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Screening, Counseling, and Health Care Utilization Among a National Sample of Adolescent Smokers

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Abstract

Our objective was to assess the association between cigarette smoking and tobacco use screening and advising to quit use by a clinician among adolescents nationwide. We also examined the relationships between smoking and health-related indicators and health care utilization. A secondary analysis of the 2017 National Survey on Drug Use and Health was conducted (N = 11 884). Ever smokers were less likely to be screened for tobacco use. Current smokers and those who were nicotine dependent were more likely to have been advised to quit use. Ever and current smokers were significantly more likely to report good/fair/poor health status, illness-related school absenteeism in the past 30 days, and were more likely to have had an emergency department visit or an overnight hospital stay. Standardized tobacco control efforts are needed in health care settings to support clinicians to screen all adolescents for tobacco use and advise every smoker irrespective of smoking frequency to quit use.

Keywords

smoking; tobacco screening; tobacco counseling; adolescence; youth

Introduction

Despite decreasing trends in cigarette smoking among US adolescents, an estimated 2000 adolescents initiate smoking every day and 300 become daily smokers.¹ Cigarette smoking initiation and nicotine addiction mainly occur during adolescence, as nearly 90% of smokers start before age 18 years.² Early initiation of smoking cigarettes increases the risk of daily and heavy smoking and nicotine dependence.³ Exposure to nicotine during adolescence may have lasting adverse consequences on the developing brain such as impaired cognitive function, in addition to an increased likelihood of smoking continuation and relapse.^{2,4}

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The corresponding author affirms that she has listed everyone who contributed significantly to the work.

Author Contributions

ALM contributed to the study design, data analysis and interpretation, and drafting the manuscript. EMMG contributed to the study design, data interpretation, and drafting the manuscript. All authors approved the final manuscript and agree to be accountable for all aspects of the work.

Declaration of Conflicting Interests

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Additionally, smoking-related US health care spending amounts to an estimated US\$170 billion annually.⁵

Adolescents are at immediate risk of experiencing adverse health consequences that may accelerate chronic disease development over time.³ If adolescents continue smoking at the present rate, it is projected that approximately 5.6 million will prematurely die from a smoking-related cause.² Active smoking has been related to lower self-reported health during adolescence.⁶ It is well established that adolescents with low academic performance and grade level retention are at increased risk of smoking.^{7–11} However, less is known on the association between smoking and illness-related school absenteeism. It is important to examine the associations between smoking and potential health-related indicators including health status and missed school due to illness to inform intervention content for the health care setting.

Evidenced-based guidelines recommend that clinicians ask all adolescents about tobacco use, encourage abstinence from use, and offer cessation counseling to smokers.^{12,13} Additionally, the primary care¹⁴ and emergency department (ED)¹⁵ settings have specific tobacco control recommendations for clinicians. Despite these recommendations that have been proven effective, only up to 1 in 2 adolescents are screened for tobacco use by clinicians.^{16,17} Given the tobacco use landscape is rapidly changing with a recent surge in current tobacco product use among US adolescents,¹⁸ up-to-date research is needed to assess if clinicians are adhering to recommended guidelines for adolescent smokers.

It is important to examine where adolescent smokers are receiving care in order to maximize screening and counseling efforts in these potential venues. The majority of adolescents have seen a clinician in the past year, typically rely on outpatient care, often use EDs for clinical preventive services and nonurgent and semi-urgent complaints,^{19–21} and have low hospitalization rates.²² Prior research indicates adolescents exposed to tobacco smoke are at risk of having increased medical visits,²³ ED visits,²⁴ and hospitalizations.^{23,25} Yet, the relationship between active smoking and health care utilization among adolescents is unknown. Elucidating this potential relationship may prompt practitioners to screen and counsel as recommended.

Our objective was to assess the association between cigarette smoking and tobacco use screening and advice to quit use among adolescents without asthma nationwide. We hypothesized that adolescent ever and current smokers would more likely be screened for tobacco use than never smokers. We also examined the associations between smoking and health-related indicators and health care utilization. We posited that ever and current smokers would be more likely to report lower overall health, illness-related school absenteeism, and have increased health care visits than never smokers.

