Original Investigation

Adolescent nondaily smokers: Favorable views of tobacco yet receptive to cessation

Matthew J. Carpenter, Elizabeth Garrett-Mayer, Camelia Vitoc, Kathleen Cartmell, Sharon Biggers, & Anthony J. Alberg

Abstract

Introduction: Favorable views of cigarette use may be a potentiating factor that influences the progression of nicotine dependence among adolescents.

Methods: Using data from the South Carolina Youth Tobacco Survey (2005–2007), a statewide two-stage cluster sample of students in Grades 6–12 ($N=7,385$), we examined attitudes toward smoking and quit behaviors among adolescent smokers across a range of smoking frequencies.

Results: Compared with past-30-day nonsmokers, adolescents who smoked 1–2 days in the past month were more likely to believe that (a) smokers have more friends, (b) smoking looks cool, and (c) it is safe to smoke in the short term and then quit, but less likely to think that (d) tobacco is as addictive as other drugs and (e) smoking few cigarettes per day is harmful. Those who smoked 1–2 days in the past month were similar to more frequent smokers, including those who smoked daily. Similar findings were found for lifetime exposure to smoking. Among those who smoked 1–2 days in the previous month, motivation to quit (54%) and incidence of quit attempts (52% in past year) were slightly higher compared with heavier smokers.

Discussion: Even minimal levels of cigarette use are associated with favorable views of smoking, and adolescents with minimal levels of cigarette use resemble chronic smokers in several key ways. Adolescents at very early stages of cigarette use are at significant risk for chronic use. Tobacco control efforts should

capitalize on motivation to quit with focused prevention strategies that arrest the progression from nondaily to daily smoking.

Introduction

Although youth smoking prevalence has declined in recent years, estimates suggest that almost one half (46%) of U.S. high school seniors have ever used cigarettes. Over one fifth have smoked in the past month (Johnston, O'Malley, Bachman, & Schulenberg, 2006). This situation is concerning because the vast majority of cigarette smokers initiate their smoking during adolescence (U.S. Department of Health and Human Services [USDHHS], 1994). If, when, and how adolescents become nicotine dependent has been the subject of considerable research (Breslau, Fenn, & Peterson, 1993; Colby, Tiffany, Shiffman, & Niaura, 2000; DiFranza et al., 2000, 2002; DiFranza, Savageau, Fletcher, O'Loughlin, et al., 2007; DiFranza, Savageau, Fletcher, Pbert, et al., 2007; Kassel, 2000). In a prospective study of several hundred adolescents, 21% experienced their first symptom of dependence within 3 months of first use and one quarter met full dependence criteria within 23 months (Kandel, Hu, Griesler, & Schaffran, 2007).

As dependence develops during adolescence, it is not a static event. Traditional models view onset of dependence as a graded rather than an all-or-none phenomenon (Chassin, Presson, Rose, & Sherman, 1996, 2001; Chassin, Presson, Sherman, & Kim, 2003; Shadel, Shiffman, Niaura, Nichter, & Abrams, 2000). Among adolescents who ultimately progress to chronic smoking, their smoking

Matthew J. Carpenter, Ph.D., *Department of Psychiatry and Behavioral Sciences, Hollings Cancer Center, Medical University of South Carolina, Charleston, SC*

Elizabeth Garrett-Mayer, Ph.D., *Department of Biostatistics, Bioinformatics, and Epidemiology, Hollings Cancer Center, Medical University of South Carolina, Charleston, SC*

Camelia Vitoc, M.D., M.S.P.H., *South Carolina Department of Health and Environmental Control (DHEC), Division of Tobacco Prevention and Control, 177 St. Julian Place, Columbia, SC*

Kathleen Cartmell, M.P.H., *Department of Biostatistics, Bioinformatics, and Epidemiology, Hollings Cancer Center, Medical University of South Carolina, Charleston, SC*

Sharon Biggers, C.H.E.S., *South Carolina Department of Health and Environmental Control (DHEC), Division of Tobacco Prevention and Control, 177 St. Julian Place, Columbia, SC*

Anthony Alberg, Ph.D., M.P.H., *Department of Biostatistics, Bioinformatics, and Epidemiology, Hollings Cancer Center, Medical University of South Carolina, Charleston, SC*

Corresponding author:

Matthew J. Carpenter, Ph.D., *Department of Psychiatry and Behavioral Sciences, Hollings Cancer Center, Medical University of South Carolina, 86 Jonathan Lucas Street, PO Box 250955, Charleston, SC 29425, USA. Telephone: 843 792-3974; Fax: 843 792-5526; E-mail: carpente@musc.edu*

doi: 10.1093/ntr/ntp023

Advance Access publication on April 14, 2009

Received May 7, 2008; accepted September 15, 2008

© The Author 2009. Published by Oxford University Press on behalf of the Society for Research on Nicotine and Tobacco. All rights reserved. For permissions, please e-mail: journals.permissions@oxfordjournals.org

trajectory is often marked by preceding periods of experimentation followed by light or intermittent use. However, no well-accepted definitions of any of these labels exist (Mayhew, Flay, & Mott, 2000; Okuyemi et al., 2002). In studies of adult smokers, clear definitions exist for smokers (USDHHS, 2007) and “chippers” (Shiffman, 1989; Shiffman & Paty, 2006). These definitions do not translate directly to adolescents because the distinctions are less apparent among experimentation, intermittent, and chronic use.

