

Smoking and Cessation Behaviors Among Young Adults of Various Educational Backgrounds

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Although overall smoking rates in the United States have decreased slowly over the past 10 years, these decreases have not been observed among young adults (i.e., individuals aged 18 to 24 years). According to the National Health Interview Survey, smoking prevalence rates among young adults have remained high and relatively stable. For instance, smoking rates in this group were 24.5% in 1990 and 23.6% in 2004; in 2004, more than 38% of men with a high school education or less smoked.¹

Data from the Monitoring the Future Project, an ongoing study of the behaviors, attitudes, and values of American students, show even higher rates in this age group, rising from about 28% in 1990 to about 33% in 2001.² In comparison, the overall adult smoking rate in 2004 was 20.9%.¹ Moreover, according to Hammond, smoking trends among young adults “may not be nearly as fixed or stable . . . as is generally assumed,”^{3(p181)} with recent data showing that up to one fifth of smokers begin smoking after the age of 18 years.

Despite the obvious need for knowledge that would help in addressing this problem, relatively few high-quality studies have compared smoking cessation attitudes and behaviors among young adults with those among adolescents and older adults, and most existing studies have focused on college students.^{4–6} Moreover, although it has been shown that educational level is a strong predictor of smoking and quitting among the adult population as a whole, the few population-based studies of young adult smokers have not reported comparison data among individuals with different educational backgrounds.^{7–12}

Our primary goal was to determine whether there are differences in smoking cessation attitudes and behaviors among young adult smokers at various educational levels. In addition, we assessed the types of cessation assistance used by individuals in this age

Objectives. We sought to determine whether the educational backgrounds of young adult smokers (aged 18 to 24 years) affect their cessation attitudes or behaviors in ways that could be used to improve smoking interventions.

Methods. We surveyed 5580 members of the HealthPartners health plan and conducted a follow-up survey 12 months later of current and former smokers. Respondents were divided into subgroups according to educational level.

Results. Higher levels of education were associated with lower smoking rates (16% among students in 4-year colleges, 31% among those in technical or 2-year colleges, and 48% among those with a high school education or less) as well as less frequent or heavy smoking. However, number of quit attempts in the past year, level of interest in quitting, and smoking relapse rates did not vary according to educational level. Seventy-three percent of those who had attempted to quit had not used some form of assistance.

Conclusions. Rates of smoking among young adults, especially those at low educational levels, are relatively high. However, most members of this age group are interested in quitting, regardless of educational background. (*Am J Public Health*. 2007;97:1421–1426. doi:10.2105/AJPH.2006.098491)

group and which of these forms of assistance predict quit attempts and successful smoking cessation. Such knowledge could help public health policymakers, health insurance companies, and medical care systems develop more effective targeted interventions for this high-risk age group.

METHODS

Study Setting and Sample

Our baseline and follow-up samples were derived from enrollees in HealthPartners, a large managed care organization that provides coverage to about 650 000 members who reside primarily in the metropolitan area of Minneapolis and St Paul. Approximately 30% of enrollees receive care from a plan-owned multispecialty medical group, and the remaining 70% receive care from a large network of contracted clinics. Although most of these members have commercial insurance coverage through their workplace, 3% receive some form of government medical assistance.

All 40 000 HealthPartners enrollees who were aged 18 to 24 years were eligible for the baseline survey. A random sample of

5580 enrollees in this age range were selected as the baseline study sample. The sample for our follow-up survey, conducted 12 months later, consisted of the 1352 respondents who had indicated on the baseline survey that they were current smokers, former smokers, or infrequent smokers.

Survey Content

Baseline and follow-up survey items were adapted from a recently tested smoking survey of health plan members¹³ and from Minnesota¹⁴ and national surveillance system surveys.¹⁵ The primary purposes of the baseline survey were to identify smokers and to collect baseline information related to interest in quitting, nicotine dependence, and other characteristics. The survey also gathered information on current health status and demographic characteristics. (In an effort to increase the response rate, we limited the survey to 15 questions on 2 pages. The survey was pre-tested with 16 young adults and revised.)

