Published in final edited form as:

Compr Psychiatry. 2007 ; 48(3): 237–244.

Association between Psychiatric Disorders and Smoking Stages Within a Representative Clinic Sample of Puerto Rican Adolescents

Lisa C. Dierker, Ph.D. and **Eve M. Sledjeski, Ph.D.**

Wesleyan University, Psychology Department, Middletown, CT

Maria Botello-Harbaum, Ed.D.

Prevention Research Branch, DESPR/NICHD/NIH Bethesda, MD

Rafael R. Ramirez, Ph.D., Ligia M. Chavez, Ph.D., and Glorisa Canino, Ph.D.

Behavioral Sciences Research Institute, Medical Sciences Campus, University of Puerto Rico, San Juan, PR

Abstract

Objective—We examined the prevalence of smoking behaviors and their association with specific psychiatric disorders in a representative sample of youth from behavioral health clinics in Puerto Rico.

Method—A complex sampling design was used to select the sample, and analyses were conducted to account for the unequal selection probability, stratification, and clustering. All analyses were weighted back to the clinical population from which they were drawn. Psychiatric and substance use disorders were assessed using the parent and youth versions of the Diagnostic Interview Schedule for Children, Version 4.0.

Results—Over one-third of the sample reported experience with cigarette smoking, the majority of whom smoked at least once per week (63.5%). As expected, the alcohol and drug use disorders demonstrated some of the strongest associations with individual smoking stages. These were the only disorders that remained significantly associated with nicotine dependence after controlling for comorbidity.

Conclusions—Our findings confirm the need for screening of smoking behavior and nicotine dependence treatment settings and the integration of psychiatric/substance use treatments with smoking cessation.

Keywords

Smoking; Clinic Sample; Psychiatric Disorders; Nicotine Dependence; Puerto Rico

Correspondence to Lisa Dierker, Wesleyan University, Department of Psychology, 207 High Street, Middletown, CT 06459. E-mail: ldierker@wesleyan.edu

Publisher's Disclaimer: This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final citable form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

1. Introduction

The robust association between cigarette smoking and psychiatric comorbidity has been well-documented in community and clinical samples [1–3]. Among adult psychiatric patients, cigarette smoking has been associated with major depression,[4–6] suicidality,[7] attention-deficit/hyperactivity disorder (ADHD),[8] schizoaffective disorder, schizophrenia and substance use disorders [4,5,9,10]. While findings surrounding the relationship between smoking and anxiety disorders have been more equivocal, studies of adult clinical populations have shown smoking to be associated with panic disorder,[11,12] generalized anxiety disorder (GAD),[13] and posttraumatic stress disorder (PTSD) [14]. Notably, smoking rates are typically two to three times higher in psychiatric settings compared to the general population [5,9,15–18].

Although similar findings between smoking and psychiatric disorders have been demonstrated in adolescents, the vast majority of these studies were conducted using community samples [3,19]. For instance, among adolescents in the general population, smoking has been related to depression, [20–24] substance use disorders, [1,25–27] anxiety disorders,[28,29] schizophrenia,[30] and disruptive behavior disorders [1,25,31]. Further, longitudinal research has suggested that adolescents with a psychiatric illness initiate smoking earlier and maintain smoking longer compared to healthy peers [31–33].

Despite the abundance of research examining the prevalence of smoking as well as the link between smoking and psychiatric illness within adolescent community settings, little is known about this relationship in adolescent patient samples. Myers and Brown [34] found high rates of smoking among adolescents undergoing inpatient substance abuse treatment with 85% reporting smoking in the past three months and 75% reporting daily smoking. However, level of posttreatment substance use was not related to posttreatment smoking quantity. In contrast, Ramsey et al. [35] found a relationship between smoking intensity and concurrent alcohol/drug use among adolescents in psychiatric treatment. Similarly, in a sample of adolescents with conduct disorder and substance use disorders, psychiatric illness severity was positively correlated with nicotine dependence [36]. To date, one study has examined the relationship between smoking and multiple psychiatric disorders among adolescents admitted to an inpatient treatment facility[19]. Although smokers had higher rates of substance abuse/dependence compared to nonsmokers, smoking status was not related to other psychiatric diagnoses including mood disorders, anxiety disorder, disruptive behavior disorders, or psychotic disorders.

In the majority of published reports on substance use and psychiatric disorders in clinic settings, alcohol and illicit drug use represent the behaviors of interest while smoking either goes unreported or takes a secondary place in the analyses. This is likely due to 1) the perception that nicotine dependence causes fewer personal and social consequence than the abuse and dependence of other substances; 2) the more established role that psychiatry has played in the assessment and treatment of dual diagnoses which do not historically include nicotine dependence; and 3) the highly publicized reductions in rates of tobacco use demonstrated over the last decades. While it is true that tobacco use does not bring with it the short term social and personal consequences associated with intoxicated driving or binge use requiring medical attention, as noted in several large-scale surveys, the longer term social and personal consequences of smoking are substantial. Deaths caused by smoking related illness reach nearly a half million each year and associated costs stand at \$100 billion [37]. Furthermore, psychiatric/substance patients represent a particularly important subgroup of smokers given that they may be more vulnerable to the negative physical and mental health consequences associated with smoking [38–40]. In addition, smoking can interfere with psychiatric treatment

by reducing the effectiveness of psychiatric medications and impacting cognitive and affective functioning [5,41,42].

