overlapping and independent influences. Consistent with arguments of cumulative advantage, family SES – specifically parents' education – defines distinct trajectories such that those from high SES backgrounds end up with lower smoking prevalence in young adulthood than those from low SES backgrounds. Consistent with the redirection arguments, achieved SES and adult roles experienced during young adulthood may independently influence smoking and partly mediate the relationship between family SES and smoking trajectories.

The attention to smoking has several advantages for the study of life course patterns of change. First, smoking contributes substantially to socioeconomic health disparities. Disparities in mortality have widened significantly in recent years (Miech et al. 2011) and their persistence in the face of public health progress has led many to label socioeconomic status as a fundamental cause of health (Link 2008). The standing of cigarette use as the largest source of premature mortality in high-income nations (CDC 2008) and its concentration among low SES groups proves critical to inequalities in health and longevity (Barbeau, Krieger, and Soobader 2004; Fagan et al. 2004; Montez and Zajacova 2013). Jha et al. (2006) thus find that smoking accounts for about half of the difference in educational disparities in mortality.

Second, cigarette smoking defines clear life course patterns that are subject to modification during the transition from adolescence to young adulthood. Although adolescents from high SES families smoke less than adolescents from low SES families (Droomers et al. 2005; Soteriades and DiFranza 2003), the difference is small and in some studies absent altogether (Hanson and Chen 2007; Jacobson et al. 2001; Johnston 2001; Tuinstra et al. 1998). Yet late initiation occurs disproportionately among low SES groups (Moon-Howard 2003), and cessation of tobacco use during the adult years depends on economic and social resources that are more common among advantaged SES groups (Honjo, Tsutsumi, and Kawachi 2006; Reid et al. 2010). Substantial change thus occurs from adolescence to adulthood. Chassin et al. (2007) report that 29 percent of adolescent smokers in their sample (those classified as quitters or experimenters) had stopped smoking by their mid 20s. Although age of onset and degree of nicotine dependence in adolescence influence adult habits (Chassin et al. 2007; Hu et al. 2008), adult experiences have the potential to redirect adolescent trajectories in ways that affect SES disparities.

Third, smoking presents something of a puzzle in understanding SES disparities in health. Many health disparities result in good part from the greater ability of high SES groups to pay for better living conditions, safer lifestyles, and quality health care. In contrast, smoking involves the purchase of a product that is increasingly expensive and widely recognized as harmful. Arguments need to account for high levels of smoking among the very groups that are less able to afford the product itself or the resulting health problems (Pampel, Krueger, and Denney 2010).

In this paper, we argue that the life course approach – and the components of both cumulative advantage and differential redirection – offers insights into how these disparities in smoking emerge and persist (Staff et al. 2010; Yu 2006). Toward that end, our primary research question asks: *Through what pathways does ascribed SES translate into smoking behaviors over the transition to adulthood and contribute to adult SES disparities?* We distinguish two interrelated life course pathways, one based on *achieved SES* and one based on *transitions to adult roles* in the domains of schooling, work, financial independence, living arrangements, union formation, and parenthood. We also distinguish between pathways involving the *nature* of the adult roles an individual assumes and the *timing* of the transitions.

To address the research question, we use the National Longitudinal Survey of Adolescent Health (Add Health) and multilevel growth models to examine life course changes in smoking among young men and women from ages 11–17 in 1994/1995 to ages 24–34 in 2007/2008. Add Health allows us to examine 1) how age trajectories of smoking vary by parental SES background; 2) how new SES attainments and roles in young adulthood affect smoking; and 3) how the new attainments and roles in young adulthood mediate the influence of parental SES on age trajectories in smoking. Our goal is to contribute to both the life course and health literatures by explaining the dynamic emergence of smoking disparities (and disparities in health behaviors more generally) over the life course rather than the static endpoint. Despite much description of adult disparities (e.g., Barbeau, Krieger, and Soobader 2004) and the patterns of smoking trajectories (e.g. Chen and Jacobson 2011), studies have done little to examine the explanatory life-course mechanisms. Identifying the influence of achieved SES and adult roles on life course changes in smoking among men and women links disparate fields in novel ways and gives new insights into an important health problem.

Recognizing that cross-sectional studies cannot tease out the intervening life-course experiences that produce changes in smoking, several studies of smoking have examined longitudinal data. However, none uses the data and models needed to answer the question we pose. Several examine life-course changes in smoking without connecting them to parental SES (Chen 2011; Staff et al. 2010; White 2009), several include parental SES but examine only part of the life course from early adolescence to young adulthood (Yang 2008; Hu 2008; Chen 2011), and several examine classes of trajectories without examining the influence of changes in adult roles (Chassin et al. 2000; Costello et al. 2008). The two studies that come closest to the goals of this study (Bachman et al. 2002; Pampel 2008) examine older data without the detail of Add Health on adult SES and roles.

The approach has policy as well as theoretical implications. The concept of linked or interdependent lives, a crucial component of the life course perspective (Elder 1994), highlights the influence of changing connections to the social convoy of family, friends, and coworkers. Knowing more about the varied pathways from adolescence to adulthood and the connections to others implied by these pathways can help define strategies for changing smoking behaviors (Fagan et al. 2004; White et al. 2009). Identifying life transitions, attainments, and new social roles that occur at key junctures of the life course and influence smoking can help target interventions (Umberson, Crosnoe, and Reczek 2010). If individuals in a specific demographic group tend to start or stop smoking in conjunction with particular life transitions, policies can kick in at the transition time with targeted support.

Achieved Socioeconomic Status and Smoking

The first major pathway through which SES in the family of origin can shape smoking trajectories during the transition to adulthood is achieved SES. During young adulthood, achieved SES grows in importance relative to ascribed family background during young adulthood (Pampel 2008; Yang et al 2008). While income and wealth often change substantially throughout adulthood, most Americans' educational attainment is set by their mid- to late twenties (Stoops 2003), and, although often not yet settled on a permanent occupation, young adults have begun to establish a career path. Mortimer et al. (2008) found in a longitudinal study of high schoolers that on average, respondents considered their job to be a "career" about five or six years after high school, in their early to mid-twenties. Young people who acquired more education further delayed their acquisition of a "career."

Three mechanisms might explain why SES attainment is negatively related to smoking in the transition to adulthood. The mechanisms we posit relate to both the *means* of achieving healthier behaviors and the *motivations* to engage in healthier behaviors (Pampel, Krueger, and Denney 2010). The first, most straightforward mechanism has to do with means: Socioeconomic resources can help smokers quit. Financial resources can help pay for counseling, nicotine replacement therapy, assistance from physicians, and prescription drugs (Honjo, Tsutsumi, and Kawachi 2006). Educational and occupational resources include skills, knowledge, and efficacy for devising solutions to overcoming obstacles in general (Mirowsky and Ross 2003) and nicotine addiction in particular (Sorenson et al. 2004). The desire to quit smoking is common among all groups, but high SES smokers succeed more than others do in realizing this goal (Barbeau, Krieger, and Soobader 2004; King et al. 2004). However, these resources may not operate during the teen years, when unconventionality and a search for independence dominate peer groups (Turbin, Jessor, and Costa 2000). They instead become central to greater cessation in adulthood. Thus, young adults on pathways to higher levels of SES or the promise of more resources to come will be more likely to never start or to quit smoking (King et al. 2004).

