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Cigarette use among young adults: Comparisons between two-year college students, four-year college students, and those not in college

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Abstract

Objective—To examine cigarette smoking among young adults based on education status.

Participants—Community-based sample of 2,694 young adults in U.S.

Methods—We compared three groups—those not in college with no college degree; two-year college students/graduates; four-year college students/graduates—on various smoking measures: ever smoked, smoked in past month, smoked in past week, consider self a smoker, began smoking before age 15, smoked over 100 cigarettes in lifetime, ever tried to quit, and plan to quit in next year.

Results—We found that for nearly all our smoking measures the four-year college group was at lowest risk, the non-college group was at highest risk, and the two-year college group represented a midpoint. Differences between groups remain after adjusting for parents' education and other potential confounding factors.

Conclusions—Smoking behaviors clearly differ between the two-year, four-year, and no college groups. Interventions should be tailored for each group.

Keywords

smoking; tobacco; young adults; education level; college

In recent years, increasing attention has been paid to the high rates of cigarette smoking among young adults in the U.S.^{1,2} As of 2008, 36% of young adults (ages 18–25) reported smoking in the past month and 45% reported smoking in the past year, the highest rates for any age group.³ These rates are somewhat lower than they were in the 1990s, but are still alarming given that young adulthood is often a time of transition when lifestyle choices are made, and taking up smoking during this period is likely to lead to addiction.²

Many of the studies examining the prevalence of young adult smoking in the U.S. have focused on surveys of college students and include either four-year college students exclusively, or include a combination of two-year and four-year college students treated as one group. These studies, conducted primarily in the 1990s, found past month cigarette use among college students to be near 30%.^{4–7} A few more recent small studies have examined smoking rates specifically among two-year college students, finding rates of current smoking (smoke on 20 days in last 30) between 16–18%^{8,9} and rates of past-month smoking at 34%.¹⁰ In addition, three recent studies compared smoking rates of two-year and four-year college students and found that rates among two-year students were about twice that of four-year students;^{11,12} however, only one of these controlled for possible mediating factors¹³ including age, sex, ethnicity, relationship status and hours worked per week, finding two-year students with 1.7 higher odds than four-year students of being a past-month smoker.

Several studies have used community-based samples of young adults, rather than college samples, to examine how smoking rates of young adults vary by education level or current educational status.^{1,3,14–17} These most recent studies show a decreasing trend in rates of past-month smoking among college students (~16% as of 2007), and young adults not currently in college or without a college degree having higher smoking rates than their same-age peers who are attending college or have a college degree.^{1,3,15–17} Yet in all but one of these studies, two-year and four-year college attendance/degrees were not considered separately, which assumes this is a homogenous group with regard to smoking behaviors. The one study that did examine two-year and four-year students/graduates separately primarily focused on quitting behaviors, but descriptive statistics of smoking status showed that four-year students were least likely to be smokers, non-students were most likely, and the two-year group represented a midpoint.¹⁷

Given the limited community-based studies that have distinguished smoking behaviors among two-year and four-year college students/graduates and non-college attending young adults, in the present study we investigated how various smoking-related behaviors differ among young adults based on level/status of education. Using a community-based sample we compared young adults across three groups: (1) not enrolled in college and no college degree; (2) enrolled in a two-year college or obtained a two-year degree; and (3) enrolled in a four-year college or obtained a four-year degree. We also expanded on many previous studies by examining how various smoking behaviors, smoking history, and quitting behaviors/intentions differ among these three sub-groups of young adults, controlling for demographics and other factors. We hypothesized that there would be distinct differences in all smoking-related measures across young adults depending on educational status/attainment, with those not in college having the highest rates of smoking and four-year

college students having the lowest rates. We also hypothesized that differences in smoking behaviors between the three groups would be minimized after controlling for parent education levels as well as other potential confounders.

METHODS

Participants and Recruitment

Data for this study are from the Minnesota Adolescent Community Cohort (MACC) study that includes participants who at baseline resided in Minnesota and four other upper Midwestern states in the U.S. (chosen as comparison states based on their demographic and cultural similarities to Minnesota). Detailed description of the study design can be found elsewhere.¹⁸ A combination of probability and quota sampling methods was used to recruit participants (ages 12–16) using modified random digit dialing. Households were called to identify those with at least one teen between 12 and 16 years old—223,065 numbers were called to reach our sample size goals. There were 7,251 known eligible households and 4241 participants at baseline in 2000 (58.5% response rate).