To our knowledge, the present study is the first to examine the relationship between smoking and psychiatric comorbidity among Puerto Rican youth from mental health treatment settings. Specifically, the present sample was drawn from an island wide survey of youth seeking mental health treatment in Puerto Rico (P.R.). Clinical interviews were conducted to determine smoking status and current psychiatric diagnoses at two time points. The goals of the present study are to 1) establish rates of experimental and regular smoking behavior and nicotine dependence among adolescents in mental health care; and 2) determine whether psychiatric disorders are associated with specific stages of smoking (i.e. experimental use, regular use vs. nicotine dependence). While multi-ethnic community samples within the United States have shown that Hispanic adolescents exhibit reduced smoking rates compared to their Caucasian counterparts,[43,44] ethnically homogenous Hispanic groups have generally been underrepresented in behavioral health research.

2. Methods

2.1. Participants

The target population for the clinical sample was the total number of medically indigent children in P.R. ages 4 to 17 who received mental health and substance abuse services through the public health system and through the private sector by Managed Behavioral Health Organizations (MBHOs) from January 1, 1998 to May 31, 1998. At that time the government of P.R. was undergoing a health reform and had initiated the contracting out with private health insurance companies of all health services previously provided by public health centers across the island to the medically indigent. In this reform, services were provided through MBHOs subcontracted by private health insurance companies using a managed care model. Data for the selection of children in the public mental health and substance abuse sectors were obtained from the rosters of children who received services during the specified time period from 11 community mental health centers and six outpatient substance abuse clinics. For the private sector, claims data from the four MBHOs were used. The selected medically indigent children and adolescents (8,568) received services within the specified period distributed as follows: public outpatient mental health clinics (N=3,489), outpatient substance abuse clinics (N=710), and MBHOs (N=4,368). A systematic sample with a random starting point was selected for both the public and private sectors. The sample was stratified by type of service (public mental health, substance, and MBHO), health reform regions and age of child. The selected sample consisted of 1,175 medically indigent children; 400 from the public mental health sector, 150 from public drug and alcohol services, and 625 from the MBHOs. Of the 1,175 selected children, 114 were deemed ineligible. Only one child was selected from each family. The total number of eligible children was 1,061 and 751 parent-child dyads were successfully interviewed for a response rate of 71.0% for parent-child dyads.

Only adolescents (11 to 17, N= 498) were selected for the present analyses. Two waves of assessment were conducted. Following the first wave (Mean age=14.2, $SD=2.25$), families were re-interviewed one year later. This follow-up assessment was successfully conducted with 91% of participants who responded to wave 1. All procedures complied with strict ethical standards in the treatment of human subjects and were approved by the University of Puerto Rico Institutional Review Board. Care was taken in the written informed consent process to assure that all participants were knowledgeable about the study and voluntarily willing to participate.

2.2. Measures

Past year psychiatric disorders and lifetime substance use disorders were assessed at both waves using the computerized Spanish Diagnostic Interview Schedule for Children (DISC-IV) following informed consent procedures in which the study was clearly described [45]. Use of the DISC is supported by a long history of psychometric testing in both clinical and community samples in its English version,[46–48] as well as the Spanish version [45,49]. For both samples, the following modules were administered to both parent (DISC-P) and youth (DISC-Y): social phobia, specific phobia, separation anxiety disorder, panic disorder, generalized anxiety disorder, post-traumatic stress disorder, major depressive disorder, attention-deficit-hyperactivity-disorder (ADHD), conduct disorder. Additionally, oppositional defiant disorder (ODD) was administered to parents only and substance use modules including nicotine dependence, alcohol use disorders, and other substance use disorders were administered only to youth [50].

The tobacco module of the DISC-Y includes lifetime and past year questions on age of onset of smoking, quantity and frequency of smoking, and criteria for nicotine dependence. For the present analyses, groups reflecting the following four mutually exclusive and non-mutually exclusive lifetime smoking stages were created: 1) never users; 2) experimenters (one or more times, with no weekly use); 3) regular users (at least weekly use for a month or longer, without a nicotine dependence diagnosis); and 4) nicotine dependent (DSM-IV criteria). Individual disorders including major depression, conduct disorder, oppositional defiant disorder (ODD), and attention deficit hyperactivity disorder (ADHD) were also examined, as were the composite categories of alcohol abuse and dependence, drug abuse and dependence, and anxiety disorders.

2.3. Statistical Methods

Youth ages 11 to 17 completing the DISC-IV were included in the present analyses (N=473). Due to the fact that the majority of youth reaching either weekly smoking levels or nicotine dependence had achieved these levels of use at the wave 1 assessment, data from the two waves of the study were aggregated into composite smoking stages and psychiatric diagnoses. For example, youth were categorized according to the highest levels of smoking that they reached and youth meeting diagnostic criteria at either assessment were considered positive for the behavior/disorder. Youth failing to meet diagnostic criteria at both waves of assessment were considered to be negative. Sample weights were used in each individual analysis to correct for differences in the probability of selection and also to adjust for non-response. Adjustments for the design effects were incorporated into the estimation process implemented by SAS version 9.1 (SAS Institute; Cary, N.C.) survey procedures to generate accurate standard errors.