Methods

Study Design

Data were obtained for a secondary analysis from the 2017 National Survey on Drug Use and Health (NSDUH), a nationally representative, cross-sectional survey that measures the prevalence and correlates of substance use among individuals 12 years and older.

Data Source and Population

A total of 11 884 adolescents from 12 to 17 years of age were included in the present study after excluding those who have ever had asthma or have a current asthma diagnosis ($n = 1235$). Additional information on 2017 NSDUH procedures can be found elsewhere.²⁶ A university-based institutional review board exempted the study from review due to a “not human subjects’ research” determination.

Independent and Dependent Variables

Cigarette Smoking Status.—Ever smoking status was defined by adolescent self-report of smoking cigarettes more than 30 days ago (no, yes). Current smoking status was defined by adolescent self-report of smoking cigarettes within the past 30 days (no, yes). Nicotine dependence in the past 30 days was defined by participants meeting the dependence criteria for either the Fagerström Test of Nicotine Dependence²⁷ and/or the Nicotine Dependence Syndrome Scale.^{28,29} We used statistically imputed variables on cigarette smoking provided by NSDUH to substitute acceptable estimated data for missing data.²⁶

Clinician Screening for Tobacco Use and Advice to Quit Use.—Tobacco use screening was defined as whether adolescents self-reported any doctor or other health care professional asked about tobacco use within the past 12 months (no, yes). Adolescents who responded “yes” to this question were asked a follow-up question about whether a doctor or other health care professional advised them to quit tobacco use within the past 12 months (no, yes).

Health-Related Indicators.—Health-related indicator outcome variables included adolescent self-report of their overall health (very good/excellent, good/fair/poor) and the number of whole school days missed due to being sick in the past 30 days (0 days, 1 day). Similar to prior research,²⁴ the overall health variable’s response options were dichotomized into 2 categories due to small numbers.

Health Care Utilization.—We assessed adolescent self-report of health care visits within the past 12 months, including (1) outpatient visits about their health, (2) ED visits, and (3) overnight hospital stays (no, yes).

Sociodemographic Characteristics.—We selected the sociodemographic covariates a priori: adolescent sex (male, female); age (continuous); race/ethnicity (white, black, Hispanic, and other races including American Indian or Alaska Native, Native Hawaiian or Other Pacific Islander, Asian, and more than one race); and federal poverty level (FPL)

threshold, which indicates family income relative to poverty thresholds (living in poverty, income up to 2 times the FPL threshold, and income >2 times the FPL threshold).

Statistical Analysis

We conducted descriptive analysis on adolescents' sociodemographic characteristics, smoking status, and clinician tobacco use screening and advice to quit use. We conducted χ^2 analyses for categorical outcome variables and independent t tests for adolescent age to assess differences between sociodemographics and ever smoking, current smoking, and clinician screening and advice to quit tobacco use. We then performed a series of multivariable logistic regression models to assess the associations between smoking status and clinician tobacco use screening and advice to quit use. We also built multivariable logistic regression models to examine the associations between ever and current smoking and health-related indicators and health care utilization. We adjusted for sociodemographic characteristics in all models and report adjusted odds ratios (aORs) and 95% confidence intervals (CIs). Appropriate sample weighting procedures provided by NSDUH were used to account for selection probability and to adjust for any survey nonresponse. Statistically imputed variables were used for cigarette smoking, and for all other variables, incomplete cases were removed before each analysis.

Results

Of the 11 884 adolescents included, 51.5% were male and mean age was 14.5 (SD = 1.7) years. The majority were non-Hispanic white (52.7%), followed by 24.5% Hispanic, 13.1% black, and 9.7% were another race. FPL threshold varied with 21.8% living in poverty, 21.7% having income up to 2 times the FPL threshold, and 56.5% having income >2 times the FPL threshold. A total of 8.3% were ever smokers, and 3.8% (n = 448) were current smokers. Of current smokers, 30.1% (n = 135) were nicotine dependent according to Fagerström Test of Nicotine dependence and/or Nicotine Dependence Syndrome Scale criteria.