In the recruitment process, standard consent procedures were followed for both parents and youth. Youth were also told the purpose of the survey (“to learn more about what kinds of things affect whether or not teenagers try or use tobacco”), that they would receive \$10 (increased to \$15 in later rounds) for each completed interview, and that they would not otherwise directly benefit from their participation. The University of Minnesota Institutional Review Board approved this study.

Data Collection

MACC participants have been interviewed via telephone in six-month intervals, from early adolescence into young adulthood (beginning in 2000–2001). Data for the present study were collected from Fall 2007 to Spring 2008 (survey round 15). Of the original 4,241 participants at baseline, 2,918 participated in round 15 (71.3% retention rate of the original cohort). For our analyses, we included only participants who were at least 18 years old and not in high school for a final sample of 2,694 (52% female; 89% White).

Comparisons at baseline between the 2,694 participants and the 1,708 non-respondents (who would be 18–24 years old, which is the age range of participants, as of round 15) showed that participants did not differ significantly ($p < .05$) from non-respondents by age or sex, but participants were more likely to be White (90% vs. 78%; $P < .001$), their parents were more likely to be college graduates (58% vs. 47%; $P < .001$), and they were less likely to have smoked in the past 30 days (7% vs. 13%; $P < .001$).

Measures

Our outcome variables included various cigarette smoking-related behaviors and attitudes. We measured three smoking behaviors: ever smoked a whole cigarette (yes/no); smoked in last seven days (yes/no), and smoked in past 30 days (yes/no). We measured two smoking history variables for those who reported ever smoking a whole cigarette: smoked at least 100 cigarettes in lifetime (yes/no; dichotomized from number of cigarettes smoked in lifetime

which had six response options—1–2, 3–10, 11–20, 21–40, 41–99, 100 or more); and smoked a whole cigarette for first time before age 15 (yes/no). For participants who smoked over ten cigarettes in their lifetime, we included “consider self a smoker” (yes/no). Lastly, for those who smoked in the past 30 days, we measured two variables related to quitting: ever tried to quit (yes/no) and plan to quit in next year (yes/no).

Our independent variables pertained to respondent’s educational level measured as: (1) not enrolled in college and no college degree; (2) enrolled in a two-year college or obtained a two-year degree; or (3) enrolled in a four-year college or obtained a four-year degree. We chose these groups primarily to categorize young adults according to work/school environments they experience or recently experienced (i.e., two-year campus, four-year campus, and no college campus or possibly a work setting). One variable included all three educational levels, and two additional variables contrasted just two levels of education—no college vs. two-year college, and two-year college vs. four-year college.

We used several control variables in the multivariate models including: age (categorical measure 18–23; the five participants who were age 24 were grouped with the age 23 participants), sex, parents’ education level as a proxy for socio-economic status (high-school diploma or less, some college, college or graduate degree), number of friends (among the four closest friends) who smoke (categorical: 0–3; collapsed 3 and 4), and whether at least one person in the household (other than self) smokes (yes/no).

Analyses

To first examine unadjusted relationships between the outcome variables and education level, we conducted bivariate analyses (Chi-square tests) between each outcome measure and each of the education-level variables. We also conducted bivariate analyses between each control variable and the education-level variables to examine differences across the three groups on these characteristics. Finally, we conducted multivariate (adjusted) analyses for each outcome variable and each education-level variable, adjusting for age, sex, parents’ education level, number of friends who smoke, and number in household who smoke. We conducted generalized linear regression analyses using SAS 9.1 (PROC GLIMMIX for multivariate models), with $p < .05$ as the significance level. We report the Least Square Means from the multivariate models.

RESULTS

Bivariate Results

In bivariate analyses between the education-level variables and each outcome variable all associations were significant with the exception of “want to quit in next year” (Table 1). Members of the no-college group had the highest smoking rates (46% smoked in past month), members in the four-year college group had the lowest rates (17% smoked in past month) and the two-year college group represented a midpoint (29% smoked in past month). Similar patterns across the three groups were found for smoking history, considering self a smoker, and ever tried to quit (Table 1).