Logistic regression analysis was used to estimate the independent associations between adolescent psychiatric disorders and individual smoking stages. Next, gender by adolescent diagnosis interaction terms were included in the models to evaluate the presence of gender differences in demonstrated associations. Models were re-estimated retaining only significant interactions.

3. Results

3.1. Youth Characteristics

The mean age of the sample at Wave 1 was 14 ($SE = 0.03$). Reflecting the over representation of males in mental health care, our sample was 70.6% male. Fifty percent of the sample reported household income levels of less than \$12,000 per year.

3.2. Use and Dependence Characteristics

Table 1 presents weighted prevalence rates of smoking behavior and DSM-IV nicotine dependence. Over one-third of the sample reported any experience with cigarette smoking, and approximately one-quarter reported smoking at least once per week (23.4%). Among youth who reported reaching at least weekly smoking levels, the most commonly experienced nicotine dependence criteria included smoking in larger amounts or longer than intended (Criterion #3) and a persistent desire or unsuccessful efforts to cut down (Criterion #4) [51]. One-third of the weekly or daily smokers met criteria for nicotine dependence. All nicotine dependence criteria were reported at statistically similar rates among males and females. Further, age of onset for both smoking and nicotine dependence were statistically similar by gender. (Male use $M=12.5$ years, $SE=0.17$, dependence $M=13.6$, $SE=0.06$ and Female use $M=13.2$, $SE=0.20$, dependence $M=14.7$, $SE=0.35$).

3.3. Association between Smoking Stages and Psychiatric Disorders

Mutually exclusive lifetime smoking stages were created to reflect use levels and achievement of dependence criteria. Sixty four (13.4%) were classified as experimental smokers (i.e. one or more times, with no weekly use), 73 (15.7%) reached regular smoking levels (i.e. at least weekly use for a month or longer, without a nicotine dependence diagnosis) and 37 (7.7%) met criteria for nicotine dependence.

The association between individual smoking stages and adolescent psychiatric disorders was first examined for each disorder separately, adjusted for adolescent age and sex through the inclusion of these variables as covariates in each of the models. Next, multivariate logistic regression analyses including a full model of *comorbid* disorders among adolescents were examined. Odds ratios and 95% confidence intervals corresponding to these unadjusted and adjusted models are presented in Table 2. While conduct disorder was found to be associated with each of the three smoking stages (i.e. experimental use, regular use and nicotine dependence) in the unadjusted models, once comorbid disorders were controlled for, conduct disorder was associated exclusively with *experimental* smoking. In contrast, alcohol use disorders were associated with both experimental smoking and nicotine dependence in the unadjusted models, but after controlling for comorbidity, alcohol use disorders were found to be uniquely associated with *nicotine dependence* rather than with nondependent smoking. Only drug use disorders were significantly associated with each smoking stage in both unadjusted and adjusted models. Anxiety disorders were found to be associated only with regular smoking. Finally, after controlling for comorbidity, major depression, ODD and ADHD were not significantly associated with any smoking stage.

When examining gender by disorder interactions based on significant associations demonstrated in the models that had been adjusted for comorbidity, none were found to be significant. Due to the particularly small number of individuals with nicotine dependence and comorbid drug use disorders ($n=19$), there was not sufficient power to investigate the drug use disorder by gender interaction for nicotine dependence.

4. Discussion

The present study aggregates two years of data from a representative island-wide sample of youth receiving behavioral health treatment to establish rates of smoking behavior and nicotine dependence, and to elucidate the association between psychiatric/substance use disorders and distinct smoking stages. Three major findings emerged. First, while over one-third of the sample reported ever smoking a cigarette, nearly two-thirds of those youth reported reaching regular smoking levels of at least once per week use. Second, the association between smoking and psychiatric/substance disorders was found to differ across smoking stages and with

statistical adjustment for comorbidity. While individual psychiatric disorders were commonly associated with smoking stages in unadjusted models, after controlling for comorbidity, only the illicit drug use disorders remained associated with each smoking stage. Finally, the association between psychiatric/substance use disorders and smoking was found to be similar for males and females.

4.1. Use and Dependence Characteristics

Rates of smoking behavior and nicotine dependence identified in the present sample generally confirmed our expectations of lower rates of smoking among Puerto Rican youth compared to rates identified in clinic populations from the US mainland. For example, in a study by Upadhyaya and colleagues [3] focusing on a sample of adolescent psychiatric inpatients, 53% of participants reported smoking cigarettes during their lifetime. Similarly, in a sample of adolescent outpatients, 45% reported nicotine use [52].

