

Smoking Prevalence and Awareness Among Undergraduate and Health Care Students

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Approximately 10,000 undergraduates from 12 Texas colleges and universities and 350 health care students completed a Web-based survey assessing the prevalence and awareness of cigarette smoking. There were few differences between health care and undergraduate students on trying smoking or quitting smoking. Health care students reported lower rates of current smoking than undergraduate students, even though both groups demonstrated similar knowledge of tobacco-related health risks. Gender differences are discussed. Findings suggest that tobacco awareness programs should continue to target young adults as an at-risk population, and that health care training programs should place a greater emphasis on tobacco cessation. (Am J Addict 2008;17:181–186)

Cigarette smoking is the leading cause of preventable death in the United States. Nearly a quarter of the population smokes, and approximately 438,000 deaths per year are related to smoking-related illnesses.¹ Despite public health efforts to reduce tobacco use, prevalence rates have not changed significantly and, in some cases, have increased.² In addition to health problems, smoking also has a significant fiscal impact, with tobacco-related medical expenses estimated at \$75.5 billion annually.¹ These harsh personal and economic costs have prompted a significant amount of research focused on gaining a better understanding of the addictive nature of cigarette smoking. The hope is that new information may help health care professionals to improve smoking prevention and cessation programs.

Primary care clinicians (eg, physicians and nurses) are on the front lines of smoking prevention and cessation efforts, given the large number of cigarette smokers who visit primary care clinics each year. It is therefore essential that primary

care providers be prepared to offer some type of intervention to their patients who report smoking behavior. In light of the specific training of primary health care professionals, it seems logical to assume that this group would be more aware of the deleterious health consequences associated with smoking, and therefore smoke at lower rates compared to other groups. Interestingly, this line of reasoning does not hold true uniformly and appears to vary by country. For example, in comparison to the respective general population, smoking rates are lower among health care professionals in the United States,³ Great Britain,^{3,4} and Brazil,⁵ but higher in Hungary,⁶ Italy,^{7,8} Japan,⁹ Saudi Arabia,¹⁰ and Spain.¹¹

Regardless of the particular rate of smoking by region, it is clear from research that it is desirable for all health care professionals to be non-smokers. Specifically, it has been shown that patients are less likely to take advice to quit smoking from health care professionals who smoke, and more likely to take advice from health care professionals who do not smoke.^{12,13} Compounding this problem is the fact that health care professionals who smoke are less likely to advise their patients to quit smoking.^{3,5,14} As such, the World Health Organization has advocated that physicians should not smoke and that researchers must investigate smoking in this specific population.¹⁵ While providing medical professionals with smoking cessation treatment can help with this problem, it may be better to target such cessation efforts earlier in their professional careers. To our knowledge, there has been little research on the smoking behaviors of health care students. Gaining such insight is a logical first step in dealing with this issue.

As observed in the literature examining health care professionals and smoking behavior, research among health care students is limited and varies by region. Specifically, among medical students, 35–56% of Turkish,¹⁶ 26.8% of Chinese,¹⁷ 22.4% of Italian,¹⁸ 12.2% of Puerto Rican,¹⁹ and 10.3% of Japanese medical students reported that they were current smokers.²⁰ However, to date, no research could be identified examining the rate of smoking among United States medical or

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health care students. While it is certain that differences among health care students will be seen across different regions of the United States, as a first step, the current study was conducted to determine smoking rates in the state of Texas.

The primary focus of the current, exploratory study was to determine whether health care professional students at the Texas Tech University Health Sciences Center exhibited lower rates of smoking in comparison to undergraduate students at Texas Tech University and undergraduate students throughout the state of Texas. First, while logically assumed, it was specifically tested whether health care students have greater awareness regarding tobacco-related health consequences. Given the presumably greater knowledge of the potential health implications related to cigarette smoking among health care students, it was hypothesized that health care students would show lower rates of smoking in comparison to undergraduate college students.