The second mechanism has to do with motivations to stop smoking or to keep from starting. Young adults who have achieved higher levels of SES take on responsibilities of work and career, and they have a strong stake in conformity to conventional health behaviors such as not smoking (Bachman et al. 2008). They also experience stricter anti-smoking environments than lower-SES individuals (Stuber, Galea, and Link 2008). Norms against smoking accordingly should be stronger for workers than the unemployed, in colleges and professional organizations than in factories and construction sites, and in richer than poorer communities. Not only should the norms against smoking be stronger, but the monitoring of higher-SES individuals is likely to be higher. For example, educated professionals are part of networks of informal social control over behaviors such as smoking (Christakis and Fowler 2008).

The third way in which achieved SES may affect smoking in the transition to adulthood also relates to motivations: Stress experienced by individuals with lower SES may lead to late initiation of smoking and difficulty in quitting. Disadvantaged groups face a struggle in daily life to meet demands they cannot satisfy (Adler et al. 1994) or face negative self-comparisons with more advantaged groups (Marmot 2004). Under difficult social and personal circumstances, use of cigarettes and nicotine may serve as a form of self-medication and coping (Bennett et al. 2005; DHHS 1998:233), one that seems to offer some relief from chronic stress to those unable to purchase more expensive forms of pleasure or therapy (Graham 1995). Socioeconomically deprived people under stress may also reason that, given the other sources of premature mortality they face, smoking represents a small additional threat (Lawlor et al. 2003).

If SES-based life experiences induce different levels of stress, they may contribute to both late initiation and difficulty in quitting. During the transition to adulthood, when youth leave school to compete in the labor market, they are confronted most clearly with the difficulties of economic and family success. Failing to advance in schooling, facing unemployment or low wage work, or experiencing financial hardship may lead to new initiation and difficulty in quitting. As a result, smoking of those in low SES positions may steadily increase during the 20s. In contrast, socioeconomic success may have the opposite effect – it may make it easier to quit smoking and give little incentive to start.

Adult Roles and Smoking

The second pathway through which ascribed SES may shape smoking trajectories in the transition to adulthood relates to the nature and timing of transitions to adult roles. The human life course can be understood as a series of phases that bring new roles and norms (Elder 1994). The transitions to adult roles of individuals from lower-SES backgrounds differ in two ways from those of their higher-SES counterparts. First, the *nature* of the adult roles tends to differ in ways that reflect social inequality. For example, people from higher-SES backgrounds are more likely to marry, and marriage confers financial and health benefits and social esteem (Demo and Cox 2000; Waite 1995). Second, lower-SES individuals tend to have earlier *timing* of transitions to adult roles, such as the transitions to full-time work and parenthood. This early timing may put people at risk for smoking. We present these arguments in general form but note that, given gender differences in life course phases and smoking norms, the arguments may not operate the same for men and women.

The Nature of Adult Roles

The nature of the adult roles assumed by young people may shape smoking trajectories through two mechanisms, each shaping the motivations to engage in healthy behavior (Bachman et al. 2002; Chassin et al. 2000; Chen, White, and Pandina 2001). First, new adult roles involve a changing balance of freedoms and responsibilities that influence motivations to smoke (Bachman et al. 2002). When young adults take on new responsibilities of work and family, they develop a greater stake in conformity to normative conventions. For example, marriage creates new systems of obligation, support, and restraint, and it imposes significant costs on non-normative behaviors (Sampson, Laub, and Wimer 2006), including habits that could lead to health problems (Staff et al. 2010). Thus, adult roles often involve a normative commitment to a lifestyle that is less focused on parties, going out, and same-sex peers and is more focused on work, livelihood, spouse, and children (Osgood et al. 1996).

Second, the increased monitoring and social control that typically come with adult roles encourage conformity to altered norms. A literature on neighborhood social capital notes that the norms of nearby residents and local networks help individuals avoid unhealthy behaviors such as smoking (Kawachi, Subramanian, and Kim 2008). Friendship, neighborhood, and acquaintance networks can offer support, encouragement, and approval for quitting (Brown et al. 2006; Chen, White, and Pandina 2001). In marriage, spouses monitor and control their partner's behavior in ways that benefit the health of both (Umberson 1992). Such monitoring and control, especially when there are children, should prevent new smoking and lead to cessation. In contrast, persons who are unemployed or unmarried may lack the social control and monitoring of partners and co-workers, or, indeed, may be encouraged in smoking by peers.

Timing of Adult Roles

Although adult work and family roles generally should promote non-smoking, the timing and ordering of life course transitions can counteract such influences (Neugarten, Moore,

and Lowe 1965; Settersten 2004). Making the same type of transition to adulthood, such as becoming a parent, may have very different consequences for smoking behaviors when done at age 16 versus 26, or when done before marrying versus after. Young people who make early transitions are violating age norms about the appropriate timing for assumption of adult roles (Settersten 2004). This norm violation can lead to stigma and negative sanctions, which may increase stress and the desire to initiate or continue smoking. Early assumption of adult roles is also associated with financial hardship (Booth, Rustenbach, and McHale 2008), which may encourage smoking.

In addition, early timing diminishes the protective effects of the responsibilities and monitoring that normally attend adult roles. High school gives youth partial independence from parents and some freedom outside school hours, and the years after high school further free young people from much of the monitoring by school and family. Although its relevance differs to some extent by socioeconomic background (Johnson, Berg, and Sirotzki 2007), for some young people this freedom makes for a period of experimentation, risk taking, youthful excess, and identity exploration that precedes a later period of conformity to more conventional social roles (Arnett 2000). The freedom creates more opportunity to take up and maintain tobacco use, which matches the rising overall usage rates from the teens through the early-to-mid twenties. When making a transition to an adult role during ages when same-age peers have generally not yet made the transition, teens are less exposed to anti-smoking environments. They do not experience the sense of responsibility, stake in conformity, and monitoring and control that moderate smoking at older ages. Thus, we suggest that the protective normative effect of transitioning to adult roles may be weaker when the transition occurs earlier.

Hypotheses

These arguments about the pathways through which ascribed SES shapes smoking trajectories during the transition to adulthood lead to three sets of predictions. *First*, descriptively, age trajectories in smoking should differ by parental socioeconomic background, with the disparities increasing over the transition to adulthood. *Second*, achieved SES and new adult roles should reduce smoking, except when the roles are assumed early in the life course or out of the normatively prescribed order. This implies that some events and roles should have different influences if they occur in adolescence or in young adulthood. *Third*, differences in achieved SES and the nature and timing of adult roles should partially explain or mediate the relationship between ascribed SES and smoking. SES life course changes should not only affect adult smoking but should also relate to parental status and mediate the influence of parental status on adult smoking.