When comparing smoking rates in the present clinic study to those in a general population sample of Puerto Rican youth,[1] the ever smoking rate among PR community youth (18.6%) was half that identified in the present study (36.8%). A higher rate of nicotine dependence was also seen in this clinical Puerto Rican sample (7.7%) compared to that reported in the community study (1.5%). Even more striking however, was the fact that among those who have tried smoking, nearly two-thirds of clinic youth had reached regular smoking levels and 20.9% met criteria for dependence. This represents markedly higher rates of progression to established and dependent smoking patterns when conditioned on exposure than has been seen among community populations. For example, in the community study of Puerto Rican adolescents, only one-third of those having ever smoked reached regular (at least once weekly) smoking levels and only 7% met criteria for dependence. These findings confirm the expected elevation in rates of both smoking and the progression to nicotine dependence in a clinic sample.

When examining patterns of individual dependence symptoms, the two most commonly reported symptoms were smoking in larger amounts or longer than intended (criterion #3), and a persistent desire or unsuccessful efforts to quit or cut down (criterion #4). The present results directly mirror those of previous work among a community sample of Puerto Rican youth [1] and within a birth cohort of 18-year olds from New Zealand [53]. Further, similar to previous community [1,53] and clinical [54] studies, experiences of nicotine dependence at the symptom and diagnostic level were found to be similar for males and females.

4.2. Association between Smoking Stages and Psychiatric/Substance Use Disorders

Analyses examining the association between stages of smoking and psychiatric/substance use disorders showed that the majority of psychiatric disorders examined were associated with each individual smoking stage. When controlling for psychiatric comorbidity, however, far fewer associations reached statistical significance. Notably, nicotine dependence was uniquely associated with substance abuse and dependence including both alcohol and illicit drugs. These findings confirm a wealth of previous research demonstrating the potency of associations among substance use disorders [3,55]. To date, only one previous study has examined the relationship between smoking and multiple disorders within a clinic sample of adolescents [19]. Similar to the present findings, smokers were found to have higher rates of substance abuse/dependence compared to nonsmokers. These findings highlight the need for intervention that deals with poly substance use rather than a separation of treatment for tobacco, alcohol and other drug use.

When considering the individual psychiatric disorders, fewer significant associations emerged and none with nicotine dependence. For example, after controlling for comorbidity, conduct

disorder was found to be exclusively associated with experimental smoking. Previous literature examining associations between smoking and conduct disorder or deviant behavior more broadly defined, have in most cases failed to examine mutually exclusive smoking stages. Emerging research, however, has begun to support this association between conduct and *lower levels* of smoking, particularly within Hispanic adolescent populations. For example, in a community study of Puerto Rican youth [1], conduct disorder was associated with both experimental and regular smoking, but not with nicotine dependence. Further, results based on the National Longitudinal Study of Adolescent Health (Add Health), showed delinquency to be a significant predictor of smoking initiation, but not a significant predictor of progression to daily smoking among Hispanic youth [56]. Given the likelihood of youth with conduct disorder developing future substance abuse and dependence, it is possible that those exhibiting current conduct disorder in the absence of a substance use disorder represent youth at an earlier stage in the etiology of comorbidity. In fact, exploratory analyses within the present sample support this in that youth with conduct disorder only were significantly younger (mean age 14) than those with a conduct and substance use disorder (mean age 16).

Anxiety disorders were found to be uniquely associated with regular smoking. Given the dearth of previous research focused on psychiatric correlates of smoking among clinic youth, future research is needed to confirm this finding. In fact, previous research focused on community samples have painted a somewhat equivocal picture in terms of the association between anxiety and smoking behavior. That is, while some studies have demonstrated an association,[57] several have not [25,58]. Given the need to aggregate various types of anxiety in the present models, the association between smoking and individual anxiety disorders requires further study.

4.3. Strengths and Limitations

While the examination of smoking behavior among island Puerto Rican youth recruited from clinic settings represents a valuable contribution to the literature on adolescent smoking correlates, some limitations should also be considered. First, our inability to use the data in a truly prospective manner (i.e. time 1 psychiatric disorders predicting the achievement of smoking stages at time 2), precluded the evaluation of temporal ordering between disorders that may assist in informing the timing of intervention. Given the wide age range and clinical nature of the sample, it is not surprising that over two-thirds of the youth who achieved nicotine dependence had done so by the first wave of assessment. Second, the use of past year psychiatric disorders at each wave likely offer conservative estimates of prevalence and with them, the possibility of conservative estimates of association. Third, although this was a clinic sample, small numbers of individual disorders required some aggregation of disorders making it impossible to evaluate more fine-grained associations. Finally, it should be noted that assessment was based exclusively on self-report of retrospectively recalled smoking behavior. While some questions have been raised regarding the accuracy of self-reported smoking, the advantages of using self-monitoring techniques are commonly believed to outweigh the disadvantages [59,60]. For example, reports of number of cigarettes smoked per day have been shown to be a valuable index of smoking heaviness, being positively correlated with level of CO, cotinine and nicotine in group data [61]. Given that lifetime smoking status was the focus of the present analysis, biological verification was not feasible.

The present study was however based on a representative island- wide survey of youth seeking behavioral health treatment and analyses were weighted back to the population from which they were drawn, providing maximally generalizable estimates. Further, our ability to control for multiple types of comorbidity and to contrast associations for dependence, regular smoking and experimentation represents an important analytic strategy in clarifying the associations between smoking and psychiatric disorders within both clinic and community populations.