METHODS

Participants

Participants included 351 health care professionals in training or health care students (59.8% female), from the Texas Tech University Health Sciences Center and 10,562 undergraduate students (62.4% female) from 12 Texas colleges and universities, including Texas Tech University. The higher proportion of females in these samples is consistent with recent gender distribution changes in higher education. Indeed, it is projected that nearly 57% of the higher education population will be female by 2013. It should also be noted that health care students represented a variety of disciplines, including medicine (24.1%), pharmacy (24.7%), nursing (17.8%), allied health (28.2%), and biomedical sciences (5.2%). All participating institutions obtained approval from their Institutional Review Boards. See Table 1 for complete demographic information for both groups of students.

Materials

A Web-based survey instrument was used that queried students about their knowledge and use of tobacco products. The survey included questions previously used in other studies about respondents' knowledge and use of tobacco products,²¹ as well as questions designed specifically for the present study. The survey also assessed demographic characteristics, attitudes toward tobacco use, responses to tobacco marketing campaigns, and knowledge of the risks associated with tobacco use (see Table 2 for questions on health risks).

Procedures

Students were invited via e-mail to participate in "a ten-minute survey" with a chance to win one of five \$500 airline gift certificates. The invitation informed participants that the purpose of the survey was to determine Texas college students' use and perception of tobacco products. The students were also informed that the Institute for Communications Research at Texas Tech University had permission from their

TABLE 1. Demographic characteristics of the sample

	HC	UG
Gender		
Male	40.2%	37.4%
Female	59.8%	62.6%
Ethnicity		
Caucasian	72.7%	72.9%
Asian American	9.5%	12.0%
Hispanic	8.3%	4.1%
Native American	0.6%	2.6%
African American	1.7%	0.7%
Other	2.9%	4.4%
Prefer not to answer	4.3%	3.3%
Age		
18–22 years	23.9%	31.6%
23–25 years	33.7%	33.0%
Older than 25 years	42.4%	34.5%
Prefer not to answer	0.0%	0.8%
Academic classification		
First year	19.5%	23.6%
Second year	20.6%	17.2%
Third year	19.2%	20.2%
Fourth year	17.2%	23.6%
Graduate	23.5%	15.3%

Note. HC refers to student health professionals from the Texas Tech University Health Sciences Center, and UG refers to all undergraduate students.

respective institutions to conduct the survey. Additionally, the invitations included a promise of anonymity. Students were informed that the survey would run for seven days and that they could complete the survey any time during that period. Instructions directed students to a hyperlink contained within the e-mail invitation, and provided the name and e-mail address of the principle investigator in the event that they had any questions regarding the survey. A reminder was e-mailed to each non-responding student three to four days after the study commenced.

Analytical Plan

Multiway frequency analyses and simple chi-square analyses were conducted to test for differences among groups. These types of analyses were chosen because they are appropriate for categorical data.²² When perusing the study results, please refer to Table 3 for a list of smoking and quitting rates among health care (HC) students, all undergraduate (UG) students, and undergraduate students at Texas Tech University (TTU students). Percentages not included in the table are listed in text.

RESULTS

A total of 10,562 undergraduate students completed the survey instrument successfully. Response rates across universities

TABLE 2. Students' knowledge of tobacco-related health risks

Statement	Correct response							
	MED	PHAR	NURS	AH	BIOMED	ALL HCS	TTU UG	ALL UG
Alcohol kills more Americans than tobacco use (false)	84.5%	68.6%	85.5%	77.6%	83.3%	78.8%	74.9%	71.6%
Secondhand smoke is harmless (false)	100.0%	95.3%	93.5%	99.0%	100.0%	97.1%	97.4%	96.2%
Tobacco kills more Americans than illegal drugs (true)	92.8%	87.2%	98.4%	91.8%	83.3%	91.7%	92.4%	89.7%
The nicotine in cigarettes is addictive (true)	97.6%	95.3%	100.0%	99.0%	94.4%	97.7%	98.7%	97.3%