Respondents were classified into the following smoking status groups: current smokers (had smoked 100 cigarettes in their lifetime and smoked every day or some days),

infrequent smokers (had smoked at least 1 cigarette in the past month but had not smoked 100 cigarettes in their lifetime), former smokers (had smoked 100 cigarettes in their lifetime but none in the past month), and never smokers (had not smoked in the past month and had not smoked 100 cigarettes in their lifetime). We asked those classified as current smokers about previous quit attempts, interest in quitting, and nicotine dependence.

The 16-item follow-up survey assessed smoking status changes in the 12 months since the baseline survey along with attitudes toward and use of various types of quit assistance. (This survey was also pretested; copies of both surveys are available from the authors.) We used HealthPartners administrative records to gather data on respondents' age, gender, address, and health insurance type and to determine whether they were primary policyholders.

Data Collection Procedures

The initial survey was mailed in late summer 2004 so that it would reach college students in our enrollee population at their home address. This mailing included an introductory letter with a \$2 cash incentive and passive consent information specifying that return of the survey would constitute willingness to participate in the study. Following a modified version of the Dillman method,¹⁶ we sent nonresponders postcard reminders 1 week later and a second survey 2 weeks after that. Beginning 5 weeks after the initial survey mailing, continuing nonresponders were called up to 6 times in an attempt to have them complete the survey over the telephone. The follow-up survey was sent in late summer 2005 with the same incentive and follow-up procedure.

Analysis

We wished to avoid arbitrary division of respondents according to educational status, so that subgroup comparisons would not combine respondents with quite different attitudes and behaviors. Thus, we initially compared the demographic, health, and smoking characteristics of 6 respondent subgroups with various baseline educational backgrounds. These subgroups consisted of those who reported that they (1) had a high school education or less and were not

currently enrolled in any school, (2) had completed at least some post-high school technical education but were not currently enrolled in any school, (3) were enrolled in a 2-year college, (4) were enrolled in a 4-year college or university, (5) had a college degree and were not currently enrolled in any school, or (6) were enrolled in graduate school.

Once we reviewed the demographic and smoking characteristics of these 6 groups, we decided that, in further analyses, it would be best to combine the 2 groups with at least some post-high school education (groups 2 and 3; "2-year college" group) and the 2 groups with at least some 4-year college experience (groups 4 and 5; "4-year college" group). Thus, the remaining analyses focused on comparisons among these combined groups and those with a high school education or less; graduate school students were dropped from further analyses because there were too few to serve as a fourth comparison group. Also, we omitted infrequent smokers from the analysis of smokers because of the small sample size and because of evidence of confusion among these respondents in their answers to some of the questions (e.g., about whether they were smokers or not and whether they had smoked in the relevant study period).

We used contingency tables and the Pearson χ^2 statistic to assess associations between educational level and baseline characteristics (demographic, health, and smoking-related items), as well as follow-up survey items such as recent smoking cessation, smoking frequency, smoking relapse, and use of cessation assistance. We assessed associations between respondent characteristics and baseline smoking status (regular smoker vs never or former smoker) with contingency tables stratified according to education group.

We conducted logistic regression analyses designed to predict smoking cessation and quit attempts during the 12-month follow-up period. The full multivariate logistic regression model for both dependent variables began with a set of a priori covariates: gender, race (White vs other), age (18–20 years vs 21–24 years), employment status, and education group (high school or less, 2-year college, 4-year college).

Baseline variables considered as potential predictors were entered in a block manner;

these variables included daily smoking (yes vs no), number of cigarettes smoked per day (0–10 vs 11 or more), smoking within 5 minutes of waking (yes vs no), plans to quit in the next 6 months (yes vs no), history of depression diagnosis (yes vs no), and self-reported general health (very good or excellent vs other). The equation for cessation also included a term for quit attempts in the 12 months before the baseline survey (yes vs no).

A restricted multivariate model consisted of all a priori covariates along with other items from the full model showing empirical promise ($P < .10$). Odds ratios (ORs) were calculated from the restricted model and thus, in each case, included adjustment for the a priori covariates.

