Published in final edited form as:

J Subst Abuse Treat. 2009 July ; 37(1): 17–24. doi:10.1016/j.jsat.2008.09.006.

Adolescent Tobacco Use and Substance Abuse Treatment Outcomes

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Abstract

This study investigated the relationship between cigarette smoking status and 12-month alcohol and marijuana treatment outcomes in a sample of 1779 adolescents from the Drug Abuse Treatment Outcomes Study for Adolescence (DATOS-A). Participants were classified into 4 groups based on change in cigarette smoking status from intake to the 12-month follow-up: Persistent Smokers, Non-Smokers, Quitters, and Smoking Initiators. Logistic regression was used to predict likelihood of relapse to alcohol, marijuana, and other drugs after controlling for intake levels and demographic/treatment characteristics. Results found Persistent Smokers and Smoking Initiators to have significantly greater odds of alcohol and marijuana relapse compared to Quitters. Furthermore, Persistent Smokers, and Smoking Initiators were also found to have distinctively shorter periods of time to marijuana relapse at follow-up. Implications for the implementation of tobacco cessation treatment in the context of substance abuse treatment for adolescents are discussed.

Keywords

Adolescent; Tobacco Use; Substance Use; Substance Abuse Treatment; DATOS-A

1. Introduction

Tobacco use among adolescent substance abusers is a common and concerning public health problem (Myers & Kelly, 2006). Rates of cigarette smoking among adolescent substance abusers have been found to be up to four times that of the general population (Udaphaya, Deas, Brady, & Kruesi, 2002; Myers & Kelly, 2006). Further, substance abusing adolescents have a greater likelihood of continued tobacco use into adulthood (Orlando, et. al., 2005). Adolescent substance users who smoke are also known to suffer from significant health problems associated with cigarette smoking - such as respiratory illnesses (Myers & Kelly,

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2006). Given these associations, the necessity of tobacco cessation efforts in the context of substance abuse treatment has gained attention (Myers & Kelly, 2006). However, such efforts have been met with resistance due to the traditionally held belief that tobacco cessation efforts and cigarette bans may undermine substance abuse treatment and decrease participation among cigarette smokers (Kurst-Swanger, 2003; Bobo & Gilchrist, 1983).

There is growing evidence for the acceptability of tobacco cessation interventions in the context of substance abuse treatment (Myers & Kelly, 2006). Cigarette bans in substance abuse treatment centers do not appear to deter adolescents from seeking substance abuse treatment (Callaghan, Brewster, Johnson, Taylor, Beach, & Lentz, 2007). In a small study (n=12) of residential substance abuse treatment centers, 75% of treatment centers were found to have policies that specifically prohibited smoking on-grounds by adolescents and over 40% of the programs offered nicotine replacement or counseling specific to tobacco cessation (Chun, Guydish, & Chan, 2007). Moreover, substance abusing adolescents who smoke cigarettes often express a desire to quit cigarette smoking and have often made at least one quit attempt (Myers & MacPherson, 2004; Myers & Kelly, 2006). In a naturalistic study of smoking cessation among adolescent substance abusers, Myers & MacPherson (2004) found that 62% of adolescents smoked cigarettes and over half had made a quit attempt in the last year. In another study, adolescents involved in therapeutic community treatment (TC) were compared with substance abusing youth not involved in TC. The TC group showed greater reductions in tobacco use from baseline to 3 month follow-up. However, between the 3 and 12 month follow-up, smoking outcomes worsened among the TC group suggesting the need for tobacco cessation efforts aimed at more long-term cessation (Morral, McCaffrey, & Ridgeway, 2004).

Efforts have also been made to test the efficacy of tobacco cessation in adolescent substance abuse treatment and to investigate the effect of quitting cigarette smoking on substance abuse outcomes (Myers & Brown, 2005; Myers, Brown, & Kelly, 2000; Myers, Doran, & Brown, 2007). Myers and Brown (2005) report initial evidence for the feasibility of including tobacco cessation treatment. In this study, tobacco cessation treatment among substance abusing adolescents was associated with a greater number of tobacco quit attempts and higher rates of tobacco abstinence at 3 month follow-up.