Sociodemographic Characteristics of Adolescents by Ever and Current Smoking Status

Males and females had similar rates of ever (3.5% and 3.0%, respectively) and current smoking (6.0% and 5.4%, respectively; Table 1). Mean age of ever smokers was 15.5 (SD = 1.4) years, and mean age of current smokers was 16.0 (SD = 1.2) years. For both ever and current smoking, rates were higher in white adolescents (8.5% and 4.2%, respectively) than adolescents who were black (6.8% and 1.3%, respectively), Hispanic (6.7% and 2.3%, respectively), and another race (4.9% and 3.1%, respectively). FPL differed based on ever and current smoking, with adolescents who had a FPL of living in poverty (9.3% and 3.6%, respectively) and income up to 2 times the FPL threshold (9.0% and 4.1%, respectively) having higher smoking rates compared with adolescents who had an income >2 times the FPL threshold (6.2% and 2.8%, respectively; see Table 1).

Sociodemographic Characteristics by Clinician Screening for Tobacco Use

A total of 49.3% adolescents were screened for tobacco use, and of those who reported ever or current cigarette smoking, 22.9% were advised to quit use by a clinician. There was a

significant difference in screening for tobacco use based on sex, with males (45.8%) reporting lower rates of being screened than females (52.8%, $P < .001$; see Table 1). Participants who were screened for tobacco use had significantly higher mean age (mean = 15.0, SD = 1.6) than those who were not screened (mean = 14.1, SD = 1.7, $P = .03$). Clinician tobacco use screening rates were significantly lower in black adolescents (46.2%), Hispanic adolescents (46.2%), and adolescents who were another race (45.1%) than white adolescents (52.1%). Adolescents who had a FPL of living in poverty (43.1%) had lower rates of being screened for tobacco use than those with an income up to 2 times the FPL threshold (45.3%) and those with an income >2 times the FPL threshold (53.0%, $P < .001$; see Table 1).

Smoking Status and Clinician Tobacco Use Screening and Advice to Quit Use

Of total participants, 71.6% visited a doctor, nurse, physician assistant, or nurse practitioner about their health at a doctor's office, clinic, or another place during the past 12 months. Ever smokers were less likely (aOR = 0.83, 95% CI = 0.71-0.96, $P = .02$) to report being screened for tobacco use by a clinician than adolescents who were never smokers (Table 2). There was no difference found between ever smoking and advice to quit use.

Although no difference was found between current smoking and screening, current smokers were 1.67 times more likely (95% CI = 1.23-2.28, $P = .001$) to report being advised to quit tobacco use (see Table 2).

Among current smokers, there were no differences between nicotine dependence and tobacco use screening. Current smokers who were nicotine dependent were 2.27 times (95% CI = 1.38-3.73, $P = .001$) more likely to be advised by a clinician to quit use than current smokers who were not nicotine dependent (see Table 2).

Cigarette Smoking Status and Health-Related Indicators

Ever smokers were at increased odds of reporting good/fair/poor health status (aOR = 1.48, 95% CI = 1.28-1.71, $P < .001$) and missing at least 1 whole day of school due to being sick in the past 30 days (aOR = 1.43, 95% CI = 1.21-1.69, $P < .001$) than never smokers (Table 3).

Current smokers were 2.40 times more likely (95% CI = 1.96-2.93, $P < .001$) to report good/fair/poor health status (Table 2). Current smokers were also 2.11 times more likely (95% CI = 1.62-2.76, $P < .001$) to have missed at least 1 whole day of school due to being sick in the past 30 days.

Cigarette Smoking Status and Health Care Utilization

Adolescent ever (aOR = 1.49, 95% CI = 1.29-1.72, $P < .001$) and current smokers (aOR = 1.80, 95% CI = 1.47-2.22, $P < .001$) were more likely to have had an ED visit within the past 12 months (see Table 3). Similarly, ever smokers were 1.90 times more likely (95% CI = 1.48-2.44, $P < .001$) and current smokers were 2.95 times more likely (95% CI = 2.15-4.05, $P < .001$) to have had an overnight hospital stay within the past 12 months. No differences

were found between ever and current smoking status and having an outpatient visit within the past 12 months.