Bivariate results for associations between control variables and education-level showed no differences between both gender and age and the two-year vs. four-year college variable, and no clear patterns were seen in age across the three education groups; however, the non-college group had a higher proportion of males than the other two groups (Table 1). All other relationships between control variables and the three education-level variables were significant. Members of the four-year college group were *most* likely to have parents with a college degree (69%) and have no friends who smoke (50%), and were *least* likely to live with a smoker (14%); in contrast, the no-college group was *least* likely to have parents with some college or a college degree (41%) and have no friends who smoke (22%), and most likely to live with a smoker (35%); again, the two-year group represented a midpoint between these two groups in terms of these control variables (Table 1).

Multivariate Results

In multivariate models where we controlled for age, gender, parents' education level, number of friends who smoke, and number in household who smoke, many associations remained significant between level of education and smoking behaviors (Figure 1). As in the unadjusted analyses, there were significant associations between the education variable that included all three education groups and all outcome variables except for "want to quit in next year". In models comparing the no-college and two-year college groups, members of the no-college group were more likely to have ever smoked a whole cigarette (74% vs. 65%), smoked in past seven days (32% vs. 22%), smoked in the past 30 days (39% vs. 28%), smoked at least 100 cigarettes in lifetime (61% vs. 50%), and to consider themselves smokers (43% vs. 33%). Similarly, in models comparing the two-year and four-year college groups, members of the two-year college group were more likely to have ever smoked a whole cigarette (65% vs. 59%), smoked in past seven days (22% vs. 16%), to have begun smoking before the age of 15 (47% vs. 35%), smoked at least 100 cigarettes in lifetime (50% vs. 37%), and to consider themselves smokers (32% vs. 19%).

COMMENT

As other studies of the young adult population have found, our results show greater intensity of smoking behavior among young adults not in college and without a college degree compared to those currently in college.^{1,15} However, unlike most previous studies, we examined two-year college students separately from four-year college students and found consistent differences in smoking behaviors between the two college groups. Similar to Solberg and colleagues,¹⁷ we found that the two-year college group holds the middle ground between the non-college young adults and the four-year college group in smoking prevalence.

Another unique aspect of our study is that we examined differences in smoking behaviors among the three sub-groups of young adults controlling for a number of factors commonly associated with smoking, particularly parents' education level (a proxy for socioeconomic status). We found that many of the differences between the three groups of young adults remained strong in the adjusted models. We hypothesized that the relationship between education level and smoking behaviors would be minimized after controlling for parents' education, based on the rationale that socioeconomic status would be the primary underlying

factor affecting the smoking behaviors among young adults with different post-secondary experiences. Our results show that a young adult's education level is a strong indicator of several smoking behaviors regardless of parent educational level. In other words, the educational experience of young adults appears to be associated with smoking behaviors regardless of the SES group in which they were raised (as measured by parent education level).

We also expanded on many previous studies by including measures beyond annual and monthly smoking rates, such as age of first cigarette and quitting attempts/intentions. We found a similar pattern among most of these smoking-related measures across the three groups, with the two-year college group representing a midpoint between the two other groups for age of first cigarette, smoking over 100 cigarettes, considering themselves smokers, and ever trying to quit. The only exception to this pattern was the "wanting to quit smoking in next year" variable—all three groups were equally and overwhelmingly likely to want to quit. The four-year group, however, is the least likely to have ever tried to quit, perhaps reflecting a perception that they are less susceptible to addiction.

To date, most efforts to reduce and prevent smoking among young adults have focused on college campuses, particularly at four-year colleges.^{2,19} Colleges can set policy and change the environment for smoking, as witnessed by the move to smoke-free buildings and in some cases smoke-free campuses. Non-college young adults, in contrast, are scattered among a wide variety of workplaces, or perhaps none at all, making them harder to reach with programmatic efforts. Media and program strategies need to be tailored to all three of the education groups identified in this study, with particular emphasis on the harder to reach young adults who are not in college, as well as two-year college students/graduates given that their smoking rates are also higher than those in the four-year college group.

Limitations

Several limitations of this study should be noted. First, the cross-sectional design prevented us from determining how educational attainment/status affects smoking behaviors over time, or determining any causal mechanisms between education levels and smoking. We do plan to conduct longitudinal analyses to address this limitation, utilizing both previous and future rounds of MACC data. Second, our data are from self-reported surveys and hence prone to under-reporting of smoking behaviors if participants were affected by social desirability. Third, our participants primarily resided in the Upper Midwestern U.S. and were primarily White, limiting generalizability to other geographic regions and to areas with more ethnic/racial diversity. Finally, our analyses comparing non-respondents to participants showed that respondents were more likely to have parents who were college graduates and were less likely to be past-month smokers, which may bias our results.