In terms of the relationship between tobacco and other substance use, the use of one substance is known to precipitate physiological and behavioral cues for the use of other substances (Niaura, et al., 1988; Sees & Clark, 1993). As such, the impact of quitting or persistent cigarette smoking on substance abuse treatment outcomes has gained attention in the adult literature (Gulliver, Kamholtz, & Helstrom, 2006; Kodl, Fu, & Joseph, 2006; Lemon, Friedman, & Stein, 2003; Friend & Pagano, 2005; Satre, Kohn, & Weisner, 2007). Findings from adult studies have concluded that tobacco cessation in the context of treatment for other drug use does not impede substance use outcomes and, may well, improve long-term outcomes (Gulliver, Kamholz, & Helstrom, 2006; Prochaska, Delucchi, & Hall, 2004). Still, the literature investigating the impact of cigarette smoking status and cessation on adolescent substance abuse treatment outcomes remains scarce. In fact, only two identified studies examined the relationship between cigarette smoking and alcohol use over a 4-year (Myers & Brown, 1997) and 8-year period after substance abuse treatment (Myers, Doran, & Brown, 2007). In the earlier study, Myers and Brown (1997) investigated the role of smoking cessation on alcohol and drug use outcomes and found that those who quit cigarette smoking had less use than those who continued smoking. In the 8-year follow-up study, frequent drinkers were found to have the most persistent smoking patterns. Although this finding highlights the “correspondence” of smoking and alcohol use following adolescent treatment for substance abuse, this study does not specifically address the question of whether smoking status or change in smoking status predicts treatment outcomes. While Myers and colleagues have made significant contributions in investigating the role of smoking in the context of adolescent substance abuse treatment,

more studies are needed to determine if their results generalize to larger samples of adolescents involved in substance abuse treatment. Furthermore, existing studies with treatment seeking adolescent substance abusers have focused on the impact of quitting tobacco or comparing cigarette smokers versus non-smokers. This approach does not consider the full spectrum of tobacco use change which may include smoking initiation, quitting, continuous smoking, and non-smokers.

The utilization of national datasets such as the Drug Abuse Treatment Outcomes Study – Adolescents (DATOS-A) offers an opportunity to investigate these research questions in a large sample of adolescents receiving substance use treatment across a variety of community based treatment centers. (Kristiansen & Hubbard, 2001). As such, the current study examined the relationship between change in cigarette smoking status and alcohol and drug use relapse during a 12-month follow-up period in a large national sample of adolescents involved in the DATOS-A study. Based on findings from the adult literature (Gulliver, Kamholz, & Helstrom, 2006; Prochaska, Delucchi, & Hall, 2004) that have shown tobacco cessation to be associated with greater substance abuse treatment outcomes, we hypothesized that adolescents who quit smoking will have more favorable treatment outcomes than those continuing to smoke. Considering the physiological and behavioral cues that contribute to greater substance use, (Niaura, et al., 1988; Sees & Clark, 1993) we also hypothesize that non-smokers will have more favorable substance abuse treatment outcomes as compared to those continuing to smoke and those initiating smoking during treatment.

2. Materials and Methods

2.1. DATOS-A

This study was a secondary analysis of data from the National Institute on Drug Abuse's Drug Abuse Treatment Outcome Study for Adolescence (DATOS-A), a national, multi-site, longitudinal study of substance abusing adolescents seeking treatment (Kristiansen & Hubbard, 2001). This prospective, community-based study was conducted during the years 1993 through 1995 in six major U.S. cities (Chicago, IL; Minneapolis, MN; Miami, FL; New York, NY; Pittsburgh, PA; Portland, ME) and involved a total of 3,382 participants ranging in ages from 13 to 18. The sample was drawn from 37 substance abuse treatment programs. The types of treatment interventions offered at each program varied and were not standardized. However, all of the treatment programs were classified into one of the following modalities: 1) short-term inpatient (28%), 2) long-term inpatient (48%), and 3) outpatient drug-free (24%), (Kristiansen & Hubbard, 2001). Informed assent was obtained from all participants. Informed consent was obtained from at least one custodial parent or legal guardian and from participants over the age of 18. All study assessments were completed face-to-face by trained interviewers at the treatment site. Interviewers were not part of the treatment intervention. For each of these assessments participants received 10 dollars compensation (Kristiansen & Hubbard, 2001).