4.4. Clinical Implications

Despite the abundance of research examining the prevalence of smoking as well as the link between smoking and psychiatric illness within adolescent community settings, the present study represents one of the first to examine rates of smoking and associations between smoking and a wide array of psychiatric and substance use disorders within a clinic sample. Our findings confirm the need for 1) screening of smoking behavior within treatment settings and 2) the integration of both mental and physical health interventions in order to address comorbid disorders that may impact the escalation of smoking behaviors[19] and smoking behavior that may impact the course of psychiatric/substance disorders. Even for those disorders not causally associated with nicotine dependence, their presence may significantly impact upon treatment effectiveness.

Similar to evidence from epidemiologic samples, adolescent psychopathology and substance use disorders represent appropriate criteria for the identification of island Puerto Rican youth in need of smoking intervention. The necessary inclusion of smoking intervention components within behavioral health treatment settings will require continued commitment to the merging of mental and physical health funding as well as a joining of expertise across multiple disciplines. This challenging but necessary collaboration will assure that intervention efforts reach those youth at highest risk for nicotine dependence and its sequelae.

Acknowledgements

This research was supported by grant U01-MH54827 from the National Institute of Mental Health (Dr. Canino, PI), P20 MD000537-01 Canino (PI), from the National Center for Minority Health Disparities and P01-MH 59876-02 Alegría (PI), from the National Institute of Mental Health. Data analyses were supported by grant K01-DA15454 from the National Institute of Drug Abuse (Dr. Dierker, PI) and an Investigator Award from the Patrick & Catherine Weldon Donaghue Medical Research Foundation (Dierker, PI).

References

1. Dierker LC, Ramirez RR, Chavez LM, Canino G. Association between psychiatric disorders and smoking stages among Latino adolescents. *Drug Alcohol Depend* 2005;80(3):361–8. [PubMed: 15964715]
2. Moolchan ET, Ernst M, Henningfield JE. A review of tobacco smoking in adolescents: Treatment implications. *J Am Acad Child Adolesc Psychiatry* 2000;39(6):682–693. [PubMed: 10846302]
3. Upadhyaya HP, Deas D, Brady KT, Kruesi M. Cigarette smoking and psychiatric comorbidity in children and adolescents. *J Am Acad Child Adolesc Psychiatry* 2002;41(11):1294–1305. [PubMed: 12410071]
4. Acton GS, Prochaska JJ, Kaplan AS, Small T, Hall SM. Depression and stages of change for smoking in psychiatric outpatients. *Addict Behav* 2001;26(5):621. [PubMed: 11676374]
5. Hughes JR, Hatsukami DK, Mitchell JE, Dahlgren LA. Prevalence of smoking among psychiatric outpatients. *Am J Psychiatry* 1986;143(8):993–7. [PubMed: 3487983]
6. Tanskanen A, Viinamaki H, Koivumaa-Honkanen H-T, Hintikka J, Jaaskelainen J, Lehtonen J. Smoking and depression among psychiatric patients. *Nord J Psychiatry* 1999;53(1):45–48.
7. Malone KM, Waternaux C, Haas GL, Cooper TB, Li S, Mann JJ. Cigarette smoking, suicidal behavior, and serotonin function in major psychiatric disorders. *Am J Psychiatry* 2003;160(4):773–9. [PubMed: 12668368]
8. Pomerleau OF, Downey KK, Stelson FW, Pomerleau CS. Cigarette smoking in adult patients diagnosed with attention deficit hyperactivity disorder. *J Subst Abuse* 1995;7(3):373–8. [PubMed: 8749796]
9. Poirier MF, Canceil O, Bayle F, Millet B, Bourdel MC, Moatti C, et al. Prevalence of smoking in psychiatric patients. *Prog Neuropsychopharmacol Biol Psychiatry* 2002;26(3):529–37. [PubMed: 11999904]
10. Venable PA, Carey MP, Carey KB, Maisto SA. Smoking among psychiatric outpatients: relationship to substance use, diagnosis, and illness severity. *Psychol Addict Behav* 2003;17(4):259–65. [PubMed: 14640821]