Many risk factors exist for progression of smoking among adolescents (cf. Kandel et al., 2007), including personal, socio-demographic, behavioral, and environmental factors (for a review, see USDHHS, 1994). How these risk factors pertain to specific stages of tobacco use is unclear. Developing more effective prevention and cessation strategies among adolescents will require further “microanalytic” research on the acquisition and escalation of tobacco use behaviors (Eissenberg & Balster, 2000), particularly given that early intermittent smoking is a strong predictor of subsequent daily use (Patton et al., 1998). Thus, a heightened focus on intermittent smoking that occurs prior to chronic use is of vital concern for tobacco control.

Studies of the perceived benefits and harms of smoking among adolescents suggest that ever-experimenters differ in meaningful ways from never-smokers (Lewinsohn, Brown, Seeley, & Ramsey, 2000; Robinson, Klesges, Zbikowski, & Glaser, 1997; Virgili, Owen, & Severson, 1991; Wang, Fitzhugh, Eddy, & Westerfield, 1996). In general, however, these studies make little distinction among adolescents who currently but only occasionally smoke. When comparing intermittent with daily adolescent smokers, the latter are likely to demonstrate stronger or more favorable attitudes toward smoking (Hill, Boudreau, Amyot, Dery, & Godin, 1997), psychopathology (Lewinsohn et al., 2000), and positive expectancies derived from smoking (Scheffels & Lund, 2005). A study of Turkish young adult smokers found differences between occasional and regular smokers with regard to smoking context but few differences in motivation to smoke (Oksuz, Mutlu, & Malhan, 2007). The results of these studies suggest that adolescent occasional smokers are dissimilar from regular smokers.

Even fewer studies have examined quit behaviors among adolescent light and intermittent smokers. Some observers might doubt that adolescents who are so early in their smoking history have any interest in quitting, but the sparse available evidence suggests that many adolescent smokers are interested in and receptive toward cessation interventions (Holmen, Barrett-Connor, Holmen, & Bjerner, 2000). Whether this applies to adolescents with infrequent smoking patterns is uncertain and has received little attention. Several reports of non-U.S. adolescent populations suggest that nondaily smokers are more motivated to quit (Leatherdale & McDonald, 2005; Scheffels & Lund, 2005) and make more quit attempts (Oksuz et al., 2007) than daily smokers.

Interpretations from many of the studies described here are constrained by the lack of a consistent definition of adolescent intermittent smoking. In this report, we take an empirical approach to examine both attitudes toward smoking and cessation behaviors among adolescent nondaily smokers. Our purpose was twofold: (a) to measure the extent to which attitudes toward smoking differ between nonsmokers and those who smoke at various levels and (b) to assess interest in and attempts at cessation among adolescent low-rate smokers.

Methods

Overview

We carried out a cross-sectional survey of a two-stage cluster sample of middle school (Grades 6–8) and high school (Grades 9–12) students in South Carolina, a state where approximately 46% of students are non-White. The South Carolina Youth Tobacco Survey (SC YTS) is part of the National Youth Tobacco Survey program sponsored by the Centers for Disease Control and Prevention. The YTS is an annual school-based survey designed to evaluate youth-related smoking practices, including initiation and prevalence, cessation, attitudes toward smoking, media influences, and more. The SC YTS is coordinated by the South Carolina Department of Health and Environmental Control and has been administered yearly since 2005. Data for this report are based on years 2005–2007.

Sampling strategy

The SC YTS uses a two-stage sample cluster design to select a representative sample of public middle school (Grades 6–8) and high school (Grades 9–12) students. Stage 1 consisted of all regular public schools. Schools were selected with probability proportional to school enrollment size. In all, 149 middle schools and 150 high schools were chosen, and school response rates ranged from 69% to 80% across years 2005 through 2007 and across middle and high schools. Stage 2 consisted of systematic equal probability sampling of approximately two classes from each school. All second-period classes in selected schools were included in the sample frame, and all students in these select classes were eligible to participate. Passive parental consent was gathered for all students. Participation was voluntary, and no individual identifying information was collected. The student response rate for stage 2 ranged from 84% to 92%, yielding an overall response rate (overall school rate $\times$ overall student rate) of 66%. In total, 7,778 adolescents completed the survey, of whom 7,385 (95%) denoted their past-month smoking status, representing the final study sample.