2.2. Participants

Of the 3,382 participants in the DATOS-A study, 1,785 participants completed the 12-month follow-up interview (Kristiansen & Hubbard, 2001). The current study used data from the intake and 12-month follow-up assessments. Therefore, participants who did not complete the follow-up assessment were excluded from this study. Galief and colleagues (2001) and Grella and colleagues (2001) provide a detailed description of intake differences between participants attending follow-up and those not attending. To summarize, participants attending follow-up (vs. not attending follow-up) were not found to differ in age, enrollment in school, severity of substance use, and in the presence of conduct disorder and ADHD at intake. A greater proportion of White (European) participants and females attended the follow-up, while African

Americans and Hispanics returned for follow-up at a significantly lower rate (Galief et al., 2001 & Grella et al., 2001).

The final sample in the current study ($n = 1779$) was composed of 1249 (70.2%) males and 530 (29.8%) females. The mean age was 15.72 ($SD=1.31$), the ethnic composition was as follows: European Americans 57% ($n=1018$), African American 21% ($n=370$), Hispanic 17% ($n=307$), and 5% “Other.” Sixty-six percent of the sample was enrolled in school at treatment intake. Sample characteristics are further summarized in Table 1.

2.3. Measures

DATOS-A Structured Interview (DSI)—The DATOS-A study adapted structured interview items from the National Health Interview Survey and the National Institute of Mental Health’s Epidemiological Catchment Area studies resulting in a DATOS-A specific structured interview (DSI). Questions from this interview covered a wide range of domains including substance use and demographic characteristics. The majority of the substance use reported in the DATOS-A study involved alcohol and marijuana. There was a low frequency of other drug use reported at intake and follow-up. Therefore, intake levels of cocaine, hallucinogen, amphetamine, inhalants, opioids (including heroin), and sedatives use were collapsed into one variable - “other drug” use.

At intake, participants were asked about the degree of alcohol, marijuana, and other drug use during the year prior to treatment using nine response options: 0) no use; 1) less than one day a month; 2) 1 to 3 days a month; 3) 1 to 2 days a week; 4) 3 to 4 days a week; 5) 5 to 6 days a week; 6) daily or almost every day; 7) 2–3 times a day; 8) 4 or more times a day. These intake levels of past year drug use were used as covariates in subsequent analyses. Twelve-months after intake, participants were dichotomously (yes/no) asked about the use of various substances. These substance abstinence variables served as the dependent variables in the models tested. In addition, participants who were not abstinent were asked about the amount of time (in weeks) after treatment before relapse to each substance. Lastly, the DSI asked participants at intake and 12-month follow-up about their current use of tobacco – “*Do you currently smoke cigarettes?*” Responses (yes or no) to this item at intake and follow-up were used to derive the four cigarette smoking status groups.

2.4. Data Analyses

Participants in this study were divided into the following cigarette smoking status groups: 1) Persistent Smokers - those who entered treatment as cigarette smokers and also reported current smoking at the 12-month follow-up (70%, $n = 1240$); 2) Non-smokers – denied “current smoking” status at baseline and follow-up (9%, $n = 164$); 3) Quitters – entered treatment endorsing current tobacco use but at follow-up reported no current use of tobacco (11%, $n = 196$); 4) Smoking Initiators – entered treatment reporting no current use of tobacco but at the 12 month follow-up reported being a current smoker (10%, $n = 179$). Groups were then compared on demographic and substance use characteristics at intake and follow-up using ANOVA and Chi-square tests.