11. Amering M, Bankier B, Berger P, Griengl H, Windhaber J, Katschnig H. Panic disorder and cigarette smoking behavior. *Compr Psychiatry* 1999;40(1):35–8. [PubMed: 9924875]
12. Himle J, Thyer BA, Fischer DJ. Prevalence of Smoking among Anxious Outpatients. *Phobia Prac Res J* 1988;1(1):25–31.
13. Baker-Morissette S, Gulliver S, Wiegel M, Barlow D. Prevalence of Smoking in Anxiety Disorders Uncomplicated by Comorbid Alcohol or Substance Abuse. *J Psychopathol Behav Assess* 2004;26(2):107.
14. Beckham JC, Kirby AC, Feldman ME, Hertzberg MA, Moore SD, Crawford AL, et al. Prevalence and correlates of heavy smoking in Vietnam veterans with chronic posttraumatic stress disorder. *Addict Behav* 1997;22(5):637. [PubMed: 9347066]
15. Glassman AH. Cigarette smoking: Implications for psychiatric illness. *Am J Psychiatry* 1993;150(4):546–553. [PubMed: 8465868]
16. Lasser K, Boyd JW, Woolhandler S, Himmelstein DU, McCormick D, Bor DH. Smoking and Mental Illness: A Population-Based Prevalence Study. *JAMA* 2000;284(20):2606–2610. [PubMed: 11086367]
17. O'Farrell TJ, Connors GJ, Uppel D. Addictive behaviors among hospitalized psychiatric patients. *Addict Behav* 1983;8(4):329–33. [PubMed: 6610282]
18. Tanskanen A, Viinamäki H, Koivumäki-Honkanen H-T, Jaaskelainen J, Lehtonen J. Smoking among psychiatric patients. *Eur J Psychiatry* 1998;12:109–118.
19. Ramsey SE, Brown RA, Strong DR, Sales SD. Cigarette smoking among adolescent psychiatric inpatients: prevalence and correlates. *Ann Clin Psychiatry* 2002;14(3):149–53. [PubMed: 12585564]
20. Breslau N, Kilbey M, Andreski P. Nicotine dependence, major depression, and anxiety in young adults. *Arch Gen Psychiatry* 1991;48(12):1069–1074. [PubMed: 1845224]
21. Covey LS, Tam D. Depressive mood, the single-parent home, and adolescent cigarette smoking. *Am J Public Health* 1990;80(11):1330–3. [PubMed: 2240299]
22. Goodman E, Capitman J. Depressive Symptoms and Cigarette Smoking Among Teens. *Pediatrics* 2000;106(4):748–755. [PubMed: 11015518]
23. Hawkins WE, Hawkins MJ, Seeley J. Stress, health-related behavior and quality of life on depressive symptomatology in a sample of adolescents. *Psychol Rep* 1992;71(1):183–6. [PubMed: 1529054]
24. Kandel DB, Davies M. Adult sequelae of adolescent depressive symptoms. *Arch Gen Psychiatry* 1986;43(3):255–62. [PubMed: 3954545]
25. Brown RA, Lewinsohn PM, Seeley JR, Wagner EF. Cigarette smoking, major depression, and other psychiatric disorders among adolescents. *J Am Acad Child Adolesc Psychiatry* 1996;35(12):1602–1610. [PubMed: 8973066]
26. Derzon JH, Lipsey MW. Predicting tobacco use to age 18: A synthesis of longitudinal research. *Addiction* 1999;94(7):995–1006. [PubMed: 10707438]
27. Federman EB, Costello JE, Angold A, Farmer EM, Erkanli A. Development of substance use and psychiatric comorbidity in an epidemiologic study of White and American Indian young adolescents: The Great Smoky Mountain study. *Drug Alcohol Depend* 1997;44(2–3):69–78. [PubMed: 9088778]
28. Goodwin RD, Lewinsohn PM, Seeley JR. Cigarette smoking and panic attacks among young adults in the community: the role of parental smoking and anxiety disorders. *Biol Psychiatry* 2005;58(9):686–93. [PubMed: 16018987]
29. Johnson JG, Cohen P, Pine DS, Klein DF, Kasen S, Brook JS. Association between cigarette smoking and anxiety disorders during adolescence and early adulthood. *JAMA* 2000;284(18):2348–51. [PubMed: 11066185]
30. Weiser M, Reichenberg A, Grotto I, Yasvitzky R, Rabinowitz J, Lubin G, et al. Higher Rates of Cigarette Smoking in Male Adolescents Before the Onset of Schizophrenia: A Historical-Pro prospective Cohort Study. *Am J Psychiatry* 2004;161(7):1219–1223. [PubMed: 15229054]
31. Milberger S, Biederman J, Faraone SV, Chen L. ADHD is associated with early initiation of cigarette smoking children and adolescents. *J Am Acad Child Adolesc Psychiatry* 1997;36(1):37–44. [PubMed: 9000779]
32. Costello E, Erkanli A, Federman E, Angold A. Development of psychiatric comorbidity with substance abuse in adolescents: Effects of timing and sex. *J Clin Child Psychol* 1999;28(3):298–311. [PubMed: 10446679]