Abbreviations: MED = medicine, PHAR = pharmacy, NURS = nursing, AH = allied health, BIOMED = biomedical sciences, HCS = health care students, UG = undergraduate students, and TTU = Texas Tech University.

ranged from 2.1% to 31.5%, with an average response rate of 11.8%. A total of 351 health care students in training from the Texas Tech University Health Sciences Center also completed the survey, yielding a response rate of 20.4%. Table 4 contains a complete list of survey response rates. These rates may appear low compared to typical response rates of telephone and mail surveys, but they are not unusual for e-mail surveys, which often exhibit significantly lower response rates compared to telephone and mail surveys.²³⁻²⁵ While response rates may reflect a general decline in responses to electronic surveys in recent years,²⁶ it does not appear that the overall content of data is significantly influenced by collecting data via e-mail in comparison to more traditional methods (eg, mail, in-person survey). Sampling topics as wide-ranging as environmental issues²⁷ and sexual behaviors²⁸ have used multiple methods and have not found differences in overall content. More specific to the study at hand, an investigation concerning health-related behaviors that used three different sampling methods (mail, e-mail, Internet posting) showed no difference in overall content of responses by sampling method.²⁹

Ever Tried Smoking

Among health care students, 62.9% reported "ever trying smoking," which did not differ significantly from the undergraduate student endorsement rate of 62.7%, $\chi^2(1) = 2.8$, $p > .1$. The proportion of undergraduates from Texas Tech University who had ever tried smoking also did not differ from the proportion of HC students who had ever tried smoking, $\chi^2(1) = .5$, $p > .5$. Across HC and all UG students combined, a greater proportion of male students than female students stated that they had ever tried smoking, 69.6% versus 65.1%, $\chi^2(1) = 23.7$, $p < .001$. A similar pattern was found when combining across HC students and TTU undergraduates, $\chi^2(1) = 9.8$, $p < .01$.

A greater proportion of male HC students in comparison to their female counterparts reported trying smoking, $\chi^2(1) = 5.0$, $p < .05$, similar to what was observed among all UG students, $\chi^2(1) = 20.7$, $p < .001$, and Texas Tech students, $\chi^2(1) = 6.1$, $p < .05$. With respect to gender differences, the proportion of female HC students endorsing trying smoking was significantly lower than female UG students, $\chi^2(1) = 4.5$, $p < .05$. Male HC students, however, did not significantly

TABLE 3. Smoking and quitting rates among health care students (HCs) and undergraduates (UGRAD)

School/discipline	Current smokers			Ever tried smoking			Ever quit smoking		
	Male	Female	Total	Male	Female	Total	Male	Female	Total
HCs									
Medicine	25.7%	11.1%	20.8%	70.0%	52.9%	63.1%	30.0%	100.0%	41.7%
Pharmacy	18.2%	15.4%	16.9%	70.5%	56.1%	63.5%	75.0%	80.0%	76.9%
Nursing	14.3%	12.2%	12.5%	87.5%	74.1%	75.8%	100.0%	57.1%	62.5%
Allied health	14.3%	15.0%	14.8%	56.0%	47.9%	50.0%	50.0%	62.5%	58.3%
Biomedical sciences	25.0%	25.0%	25.0%	84.6%	80.0%	83.3%	50.0%	50.0%	50.0%
Total	20.8%	13.8%	16.8%	7.0%	58.2%	62.9%	51.9%	66.7%	58.8%
UGRAD									
TTU	47.0%	42.6%	44.7%	67.3%	62.2%	64.5%	61.2%	62.4%	61.8%
Total	41.0%	37.4%	38.2%	69.6%	65.3%	62.7%	65.4%	70.8%	68.6%

TABLE 4. E-mail survey response rates

University	<i>n</i>	%
Texas Tech University	2211	10.6
Texas State University–San Marcos	3143	13.1
Midwestern State University	414	11
Sull Ross State University	154	6.1
Texas A & M University, Corpus Christi	516	11.1
Abilene Christian University	855	21.7
University of North Texas	1473	5.3
Stephen F. Austin University	204	2.1
Texas Lutheran University	210	18.2
Austin College	195	15.6
University of Texas at Austin	773	13.1
Lubbock Christian University	414	31.5
Average (undergraduate)	759.2	11.8
TTUHSC	1719	20.4

differ from male UG students, $\chi^2(1) = 0.01$, $p > .10$. There were no gender differences between HC and TTU students, $\chi^2(1) = 1.2$, $p > .3$ for females and $\chi^2(1) = .4$, $p > .5$ for males.