Discussion

We found that 8% of adolescents were ever smokers, and nearly 4% were current smokers. We report that males and females had similar rates of smoking behavior, which differs from prior research that indicated males have higher current smoking rates than females.¹⁸ Comparable to prior literature on racial/ethnic¹⁸ and socioeconomic status (SES)³⁰ differences in smoking behavior, we found that white adolescents and those with lower SES reported higher rates of ever and current smoking compared with minority adolescents and those with higher SES. Of current smokers, we report remarkably high rates of nicotine dependence with 30% meeting commonly used diagnostic criteria. This rate aligns with prior work and is concerning as even intermittent, nondaily use can lead to nicotine dependence,^{31,32} which is a strong predictor of physical health symptoms (eg, chest pain) in young adulthood.³³ This study highlights the critical need for adolescent smoking initiation and reduction efforts nationwide.

Our study indicated that clinicians screened only 49% of adolescents for tobacco use within the past year. Those with lower screening rates were on average about 14 years old and were male, black, Hispanic, or another race, and of lower SES. A study that used NSDUH 2013 data also found that adolescents who were screened at lower rates were male, in early adolescence, racial/ethnic minorities, and had public health insurance.¹⁷ Our study highlights that despite recommendations for clinicians to universally screen all adolescent patients for tobacco use,^{12,13} inconsistencies in practice remain. These missed screening opportunities for adolescents with disproportionately high smoking rates, such as those of low SES, are concerning as these adolescents tend to have high initiation rates, stronger addiction, and lower successful quit attempts.³⁰

A main objective was to assess the association between smoking behavior and clinician tobacco use screening and advising to quit use among adolescents nationwide. Contrary to our hypothesis, ever smokers were less likely to be screened for tobacco use than never smokers, but no difference was reported based on current smoking. This may be due to infrequent smokers viewing themselves as nonsmokers and perceiving their smoking behavior as not harmful to their health. This has serious implications for identifying and treating this unique smoking population, as rewording the question clinicians ask during tobacco use screening may be necessary.³⁴ Concerning provision of cessation counseling, current smokers were over 1.5 times more likely to be advised to quit, but no difference was found based on ever smoking. Those who were nicotine dependent were over 2 times as likely to be advised to quit. While this is encouraging, there is room for improvement as over one third of current smokers were not screened. Taken together, we posit that clinicians may be able to identify current smokers and those who are nicotine dependent since adolescents may ask them for assistance. Prior research has found that established adolescent smokers are more likely to report undergoing screening and receiving advice to quit, which has been related to an increased likelihood of making a past year quit attempt.¹⁶ These findings highlight the need for changes at the health care systems level for

implementing universal tobacco use screening interventions to ensure all clinicians are appropriately asking adolescent patients with varying smoking behaviors about their tobacco use and advising them to quit.

Another study aim was to examine the associations between cigarette smoking and health-related indicators and health care utilization. We found that adolescent ever and current smokers were at increased odds of self-reporting good/fair/poor health status, aligning with prior research.⁶ Results also indicated ever and current smokers were more likely to have had illness-related school absenteeism within the past month. This study expands on well-known school-related factors (eg, academic achievement)^{7–11} by focusing solely on health-related absenteeism. In sum, engaging in any amount of smoking during adolescence increases the risk of lower overall health and missed school due to illness. These health-related indicators present a unique opportunity for clinicians to intervene with adolescent smokers as they may come in for preventive care or ill visits due to experiencing smoking-related morbidity.

As hypothesized, adolescent ever and current smokers were significantly more likely to have had an ED visit. We found that ever and current smoking behavior increased the odds of having an overnight hospital stay, which aligns with work that indicates adolescent smokers have higher rates of hospitalizations and longer stays.³⁵ Study findings on adolescent smoking expands on our prior research²⁵ that found adolescents who had biochemically validated tobacco smoke exposure levels equivalent to active smoking (cotinine 3 ng/mL) were more likely to seek ED care. EDs should be considered high priority for tobacco control initiatives, as EDs serve an adolescent population that may seek preventive clinical services that they may not receive elsewhere due to limited access to primary health care settings.³⁶ The American College of Emergency Physicians Task Force on Smoking Cessation¹⁵ recommends ED clinicians to routinely ask about smoking status and offer advice to quit smoking. Although these efforts can be high-impact, brief, and cost-effective, common barriers cited by ED clinicians include time constraints and lack of training.¹⁵ Thus, ED clinicians should be educated on the smoking burden among adolescents and ways to seamlessly implement smoking initiatives in this setting to increase screening and counseling, and in turn reduce related morbidity.