Methods

Data

The wide use and familiarity of the longitudinal Add Health data to most researchers testify to its value. The survey data cover a nationally representative sample at four time points (1994/1995/1996/2001/2007/2008) and for ages from 11–17 (wave 1) to 26–34 (wave 4). With a cluster design that samples students within 132 randomly selected middle and high schools and oversamples minority youth, Add Health contains at-home interviews of 20,745 students at wave 1 and 15,701 at wave 4 (Add Health 2011). Of the 19,560 Wave 1 participants who were alive, in the country, and not active duty military in Wave 4, the response rate was 80.3%, with 7.5% of respondents not being able to be located or contacted, and 9.1% being unwilling to complete the survey (Brownstein et al. 2011). Though attrition limits samples at later waves, analyses reveal that, at all waves of the study, non-response does not seem to bias the sample, and the Wave 4 sample adequately

represents the Wave 1 sample (Brownstein et al. 2011). A survey of a parent or guardian in wave 1 complements the respondent surveys and allows for comparisons across groups defined by parental SES characteristics.

Smoking

The outcome variable of being a current smoker is defined by self reports of smoking in the last 30 days. Initial questions ask all respondents whether they have ever tried a cigarette or have ever smoked an entire cigarette. Those answering yes are then asked how many days in the last month they smoked. Combining the two questions leads to the following classification: Current smokers (coded 1) have both tried a cigarette and smoked at least one day in the last month, while current non-smokers have either never tried smoking or not smoked in the last 30 days. However, wave 3 differs from the format of the other waves. Those having tried a cigarette are simply asked if they smoked in the last month and only those answering yes, rather than all those having tried a cigarette, are asked to identify the number of days. The questions in wave 3 may lead to less effort at recall and underestimate the level of smoking.

Add Health does not have items to create a detailed smoking history. Despite a few questions on age of starting and, for current non-smokers, on having smoked in the past, Add Health does not measure exact ages of quitting or patterns of tobacco use between surveys. The measures of smoking at the time of survey thus miss events that occur before the first survey or during the five years between Waves 2 and 3 and the six to seven years between waves 3 and 4. Nonetheless, the Add Health data have clear advantages for the study of life course patterns. The measurement of smoking at the time of the surveys avoids error-prone recall of past behavior. The measure of whether the subject currently smokes in the first survey at ages 11–17 avoids recall error but still captures initiation at young ages, just as the next three surveys capture changes in smoking from early adolescence to young adulthood. With a sample of four time points and the varying ages of the sample respondents at time point, Add Health contains subjects at each single year of age from 11 to 34 and allows for population-averaged estimation of age-based smoking prevalence without needing a yearly survey for each individual. The life course pattern of starting and stopping tobacco use can be inferred at the population level without knowing the exact age of starting and stopping for each subject.

Ascribed SES and Background

Parents' education level is the most complete, reliable, and influential measure of parental SES available in Add Health. It equals the average of the years of education for two parents when available or the reported years of education for one otherwise. The measure comes from the parents' reports in the wave 1 parent interview. Missing data from parents was filled in from the in-home interviews given to the child in waves 1 and 2, who also reported on parents' education. This number of years is then represented in a categorical variable, with a reference group of parents who have not completed high school. Other categories include high school degree, some college, and a college degree.

Since sex was identified in wave 1 and corrected or confirmed in later waves, this variable is based on the latest wave of information available. Females are coded 1, males 0. Race and ethnicity is represented in the mutually exclusive categories for white, black, Hispanic, Asian, American Indian, and other. Other race reflects individuals responding "other" to the question. Age was calculated at each wave from comparing the month and year of the interview to the respondent's birth month and year. To limit decimal places and ease the interpretation of the quadratic coefficients, age is divided by 10 and recoded to have a value of zero at age 11 (the age of the youngest respondents at wave 1).

Parent smoking status is a dichotomous variable capturing whether the mother or the father ever smoked, according to the child's responses to the in-home interview in wave 1. Of the 433 missing this variable, 226 had a parent respond to the question "Do you smoke?" during the parent interview, and were filled in with the response to this question.

Achieved SES

We measure achieved SES in the transition to adulthood through educational attainment, income, and home ownership. Years of education of the respondent was collected at each of the four waves.

A categorical variable was used to represent personal earnings, which includes wages, salaries, tips, bonuses, overtime pay, and income from self-employment. As well as providing a measure of income that does not include parent contributions, this variable has the advantage of being available at all waves. These responses were then converted to 2010 dollars using figures from the Consumer Price Index for all Urban Consumers. Earnings were divided into four categories, with one category for missing earnings information, and the other categories for tertiles of \$0–\$5,000, \$5,001–\$18,223, and \$18,224 and above

A dichotomous variable to show whether the respondent reported owning a home, condominium, or other residence was created for each wave, with waves 1 and 2 set to 0. This measure is a rough indicator of wealth, which is an important component of SES across the life course (Willson, Shuey, and Elder 2007).

Adult Roles

The gaps between the last three waves of the Add Health make it hard to measure the precise timing of life transitions. However, as we argued for smoking, the adult roles stemming from these transitions can be measured directly and accurately. For example, continuation into advanced schooling or exit from schooling into the labor force affect current school attendance and labor force status. Similarly, marriage, birth of a child, and moving to a new residence affect current marital status, number of children, and living arrangements. To measure the important influence of timing, indicators of adult roles can interact with age.

Whether or not the respondent was in school was collected at each wave (in school equal to 1, not in school equal to 0). Respondents attending school for only part of the year were treated as not currently in school.

Following Staff et al. (2010), work status has three categories: not working, working in a nonprofessional job, or working in a professional job. Not working was defined as not having a job or working less than ten hours per week. Whether or not a job is professional was determined from the Standard Occupational Classification System used in waves 3 and 4, with all occupations with prefixes 11–29 defined as professional and those with prefixes 31–55 defined as nonprofessional. For waves 1 and 2, all occupations were classified as not professional.

A binary variable captures whether or not the respondent lives with his or her parents at each wave. A categorical variable represents whether or not, at each wave, the respondent is married and living with a son or daughter during the time of the interview. The reference group comprises those who are not married and without children, and the three other groups include those that are married with children, not married with children, and married without children. Preliminary models indicated that cohabiting respondents showed similar effects to those unmarried and not cohabiting and were therefore not treated separately. Living with a son or daughter was obtained from the household roster for each wave, and includes biological, adopted, foster, and step children. Marital status was obtained in wave 2 through

a direct question and in waves 3 and 4 by determining if any relationship was a current marriage. For waves 1 and 2, all respondents under the age fifteen were coded as not married.

Other measures to be used as controls aim to tap individual differences that affect both life course positions and smoking (Staff et al. 2010). Perhaps adult SES and new work and family roles do not themselves causally determine smoking propensities or disparities but are both determined by other traits that emerge early in life and persist into adulthood. We measure three characteristics at wave one that may affect life course transitions and smoking. Although available for all waves, the measures change in ways that limit their comparability. Also justifying use of wave one characteristics, treatment of the variables as time varying would create problems of endogeneity. Smoking may promote contact with other smokers who tend to participate more in delinquent acts, limit contact with religious, non-smoking youth, and worsen issues of depression (via stigma and addiction). Measuring the control variables at wave one minimizes this problem.