Measures

Smoking status. Respondents were asked about past-month smoking (responses in ordinal categories from none to all 30 days), number of cigarettes smoked in lifetime (responses in ordinal categories from none to at least 100), and age at first whole cigarette (≤ 8 through ≥ 17). The survey also asked respondents whether they lived with any tobacco users; this response was used as a covariate (see below). Only the 2007 survey asked whether parents smoked; these data are not included here. For the remainder of this report, the following definitions are used to identify past-month smoking status: nonsmoker (0 days), minimal nondaily smoker (1–2 days), moderate nondaily smoker (3–9 days), high nondaily smoker (10–29 days), and daily smoker (all 30 days). The following definitions are used for lifetime smoking exposure: none (never smoking or only a few puffs), minimal (1–5 cigarettes total), moderate (6–99 cigarettes), and high (≥ 100 cigarettes).

Attitudes toward smoking. The SC YTS asks respondents about (a) perceived addictive potential of tobacco relative to other drugs like cocaine or heroin; (b) whether young people who smoke have more friends; (c) whether smoking makes

Table 1. Smoking during the past 30 days among middle and high school students according to demographic characteristics, South Carolina, 2005–2007

	Total ^b (N = 7,385)	Past-30-day smoking ^a				
		None (n = 6,279)	1–2 days (n = 309)	3–9 days (n = 278)	10–29 days (n = 273)	Daily (n = 246)
Mean age (SD)	14.6 (2.1)	14.5 (2.1)	15.0 (1.9)	15.3 (1.8)	15.7 (1.6)	16.2 (1.5)
Race						
White (%)	56	81	5	4	5	6
Black (%)	40	90	4	3	2	1
Other (%)	5	82	5	5	3	5
Gender						
Female (%)	50	86	4	3	4	3
Male (%)	50	83	4	4	4	4
Type of school						
Middle school (%)	44	90	4	3	2	1
High school (%)	55	80	5	5	5	6
Live with smoker						
Yes (%)	44	79	5	4	5	6
No (%)	56	90	4	3	2	2
Total (%)	100	84	4	4	4	4

Note. ^aRow percentages.

^bColumn percentages.

young people look cool or fit in; (d) perceived harm of smoking 1–5 cigarettes/day; and (e) perceived safety of smoking for only a year or 2 and then quitting, all asked in 4-point Likert format. We also grouped future intentions to smoke, that is, likelihood of smoking in 5 years (asked among 2005 and 2006 samples only), with attitude items.

Quit behaviors. All adolescents were asked if they wanted to quit smoking (yes/no, with an additional option for non-smokers). Respondents were asked how many times they stopped smoking 1 day or longer “because you were trying to quit smoking.” The latter distinction is important, given that a period of no smoking by itself cannot be an indicator of quit attempts among nondaily smokers who by definition go for periods of time without smoking; there needs to be some intent to quit for good. Finally, all respondents were asked to rate their ability to quit for good if they wanted.

Data analyses

With the exception of the latent class analysis (described below), all analyses were adjusted for the survey sampling design using the sampling weights. Proportions, means, and SDs were used for descriptive analyses. Odds ratios (ORs) were estimated (see Tables 2 and 3) using logistic regression models that included age (continuous), race (White, Black, and other), gender, an indicator of whether the respondent lived with a smoker, and the school. The *p* values and 95% CIs for ORs were based on the results from the logistic regression models. Alpha was set at .01 due to the large sample size and the number of comparisons considered. This approach is not as stringent as a Bonferroni correction, but it does adjust to some extent for the issue of multiple comparisons. In general, due to the large sample size, *p* values should be interpreted in light of effect sizes (e.g., ORs) so as not to misrepresent statistical significance for clinical significance.

Latent class analysis was performed using five binary items for each of five attitudes. Two-, three-, and four-class models were fit. Statistical evidence and scientific interpretation were used to determine that the three-class model was most appropriate. From the latent class model, item prevalence and class size for each class were estimated. Tabulations were performed with smoking patterns and were tested for significance using chi-square tests.

Results

Sample characteristics

Respondent characteristics are presented in Table 1. Not surprisingly, past-month smoking frequency was positively associated with increasing age ($p < .001$), type of school (high school > middle school; $p < .001$), and living with another smoker ($p < .001$). Compared with Black students, Whites were more likely to smoke ($p < .001$) and, among past-month smokers, to be more frequent smokers ($p < .001$). Females were less likely to smoke ($p < .001$), but we found no gender differences with regard to frequency of past-month smoking. We found parallel associations for lifetime smoking exposure (data not shown).

Attitudes toward smoking

In keeping with our study objectives, we focused the statistical comparisons on nonsmokers compared with minimal nondaily smokers (1–2 days in past 30) and minimal smokers (1–5 cigarettes in lifetime) only. Compared with nonsmokers, minimal nondaily adolescent smokers were significantly less likely to believe that people can get addicted to tobacco as easily as to other drugs of abuse and less likely to consider 1–5 cigarettes/day as being harmful (Table 2). These same minimal nondaily smokers were significantly more likely than nonsmokers to think that young smokers have more friends, that smoking is cool, and that it is safe to smoke for a few years prior to quitting. We found few