RESULTS

A total of 3756 enrollees responded to the baseline survey (3216 by mail and 540 by telephone). After removal of 127 respondents whose survey data were not usable and 15 who did not complete the survey as a result of language barriers, the adjusted response rate was 69.1%. Approximately 57% of the respondents were women, 15.8% were non-White, 84% were employed at least part time, 10% received some form of government medical assistance, and 80% resided in the greater Minneapolis–St Paul metropolitan area. Women responded at a higher rate than men (72.2% vs 65.4%; $P < .001$).

Respondents were distributed into smoking status groups as follows: 24.5% were current smokers, 3.7% were infrequent smokers, 8.0% were former smokers, and 63.8% were never smokers. Of the young adults who responded to the baseline survey and were sent follow-up surveys because they identified themselves as current or former smokers, 809 returned completed surveys (an adjusted response rate of 62.6%).

Table 1 presents a comparison of the 3 primary education subgroups according to baseline demographic and health characteristics and smoking status. Respondents in the 4-year college group were much less likely than those in the other groups to be current smokers. In addition, in the case of all significant variables, rates for respondents in the 2-year college group fell between

TABLE 1—Sample Baseline Characteristics, by Educational Background: Minnesota HealthPartners Enrollees, 2004–2005

| | Education Group, % | | |
|---|-------------------------------|---------------------------------------|--|
| | High School or Less (n = 510) | 2-Year College ^a (n = 915) | 4-Year College ^b (n = 2042) |
| Women** | 46.9 | 53.1 | 60.0 |
| Age, y | | | |
| 18–19 | 33.5 | 37.3 | 37.0 |
| 20–21 | 29.8 | 31.4 | 32.5 |
| 22–24 | 36.7 | 31.4 | 30.5 |
| Non-White** | 24.5 | 17.4 | 12.9 |
| Employed full time** | 60.0 | 48.3 | 40.2 |
| Main policyholder** | 63.3 | 35.2 | 17.5 |
| Health-related variables | | | |
| Self-reported overall health very good or excellent** | 53.0 | 67.7 | 78.6 |
| Had a history of depression diagnosis** | 26.1 | 20.5 | 15.6 |
| Smoking status ^{c**} | | | |
| Current smoker | 47.5 | 30.6 | 16.4 |
| Infrequent smoker | 2.4 | 3.0 | 4.3 |
| Never smoker | 39.6 | 57.3 | 72.3 |
| Former smoker | 10.6 | 9.2 | 7.1 |

^aThe 2-year college group included those respondents who had completed at least some post-high school technical education but were not currently enrolled in any school and those that were enrolled in a 2-year college.

^bThe 4-year college group included those respondents who had been enrolled in a 4-year college or university and those who had a college degree and were not currently enrolled in any school.

^cCurrent smokers were those respondents who had smoked 100 cigarettes in their lifetime and smoked every day or some days; infrequent smokers had smoked at least 1 cigarette in the past month but had not smoked 100 cigarettes in their lifetime; never smokers had not smoked in the past month and had not smoked 100 cigarettes in their lifetime; and former smokers had smoked 100 cigarettes in their lifetime but none in the past month.

* $P < .05$; ** $P < .001$ (Pearson χ^2 comparisons across columns).

those for respondents in the 4-year college group and respondents with a high school education or less.

The demographic and health characteristics of the respondents who reported smoking at baseline were similar to those of the overall sample (Table 2). However, whereas they were no more likely to be interested in quitting than those with a high school education or less, respondents in the 2-year college group were lighter smokers and less addicted. Virtually all smokers in all 3 education groups had close friends who smoked.

We found associations across the 3 education groups when we compared current smokers with never smokers and former smokers. For example, regular smokers were more likely than never smokers and former smokers to be aged 21 to 24 years (vs aged 18 to 20 years; OR=1.56; 95% CI=1.33,

1.84), White (OR=1.32; 95% CI=1.05, 1.65), employed full time (OR=1.50; 95% CI=1.27, 1.76); to be main policyholders instead of dependents (OR=1.56; 95% CI=1.31, 1.86); and to have ever been diagnosed as having depression (OR=2.49; 95% CI=2.05, 3.02). In contrast, they were much less likely to report that their general health was very good or excellent (OR=0.34; 95% CI=0.29, 0.40).