Although adolescents commonly interact with outpatient settings, no differences were found based on smoking behavior, differing from prior research that found general practitioners interact with tobacco users more frequently.³⁵ It is important to note that the US Preventive Services Task Force¹⁴ recommends that primary care clinicians should provide education and brief counseling to prevent and reduce adolescent tobacco use. Therefore, regardless of tobacco use status, all adolescents should be asked about smoking and educated on the related dangers. Evidence-based policies and procedures including the implementation of efforts to prevent, identify, and treat nicotine dependence can empower health care systems and professionals to prevent smoking initiation and improve cessation rates.^{12,37}

Our study has many strengths including generalizable results to the US adolescent population without asthma. Concerning limitations, the NSDUH is cross-sectional in nature and causal relationships could not be determined. The study was limited to self-reported

NSDUH variables publicly available for analyses. For example, the NSDUH does not include information on electronic cigarettes. Future research should examine these relationships using objective measures such as medical record review of health care visits and cotinine, a biomarker widely used to biochemically validate smoking status.³⁸

Conclusion

Our findings indicate that about one half (49%) of adolescents without asthma, approximately 18 million,³⁹ were not screened for tobacco use by a clinician. Among ever and current smokers, cessation counseling was not offered during nearly 4 of 5 visits. Sociodemographic disparities in screening current smokers exist as males, younger adolescents, and racial/ethnic minorities had low rates. Ever smokers were also at reduced odds of being screened for tobacco use than never smokers. Additionally, ever and current smokers were at increased odds of experiencing lower overall health and higher school absenteeism, ED utilization, and overnight hospital stays.

These findings underscore the need to standardize tobacco control efforts in health care delivery systems and support clinicians to screen all adolescents for smoking and advise every smoker irrespective of smoking frequency to quit use. Implementation of evidence-based policies and tobacco control interventions in the health care setting while working with health insurers to expand coverage to include cessation treatment options would enhance screening measures and cessation resources.^{13,40} This could in turn result in a major decline in adolescent cigarette smoking and related illnesses and health care visits.

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Table 1.
Adolescent Sociodemographics by Ever and Current Smoking, and Clinician Screening for Tobacco Use, NSDUH 2017.

Sociodemographic Characteristic	Ever Cigarette Smoking			Current Cigarette Smoking			Clinician Screened for Tobacco Use		
	Overall, n (%) ^a	No, n (%) ^a	Yes, n (%) ^a	P	No, n (%) ^a	Yes, n (%) ^a	No, n (%) ^a	Yes, n (%) ^a	P
Sex				.14					<.001
Male	6177 (51.5)	5643 (92.1)	534 (7.9)		5930 (96.5)	247 (3.5)	2434 (54.2)	2303 (45.8)	
Female	5707 (48.5)	5256 (93.0)	451 (7.0)		5506 (97.0)	201 (3.0)	2140 (47.2)	2535 (52.8)	
Age in years, mean (SE)	14.5 (1.7)	14.5 (1.7)	15.5 (1.4)	<.001	14.5 (1.7)	16.0 (1.2)	14.1 (1.7)	15.0 (1.6)	.03
Race/ethnicity				.002					<.001
White	6313 (52.7)	5736 (91.5)	577 (8.5)		6032 (95.8)	281 (4.2)	2357 (47.9)	2778 (52.1)	
Black	1511 (13.1)	1411 (93.2)	100 (6.8)		1489 (98.7)	22 (1.3)	625 (53.8)	541 (46.2)	
Hispanic	2679 (24.5)	2471 (93.3)	208 (6.7)		2600 (97.7)	79 (2.3)	1070 (53.8)	989 (46.2)	
Other race	1381 (9.7)	1281 (95.1)	100 (4.9)		1315 (96.9)	66 (3.1)	522 (54.9)	530 (45.1)	
FPL				<.001					<.001
Poverty	2570 (21.8)	2317 (90.7)	253 (9.3)		2464 (96.4)	106 (3.6)	1074 (56.9)	879 (43.1)	
Income up to 2× FPL threshold	2668 (21.7)	2399 (91.0)	269 (9.0)		2543 (95.9)	125 (4.1)	1097 (54.7)	1000 (45.3)	
Income more than 2× FPL threshold	6646 (56.5)	6183 (93.8)	463 (6.2)		6429 (97.2)	217 (2.8)	2403 (47.0)	2,959 (53.0)	

Abbreviations: NSDUH, National Survey on Drug Use and Health; FPL, federal poverty level.