Current Smoking

In examining endorsement rates of “smoking within the last 30 days,” HC students were significantly lower than UG students, $\chi^2(1) = 45.8$, $p < .001$, and TTU students, $\chi^2(1) = 64.3$, $p < .001$. Across HC and UG students, a greater proportion of males (40.2%) compared to females (36.7%) reported current smoking, $\chi^2(1) = 9.1$, $p < .01$. There were no gender differences in current smoking rates across HC and TTU students, $\chi^2(1) = .01$, $p > .9$.

Within the HC student and the TTU student group separately, males and females did not significantly differ in current smoking status, $\chi^2(1) = 2.0$, $p > .10$ for HC students and $\chi^2(1) = 2.7$, $p > .1$ for TTU students. Within the UG group as a whole, however, a greater proportion of males than females reported current smoking, $\chi^2(1) = 9.0$, $p < .01$. Across the groups, a greater proportion of female UG students reported current smoking compared to female HC students, $\chi^2(1) = 30.1$, $p < .001$, and a greater proportion of female TTU students reported current smoking compared to female HC students, $\chi^2(1) = 38.8$, $p < .001$. This finding was also true among males, with a greater proportion of male UG and TTU students reporting current smoking compared to male HC students, $\chi^2(1) = 16.5$, $p < .001$ and $\chi^2(1) = 24.5$, $p < .001$, respectively.

Quit Attempts

With respect to quit attempts, there was no significant difference in the proportion of previous attempts by UG students compared to HC students, $\chi^2(1) = 2.1$, $p > .05$. The same was true for TTU students in comparison to HC students, $\chi^2(1) = .3$, $p > .6$. Across UG and HC students, however,

a greater proportion of females (70.7%) reported previous quit attempts compared to males (65.1%), $\chi^2(1) = 8.9$, $p < .01$. Within-group comparisons revealed that a statistically equivalent number of male and female HC students reported that they had attempted to quit smoking, $\chi^2(1) = 1.2$, $p > .10$. Among UG students, however, a greater proportion of females compared to males indicated that they had tried to quit smoking, $\chi^2(1) = 7.8$, $p < .01$. Examining gender across groups, a similar proportion of females reported previous quit attempts among HC and UG students, $\chi^2(1) = .2$, $p > .10$. The same finding was observed among males, with HC and UG students reporting a similar proportion of reported quit attempts, $\chi^2(1) = 2.1$, $p > .10$. There were no gender differences on quit attempts within or across TTU and HC students.

Health Awareness

For the most part, HC and UG students were equally aware of the health risks associated with tobacco use (see Table 2). The lone significant difference across groups was with respect to the question assessing health risk awareness concerning differential mortality rates with tobacco versus alcohol consumption. For this question, HC students were significantly more likely to correctly identify smoking as being associated with more deaths in the United States than alcohol in comparison to UG students, $\chi^2(1) = 6.2$, $p < .05$. A similar pattern was found when comparing HC students to Texas Tech undergraduates. In general, health awareness was high across all health care disciplines (eg, medicine, pharmacy, etc.), but small numbers of participants in each group precluded statistical comparisons among the different disciplines (see Table 2 to visually examine the data).