Table 3 shows that, at the 12-month follow-up, smokers in the 2-year and 4-year college groups were slightly more likely than those with a high school education or less to have quit, and respondents in these 2 groups who were daily smokers were more likely to have reduced their frequency of smoking. Approximately 20% of former smokers and 25% of recent quitters (data not shown) at baseline had relapsed 12

months later, with no differences according to educational level.

Bivariate analyses showed that few of the characteristics assessed were associated with quitting at follow-up. Recent cessation increased as educational level increased; cessation rates were 12.7% among those with a high school education or less, 15.3% in the 2-year college group, and 21.9% in the 4-year college group (χ^2_1 trend=4.83, $P=.03$). Also, the cessation rate was higher among those who smoked only on some days than among those who smoked daily (28.4% vs 10.4%; $\chi^2_1=25.76$, $P<.001$). Finally, the cessation rate was higher among those who smoked less than half a pack per day than among those who smoked half a pack a day or more (19.9% vs 9.0%; $\chi^2_1=8.5$, $P=.004$).

However, the full multivariate logistic regression analysis indicated that only daily smoking predicted recent cessation; the bivariate association with educational level disappeared. A reduced multivariate model that retained only the daily smoking variable and a priori covariates (gender, race, age, employment status, and education group) showed that daily smoking predicted reduced smoking cessation rates (adjusted OR=0.31; 95% CI=0.18, 0.52).

In both bivariate and multivariate analyses, only showing interest in quitting at baseline was related to attempting to quit during the follow-up period. In the reduced multivariate model, those who reported that they were seriously considering quitting within the upcoming 6 months were more likely to report 1 or more quit attempts than those who either were not considering quitting or never expected to quit (adjusted OR=1.99; 95% CI=1.32, 2.98).

When the 290 smokers who reported having quit or attempting to quit in the past year were asked about the types of cessation approaches and assistance they had used, 73% indicated that they had not used any form of assistance and rather had quit “cold turkey,” or by reducing their use of cigarettes gradually. Of those reporting use of assistance, 22% had used nicotine replacement products, 8.5% had used bupropion, and 9.4% had sought support from a friend or family member. Only a total of 12% had used self-help books, attended classes or groups, or sought

TABLE 2—Characteristics of Smokers at Baseline, by Educational Background: Minnesota HealthPartners Enrollees, 2004–2005

| Health-related variables | Education Group, % | | |
|--|-------------------------------|---------------------------------------|---------------------------------------|
| | High School or Less (n = 242) | 2-Year College ^a (n = 280) | 4-Year College ^b (n = 334) |
| Self-reported overall health very good or excellent** | 37.2 | 56.6 | 57.7 |
| Had a history of depression diagnosis | 35.0 | 31.2 | 28.3 |
| Smoking-related variables | | | |
| Smokes every day** | 76.9 | 64.3 | 47.0 |
| No. of cigarettes smoked per day** | | | |
| 0–10 | 58.4 | 66.9 | 81.7 |
| 11–20 | 28.2 | 28.4 | 15.6 |
| ≥20 | 13.5 | 4.7 | 2.7 |
| Smokes within 5 min of waking** | 11.6 | 6.1 | 3.6 |
| 1 or more close friends smoke | 99.2 | 99.3 | 99.1 |
| 1 or more quit attempts in past year | 56.5 | 62.6 | 55.8 |
| Seriously considering quitting in next 6 mo ^c | 66.8 | 60.4 | 58.9 |

^aThe 2-year college group included those respondents who had completed at least some post-high school technical education but were not currently enrolled in any school and those that were enrolled in a 2-year college.

^bThe 4-year college group included those respondents who had been enrolled in a 4-year college or university and those who had a college degree and were not currently enrolled in any school.

^cAfter removal from analyses of those who had already quit.

** $P < .001$ (Pearson χ^2 comparisons across columns).

counseling on the Internet, in person, or by telephone. There were no differences according to education group in regard to use of any of these quit aids.

As can be seen in Table 4, reports of assistance from a physician were quite frequent among smokers at follow-up; however, such assistance was mostly limited to advice and assessment, with almost no follow-up. The only type of assistance for which there was a difference according to educational level involved advice to quit; 71% of respondents in the 4-year college group reported being advised to quit, as compared with 61% of those in the 2-year college group and 56% of those with a high school education or less ($P < .05$). Only 13% of respondents reported being offered cessation medications, and fewer than half of these individuals were actually given a prescription. Bivariate analyses showed that none of the types of assistance reported were associated with higher rates of successful smoking cessation. In all cases, reports of assistance received from dentists were much less frequent than reports of assistance from physicians.