First, a scale of religiosity comes from two variables: how often the respondent attends services (ranging from 0, never attends, to 3, once a week or more) and how important religion or religious faith is (ranging from 0, not important at all or no religion, to 3, very important). Combined into a standardized scale, the two items have an alpha reliability of .78. Second, respondents were asked 15 questions about how often they engaged in delinquent acts. These items were combined to create a standardized scale of delinquency at wave 1 with an alpha reliability coefficient of .85. Third, a scale of depressive symptoms comes from a series of statements asking how often the respondent had particular feelings in the last week. The alpha reliability coefficient is .87. Both the delinquency and depressive symptom scales are highly skewed and logged before using in the models.

Models and Statistical Analysis

The analysis will examine the influence on smoking of: 1) time-invariant background factors such as parental education, 2) time-varying variables relating to achieved SES, adult roles, and related control variables, and 3) the timing-based interactions of age and adult roles. Examining men and women separately because of established differences in their smoking trajectories (Pampel 2008), the strategy is to first compare trajectories across groups defined by parents' education and then to examine the influence on smoking of mediating variables related to the nature and timing of new roles and achieved SES during young adulthood. The contribution of achieved SES and adult roles to widening disparities in smoking will show in their ability to explain the differences in age trajectories by parents' education.

A multilevel framework using binary logistic regression is well suited to examine variation in smoking trajectories. Age serves as the level-1 unit and person as the level-2 unit. The time-varying variables are included at level-1, and the time-invariant variables are included at level 2. With the logit of smoking treated as a nonlinear function of age at level 1, the growth-curve coefficients for age are then treated as linear functions of parental SES at level 2. Under assumptions of multivariate normality at level 2 (Raudenbush and Bryk 2002), the models provide statistically unbiased and efficient estimates that can capture the effects on the trajectories in smoking. The models also allow for use of subjects with incomplete data, a key need given the loss of cases through attrition. In particular, wave 2 excludes wave 1 high school seniors, but the models retain these cases for other waves.

The basic multilevel model takes the following form for person i at time t :

$$\text{Logit}(S_{ti}) = \beta_{0i} + \beta_{1i}(A_{ti} - L) + \beta_{2i}(A_{ti} - L)^2 + \sum \beta_{ki}X_{kti} \quad (1)$$

$$\beta_{0i} = \gamma_{00} + \sum \gamma_{0j} W_{ji} + u_{0i}, \quad (2a)$$

$$\beta_{1i} = \gamma_{10} + \sum \gamma_{1j} W_{ji} + u_{1i}, \quad (2b)$$

$$\beta_{2i} = \gamma_{20} + \sum \gamma_{2j} W_{ji} + u_{2i}, \quad (2c)$$

$$\beta_{ki} = \gamma_{k0}. \quad (2d)$$

The coefficients γ_{1j} and γ_{2j} , both treated as random effects, describe, respectively, the linear increase (at the centered value L of age 11) and rate of acceleration (or deceleration) of the smoking trajectory for each individual. The γ_{ki} coefficients for k level-1 time-varying variables are treated as fixed (i.e., $\gamma_{ki} = \gamma_{k0}$). The γ_{0j} coefficients for j time-invariant W variables show how stable background characteristics such as parental SES modify the level of smoking in 2a and the age trajectories in smoking in 2b–2c. The focus on within-individual change also helps control for unmeasured stable differences across individuals.

With random effects for the intercept, slope of age, and slope of age squared, some simplifying assumptions about the variance components were needed to obtain reliable estimates. The models assign one unique variance parameter per random effect but assume covariance parameters are zero.

Results

Table 1 lists descriptive statistics for the model variables, both pooled across waves and separately by wave. On average, about 34 percent of the sample smoked in the last month, and the average rises over time across all waves, except in wave 3 (which may be underestimated slightly because of a different form of the smoking question). However, to describe the trajectories correctly, smoking should be matched to age rather than to wave.

As shown by statistics for the background variables, the sample is largely white and ranges from an average age of 15.5 in wave 1 to 28.3 in wave four. The parents of respondents most commonly have some college education and at wave 1 report having ever smoked. The time-varying variables show increases across the waves in years of school, higher personal earnings, and work in professional occupations, and decreases in school attendance, earning less money personally, and having no occupation. In the first wave, most respondents live with their parents, are single, and have no children, but by the last wave, most are married, have kids, or both. Since homeownership in the first two waves would reflect parents' socioeconomic status, the first two waves are coded 0 to indicate that the respondents did not own the residence, but by wave 4, more than two out of five respondents own a residence. Wave 1 controls of religiosity, delinquency, and psychological depression may tap underlying traits associated with life positions and smoking.

Table 2 presents the models predicting smoking based on age and the background variables (BIC tests show that combining males and females into a single model loses significant information). Unadjusted for mediating life course variables, the odds ratios in the table represent total effects (i.e., both direct and indirect effects). Models 1 and 2, one for females and one for males, include only additive or main effects (i.e., without age interactions). The age odds ratios are above one, showing that smoking initially rises as youth grow older, but the odds ratios for age squared are less than one, showing that smoking drops after rising to

a peak at age 23 for females and 25 for males. The effects of age vary across individuals, as indicated by the significant variance components for both age and age squared. The other background variables have expected effects. Blacks, Hispanics, and Asian Americans smoke less than non-Hispanic whites for these ages. Youth with parents who graduated from college are less likely to smoke, and youth with parents who smoked are more likely to smoke.

Hypothesis 1: Varied Trajectories by Parents' Education

While the initial models assume that the age trajectories in smoking are the same for all groups within each gender, the next two models relax this assumption. Models 3 and 4 in Table 2 let the trajectories vary by parents' education, first for females and then for males. The interaction odds ratios of age and age squared in the two models generally reach statistical significance, meaning the trajectories differ between youth whose parents did not complete high school (the reference category) and others. Generally, the interactions show that the ratios for age are even greater, and the ratios for age squared are closer to zero for those with more highly educated parents. This reflects a greater rise and greater fall with age in smoking prevalence for those from more advantaged backgrounds. Figures 1a and 1b graph the predicted probabilities implied by the interactions in models 3 and 4 of Table 2. The graphs generally depict lower smoking of those with more highly educated parents, but more importantly depict a different trajectory for one group. Among those with parents who did not complete high school, the peak in smoking is less pronounced, with gentler rises and falls. The other groups show a greater decline in smoking prevalence at the older ages, and the gaps change substantially across ages. For males, only a small gap in smoking exists at the youngest ages between youth whose parents did not complete high school and youth whose parents completed college, but the gap expands substantially at the oldest age. In support of the hypothesis, then, family socioeconomic circumstances translate into smoking disparities in young adulthood.