Table 2. Attitudes toward smoking by past-month smoking^a

Past-30-day smoking rate

	None (<i>n</i> = 6,279)	Minimal nondaily 1–2 days (<i>n</i> = 309)	Moderate nondaily 3–9 days (<i>n</i> = 278)	High nondaily 10–29 days (<i>n</i> = 273)	Daily smoker (<i>n</i> = 246)
Do you think people can get addicted to tobacco just like they can get addicted to using cocaine or heroin?					
Percent definitely/probably yes	90	80	75	82	80
OR (95% CI) (<i>p</i> value)	1.0	0.3 (0.2–0.5) (<.001)	0.3 (0.2–0.5) (<.001)	0.4 (0.3–0.6) (<.001)	0.3 (0.2–0.5) (.0000)
		1.0	0.9 (0.6–1.5) (.8)	1.2 (0.7–2.0) (.6)	1.0 (0.6–1.6) (1.0)
Young smokers have more friends					
Percent definitely/probably yes	24	32	45	43	46
OR (95% CI) (<i>p</i> value)	1.0	1.5 (1.1–2.1) (.01)	2.8 (2.1–3.8) (<.001)	2.9 (2.1–4.0) (<.001)	3.5 (2.5–4.8) (<.001)
		1.0	1.9 (1.3–2.9) (.002)	2.0 (1.3–3.0) (.001)	2.4 (1.5–3.6) (<.001)
Smoking cigarettes makes young people look cool					
Percent definitely/probably yes	14	25	33	25	29
OR (95% CI) (<i>p</i> value)	1.0	2.3 (1.7–3.2) (<.001)	3.5 (2.5–4.9) (<.001)	2.5 (1.8–3.5) (<.001)	3.0 (2.1–4.3) (<.001)
		1.0	1.5 (1.0–2.3) (.06)	1.1 (0.7–1.7) (.7)	1.3 (0.8–2.0) (.2)
1–5 cigarettes/day harmful to young people					
Percent definitely/probably yes	91	82	80	82	70
OR (95% CI) (<i>p</i> value)	1.0	0.4 (0.3–0.6) (<.001)	0.4 (0.3–0.7) (<.001)	0.4 (0.3–0.6) (<.001)	0.2 (0.1–0.2) (.000)
		1.0	1.0 (0.6–1.7) (1.0)	0.9 (0.5–1.5) (.6)	0.4 (0.2–0.6) (.000)
Safe to smoke for a year or 2 and then quit					
Percent definitely/probably yes	11	29	34	33	31
OR (95% CI) (<i>p</i> value)	1.0	3.1 (2.3–4.3) (<.001)	4.1 (3.0–5.7) (<.001)	4.0 (2.9–5.4) (<.001)	3.1 (2.2–4.3) (<.001)
		1.0	1.3 (0.9–2.0) (.2)	1.3 (0.9–1.9) (.3)	1.0 (0.6–1.5) (.9)
Do you think you will be smoking 5 years from now? ^b					
Percent definitely/probably yes	7	39	47	66	74
OR (95% CI) (<i>p</i> value)	1.0	9.7 (6.8–13.9) (<.001)	16.3 (11.2–23.5) (<.001)	30.2 (20–45) (<.001)	52.5 (33–84) (<.001)
		1.0	1.7 (1.0–2.7) (.03)	3.1 (1.9–5.1) (<.001)	5.4 (3.2–9.3) (<.001)

Note. ^aOdds ratios (ORs, not percentages) are adjusted for age, race, gender, living with smoker, and school cohort.

^bAsked only of 2005 and 2006 respondents (*n* per group: none, 4,020; 1–2 days, 205; 3–9 days, 186; 10–29 days, 186; and daily, 154). Readers interested in other pairwise comparisons may contact the first author.

attitudinal differences between minimal nondaily smokers and more frequent smokers (i.e., moderate/high nondaily and daily smokers). The one exception was that moderate nondaily and daily smokers were more likely to consider young smokers as having more friends than did minimal nondaily smokers. Minimal nondaily smokers were significantly more likely than nonsmokers to intend to be smoking in 5 years (39% vs. 7%). Future intentions to smoke increased as smoking frequency escalated.

In general, we found convergent results when we examined attitudes toward smoking in relation to lifetime smoking history (Table 3). Adolescents with minimal smoking history (1–5 cigarettes in their lifetime) again were less likely than never-smokers to believe that people can get addicted to tobacco as easily as to other drugs of abuse; yet, they were more likely to think that young smokers have more friends, that smoking is cool, and that it is safe to smoke for a few years prior to quitting. By contrast, however, positive attitudes toward smoking increased as lifetime smoking history increased.

Latent class analysis of attitudes revealed three distinct groups (Figure 1). Class I (70% of the entire sample) consisted of adolescents who held primarily negative views of smoking. This included views that smoking is addictive, harmful, and with few social benefits (e.g., looks cool; smokers have more friends). Class II (18%) consisted of adolescents who also be-

lieved cigarettes to be addictive and harmful, but this was countered by views that smoking offers some social benefits. Class III (11%) consisted of those adolescents who were less likely to believe smoking to be addictive or harmful but even less likely to endorse any social benefits. Each of these latent classes was significantly associated ($p < .0001$) with smoking behavior, both over the past month and over the lifetime (Table 4). As smoking frequency in the past month and exposure over the lifetime increased, fewer adolescents were in Class I and more adolescents were in Class II; there were minimal fluctuations in Class III.