In order to test whether cigarette smoking status was a significant predictor of substance abuse treatment outcomes, a series of 3 multiple logistic regressions were conducted. The three dependent variables used in the logistic models were: 1) abstinence from alcohol use at follow-up; 2) abstinence from marijuana use at follow-up; 3) abstinence from “other drug” use at follow-up. The four cigarette smoking status groups were used as the predictor variables in the logistic regression analyses. Level of alcohol, marijuana, and “other drug” use at intake were controlled and entered into each corresponding logistic model. Based on the findings of Lemon, Friedman, & Stein, (2003), the Quitter group was expected to have the most favorable substance

abuse treatment outcome, therefore this group was used as the reference group in the logistic regression models. Lastly, two separate Cox hazard regression analyses were conducted to evaluate the time to 1) alcohol and 2) marijuana use at follow-up (data for the weeks to “other drugs” relapse was unavailable). The number of weeks to alcohol and marijuana were used as the time variables and the dichotomous alcohol and marijuana relapse variables served as the censoring variables in the models. The cigarette smoking status group variable was the predictor of interest; the Quitter group was once again used as the reference group. Treatment modality, race/ethnicity, and intake levels of alcohol and marijuana use were entered as covariates. All analyses were conducted using SPSS Version 16.0 (SPSS Inc, 2007).

3. Results

3.1. Baseline Characteristics by cigarette smoking status group

We compared the four cigarette smoking status groups on their baseline demographic and substance use characteristics (See Table 1). There were no significant differences in the proportions of males and females in each of the smoking status groups. Similarly, there were no significant group differences in age. The mean age of each group was comparable to the overall sample mean age of 15.72 (SD = 1.31). Cigarette smoking status groups did not differ in their grade level or school status (in school or not) at intake. The mean grade level was 9.71 (SD = 1.30) and 66% of the sample reported being in school.

The cigarette smoking status groups were found to significantly differ with respect to racial/ethnic composition ($\chi^2 = 36.09, p < .001$). There was a lower proportion of Whites in the Non-Smoker (41.5%) and Quitter (51%) groups as compared to the Persistent Smoker (60%) and Smoking Initiator (60%) groups. Consequently, there was a moderate degree of disproportionate representation of African Americans, Hispanics, and “Other” among the 4 cigarette smoking status groups (See Table 1). Moreover, a significant difference was found between the smoking status groups in the proportions enrolled in each of the three treatment modalities ($\chi^2 = 32.85, p < .001$). Participants in the Quitter and Smoking Initiators groups were more highly represented in the residential treatment modality (47.4%, and 52%, respectively) as compared to the proportions found in the Persistent Smokers (38.7%) and Non-Smoker (36%) groups.

There were no group differences in baseline levels of alcohol use among cigarette smoking status groups. However, a significant difference was found in baseline level of marijuana use [$F(3, 1641) = 3.86, p = .009$] between the Persistent Smokers ($\bar{x} = 5.51$), and the Non-Smokers ($\bar{x} = 4.93$). Similarly, the Smoking Initiator group was found to significantly differ in the level of “other drug” use as compared to the Non-Smoker and Quitter groups [Smoking Initiators $\bar{x} = 4.06$, Non-Smokers $\bar{x} = 2.88$, Quitters $\bar{x} = 3.12$; $F(3, 824) = 4.07, p = .007$]. Baseline characteristics by smoking status group are also summarized in Table 1. All subsequent analyses controlled for baseline levels of substance use, treatment modality, and race/ethnicity.

3.2. Substance use relapse by cigarette smoking status group

Overall, 68.2% of the total sample reported relapse to alcohol, 66.7% reported relapse to marijuana, and 33.1% to “Other Drugs” (see Table 2). The smoking status groups were found to significantly differ in their rates of relapsed to alcohol ($\chi^2 = 24.19, p < .001$), marijuana ($\chi^2 = 31.53, p < .001$), other drugs ($\chi^2 = 29.11, p < .001$). As noted in Table 2, Smoking Initiators and Persistent Smokers showed the greatest rates of relapse to all three substances categories as compared to the Quitter and Non-smoker groups.

The first logistic regression model identified significant group differences in the odds of alcohol use at follow-up ($\chi^2 = 95.39, p < .001$) after controlling for race/ethnicity, treatment modality,