Finally, when the 450 respondents who reported smoking at follow-up were asked to indicate factors that helped or hindered them in their attempts to quit, 71% and 46%, respectively, cited concerns about future health and concerns about current health as very important to their decision; there were no differences according to educational level (data not shown). The main differentiating motivator was the cost associated with smoking, with 59% of respondents with a high school education or less, 42% in the 2-year college group, and 36% in the 4-year college group citing cost as a very important factor (overall rate = 44.4%; $P < .001$). Also, those with a high school education or less were more likely to have concerns about exposing others to smoke (36% vs approximately 22% in the 2-year college group and in the 4-year college group; $P < .05$).

DISCUSSION

This study is important because it provides, for the first time, data derived from direct

comparisons of smoking cessation attitudes and behaviors between college students (who have been the subject of nearly all smoking studies focusing on young adults) and individuals with different educational backgrounds. We found some noteworthy differences among education subgroups of young adults in regard to sociodemographic characteristics, health status, and smoking variables. For example, smoking rates were dramatically higher among individuals with a high school education or less than among those in our 2-year college group and 4-year college group. Also, respondents with a high school education or less were more likely than respondents in the 2-year college group to smoke daily, to smoke more cigarettes per day, and to smoke within 5 minutes of waking, and the same differences were observed in comparisons between the 2-year and 4-year college groups.

More important for developing cessation interventions, however, are the similarities among these groups in smoking cessation attitudes and behaviors. Despite large differences in smoking rates, 60% of the respondents in each education subgroup had attempted to quit in the past year, and similar percentages were seriously considering quitting in the upcoming 6 months. Furthermore, when daily smoking frequency was controlled, there were no between-group differences in likelihood of quitting over the 12-month follow-up period. With the exception of a greater likelihood among those who smoked less or smoked less frequently, there were few predictors of likelihood of quitting during the upcoming year.

Finally, respondents in all of the subgroups reported little use of cessation aids and relatively infrequent cessation assistance from physicians or dentists beyond advice to quit and assessments of interest in doing so. Overall, rates of assistance received from physicians were comparable to those we observed in a cross-sectional study of adult smokers in a similar Minnesota health plan population several years earlier.¹⁷ However, frequencies of various specific forms of assistance were substantially higher in that population than among this study's participants, perhaps reflecting their much lower levels of interest in cessation assistance.

We found 8 studies in the literature reporting on 48 different potential predictors of

TABLE 3—Changes in Smoking Status From Baseline to 1-Year Follow-Up, by Educational Background: Minnesota HealthPartners Enrollees, 2004–2005

| | Education Group | | |
|---|---------------------|-----------------------------|-----------------------------|
| | High School or Less | 2-Year College ^a | 4-Year College ^b |
| Status at follow-up of baseline current smokers, ^{c,*} % | | | |
| Total | 127 | 164 | 195 |
| Current smoker ^d | 86.6 | 84.2 | 76.9 |
| Former smoker ^d | 13.4 | 15.9 | 23.1 |
| Status at follow-up of baseline current daily smokers, ^e % | | | |
| Total | 102 | 100 | 89 |
| Daily smoker | 83.3 | 74.0 | 61.8 |
| Smokes some days | 7.8 | 16.0 | 22.5 |
| Former smoker ^d | 8.8 | 10.0 | 15.7 |
| Status at follow-up of baseline former smokers, ^e % | | | |
| Total | 31 | 52 | 91 |
| Current smoker ^d | 16.1 | 21.2 | 19.8 |
| Former smoker ^d | 83.9 | 78.9 | 80.2 |

^aThe 2-year college group included those respondents who had completed at least some post-high school technical education but were not currently enrolled in any school and those that were enrolled in a 2-year college.

^bThe 4-year college group included those respondents who had been enrolled in a 4-year college or university and those who had a college degree and were not currently enrolled in any school.