33. Patton GC, Carlin JB, Coffey C, Wolfe R, Hibbert M, Bowes G. Depression, anxiety, and smoking initiation: a prospective study over 3 years. *Am J Public Health* 1998;88(10):1518–22. [PubMed: 9772855]
34. Myers MG, Brown SA. Smoking and health in substance-abusing adolescents: a two-year follow-up. *Pediatrics* 1994;93(4):561–6. [PubMed: 8134209]
35. Ramsey SE, Brown RA, Strong DR, Stuart GL, Weinstock MC, Myers MG. Cigarette Smoking and Substance Use Among Adolescents in Psychiatric Treatment. *J of Child Adolesc Subst Abus* 2005;14(4):1–13.
36. Riggs PD, Mikulich SK, Whitmore EA, Crowley TJ. Relationship of ADHD, depression and non-tobacco substance use disorders to nicotine dependence in substance-dependent delinquents. *Drug Alcohol Depend* 1999;54(3):195–205. [PubMed: 10372793]
37. CDC. Morbidity and Mortality Weekly Report. Washington D.C: U.S. Department of Health and Human Services; 2002 April 12. Annual Smoking-Attributable Mortality, Years of Potential Life Lost, and Economic Costs --- United States, 1995–1999.
38. Blot WJ, McLaughlin JK, Winn DM, Austin DF, Greenberg RS, Preston-Martin S, et al. Smoking and drinking in relation to oral and pharyngeal cancer. *Cancer Res* 1988;48(11):3282–7. [PubMed: 3365707]
39. Brown S, Barraclough B, Inskip H. Causes of the excess mortality of schizophrenia. *Br J Psychiatry* 2000;177(3):212–217. [PubMed: 11040880]
40. Linkins RW, Comstock GW. Depressed mood and development of cancer. *Am J Epidemiol* 1990;132(5):962–72. [PubMed: 2239911]
41. Quattrocki E, Baird A, Yurgelun-Todd D. Biological aspects of the link between smoking and depression. *Harv Rev Psychiatry* 2000;8(3):99–110. [PubMed: 10973935]
42. Williams JM, Ziedonis D. Addressing tobacco among individuals with a mental illness or an addiction. *Addict Behav* 2004;29(6):1067. [PubMed: 15236808]
43. Griesler PC, Kandel DB, Davies M. Ethnic differences in predictors of initiation and persistence of adolescent cigarette smoking in the National Longitudinal Survey of Youth. *Nicotine Tob Res* 2002;4(1):79–93. [PubMed: 11906684]
44. Kandel DB, Chen K. Extent of smoking and nicotine dependence in the United States: 1991–1993. *Nicotine Tob Res* 2000;2(3):263–274. [PubMed: 11082827]
45. Bravo M, Ribera J, Rubio-Stipec M, Canino G, Shrout P, Ramirez R, et al. Test-retest reliability of the Spanish version of the Diagnostic Interview Schedule for Children (DISC-IV). *J Abnorm Child Psychol* 2001;29:433–444. [PubMed: 11695544]
46. Shaffer D, Fisher P, Lucas CP, Dulcan MK, Schwab-Stone ME. NIMH Diagnostic Interview Schedule for Children Version IV (NIMH DISC-IV): Description, differences from previous versions, and reliability of some common diagnoses. *J Am Acad Child Adolesc Psychiatry* 2000;39(1):28–38. [PubMed: 10638065]
47. Jensen P, Roper M, Fisher P, Piacentini J, Canino G, Richters J, et al. Test-retest reliability of the Diagnostic Interview Schedule for Children (DISC 2.1): Parent, child, and combined algorithms. *Arch Gen Psychiatry* 1995;52:61–71. [PubMed: 7811163]
48. Schwab-Stone M, Shaffer D, Dulcan M, Jensen P, Fisher P, Bird H, et al. Criterion validity of the NIMH Diagnostic Interview Schedule for Children Version 2.3 (DISC-2.3). *J Am Acad Child Adolesc Psychiatry* 1996;35:878–888. [PubMed: 8768347]
49. Ribera JC, Canino G, Rubio-Stipec M, Bravo M, et al. The Diagnostic Interview Schedule for Children (DISC-2.1) in Spanish: Reliability in a Hispanic population. *J Child Psychol Psychiatry* 1996;37(2):195–204. [PubMed: 8682899]
50. Jensen PS, Rubio-Stipec M, Canino G, Bird HR, Dulcan MK, Schwab-Stone ME, et al. Parent and child contributions to diagnosis of mental disorder: Are both informants always necessary? *J Am Acad Child Adolesc Psychiatry* 1999;38(12):1569–1579. [PubMed: 10596258]
51. APA. Diagnostic and statistical manual of mental disorders. 4. 1994.
52. Martin CA, Milich R, Martin WR, Hartung CM, Haigler ED. Gender differences in adolescent psychiatric outpatient substance use: associated behaviors and feelings. *J Am Acad Child Adolesc Psychiatry* 1997;36(4):486–94. [PubMed: 9100423]