Quit behaviors

Among past-month smokers, we found few differences across any of the groups on either desire to quit or the incidence of purposeful quit attempts (i.e., with the intent to quit for good) in the past year (Figure 2). However, adolescents who smoked 1–2 days in the past month were more likely to express desire to quit than were daily smokers (54% vs. 39%; $p < .01$). This finding that even minimal nondaily smokers are as or more interested in quitting and make comparable attempts to quit, compared with more frequent smokers, was somewhat unexpected, though not without precedent (Wellman, DiFranza, Savageau, & Dussault, 2004). This pattern of associations could have been a consequence of low-rate smokers smoking infrequently as a means toward quitting (i.e., gradual cessation). However, among adolescents who smoked 1–2 days within the

Table 3. Attitudes toward smoking by lifetime smoking^a

Lifetime smoking history

	None (<i>n</i> = 5,565)	Minimal 1–5 cigarettes (<i>n</i> = 743)	Moderate 6–99 cigarettes (<i>n</i> = 752)	High 100+ cigarettes (<i>n</i> = 557)
Do you think people can get addicted to tobacco just like they can get addicted to using cocaine or heroin?				
Percent definitely/probably yes	90	88	82	81
OR (95% CI) (<i>p</i> value)	1.0	0.8 (0.6–1.0) (.009)	0.4 (0.3–0.6) (<.001)	0.4 (0.3–0.5) (<.001)
		1.0	0.5 (0.4–0.7) (<.001)	0.6 (0.3–0.7) (<.001)
Young smokers have more friends				
Percent definitely/probably yes	24	35	38	40
OR (95% CI) (<i>p</i> value)	1.0	1.6 (1.3–1.9) (<.001)	2.2 (1.8–2.7) (<.001)	2.9 (2.3–3.6) (<.001)
		1.0	1.4 (1.1–1.8) (.02)	1.8 (1.3–2.4) (<.001)
Smoking cigarettes makes young people look cool				
Percent definitely/probably yes	13	24	28	24
OR (95% CI) (<i>p</i> value)	1.0	2.1 (1.7–2.6) (<.001)	3.1 (2.4–3.8) (<.001)	2.6 (2.0–3.4) (<.001)
		1.0	1.5 (1.1–2.0) (.006)	1.3 (0.9–1.7) (.2)
1–5 cigarettes/day harmful to young people				
Percent definitely/probably yes	90	87	84	78
OR (95% CI) (<i>p</i> value)	1.0	0.8 (0.6–1.1) (.11)	0.5 (0.4–0.7) (.000)	0.3 (0.2–0.4) (<.001)
		1.0	0.6 (0.4–0.9) (.01)	0.4 (0.2–0.5) (<.001)
Safe to smoke for a year or 2 and then quit				
Percent definitely/probably yes	11	20	26	32
OR (95% CI) (<i>p</i> value)	1.0	2.0 (1.6–2.6) (<.001)	3.2 (2.5–4.0) (<.001)	4.3 (3.3–5.6) (<.001)
		1.0	1.5 (1.2–2.1) (.003)	2.1 (1.5–2.9) (<.001)
Do you think you will be smoking 5 years from now? ^b				
Percent definitely/probably yes	6	22	38	59
OR (95% CI) (<i>p</i> value)	1.0	4.9 (3.6–6.6) (<.001)	13.3 (10–18) (<.001)	39.4 (28–59) (<.001)
		1.0	2.7 (2.0–3.8) (<.001)	6.6 (5.6–12) (<.001)

Note. ^aOdds ratios (ORs, not percentages) are adjusted for age, race, gender, living with smoker, and school cohort.

^bAsked only of 2005 and 2006 respondents (*n* per group: none, 3,766; 1–5 cigarettes, 506; 6–99 cigarettes, 513; and 100+ cigarettes, 383). Readers interested in other pairwise comparisons may contact the first author.

past month, 89% had smoked fewer than 100 cigarettes in their lifetime and 76% had smoked no more than 25 cigarettes total. Comparable numbers for those adolescents who smoked 3–9

days within the past month were 73% and 52%. Thus, these do not appear to be adolescents who were once heavier smokers and are now smoking infrequently in an effort to quit. Confidence in quitting varied significantly across past-month smoking groups, with confidence greatest among those adolescents who smoked 1–2 days (90%), followed in descending order for those smoking 3–9 (87%), 10–29 (71%), and all 30 days (58%).

Figure 1. Latent class analysis of attitudes toward smoking.

Discussion

The present study examined attitudes toward smoking and quit behaviors within a large, statewide sample of high school and middle school students, with a primary focus on adolescents who reported varying levels of current tobacco use. Our data support three general conclusions: (a) minimal levels of cigarette use, even infrequent use of 1–2 days per month, are associated with favorable views of smoking; (b) adolescents with minimal levels of cigarette use resemble chronic smokers in several key ways; and (c) adolescent low-rate smokers, despite a limited smoking history, have both motivation and experience in quitting. Adolescent low-rate smokers appear to be a unique population between those who do not smoke and those who use more regularly. They also appear to be interested in and perhaps receptive toward cessation efforts.