Conclusions

Our study provides one of the first examinations of the differential role of college attendance, considering two-year and four-year college students separately, on smoking behaviors among a community-based sample of young adults. These results support the limited literature on differences in smoking pattern by college attendance, suggesting that

young adults who do not attend college have the highest rates of smoking, four-year students/graduates have the lowest rates, and two-year students have smoking rates that fall between these two groups. Most importantly, these differences remain after controlling for parental educational status. Our results suggest that post-secondary education may be a protective factor for smoking among young adults, with four-year college education having the greatest protective effect. A possible underlying mechanism for this protective effect may be exposure to smoking prevention and policies on college campuses, with possible stronger policies/programs on four- year vs. two-year campuses. As young adults engage in smoking behaviors regardless of being in a college or community setting, these findings underscore the importance of college and community tobacco control policies and programs to address this population.

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Figure 1. Multivariate (adjusted) Models: Outcomes by Level of Education^a

Note: Models adjusted for age, sex, parents' education level, no. of 4 closest friends who smoke and no. in household who smoke.

* = significant association ($p < .05$); associations between outcome variables and three-level education variable were all significant except for "Want to quit in next year".

^aNo college = not currently in college and no college degree

2-yr college = currently in tech or community college OR tech/community degree

4-yr college = currently in 4-yr college OR 4-yr college degree

Table 1

Bivariate Results: Level of Education by Outcome and Control variables (n=2694)

		Level of Education ^a		
		No college n=708	2-yr college n=519	4-yr college n=1467
		Column Percents		
Outcome Variables	Ever smoked a whole cigarette ^{b c d}	73% (519)	59% (304)	45% (656)
	Smoked cigarette in past 7 days ^{b c d}	41% (287)	24% (122)	12% (171)
	Smoked cigarette in past 30 days ^{b c d}	46% (322)	29% (149)	17% (253)
	<i>If ever smoked a whole cigarette:</i>			
	Smoked first cigarette before age 15 ^{b c d}	55% (280)	47% (140)	28% (184)
	Smoked 100+ cigarettes in lifetime ^{b c d}	69% (332)	53% (151)	33% (206)
	<i>If smoked >10 cigarettes in lifetime:</i>			
	Consider self a smoker ^{b c d}	55% (237)	40% (91)	21% (85)
	<i>If smoked in past 30 days:</i>			
	Ever tried to quit ^{b c d}	72% (226)	61% (89)	50% (121)
	Want to quit in next year	88% (261)	85% (114)	85% (198)
Control Variables	Age ^{b d}			
	18	8% (54)	10% (53)	8% (112)
	19	16% (113)	22% (115)	19% (281)
	20	21% (150)	17% (86)	19% (277)
	21	20% (139)	16% (81)	19% (274)
	22	17% (119)	19% (96)	19% (282)
	23–24	19% (133)	17% (88)	16% (241)
	Sex (male) ^{b d}	56% (397)	47% (246)	44% (651)
	Parents' Education ^{b c d}			
	High school or less	32% (201)	23% (114)	11% (152)
	Some college	27% (166)	29% (139)	20% (282)
	College or graduate degree	41% (257)	48% (234)	69% (975)
	No. of 4 closest friends who smoke ^{b c d}			
	0	22% (156)	31% (161)	50% (731)
	1	20% (139)	25% (129)	26% (385)
	2	23% (164)	23% (121)	16% (235)
	3–4	35% (247)	21% (107)	8% (115)
	At least one person in household smokes ^{b c d}	35% (251)	27% (140)	14% (199)

^aNo college= not currently in college and no college degree

2-yr college = currently in tech or community college OR tech/community degree

4-yr college = currently in 4-yr college OR 4-yr college degree

^b association with 'no college vs. 2-yr college' variable is significant ($p < .05$)

^c association with '2-yr vs. 4-yr college' variable is significant ($p < .05$)

^d association with 'no college vs. 2-yr vs. 4-yr college' variable is significant ($p < .05$)