and intake levels of use (see Table 3). Persistent Smokers (OR = 1.49, 95% CI = 1.07 – 2.11, $p = .02$) and Smoking Initiators (OR = 2.19, 95% CI = 1.34 – 3.58, $p = .002$) were significantly more likely to relapse to alcohol as compared to Quitters. Similarly, in the final model predicting marijuana use at follow-up (see Table 4), the Persistent Smokers (OR = 1.71, 95% CI = 1.24 – 2.37, $p = .001$) and Smoking Initiators (OR = 3.08, 95% CI = 1.88 – 5.04, $p < .001$) were significantly more likely to relapse to marijuana as compared to Quitters ($\chi^2 = 65.87$, $p < .001$). Lastly, in the final model predicting relapse to “other drugs” at follow-up (see Table 5), Smoking Initiators (OR = 2.42, 95% CI = 1.29 – 4.52, $p < .006$) were significantly more likely to relapse to “other drugs” as compared to the Quitter reference group ($\chi^2 = 33.02$, $p < .001$). Additionally, a near significant odds ratio was found for the Persistent Smokers (OR = 1.46, 95% CI = .941 – 2.25, $p = .092$). In summary, Persistent Smokers and Smoking Initiators were found to be at greater risk for relapse to alcohol, marijuana, and “other drugs” as compared to the Quitter and Non-Smoking groups.

3.3. Cigarette smoking status group and number of weeks to relapse

We evaluated the number of weeks to alcohol and marijuana relapse at follow-up using Cox hazard regression analyses. In the alcohol relapse analyses, the hazard ratio associated with the Non-Smoker group was significant; indicating a longer period of time to alcohol relapse (median number of weeks = 8.29, HR = .71, 95% CI = .532 – .946, $p = .019$) as compared to the Quitter reference group (median wks. = 4.30). In the marijuana relapse analysis, Non-smokers were also found to have a significantly longer period of time to marijuana relapse (median number of weeks = 6.57, HR = .68, 95% CI = .508 – .925, $p = .014$) as compared to Quitter reference group (median wks. = 2.87).

4. Discussion

A limited number of studies have examined the relationship between cigarette smoking status and adolescent substance abuse treatment outcomes (Myers & Brown, 1997; Myers & Brown, 2005; Myers, Doran, & Brown, 2007). The current study examined the relationship between cigarette smoking status and substance abuse treatment outcomes in the hopes of better understanding the potential impact of smoking cessation on substance use treatment outcomes. We found that adolescents who initiated tobacco use during the 12-month period of treatment/follow-up had the greatest odds of relapse to alcohol, marijuana, and “other drugs.” Moreover, adolescents who entered treatment as smokers and continued to smoke were at greater risk for relapse to alcohol and marijuana. In comparison, both non-smokers and those who quit had a decreased likelihood of relapse to alcohol and marijuana. Taken together, these findings suggest that cigarette smoking – either continued smoking or initiation during or after treatment is associated with an increased risk for relapse.

Results are consistent with the adult literature that has found an association between the use and cessation of tobacco and substance abuse treatment outcomes (Gulliver, Kamholtz, & Helstrom, 2006; Prochaska, Delucchi, & Hall, 2004). Further, results are also consistent with Myers & Brown’s (1997) study that found quitting smoking to be associated with improved substance abuse treatment outcomes among adolescents. As noted previously, it is likely that the use of one substance precipitates physiological and behavioral cues for the use of other substances (Niaura, et al., 1988; Sees & Clark, 1993). Nonetheless, the current study is unique in its ability to specifically compare the odds of relapse in four distinct cigarette smoking status groups over a 12-month follow-up period.

Given the widely held notion that smoking cessation may undermine substance abuse treatment and decreases participation among smokers (Kodl, Fu & Joseph, 2006; Kurst-Swanger, 2003; Bobo & Gilchrist, 1983), these current findings have implications for adolescent substance abuse treatment centers incorporating smoking bans or smoking cessation

interventions into their programs. In our study, quitting smoking was found to be associated with more favorable treatment outcomes as compared to continued smoking or smoking initiation. These results add to growing evidence supporting the effectiveness and feasibility of addressing cigarette smoking cessation during substance abuse treatment (Myers & Brown, 1997; Myers & Brown, 2005; Myers, Doran, & Brown, 2007). Tobacco cessation may enhance substance abuse treatment outcomes as well as resolve the legal and health concerns associated with allowing youth to smoke cigarettes during treatment.