^cAfter removal from analyses of respondents who reported that they were nonsmokers or infrequent smokers at follow-up.

^dCurrent smokers were those respondents who had smoked 100 cigarettes in their lifetime and smoked every day or some days; former smokers had smoked 100 cigarettes in their lifetime but none in the past month.

^eNonsmokers at follow-up were pooled with former smokers.

* $P < .05$ (Pearson χ^2 comparisons across columns).

TABLE 4—Types of Cessation Assistance Smokers Received From Physicians or Dentists: Minnesota HealthPartners Enrollees, 2004–2005

| | Assistance From Physician, % | Assistance From Dentist, % |
|---|------------------------------|----------------------------|
| Asked about smoking status | 63.8 | 33.8 |
| Advised to quit | 48.2 | 22.9 |
| Interest in quitting assessed | 32.4 | 10.4 |
| Assisted in quitting | | |
| Asked about willingness to set quit date | 5.8 | 2.7 |
| Given self-help quitting material | 13.3 | 2.4 |
| Offered information on cessation classes/counseling | 8.2 | 1.7 |
| Referred for quit assistance | 2.4 | 1.1 |
| Recommended for cessation medication prescription | 13.1 | 2.2 |
| Given prescription for cessation medications | 5.8 | 0.7 |
| Follow-up visit or telephone call arranged | 2.2 | 0.7 |

Note. These analyses were restricted to the 450 respondents who reported smoking at follow-up.

cessation in a wide variety of young adult populations.^{7,8,10,18–22} Only 2 variables were significantly associated with smoking cessation in at least 2 of these studies: higher

educational levels and smaller percentages of friends who smoke. Our study clarifies these findings. In addition, 3 studies have reported on the use of various forms of cessation

assistance by college smokers.^{23–25} All of these studies showed a primary reliance on quitting “cold turkey” or cutting down, with little use of or interest in specific forms of assistance. Sixty-five percent of former smokers in the DeBernardo et al. study had quit abruptly on their own, and none had used any type of cessation aid.²³ Although our respondents reported somewhat more use of various cessation aids, we found that these previous findings are as applicable to individuals at lower educational levels as they are to college students.

Limitations

This study has few limitations other than the somewhat low percentages of non-White, rural, and low-income respondents in our sample, which was a reflection of the demographics of the metropolitan area served by HealthPartners. However, this could be an important limitation given that some studies have suggested differences according to race/ethnicity in smoking behaviors and cessation support received from physicians.^{26,27} Also, although the 63% response rate for our follow-up survey was not optimal, it was relatively good considering the transient age group under study, one that is generally not overly responsive to surveys. Finally, although our sample was limited to the members of a single health plan, this plan includes many patients receiving prepaid medical assistance, and the demographic characteristics of its membership are similar to those of the state as a whole in most ways.

Conclusions

Because of the high and increasing rate of smoking among young adults, it is important to gain an increased understanding of the intervention approaches needed for individuals in this age group at different educational levels. In particular, according to Lantz, there is a need for more information about the socio-demographic factors, behaviors, and attitudes that should be considered in developing tobacco control policies and programs.⁶

Our findings suggest that, in policies, programs, and research studies, it should be assumed that young adult smokers will have a high level of interest in quitting, regardless of their educational background. Our results also

suggest that the only individual factor of much predictive value in terms of cessation is smoking frequency. The health concerns reported by our participants as important motivators for quitting indicate that much more attention should be focused on health care–related interventions and settings. Because young adults appear to have limited interest in formal cessation aids of any kind, we especially need to assess informal assistance and follow-up options.

Overall, our findings could be interpreted as showing that young adult smokers of all educational backgrounds should be viewed as similar to smokers in other age groups. Certainly, we should stop thinking of these individuals, especially those who lack a college education, as resistant to quitting. Innovative efforts to support the already common interest in quitting among many members of this age group are warranted if we want to avoid adding new legions of older smokers. ■

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Contributors

L. I. Solberg led the project and wrote the article. S. E. Asche conducted all analyses and helped revise the article. R. Boyle, M. C. McCarty, and M. J. Thoele helped plan analyses and revise the article.

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Human Participant Protection

This study was approved by the HealthPartners institutional review board.

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