Hypothesis 2: Influence of Achieved SES and Adult Roles

The models in Table 3 add time-varying variables that both relate to smoking and may attenuate the relationship between parents' education and smoking and some important controls that may influence smoking. Because of missing data on the role measures, achieved SES, and stable control variables, these models have a smaller sample size, but checks show the loss of cases affects the ratios only trivially. In support of hypothesis 2, the adult role variables in Table 3 have expected effects. For women, having a professional job, and having a spouse or kids lower smoking. For men, being in school, having a professional job, and being married lower the likelihood of smoking. Both men and women in non-professional occupations show elevated smoking risk. For achieved SES, higher schooling and owning a home reduce smoking, while earning the middle category of personal earnings increases smoking. Without accounting for timing in the life course, transitions into high SES positions and adult roles serve to prevent smoking or promote cessation. Lastly, the control variables have expected effects. Religiosity reduces the probability of smoking, while delinquency and depression increase the probability of smoking.

The last models test for difference in the timing of adult roles by allowing the adult role variables to interact with age. Table 4 presents these interaction odds ratios (with controls for all the variables in Table 3). The first interactions involve school, the second involve work variables, and the third involve family and living arrangements. Few of the interactions reach significance, and the results overall give only limited support to the changing influence of adult roles with age. First, while schooling may reduce smoking for males, the timing of schooling does not change this effect, as the interaction term is non-significant (as shown by the $\text{In school} \times \text{age}$ coefficient). The term is also non-significant for females.

Second, the significant interactions for being in a non-professional occupation (Not professional*age) for males and females indicate that the positive effects of these occupations on smoking decreases as the respondents get older. In addition, being in a professional occupation compared to not working becomes protective with age for males but not females (Professional*age). Third, for both genders, being unmarried with children (compared to being unmarried without children) starts out as protective but becomes a risk for smoking at older ages (Not married with kids*age). Family status thus has different influences at older than younger ages, and the ordering of marriage relative to childbearing has consequences for smoking.

Hypothesis 3: Mediation by Achieved SES and Adult Roles

In support of hypothesis 3, the adult role and achieved SES variables partly account for the divergent trajectories in smoking by ascribed SES. With controls for life positions, the interactions of age and age squared with parents' education in Table 3 generally remain significant. Figures 2a and 2b graph the predicted probabilities of smoking by parents' education net of life positions and can be compared to those in Figures 1a and 1b without controls for life positions. With mediation, differences by parents' education should appear smaller with the life position controls. Consider the groups with the least and most parental education. For females, the mean difference in probabilities across all ages equals .040 without controls and .012 with controls. With controls, those with the least educated parents have predicted probabilities lower than those with the most educated parents from age 17 to 26 (although gap reverses at older ages). For males, the mean difference in probabilities across all ages equals .087 without controls and .019 with controls. For example, at age 34, the difference in the predicted probability of smoking in Figure 1b between males with the least and most highly educated parents equals .142, and the difference in figure 2b with the controls for time-varying variables equals .080. Completed years of schooling and family structure contribute most to the declining differences, which highlight the importance of education and social support for changes in smoking. In addition, though we have not provided separate models that include role measures and achieved SES without religiosity, delinquency, and depression, supplementary runs indicate that, though influential on smoking, these controls do not reduce the effect of parental education on smoking for either males or females.

Offering less support for hypothesis 3, however, the age interactions in Table 4 do not greatly affect the differences in age trajectories by parents' education.

Discussion

Our analysis of life course changes in smoking produces three sets of findings corresponding to each of the hypotheses. First, differences in smoking disparities by parents' education start small in adolescence but widen in young adulthood, thus contributing to SES disparities among adults. Others have found such a pattern (Lacey et al. 2010; Yang et al. 2008), but description of smoking trajectories from adolescence to young adulthood with high quality national longitudinal data up to age 34 improves on previous studies. Second, achieved SES, the assumption of adult roles, and the normative timing and sequencing of adult roles are related to smoking in young adulthood, with lower smoking most common among advantaged persons who successfully navigate work and family roles. Many studies have described the relationship between smoking and SES, and a few have examined the social sources behind the emergence of disparities over the early life course (see Bachman et al. 2008; Staff et al 2010). However, this study moves beyond static descriptions of teen and adult smoking to consider how unfolding life course processes connect family background to the emergence of adult smoking. The relationships modeled here give new insight into how life course changes contribute to adult smoking disparities. Third, the mediating

variables relating to adult SES and roles account for a portion of differences in the age trajectories of smoking for youth with low and high parents' education. This finding extends the common descriptions of age trajectories in smoking to help explain widening disparities from adolescence to adulthood: Differences in socioeconomic attainment and successful assumption of adult roles affect late initiation and cessation in ways that increasingly stratify smoking by SES.

The results are limited by the lack of a continuous history of smoking over the full range of years covered by the Add Health surveys. Information on smoking at the time of the four surveys does not directly measure starting and quitting between surveys. We instead take life course characteristics at each time point as determinants of smoking at the same time point. We argue for the value of such an approach – it measures smoking directly at the time of the survey without recall error and it defines population-level estimates of smoking at each age that reflect patterns of quitting and starting. Plus, use of the Add Health data improves considerably on other data sets in its age span, geographical coverage, and sample size. Following subjects to older ages, which will be possible with the release in coming years of Wave 5 of Add Health, will further improve the data set. Nonetheless, more information on what occurs between the surveys would allow for subject-specific estimates of the exact timing of starting and quitting. Other personality characteristics, such as anxiety, could be considered as controls to better isolate the effects of ascribed and achieved socioeconomic statuses. A more complete picture also requires examination of life course patterns of smoking across race and ethnic groups. We focus here on socioeconomic background, but life course transitions may similarly differentiate smoking of race and ethnic groups. Add Health allows for such study, but the topic requires a separate paper.

Our findings follow from a theoretical perspective on life course transitions during the period from adolescence to young adulthood. The life course perspective emphasizes both the enduring impact of childhood and adolescence backgrounds and the potential for new experiences during young adulthood to redirect trajectories set at earlier ages. The perspective fits a wide range of behaviors but proves helpful in understanding smoking and health disparities. We demonstrate the influence of parental education on smoking patterns later in life but also show how the varied pathways from adolescence to adulthood and the connections to others implied by these pathways affect smoking. Life transitions, attainments, and new social roles that occur at key junctures of the life course influence the tendency to initiate or quit smoking. Since these life course changes are related to family background, they help to translate family socioeconomic advantages into smoking advantages in young adulthood.

Our findings for smoking suggest that differentiation in smoking patterns, although related to family background, occurs relatively late. In many ways, socioeconomic attainments reflect processes of cumulative advantage in which favorable family positions produce resources for future gain. In addition, however, achieved SES and assumption of new roles in young adulthood (which correlate with family background) contribute to disparities in smoking prevalence. For smoking, then, adolescence sets the stage for later behavior but does not determine it – life course changes in adulthood have the potential to widen smoking disparities.