DISCUSSION

The percentage of undergraduate students (38.2% for all colleges and 44.7% for TTU students) who reported smoking within the last 30 days was higher than the adult national average of 22.5%, the young adult (ages 18–24) national average of 26%,^{30,31} and estimates of the Texas young adult current smoking average (23%).³⁰ However, recent epidemiological estimates of young adults in college places current smoking status at approximately 30%,³² which is closer to the current undergraduate sample. As hypothesized, smoking prevalence among health care students (16.8%) was much lower than rates observed among undergraduates in the current study, young adults in the United States, and the general population. However, the second hypothesis was only partially supported. Healthcare students showed greater knowledge for only one of the questions regarding tobacco-related health risks, but showed a level of overall knowledge that was similar to undergraduate students. Given the lack of significant differences across groups with respect to these questions, it is interesting that undergraduate students continued to smoke at significantly higher rates. This suggests that knowledge of the health risks associated with smoking may not be enough in and of itself to dissuade either group from continuing to smoke.

With regard to gender, males in both samples were more likely to have tried smoking, and males in the undergraduate sample were more likely to be current smokers. These statistics are comparable to national averages, which show higher prevalence rates among young adult and adult males (26.3% and 24.2%, respectively) compared to young adult and adult females (21.5% and 19.2%, respectively).^{2,33} However, females reported higher rates of quit attempts. This is not surprising and is consistent with previous smoking cessation outcome studies that have examined gender differences. Specifically, many studies have found that women have poorer cessation outcomes compared to men,³⁴ so it would make sense that they would attempt to quit a greater number of times across their lifespan. Why women have a harder time quitting is not entirely clear. What is known is that compared to male smokers, female smokers do not smoke at greater rates,³⁵ they do not experience more intense symptoms of nicotine withdrawal,³⁶ and they are not less motivated to quit.³⁷ In fact, compared to their male counterparts, female smokers are more likely to seek assistance in their quit attempts³⁷ and report greater social pressure to quit.³⁸

The results of the current study are encouraging because they indicate that both undergraduate and health care professional students enrolled in Texas colleges and universities are generally aware of the health risks associated with smoking. This may in turn suggest that tobacco awareness programs in the state of Texas have been effective in educating youth about the dangers of smoking. However, the current study suggests that in spite of their knowledge about the health risks of smoking, Texas undergraduates continue to smoke at much higher rates than young adults and adults in the general population. These smoking rates remain high even though 33% of the institutions that were surveyed offered smoking cessation classes to students at the time of data collection, which suggests that these classes were not effective in reducing smoking rates. However, the attendance rates of these classes and the quality of their curricula are unknown, which makes it difficult to attribute high smoking rates to a failure of these programs.

Clearly, smoking cigarettes remains a national concern despite the apparent effectiveness of tobacco awareness programs, especially among young adults. In fact, smoking rates have actually increased among this population during much of the past decade, only recently declining from 28.5% in 2002 to 23.9% in 2003.^{23,39,40} As such, clinicians and researchers who are developing and implementing tobacco awareness and prevention programs may consider continuing to target young adults (and especially college students) as an at-risk population, but attempt to develop new intervention techniques in addition to focusing on tobacco-related health risks.

Despite the fact that health care professionals in training exhibited much lower smoking rates than undergraduates, approximately 16.8% still identified themselves as current smokers. Given their potential influence on patients who smoke, and the evidence to suggest that health care professionals who smoke are less likely to advocate smoking cessation,

health care training programs may want to place a greater emphasis on tobacco awareness and cessation.

The primary limitation of the present study is the low survey response rate, as it has the potential to introduce response bias. However, the authors have no compelling reason to suspect a marked response bias because of the overall large sample size and assurances of participant anonymity. Further, our sample is characteristic of the state of Texas as a whole, as the colleges and universities that participated in the study represent nearly every major region in the state.

CONCLUSIONS

In summary, results from the present study imply that clinicians and researchers should continue to target young adults (and especially college students) as an at-risk population for cigarette smoking, but move beyond a sole focus on teaching tobacco-related health risks. While smoking prevalence among student health professionals was much lower than rates observed among their undergraduate peers, 16.8% still identified themselves as current smokers. Given the potential influence these health care students will have on their patients who smoke, health care training programs may benefit from placing a greater emphasis on tobacco cessation among these future primary care clinicians.

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