Among adolescents that relapsed during the follow-up period, Non-Smokers were found to have a significantly greater number of weeks to alcohol and marijuana relapse. These findings support the notion that the use of tobacco may advance the use of other substances through physiological and behavioral cue related mechanisms (Niaura, et al., 1988; Sees & Clark, 1993). One can speculate that among Non-Smokers, the lack of such behavioral and physiological cues contributed to a more extending period of abstinence. Beyond the behavioral and physiological cues, peer affiliations may also play a critical role in relapse to substances. As noted by Kobus' (2003) review of the literature, it is well known that adolescent smokers affiliate with other tobacco smoking youth. Given the high rate of concordance between tobacco and other substance use (Udaphyaya, Deas, Brady, & Kruesi, 2002; Myers & Kelly, 2006), affiliation with tobacco using peers may also lead to a greater likelihood of substance relapse and shorter periods of abstinence.

Notably, there were racial/ethnic group differences in cigarette smoking status group representation. White adolescents were found to have the highest representation in the Persistent Smoker and Smoking Initiator groups (see Table 1). As noted previously, these status groups were found to have the poorest substance abuse treatment outcomes. Furthermore, African-Americans were highly represented in the non-smoker group. These ethnic group differences are consistent with findings from the Monitoring the Future Study which has found African Americans to have the lowest levels of tobacco use and Whites to have the highest levels of tobacco use (Johnston, O'Malley, Bachman, & Schulenberg, 2007). Considering our findings related to the differential odds of relapse by cigarette smoking status group, as well as the known behavioral and physiological precipitating effect of tobacco use, studies seeking to examine ethnic/racial group differences in substance abuse treatment outcomes may benefit from accounting for the impact of tobacco use. Rounds-Bryant and Staab (2001) examined ethnic group differences in substance abuse treatment outcomes using the DATAS-A data. Their findings failed to detect ethnic/racial group differences in post-treatment substance use. However, this study did not consider differing levels of tobacco use at intake or during follow-up which may have impacted substance abuse outcomes.

Similarly, the treatment modality differences with respect to cigarette smoking status group representation are noteworthy. In the DATOS-A study, the initiation of smoking as well as quitting occurred at a significantly greater rate among adolescents involved in long-term inpatient treatment. Again, without data relating to the timing and nature of the tobacco quit or initiation experience, these findings cannot be fully interpreted. However, one can speculate about factors that may have contributed to this modality related distinction. For one, unlike outpatient treatment settings where smoking cannot be fully monitored or banned, long-term inpatient facilities often implement and enforce smoking restrictions or bans. Hence, quitting may be more greatly supported and even required. Conversely, inpatient facilities without smoking bans or restrictions may have routine smoking breaks that offer adolescents the opportunity to socialize with peers outdoors. These strong peer group experiences may contribute to a greater likelihood of smoking initiation in such inpatient treatment centers.

4.1. Limitations & Future Directions

The high level of attrition in this study was a significant limitation and raises questions of 1) the generalizability of results and 2) whether findings from this study would differ if a greater number of participants returned for follow-up. Retaining adolescents in treatment studies has been a challenge for investigators. Future studies might employ innovative retention strategies that specifically target adolescent populations and possibly decrease high rates of study attrition. The disproportionate number of males (70%) in our sample raises the question of the generalizability of findings to female populations. Overall, adolescent males are disproportionately represented among substance abusers seeking treatment (Heflinger, Chatman, & Saunders 2006), however females are entering treatment at increasing rates and a more gender balanced sample would have been advantageous. Similarly, a greater number of ethnic/racial minorities did not return for follow-up in the DATOS-A study; which also limits generalizability of findings. Future studies can benefit from employing targeted efforts aimed at increasing study retention among ethnic/racial minorities.

The use of a dichotomous measure of relapse is also a limitation of the current study. This approach limits our ability to fully appreciate and examine the intensity and nature of the relapse experience. Future studies would benefit from employing an assessment approach that includes the use of continuous measures of post-treatment tobacco, alcohol and drug use. Furthermore, an assessment approach that attempts to capture the behavioral and psychosocial circumstances associated with substance relapse and tobacco use would advance this area and allow for an examination of potential mediators and moderators of the relationship between tobacco use and post-treatment substance use.