Prevention strategies and public policies should work to capitalize on our study's insight that smoking is not predetermined by ascribed socioeconomic position. The assumption of adult roles through occupations, family formation, and home ownership has important implications for smoking trajectories. The timing of these transitions also matters in many cases—for example, working in a non-professional job compared to not working facilitates smoking at younger ages but protects from it later on. Our findings also suggest that

effective policies should account for the gendered nature of smoking behaviors. For example, parenthood yields considerable protective effects for smoking among women, whereas for men, marriage is more important. The adoption of a professional occupation in young adulthood is another protective role transition for men, but not for women. Although we cannot disentangle desistance from smoking from the uptake of smoking by new people over time, our findings suggest the importance for smoking behavior of points of transition when individuals feel that they are “becoming adult” and becoming responsible for important new people (e.g., spouses, children) and things (e.g., homes, jobs). Smoking prevention and desistance efforts could take either or both of the following broad approaches: (1) working to strengthen anti-smoking norms at these points of transition, or (2) attempting to increase the prevalence of transitions that predict less smoking (for example, by encouraging home ownership, work involvement in young adulthood, or higher educational attainment). Our identification of multiple pathways to decreased smoking from adolescence through young adulthood supports the idea that policies could experiment with a wide variety of approaches to curb smoking.

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Highlights

- Youth with highly educated parents smoke less in adolescence
- Differences in smoking by parental education widen in young adulthood
- Achieved socioeconomic status (SES) in young adulthood reduces smoking
- Achieved SES helps account for diverse age trajectories by parental education
- Family background and life course transitions combine to affect smoking

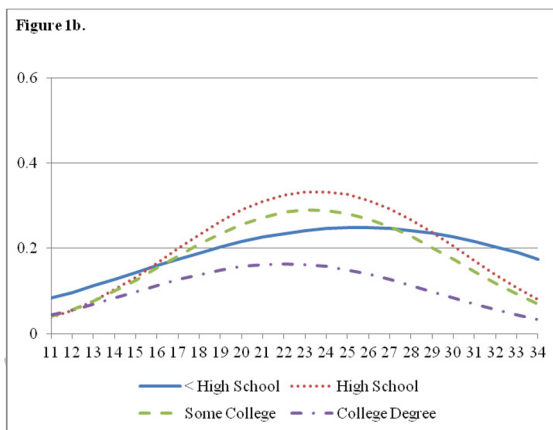
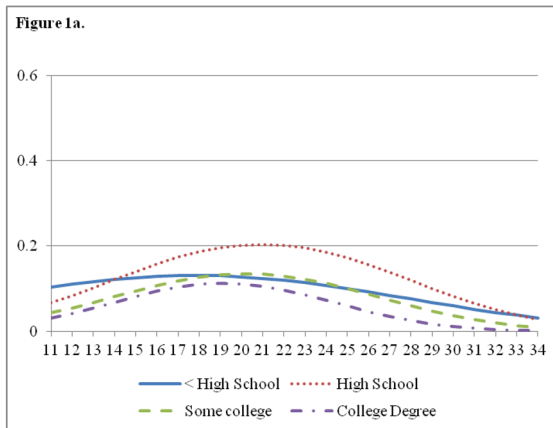


Figure 1.

Figure 1a. Predicted Probabilities of Smoking by Parents' Education: Females, Table 2 (Interaction Model)

Figure 1b. Predicted Probabilities of Smoking by Parents' Education: Males, Table 2 (Interaction Model)

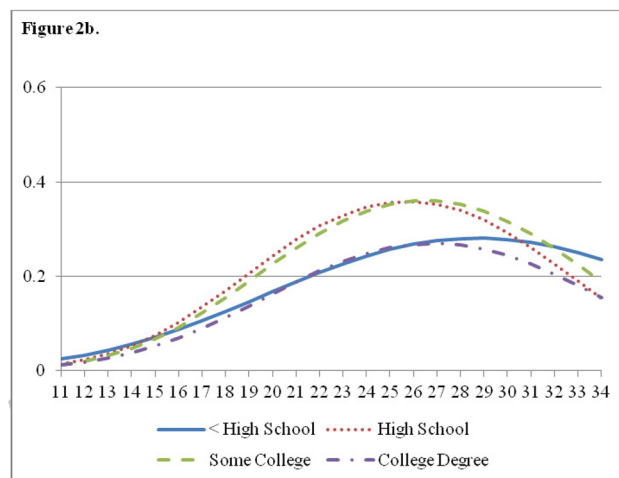
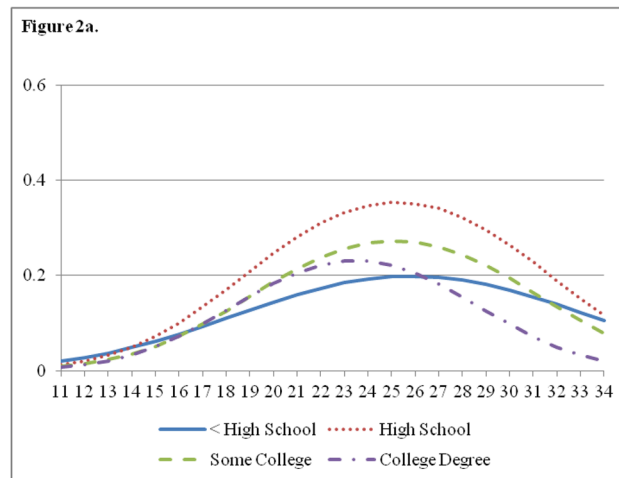


Figure 2.

Figure 2a. Predicted Probabilities of Smoking by Parents' Education: Females, Table 3

Figure 2b. Predicted Probabilities of Smoking by Parents' Education: Males, Table 3

Table 1

Descriptive Statistics

	N	Mean	SD	Min	Max	Mean by Wave			
						W1	W2	W3	W4
Current smoker	60857	0.34	0.47	0	1	0.28	0.35	0.35	0.39
<i>Ascriptive variables</i>									
Age	61614	20.13	5.51	11	34	15.5	16.0	21.8	28.3
White	75640	0.67	0.47	0	1	0.67			
Black	75640	0.16	0.37	0	1	0.16			
Hispanic	75696	0.12	0.33	0	1	0.12			
Asian	75696	0.04	0.19	0	1	0.04			
Native American	75696	0.01	0.09	0	1	0.01			
Other & missing	75696	0.01	0.10	0	1	0.01			
Female	75696	0.49	0.50	0	1	0.49			
Parent educ. <high school	74384	0.21	0.41	0	1	0.21			
Parent educ. high school deg	74384	0.22	0.41	0	1	0.22			
Parent educ. some college	74384	0.39	0.49	0	1	0.39			
Parent educ. college degree	74384	0.18	0.38	0	1	0.18			
Parent ever smoked	74868	0.66	0.47	0	1	0.66			
<i>Role Measures</i>									
In school	61585	0.63	0.48	0	1	0.98	0.91	0.36	0.16
Professional occupation	60744	0.12	0.33	0	1	0	0	0.18	0.33
Not professional occupation	60744	0.43	0.49	0	1	0.34	0.40	0.51	0.48
No occupation	60744	0.45	0.50	0	1	0.66	0.60	0.31	0.19
Living with parents	61558	0.64	0.48	0	1	0.94	0.93	0.43	0.16
Married with kids	61273	0.09	0.29	0	1	0.00	0.00	0.10	0.30
Married without kids	61273	0.05	0.22	0	1	0.00	0.00	0.07	0.13
Not married with kids	61273	0.07	0.26	0	1	0.01	0.02	0.11	0.16
Not married without kids	61273	0.78	0.41	0	1	0.98	0.97	0.72	0.41
<i>Achieved SES</i>									
Years of education	61088	11.50	2.73	6	22	9.44	9.93	13.07	14.01
Personal earnings \$0-\$5000	61615	46.16	0.50	0	1	0.70	0.65	0.33	0.13