53. Stanton WR. DSM-III--R tobacco dependence and quitting during late adolescence. *Addict Behav* 1995;20(5):595–603. [PubMed: 8712057]
54. Strong DR, Brown RA, Ramsey SE, Myers MG. Nicotine dependence measures among adolescents with psychiatric disorders: evaluating symptom expression as a function of dependence severity. *Nicotine Tob Res* 2003;5(5):735–46. [PubMed: 14577990]
55. USDHHS. Preventing Tobacco use among young people: A report of the Surgeon General. Atlanta, GA: Center for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, Office on Smoking and Health; 1994.
56. Kandel DBK, Gebre-Egziabher Schaffran, Christine Hu, Mei-Chen. Racial/Ethnic-Differences in Cigarette Smoking Initiation and Progression to Daily Smoking: A Multilevel Analysis. *Am J Public Health* 2004;94(1):128–135. [PubMed: 14713710]
57. Dierker LC, Avenevoli S, Merikangas KR, Flaherty BP, Stolar M. Association between psychiatric disorders and the progression of tobacco use behaviors. *J Am Acad Child Adolesc Psychiatry* 2001;40(10):1159–67. [PubMed: 11589528]
58. Rohde P, Lewinsohn PM, Brown RA, Gau JM, Kahler CW. Psychiatric disorders, familial factors and cigarette smoking: I. Associations with smoking initiation Nicotine. *Tob Res* 2003;5(1):85–98.
59. Patrick D, Cheadle A, Thompson D, Diehr P, Koepsell T, Kinne S. The validity of self-reported smoking: A review and meta-analysis. *Am J Public Health* 1994;84(7):1086–1093. [PubMed: 8017530]
60. Stanton W, McClelland M, Elwood C, Ferry D, Silva P. Prevalence, reliability and bias of adolescents' reports of smoking and quitting. *Addiction* 1996;91(11):1705–1714. [PubMed: 8972928]
61. Heatherton TF, Kozlowski LT, Frecker RC, Rickert W, Roninson R. Measuring the heaviness of smoking: Using self-reported time to the first cigarette of the day and number of cigarettes smoked per day. *British Journal of Addiction* 1989;84(7):791–799. [PubMed: 2758152]

Table 1
Prevalence of Smoking and DSM-IV Nicotine Dependence

	Clinic (N = 473)	
	Weighted %	SE
<i>Among the total sample</i>		
Ever smoked	36.8	1.81
Ever smoked once per week for a month or longer	23.4	1.62
Nicotine dependence	7.7	1.12
<i>Among ever smokers</i>		
Ever smoked once per week for a month or longer	63.5	3.08
Nicotine dependence	20.9	2.73
<i>Among regular smokers</i>		
<u>Nicotine dependence criteria</u>		
Tolerance	27.8	3.17
Withdrawal	25.7	3.18
Smoking in larger amounts or longer than intended	43.9	3.67
Persistent desire or unsuccessful efforts to cut down	35.8	3.43
Great deal of time spent to obtain, use or recover	12.7	2.46
Activities given up or reduced	20.8	1.86
Smoking despite physical or psychological problems	24.0	2.66
<u>Regular smoking subtypes</u>		
Smoking with no nicotine dependence criteria	18.2	2.61
Met some criteria with no nicotine dependence diagnosis	48.8	3.58
Nicotine dependence	33.0	3.54

Table 2

The Association between Smoking Stages and Psychiatric Disorders

	Experimentation vs. Non Smoking n=64 vs. n=299		Regular Smoking vs. Lower levels of use/nonuse n=73 vs. n=363		Nicotine Dependence vs. lower levels of use/nonuse n=37 vs. n=436	
	Unadjusted for comorbidity	Adjusted for comorbidity	Unadjusted for comorbidity	Adjusted for comorbidity	Unadjusted for comorbidity	Adjusted for comorbidity
Major Depression	1.9 [*] (1.11 – 3.31)	0.8 (0.36 – 1.83)	2.2 ^{*,**} (1.16 – 4.31)	1.2 (0.52 – 2.99)	3.9 ^{**,} (1.99 – 7.50)	2.0 (0.72 – 5.53)
Anxiety Disorder	1.3 (0.73 – 2.14)	1.0 (0.54– 1.95)	2.6 ^{*,**} (1.43 – 4.68)	2.5 [*] (1.21 – 5.14)	1.8 (0.97 – 3.34)	1.2 (0.53 – 2.64)
Conduct Disorder	7.9 ^{**,} (4.41 – 14.17)	5.3 ^{**,} (2.72 – 10.28)	2.6 [*] (1.34 – 5.03)	1.6 (0.71 – 3.83)	4.0 ^{**,} (1.92 – 8.46)	1.2 (0.53 – 2.89)
Oppositional Defiant Disorder	3.3 ^{**,} (1.95 – 5.43)	1.8 (0.83 – 3.80)	2.2 [*] (1.21 – 4.12)	1.3 (0.55 – 3.25)	2.4 [*] (1.21 – 4.68)	1.7 (0.51 – 5.47)
Attention Deficit Hyperactivity Disorder	1.9 [*] (1.17 – 3.17)	1.1 (0.54 – 2.29)	1.2 (0.64 – 2.29)	0.67 (0.30 – 1.52)	1.2 (0.58 – 2.52)	0.5 (0.17 – 1.56)
Alcohol Abuse/Dependence	4.8 [*] (1.37 – 16.56)	1.8 (0.46 – 7.28)	1.1 (0.35 – 3.38) [*]	0.5 (0.11 – 2.01)	10.4 ^{**,} (4.63 – 23.28)	6.1 ^{**,} (2.47 – 15.00)
Drug Abuse/Dependence	12.3 ^{**,} (3.81 – 39.86)	6.0 [*] (2.06 – 17.77)	3.38 [*] (1.59 – 7.17)	2.64 [*] (1.13 – 6.20)	7.8 ^{**,} (3.46 – 17.73)	4.4 ^{**,} (1.929 – 10.200)

Results of logistic regression models (odds ratios and 95% confidence limits). Each odds ratio and confidence interval is adjusted for adolescent age, sex and poverty status through their inclusion as covariates.

* = p<.05,
** = p<.001