Our results support the notion of a steep gradient in the onset of favorable views of tobacco. Across a number of attitudinal

Table 4. Latent classes of attitudes toward smoking by smoking behavior

According to past-month smoking rate

	None (%)	1–2 days (%)	3–9 days (%)	10–29 days (%)	Daily (%)
Class I	76	58	49	58	50
Class II	14	27	38	29	35
Class III	10	15	14	13	14

According to lifetime smoking exposure

	Number of cigarettes			
	None (%)	1–5 (%)	6–99 (%)	100+ (%)
Class I	75	65	60	58
Class II	14	24	29	28
Class III	11	11	11	14

variables, minimal nondaily smokers (i.e., those smoking 1–2 days per month) are markedly different from nonsmokers and comparable in many ways to heavier smokers. Early occasional smoking is a strong predictor of subsequent chronic smoking (Patton et al., 1998), and our finding that minimal nondaily smoking is associated with favorable views of tobacco suggests that favorable opinions could be a contributing factor on the pathway toward tobacco dependence.

Our study made distinctions between minimal, moderate, and high nondaily smokers that seem reasonable but have not been used consistently in previous research. These groups have yet to be defined precisely in a way that has been adopted widely. In studies of adults, smokers are defined as having smoked at least 100 cigarettes over the lifetime and currently smoking (USDHHS, 2007). Applying this definition to adolescents would fail to capture many who have smoked in the past month, by missing either those who have smoked fewer than 100 cigarettes or those who are smoking infrequently and do not consider themselves “current smokers.” Indeed, many nondaily adolescent and young adult smokers do not consider themselves to be smokers at all (Levinson et al., 2007; Thompson et al., 2007). On the other hand, simply classifying a smoker as having smoked one or more cigarettes in the past month would be too crude and would miss the finer distinctions within this group. Research on adolescent smoking will benefit from a more specific conceptualization

of smoking behavior at these earlier stages of use. We recommend that future research avoids use of ambiguous labels such as “light” or “regular” smokers, particularly among adolescents, as these terms lack inherent or objective meaning.

Adolescents who hold favorable attitudes toward smoking are at risk for progression to heavier use (Piko, 2001; Piko, Bak, & Gibbons, 2007). Attitudes may be particularly important during earlier developmental periods (i.e., adolescence), when smoking behaviors are acquired (Andrews & Duncan, 1998). Thus, the relatively favorable views of smoking seen within adolescents with a minimal history of smoking are cause for concern. This concern is accentuated further by our finding that minimal nondaily adolescent smokers were 10 times more likely than nonsmokers to predict that they would be smokers in 5 years. Similarly, adolescents who had smoked five or fewer cigarettes in their lifetime were five times more likely than never-smokers to make the same prediction.

A review estimated that 55%–65% of adolescents who smoke regularly want to quit smoking (Kassel, 2000). Within our study population, interest in quitting was lower (41% among daily smokers). Whether this finding represents a downward trend in motivation to quit or a difference between the study populations is unclear. Over half (55%) of adolescents who had smoked only 1–2 days in the past month wanted to quit, more than in all other smoking groups. The incidence of quit attempts in the past year was comparable across all groups, ranging from 46% to 52%. Adolescent smokers, including those who smoke infrequently, are a receptive audience for cessation programs. This observation has been made among adult nondaily smokers (Wortley, Husten, Trosclair, Chrismon, & Pederson, 2003). Unfortunately, many adolescent smokers, including intermittent and low-rate smokers, are prone to using unsubstantiated methods to assist in quitting (e.g., trying to quit on their own; Leatherdale & McDonald, 2005).

Effective cessation programs for adolescent smokers are available. Proven treatments are those that include a combination of social influence, motivational enhancement, and cognitive behavioral components (Sussman, Sun, & Dent, 2006). The relative merits of these approaches among adolescents who smoke infrequently are uncertain. Adolescent cessation programs may need to be tailored to varying degrees of dependence (Backinger, Fagan, Matthews, & Grana, 2003). At a minimum, cessation programs should be proactive to identify and include any and all adolescent smokers, not just those who smoke daily. The challenges of recruitment and retention of adolescents into cessation programs will continue to need further focus (cf. Kealey et al., 2007).

Figure 2. Motivation to quit and quit attempts among past-30-day smokers.

Limitations

These data should be interpreted with caution. The SC YTS is cross-sectional, and we can infer no causal relationships between attitudes toward smoking and smoking behavior, though both epidemiological (Johnston et al., 2006) and clinical evidence (Wetter et al., 2004) suggests that favorable attitudes toward smoking often precede smoking behavior. Further, our data are based solely on adolescents who attended South Carolina public schools and do not include students who dropped out of school or those in correctional facilities or treatment centers. Students who frequently miss school, and who have a

greater likelihood of smoking, may be underrepresented. Also, due to the sampling strategy, there is a slight chance that the same student was surveyed twice in successive years. Due to the confidential and anonymous nature of survey sampling, it is impossible to determine how often this occurred, but it is likely to have been so rare as to be inconsequential. Smoking status was based entirely on self-report. To the extent that smoking status was misclassified, it would likely bias the associations toward the null. For example, if those who truly smoked reported that they were never-smokers, this would make the never-smoker category appear more similar to the smokers across the independent variables studied. The confidential and anonymous nature of the survey would be expected to minimize misclassification of smoking status. Finally, the YTS was not designed to assess attitudes toward smoking in full; there are likely other attitudes that influence smoking behavior (e.g., risk perception, affective and social expectancies; USDHHS, 1994).