	N	Mean	SD	Min	Max	Mean by Wave			
						W1	W2	W3	W4
Personal earnings \$5001–\$18223	61615	0.25	0.44	0	1	0.24	0.28	0.32	0.18
Personal earnings \$18224+	61615	0.24	0.43	0	1	0.02	0.03	0.30	0.67
Personal earnings missing	61615	0.02	0.12	0	1	0	0	0.04	0.02
Own residence	61535	0.13	0.34	0	1	0	0	0.13	0.42
<i>Controls</i>									
Religiosity scale	60969	−0.05	0.89	−1.83	1.29	0.02			
Delinquency scale	61333	0.01	1.01	−0.98	24.57	−0.01			
Depression scale	61566	−0.03	1.00	−1.58	6.24	−0.04			

Source: National Longitudinal Study of Adolescent Health

Notes: Statistics adjust for weighting.

Table 2
Odds Ratios and 95% Confidence Intervals for Multilevel Logistic Regression Models of Current Smoking: Ascriptive Variables

	Additive Model				Interaction Models			
	(1) Females		(2) Males		(3) Females		(4) Males	
	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI
Fixed Effects								
Constant	0.01 ***	0.01,0.02	0.01 ***	0.01,0.02	0.06 ***	0.02,0.14	0.04 ***	0.02,0.1
Age/10	10.97 ***	7.19,16.43	24.99 ***	15.77,37.13	2.20	0.90,5.33	6.02 ***	2.36,16.03
Age/10 Squared	0.26 ***	0.21,0.32	0.27 ***	0.23,0.34	0.56 **	0.37,0.84	0.54 **	0.35,0.82
Race (Other)								
Black	0.08 ***	0.06,0.10	0.22 ***	0.19,0.28	0.08 ***	0.06,0.10	0.22 ***	0.18,0.28
Hispanic	0.21 ***	0.16,0.27	0.40 ***	0.33,0.51	0.21 ***	0.17,0.27	0.40 ***	0.33,0.51
Asian	0.20 ***	0.14,0.28	0.33 ***	0.25,0.45	0.20 ***	0.14,0.28	0.33 ***	0.25,0.45
Native American	0.78	0.29,1.70	1.83	0.84,3.69	0.77	0.29,1.68	1.83	0.83,3.68
Other	0.41	0.10,1.64	1.20	0.09,2.79	0.41	0.10,1.61	1.21	0.09,2.79
Parent ever smoked	3.42 ***	2.82,4.02	2.24 ***	1.87,2.57	3.41 ***	2.82,4.01	2.24 ***	1.86,2.57
Parent Education (< high school)								
High school degree	1.33 *	1.02,1.68	1.11	0.89,1.44	0.27 *	0.08,0.90	0.13 **	0.05,0.58
Some college	0.83	0.64,1.00	0.99	0.81,1.23	0.13 ***	0.05,0.38	0.16 **	0.06,0.51
College degree	0.65 **	0.49,0.83	0.64 ***	0.50,0.82	0.05 ***	0.01,0.15	0.25 *	0.07,0.92
Interactions								
Parent ed HS degree * age					5.87 **	1.64,19.64	9.48 ***	2.08,29.05
Parent ed HS degree * age ²					0.49 *	0.28,0.89	0.37 **	0.22,0.73
Parent ed some college * age					6.86 ***	2.23,20.16	6.71 ***	2.06,20.43
Parent ed some college * age ²					0.41 ***	0.25,0.69	0.42 ***	0.25,0.71
Parent ed college degree * age					13.32 ***	3.91,51.69	2.36	0.62,9.04
Parent ed college degree * age ²					0.23 ***	0.12,0.4	0.56	0.3,1.04
Random Effects								
Variance of age	Estimate	SE	Estimate	SE	Estimate	SE	Estimate	SE
	4.856	0.445	4.744	0.495	5.100	0.460	4.961	0.512

	Additive Model				Interaction Models			
	(1) Females		(2) Males		(3) Females		(4) Males	
	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI
Variance of age ²	0.365	0.078	0.619	0.089	0.360	0.079	0.633	0.091
Variance of constant	5.578	0.378	3.966	0.339	5.465	0.379	3.880	0.342

p < .001;

**
p < .01;

*
p < .05

Source: National Longitudinal Study of Adolescent Health (Female N person = 8901; Female N person-time = 29982 Male N person = 8396 Male N person-time = 27298

Notes: Age squared, racial categories, and parent smoking status are centered to their sample means. Age is centered at the minimum, such that 11 year old respondents are set to 0.

Table 3

Odds Ratios and 95% Confidence Intervals for Multilevel Logistic Regression Model of Current Smoking:
Time-Varying Variables

	(1) Females		(2) Males	
	OR	95% CI	OR	95% CI
Fixed Effects				
Constant	0.01 ***	0,0.01	0.01 ***	0,0.03
Age/10	28.36 ***	9.92,81.04	21.36 ***	7.24,63.05
Age/10 Squared	0.32 ***	0.21,0.50	0.42 ***	0.27,0.67
Race (White)				
Black	0.08 ***	0.06,0.09	0.23 ***	0.19,0.28
Hispanic	0.18 ***	0.14,0.22	0.36 ***	0.3,0.44
Asian	0.18 ***	0.13,0.25	0.37 ***	0.28,0.48
Native American	0.31 **	0.14,0.69	0.97	0.5,1.9
Other	0.33	0.09,1.13	0.47	0.1,2.19
Parent ever smoked	2.12 ***	1.81,2.48	1.58 ***	1.37,1.83
Parent Education (< hs)				
High school degree	0.25 *	0.08,0.81	0.22 *	0.06,0.78
Some college	0.17 ***	0.06,0.49	0.22 **	0.08,0.67
College degree	0.07 ***	0.02,0.26	0.26 *	0.07,0.95
Interactions				
Parent ed HS degree * age	7.03 **	2.08,23.83	6.26 **	1.71,22.85
Parent ed HS degree * age ²	0.48 *	0.27,0.85	0.45 **	0.25,0.82
Parent ed some coll * age	7.11 ***	2.39,21.18	5.85 **	1.89,18.16
Parent ed some coll * age ²	0.47 **	0.29,0.78	0.50 **	0.3,0.84
Parent ed coll deg * age	14.23 ***	3.9,51.94	3.44	0.9,13.17
Parent ed coll deg * age ²	0.28 ***	0.15,0.51	0.61	0.33,1.13
<u>Role Measures</u>				
In school	0.93	0.8,1.08	0.83 *	0.71,0.97
Occupation (None)				
Professional	0.77 *	0.62,0.95	0.48 ***	0.38,0.61
Not professional	1.23 **	1.08,1.4	1.21 **	1.06,1.37
Living with parents	1.05	0.91,1.22	1.13	0.98,1.32
Family (not married without kids)				
Married with kids	0.28 ***	0.22,0.36	0.65 **	0.49,0.86
Married without kids	0.34 ***	0.25,0.45	0.54 ***	0.4,0.74
Not married with kids	0.73 **	0.59,0.9	1.38 *	1.01,1.9
<u>Achieved SES</u>				