^a n refers to raw scores and percentages are weighted unless otherwise noted.

Table 2.
Adolescent Smoking Status by Clinician Tobacco Use Screening and Advice to Quit Use, NSDUH 2017.

Smoking Status Variable	Clinician Screened for Smoking			Clinician Advised to Quit Smoking		
	No, n (%) ^a	Yes, n (%) ^a	Multivariable Regression ^b , aOR (95% CI)	No, n (%) ^a	Yes, n (%) ^a	Multivariable Regression ^b , aOR (95% CI)
Ever cigarette smoking						
No	4208 (50.9)	4412 (49.1)	Ref	461 (75.5)	147 (24.5)	Ref
Yes	366 (48.3)	426 (51.7)	0.83 (0.71–0.96) [*]	328 (79.9)	87 (20.1)	0.85 (0.63–1.16)
Current cigarette smoking						
No	4445 (51.2)	4599 (48.8)	Ref	529 (81.6)	126 (18.4)	Ref
Yes	129 (34.5)	239 (65.5)	1.17 (0.94–1.47)	260 (69.1)	108 (30.9)	1.67 (1.23–2.28) ^{**}
Nicotine dependence in past month (N = 448)						
No	93 (35.2)	168 (64.8)	Ref	199 (75.5)	63 (24.5)	Ref
Yes	36 (32.6)	71 (67.4)	1.05 (0.64–1.73)	61 (52.4)	45 (47.6)	2.27 (1.38–3.73) ^{**}

Abbreviations: NSDUH, National Survey on Drug Use and Health; aOR, adjusted odds ratio; CI, confidence interval; Ref, reference group.

^a n refers to raw scores and percentages are weighted.

^b Logistic regression controlling for adolescent sex, age, race/ethnicity, and federal poverty level threshold.

^{**} $P < .01$.

^{*} $P < .05$.

Table 3.
Adolescent Smoking Status by Health-Related Indicators and Health Care Utilization, NSDUH 2017.

	Ever Cigarette Smoking (n = 985)		Current Cigarette Smoking (n = 448)	
	No, n (%) ^a	Yes, n (%) ^a	No, n (%) ^a	Yes, n (%) ^a
<i>Health-related indicators</i>				
Overall health status				
Very good/excellent	8305 (93.4)	671 (6.6)	Ref	Ref
Good/fair/poor	2591 (89.7)	314 (10.3)	1.48 (1.28–1.71) ***	2.40 (1.96–2.93) ***
Missed school due to illness				
No	4005 (94.2)	271 (5.8)	Ref	Ref
Yes	3739 (91.8)	370 (8.2)	1.43 (1.21–1.69) ***	2.11 (1.62–2.76) ***
<i>Health care utilization in the past 12 months</i>				
Outpatient visit about health				
No	1832 (91.9)	191 (8.1)	Ref	Ref
Yes	7822 (92.4)	717 (7.6)	0.93 (0.78–1.10)	1.21 (0.93–1.58)
Emergency department visit				
No	7503 (93.5)	590 (6.5)	Ref	Ref
Yes	2765 (89.8)	337 (10.2)	1.49 (1.29–1.72) ***	1.80 (1.47–2.22) ***
Overnight hospital stay				
No	10 288 (92.9)	887 (7.1)	Ref	Ref
Yes	477 (84.7)	83 (9.3)	1.90 (1.48–2.44) ***	2.95 (2.15–4.05) ***

Abbreviations: NSDUH, National Survey on Drug Use and Health; aOR, adjusted odds ratio; CI, confidence interval; Ref, reference group.

^a n refers to raw scores and percentages are weighted.

^b Logistic regression controlling for adolescent sex, age, race/ethnicity, and federal poverty level threshold.

*** $P < .001$.