The use of participant reports through structured interviews is another limitation of this study. Participants may purposely falsify their responses due to the social desirability of reporting lower substance use (Williams & Nowatzki, 2005). This limitation may have led to underreporting of smoking at intake and follow-up; which in turn, may have led to a misclassification of youth based on smoking status. The addition of biological tests of tobacco and substance use is one way to compliment and increase the validity of self-report measures. In the DATOS-A study, urine drug screening was administered; however, there was an insufficient amount of complete and accurate data to examine the validity of participant reports of substance use (Kristiansen, & Hubbard, 2001; Galief et al., 2001; Grella et al., 2001). Furthermore, the exact wording of the smoking status variable focuses on “current smoking” which does not account for previous smoking that adolescents may no longer consider “current”. This limitation is significant considering that the smoking status variable was used to group participants. Future studies can address this limitation by using comprehensive measures of tobacco use that capture lifetime histories of tobacco use as well as all smoking and quit experiences during the follow-up period. Such measures can then be used to develop a more sophisticated method of grouping participants beyond the “current smoking” status variables used in the current study.

As noted earlier, in the DATOS-A study, the three broad treatment modality types were not standardized. This lack of standardization limited our ability to examine the moderating role of treatment modality on the relationship between tobacco use and substance abuse treatment outcomes. This is a particularly relevant issue when one considers that inpatient substance abuse treatment facilities often enforce smoking restrictions. Future studies that can better control for treatment characteristics can potentially elucidate the moderating role of specific treatment types.

Lastly, it has been over a decade since the DATOS-A study was conducted in six major cities in the United States. This raises the question of whether or not the findings of the current study remain applicable and relevant to the increasingly evolving enterprise of substance abuse

treatment in the United States. Still, this study has significant strengths given the paucity of research in this area and the utilization of a large, nationally representative dataset, such as DATOS-A. Moreover, given the high prevalence of tobacco use among substance abusing adolescents (Myers & Macpherson, 2004), the issue of tobacco control policy and cessation treatment within the context of substance abuse treatment is an important issue for providers. In our sample, 70% of participants were categorized as Persistent Smokers which further confirms the great extent of smoking among adolescents involved in substance abuse treatment. Given that Persistent Smokers were also found to be at greater risk for substance relapse, findings from the current study support efforts to incorporate tobacco cessation interventions into substance abuse treatment programs for youth.

Acknowledgments

The data for this study were collected and made available by the U.S. Department of Health and Human Services, National Institute on Drug Abuse, DRUG ABUSE TREATMENT OUTCOME STUDY - ADOLESCENT (DATOS-A), 1993–1995: Conducted by the Coordinating DATOS Research Center at the National Development and Research Institute (NDRI), North Carolina, and collaborating research center at Texas Christian University and the University of California at Los Angeles, with data collected by the Research Triangle Institute. 2nd ICPSR ed. Ann Arbor, MI: Inter-University Consortium for Political and Social Research, 2004; This research was supported by grants T32-HL-076134-02 (R. Wing, Ph.D., PI) from the National Heart Blood and Lung Institute, K07-CA95623 from the National Cancer Institute (C. Stanton, PI), an NIH-funded Transdisciplinary Tobacco Use Research Center (TTURC) Award (P50 CA084719), and by the Robert Wood Johnson Foundation..

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Table 1
Demographic and Substance Use Characteristics by Smoking Status

Variable	Persistent Smoker (n=1240)	Non-Smoker (n=164)	Smoking Initiator (n=179)	Quitters (n=196)	Total (n=1779)
Male (%)	70.2	65.2	73.7	70.9	70.2
Female (%)	29.8	34.8	26.3	29.1	29.8
Race (%)**					
White	59.9	41.5	59.9	51	57.2
Black	18.1	36	21.2	24.5	20.8
Hispanic	17.3	17.1	14.0	19.9	17.3
Other	4.6	5.5	5	4.6	4.7
% in School	65.4	70.1	64.2	66.3	65.8
Highest Grade	9.7 (1.31)	9.8 (1.37)	9.6 (1.23)	9.6 (1.30)	9.7 (1.31)
Age ($\bar{x}$, SD)	15.7(1.31)	15.8(1.4)	15.6(1.34)	15.9(1.31)	15.7(1.32)
Modality(%)**					
Long-term Inpt.	38.7	36	52	47.4	40.8
Short-term Inpt.	37.3	26.2	26.8	30.1	34.4
Outpatient	24	37.8	21.2	22.4	24.8
Mean Intake Use					
Alcohol	2.68(1.83)	2.33(1.64)	2.36(1.71)	2.62(1.67)	2.61(1.67)
Marijuana***	5.51(2.18)a	4.93(2.37)b	5.13(2.19)ab	5.54(2.17)a,b	5.43(2.2)
Other Drug***	3.52(2.16)a,b	2.88(1.99)a	4.07(2.31)b	3.13(2.13)a	3.48(2.18)