Conclusion

Among adolescent smokers, even minimal experience with smoking is associated with pro-smoking attitudes. Despite these favorable views, these same adolescents are interested in cessation and are actively trying to quit. Tobacco control efforts should attend to low-rate smokers, given their significant risk for chronic use, and capitalize on their motivation to quit with focused prevention strategies that arrest the progression from nondaily to daily smoking.

Funding

Support for this project was provided in part by a Career Development Award from the National Institute on Drug Abuse (K23DA020482). Funding from the SC YTS came from the Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, Office on Smoking and Health.

Declaration of Interests

None declared.

Acknowledgments

The authors thank Amy Herrin for assistance with data analyses.

References

- Andrews, J., & Duncan, S. (1998). The effect of attitude on the development of adolescent cigarette use. *Journal of Substance Abuse, 10*, 1–7.
- Backinger, C., Fagan, P., Matthews, E., & Grana, R. (2003). Adolescent and young adult tobacco prevention and cessation: Current status and future directions. *Tobacco Control, 12*(Suppl. 4), iv46–iv53.
- Breslau, N., Fenn, N., & Peterson, E. (1993). Early smoking initiation and nicotine dependence in a cohort of young adults. *Drug and Alcohol Dependence, 33*, 129–137.
- Chassin, L., Presson, C., Rose, J., & Sherman, S. (1996). The natural history of cigarette smoking from adolescence to adulthood: Demographic predictors of continuity and change. *Health Psychology, 15*, 478–484.
- Chassin, L., Presson, C., Rose, J., & Sherman, S. (2001). From adolescence to adulthood: Age-related changes in beliefs about cigarette smoking in a midwestern community sample. *Health Psychology, 20*, 377–386.
- Chassin, L., Presson, C., Sherman, S., & Kim, K. (2003). Historical changes in cigarette smoking and smoking-related beliefs after 2 decades in a midwestern community. *Health Psychology, 22*, 347–353.
- Colby, S., Tiffany, S., Shiffman, S., & Niaura, R. (2000). Are adolescent smokers dependent on nicotine? A review of the evidence. *Drug and Alcohol Dependence, 59*(Suppl. 1), S83–S95.
- DiFranza, J., Rigotti, N., McNeil, A., Ockene, J., Savageau, J., St. Cyr, D., et al. (2000). Initial symptoms of nicotine dependence in adolescents. *Tobacco Control, 9*, 313–319.
- DiFranza, J., Savageau, J., Fletcher, K., Ockene, J., Rigotti, N., McNeil, A., et al. (2002). Measuring the loss of autonomy over nicotine use in adolescents: The DANDY (Development and Assessment of Nicotine Dependence in Youths) study. *Archives of Pediatric and Adolescent Medicine, 156*, 397–403.
- DiFranza, J., Savageau, J., Fletcher, K., O'Loughlin, J., Pbert, L., Ockene, J., et al. (2007). Symptoms of tobacco dependence after brief intermittent use: The development and assessment of nicotine dependence in youth–2 study. *Archives of Pediatric and Adolescent Medicine, 161*, 704–710.
- DiFranza, J., Savageau, J., Fletcher, K., Pbert, L., O'Loughlin, J., McNeill, A., et al. (2007). Susceptibility to nicotine dependence: The development and assessment of nicotine dependence in youth 2 study. *Pediatrics, 120*, e974–e983.
- Eissenberg, T., & Balster, R. (2000). Initial tobacco use episodes in children and adolescents: Current knowledge, future directions. *Drug and Alcohol Dependence, 59*(Suppl. 1), S41–S60.
- Hill, A., Boudreau, F., Amyot, E., Dery, D., & Godin, G. (1997). Predicting the stages of smoking acquisition according to the Theory of Planned Behavior. *Journal of Adolescent Health, 21*, 107–115.
- Holmen, T., Barrett-Connor, E., Holmen, J., & Bjørner, L. (2000). Adolescent occasional smokers, a target group for smoking cessation? The Nord-Trøndelag Study, Norway, 1995–1997. *Preventive Medicine, 31*, 682–690.
- Johnston, L., O'Malley, P., Bachman, J., & Schulenberg, J. (2006). *Monitoring the future national results on adolescent drug use: Overview of key findings, 2005*. Bethesda, MD: National Institute on Drug Abuse.
- Kandel, D., Hu, M.-C., Griesler, P., & Schaffran, C. (2007). On the development of nicotine dependence in adolescence. *Drug and Alcohol Dependence, 91*, 26–39.
- Kassel, J. (2000). Are adolescent smokers addicted to nicotine? The suitability of the nicotine dependence construct as applied to adolescents. *Journal of Child and Adolescent Substance Abuse, 9*, 27–49.