	(1) Females		(2) Males	
	OR	95% CI	OR	95%CI
Years of education	0.77 ***	0.73,0.8	0.83 ***	0.79,0.86
Personal earnings (No earnings-\$5000)				
Personal earnings \$5001-\$18223	1.28 ***	1.12,1.47	1.45 ***	1.27,1.66
Personal earnings \$18224+	1.00	0.83,1.21	1.01	0.84,1.21
Personal earnings missing	0.75	0.52,1.08	0.72	0.5,1.03
Own residence	0.61 ***	0.49,0.75	0.65 ***	0.52,0.82
Religiosity	0.71 ***	0.66,0.76	0.86 ***	0.8,0.92
Delinquency	23.29 ***	18.19,29.83	10.28 ***	8.54,12.37
Depression	1.80 ***	1.55,2.1	1.52 ***	1.3,1.77
Random Effects	Estimate	SE	Estimate	SE
Variance of age	4.804	0.386	4.874	0.439
Variance of age ²	0.256	0.074	0.577	0.875
Variance of constant	3.262	0.273	2.189	0.262

p < .001;

**
p < .01;

*
p < .05

Source: National Longitudinal Study of Adolescent Health (Female N person = 8774; Female N person-time = 29584; Male N person = 8233; Male N person-time = 26805).

Notes: Age squared, female, racial categories, parent smoking status, role measures, achieved SES and controls are centered to the sample means. Age is centered to the minimum, such that 11 year old respondents are set to 0.

Table 4
Odds Ratios and 95% Confidence Intervals for Multilevel Logistic Regression Models of Current Smoking: Age by Role Interactions

	Females			Males								
	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3						
OR	95%CI											
Fixed Effects												
Age/10	25.18 ***	8.3,76.5	24.86 ***	8.5,73.0	27.34 ***	8.9,84.0	28.98 ***	9.2,91.5	13.81 ***	4.6,42.0	19.98 ***	6.2,64.5
Age/10 Squared	0.34 ***	0.2,0.6	0.35 ***	0.2,0.5	0.31 ***	0.2,0.5	0.36 ***	0.2,0.6	0.52 **	0.3,0.8	0.44 **	0.3,0.7
Interactions												
Parent ed HS deg * age	7.08 **	2.1,24.0	7.37 **	2.2,25.0	6.85 **	2.0,23.4	6.25 **	1.7,22.8	6.35 **	1.7,23.2	6.45 **	1.7,23.7
Parent ed HS deg * age ²	0.48 *	0.3,0.8	0.47 **	0.3,0.8	0.49 *	0.3,0.9	0.45 **	0.3,0.8	0.45 **	0.3,0.8	0.45 **	0.2,0.8
Parent ed some coll * age	7.15 ***	2.40,21.3	7.53 ***	2.5,22.5	6.90 ***	2.3,20.7	5.81 **	1.9,18.0	5.79 **	1.9,18.0	5.77 **	1.9,18.0
Parent ed some coll * age ²	0.47 **	0.3,0.8	0.46 **	0.3,0.8	0.48 **	0.3,0.8	0.50 **	0.3,0.8	0.50 **	0.3,0.9	0.50 *	0.3,0.9
Parent ed coll deg * age	14.43 ***	4.0,52.7	15.25 ***	4.2,55.9	13.53 ***	3.7,50.0	3.39	0.9,13.0	3.20	0.8,12.3	3.43	0.9,13.3
Parent ed coll deg * age ²	0.28 ***	0.2,0.5	0.27 ***	0.2,0.5	0.29 ***	0.2,0.5	0.62	0.3,1.1	0.64	0.3,1.2	0.61	0.3,1.1
Role Measures												
In school	0.82	0.5,1.3	0.91	0.8,1.1	0.92	0.8,1.1	1.15	0.8,1.8	0.81 **	0.7,1.0	0.83 *	0.7,1.0
Occupation (None)												
Professional	0.77 *	0.6,1.0	0.68	0.3,1.4	0.77 *	0.6,1.0	0.48 ***	0.4,0.6	1.04	0.5,2.4	0.48 ***	0.4,0.6
Not professional	1.23 **	1.1,1.4	1.76 ***	1.4,2.2	1.23 **	1.1,1.4	1.20 **	1.1,1.4	1.99 ***	1.5,2.6	1.20 **	1.1,1.4
Living with parents	1.05	0.9,1.2	1.03	0.9,1.2	1.04	0.7,1.5	1.13	1.0,1.3	1.12	1.0,1.3	1.05	0.7,1.6
Family (not married without kids)												
Married with kids	0.28 ***	0.2,0.4	0.27 ***	0.2,0.4	0.57	0.3,1.3	0.65 **	0.5,0.9	0.67 **	0.5,0.9	1.83	0.6,5.4
Married without kids	0.34 ***	0.3,0.5	0.34 ***	0.3,0.5	0.33 *	0.1,0.9	0.54 ***	0.4,0.7	0.55 ***	0.4,0.7	0.52	0.2,1.8
Not married with kids	0.73 **	0.6,0.9	0.73 **	0.6,0.9	0.34 ***	0.2,0.6	1.37 *	1.0,1.9	1.39 *	1.0,1.9	0.23 *	0.1,0.7
Role * Age Interactions												
In school * age	1.13	0.8,1.6			0.73	0.5,1.1						
Occupation (None)												
Professional * age			0.97	0.6,1.6			0.46 *	0.3,0.9				

	Females		Males	
	Model 1	Model 2	Model 1	Model 2
OR	95%CI			
Not professional [*] age		0.63 ^{***}		0.52 ^{***}
Living with parents [*] age		1.02		0.4,0.7
Family (not married without kids)				
Married with kids [*] age		0.65		0.52
Married without kids [*] age		1.03		0.3,1.1
Not married with kids [*] age		1.91 ^{**}		1.03
				0.5,2.4
				3.59 ^{**}
				1.6,7.9

^{***} p < .001;
^{**} p < .01;
^{*} p < .05

Source: National Longitudinal Study of Adolescent Health (Female N person = 8774; Female N person-time = 29584; Male N person = 8233; Male N person-time = 26805)

Note: Controls for other variables in Table 3 included.