*
p < .05;

**
p < .001;

Values in the same row that do not share subscripts (a or b) differ at p<.05

Table 2

Proportion Relapsed by Smoking Status Group (% Relapsed)

Variable	Alcohol	Marijuana	Other Drugs
Persistent Smokers (n=1240)	70.0	68.7	35.2
Non-smokers (n=164)	59.8	56.1	16.5
Smoking Initiators (n=179)	75.8	76.0	39.7
Quitters (n=196)	56.6	54.1	27.6
Total (n=1779)	68.2	66.7	33.1

Table 3
Logistic Regression Models: Alcohol Relapse by Status Group

Covariates/Predictors	OR	95% CI	Wald Statistic	p Value
Treatment Modality				
Long-Term Inpatient	.950	.72 – 1.25	.134	.715
Short-Term Inpatient	1.24	.923 – 1.67	2.03	.154
Outpatient**	-	-	-	-
Race/Ethnicity				
White*	2.75	2.07 – 3.64	49.37	< .001
African American*	1.41	1.17 – 1.71	12.34	< .001
Hispanic	.672	.434 – 1.04	3.17	.075
Other**	-	-	-	-
Intake Level of Alc*	1.07	1.003 – 1.14	4.158	.041
Tobacco Status Groups				
Persistent Smoker*	1.50	1.07 – 2.11	5.40	.02
Non-smoker	1.40	.868 – 2.27	1.91	.167
Smoking Initiator*	2.19	1.34 – 3.58	9.78	.002
Quitters**	-	-	-	-

* p < .05

** Reference group

Table 4
Logistic Regression Models: Marijuana Relapse by Status Group

Covariates/Predictors	OR	95% CI	Wald Statistic	p Value
Treatment Modality				
Long-Term Inpatient *	.718	.544 – .948	5.46	.019
Short-Term Inpatient	1.202	.894 – 1.62	1.49	.222
Outpatient **	-	-	-	-
Race/Ethnicity				
White *	1.530	1.16 – 2.01	9.16	.002
African American	1.086	.908 – 1.30	.814	.367
Hispanic	1.244	.817 – 1.90	1.04	.309
Other **	-	-	-	-
Intake Level of Marij. *	1.096	1.04 – 1.15	13.68	< .001
Tobacco Status Groups				
Persistent Smoker *	1.71	1.24 – 2.37	10.54	.001
Non-smoker	1.44	.898 – 2.31	2.29	.131
Smoking Initiator *	3.08	1.88 – 5.04	19.95	< .001
Quitters **	-	-	-	-

*
p < .05

**
Reference group

Table 5
Logistic Regression Models: “Other Drug” Relapse by Status Group

Covariates/Predictors	OR	95% CI	Wald Statistic	p Value
Treatment Modality				
Long-Term Inpatient *	.645	.427 – .975	4.32	.038
Short-Term Inpatient	.955	.641 – 1.42	.05	.822
Outpatient **	-	-	-	-
Race/Ethnicity				
White *	2.658	1.2 – 5.88	5.81	.016
African American	1.050	.746 – 1.48	.078	.781
Hispanic *	2.008	1.07 – 3.77	4.71	.03
Other **	-	-	-	-
Intake Level of Othr Drg	1.022	.956 – 1.09	.415	.519
Tobacco Status Groups				
Persistent Smoker	1.46	.941 – 2.25	2.84	.092
Non-smoker	.80	.392 – 1.64	.373	.541
Smoking Initiator *	2.42	1.29 – 4.52	7.62	.006
Quitters **	-	-	-	-

* p < .05

** Reference group