- Kealey, K., Ludman, E., Mann, S., Marek, P., Phares, M., Riggs, K., et al. (2007). Overcoming barriers to recruitment and retention in adolescent smoking cessation. *Nicotine & Tobacco Research*, 9, 257–270.
- Leatherdale, S., & McDonald, P. (2005). What smoking cessation approaches will young smokers use? *Addictive Behaviors*, 30, 1614–1618.
- Levinson, A., Campo, S., Gascoigne, J., Jolly, O., Zakharyan, A., & Tran, Z. (2007). Smoking, but not smokers: Identity among college students who smoke cigarettes. *Nicotine & Tobacco Research*, 9, 845–852.
- Lewinsohn, P., Brown, R., Seeley, J., & Ramsey, S. (2000). Psychosocial correlates of cigarette smoking abstinence, experimentation, persistence, and frequency during adolescence. *Nicotine & Tobacco Research*, 2, 121–131.
- Mayhew, K., Flay, B., & Mott, J. (2000). Stages in the development of adolescent smoking. *Drug and Alcohol Dependence*, 59(Suppl. 1), S61–S81.
- Okusz, E., Mutlu, E., & Malhan, S. (2007). Characteristics of daily and occasional smoking among youths. *Public Health*, 121, 349–356.
- Okuyemi, K., Harris, K., Scheibmeir, M., Choi, W., Powell, J., & Ahluwalia, J. (2002). Light smokers: Issues and recommendations. *Nicotine & Tobacco Research*, 4, S103–S112.
- Patton, G., Carlin, J., Coffey, C., Wolfe, R., Hibbert, M., & Bowes, G. (1998). The course of early smoking: A population-based cohort study over three years. *Addiction*, 93, 1251–1260.
- Piko, B. (2001). Smoking in adolescence: Do attitudes matter? *Addictive Behaviors*, 26, 201–217.
- Piko, B., Bak, J., & Gibbons, F. (2007). Prototype perception and smoking: Are negative or positive social images more important in adolescence? *Addictive Behaviors*, 32, 1728–1732.
- Robinson, L., Klesges, R., Zbikowski, S., & Glaser, R. (1997). Predictors of risk for different stages of adolescent smoking in a biracial sample. *Journal of Consulting and Clinical Psychology*, 65, 653–662.
- Scheffels, J., & Lund, K. (2005). Occasional smoking in adolescence: Constructing an identity of control. *Journal of Youth Studies*, 8, 445–460.
- Shadel, W., Shiffman, S., Niaura, R., Nichter, M., & Abrams, D. (2000). Current models of nicotine dependence: What is known and what is needed to advance understanding of tobacco etiology among youth. *Drug and Alcohol Dependence*, 59, S9–S22.
- Shiffman, S. (1989). Tobacco “chippers” - Individual differences in tobacco dependence. *Psychopharmacology*, 97, 539–547.
- Shiffman, S., & Paty, J. (2006). Smoking patterns and dependence: Contrasting chippers and heavy smokers. *Journal of Abnormal Psychology*, 115, 509–523.
- Sussman, S., Sun, P., & Dent, C. (2006). A meta-analysis of teen cigarette smoking cessation. *Health Psychology*, 25, 549–557.
- Thompson, B., Coronado, G., Chen, L., Thompson, L., Halperin, A., Jaffe, R., et al. (2007). Prevalence and characteristics of smokers at 30 Pacific Northwest colleges and universities. *Nicotine & Tobacco Research*, 9, 429–438.
- U.S. Department of Health and Human Services. (1994). *Preventing tobacco use among young people. A report of the surgeon general*. Washington, DC: US Govt. Printing Office.
- U.S. Department of Health and Human Services. (2007). Cigarette smoking among adults—United States, 2006. *MMWR Morbidity and Mortality Weekly Report*, 56, 1157–1161.
- Virgili, M., Owen, N., & Severson, H. (1991). Adolescents’ smoking behavior and risk perceptions. *Journal of Substance Abuse*, 3, 315–324.
- Wang, M., Fitzhugh, E., Eddy, J., & Westerfield, R. (1996). Attitudes and beliefs of adolescent experimental smokers: A smoking prevention perspective. *Journal of Alcohol and Drug Education*, 41, 1–12.
- Wellman, R., DiFranza, J., Savageau, J., & Dussault, G. (2004). Short term patterns of early smoking acquisition. *Tobacco Control*, 13, 251–257.
- Wetter, D., Kenford, S., Welsch, S., Smith, S., Fouladi, R., Fiore, M., et al. (2004). Prevalence and predictors of transitions in smoking behavior among college students. *Health Psychology*, 23, 168–177.
- Wortley, P., Husten, C., Trosclair, A., Chrismon, J., & Pederson, L. (2003). Nondaily smokers: A descriptive analysis. *Nicotine & Tobacco Research*, 5, 755–759.