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The role of mental illness on cigarette dependence and successful quitting in a nationally representative, household based sample of U.S. adults

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Abstract

Purpose—To begin to explore whether the association between mental illness (MI), cigarette dependence and unsuccessful quit attempts differs across particular demographic subgroups.

Methods—This study examines data from adults aged 18 or older participating in the 2008–2012 National Surveys on Drug Use and Health. Analyses explored the moderating effects of age, gender, and race/ethnicity on associations between three levels of MI: (serious mental illness [SMI], any mental illness but no SMI, and no MI) and two smoking-related outcomes (cigarette dependence among current smokers and successful quitting among ever daily smokers).

Results—After confirming that adults with MI were more likely to be dependent on cigarettes and less likely to successfully quit smoking, particularly among those with SMI, adjusted analyses indicated that age (but not gender or race/ethnicity) moderated the associations between MI and cigarette dependence and between MI.

Conclusions—The magnitude of the association between MI and cigarette dependence and between MI and successful quitting appears to be stronger among older adults than among younger adults. Identifying subgroups at particular high risk of cigarette dependence is paramount to targeting smoking prevention, cessation, and treatment services appropriately.

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Ethical standards: The authors assert that all procedures contributing to this work comply with the ethical standards of the relevant national and institutional committees on human experimentation and with the Helsinki Declaration of 1975, as revised in 2008.

Keywords

Cigarette Smoking; Tobacco Use Disorder; Smoking Cessation; Mental Disorders

INTRODUCTION

Cigarette smoking continues to be one of the world's largest public health problems despite significant advances in the recognition of its adverse effects on health and well-being (1). People with mental illness (MI) are at particular risk for cigarette-related negative health outcomes because they have higher rates of having ever smoked cigarettes (2-4), smoke more cigarettes per day (5, 6), have higher rates of nicotine dependence (7-9), and suffer more smoking-related morbidity and mortality (10) than people without MI. These problems have made smoking prevention and cessation among those with MI—particularly serious MI (SMI)—a national priority (11). Although the prevalence of smoking appears to be decreasing in the population overall (12), the prevalence is not decreasing as much among those with MI (13), and individuals with MI are less likely to successfully quit smoking than those without MI (2, 4, 6, 14, 15).

Research indicates that a substantial proportion of people with MI have a desire to quit smoking (16, 17) and that smoking cessation interventions can be effective among those with MI (18, 19). This suggests that targeted interventions for cessation may be useful for reducing the smoking burden among those with MI. However, identifying where prevention and cessation programs may be optimally implemented is important, given limited resources.

Some evidence suggests that the relationship between smoking status and MI may not be the same across all subpopulations. For example, data from the 2007 Health Information National Trends Survey found that general psychological distress was related to current smoking for white but not for black or Hispanic respondents (20). Whether these differences by race/ethnicity extend to the association between MI and *cigarette dependence*, however, is unknown. To our knowledge, no published studies have formally assessed the moderation of MI and cigarette dependence by other demographic characteristics such as gender or age that might influence the association between mental illness and cigarette dependence. Likewise, it is important to adjust for other sociodemographic covariates such as employment, education, and income which have been indicated as having significant associations with both mental illness and smoking outcomes (21).

Additionally, there is a paucity of research examining the interaction between MI and demographic characteristics on *successful quitting*. One prospective study of more than 4,000 adults in the United States found that the relationship between depression symptoms and smoking cessation was not significantly moderated by gender or race. However, that study only included white and black respondents and it did not examine age (22). Moreover, the study focused only on depression symptoms and did not evaluate other mental illnesses.

This study builds upon past work by using recent, nationally representative data from the National Survey on Drug Use and Health (NSDUH) to begin to explore whether the

associations between MI and cigarette dependence, and MI and successful quitting are moderated by age, gender, and race/ethnicity in covariate adjusted models. This investigation is paramount because there is only limited evidence regarding the moderation of the association between MI and cigarette dependence and quitting, especially in population-based samples. Age, gender, and race/ethnicity were selected as the first three potential moderators for investigation because these characteristics are easily identified during a clinical encounter thereby making them potentially useful markers for targeting prevention and treatment efforts. Moreover, prior research has shown that rates of MI differ by age, gender, and race/ethnicity, as do rates of cigarette dependence and successful quitting (11, 23, 24), and there may be a differential relationship between MI and cigarette dependence or quitting, and age, gender, and race/ethnicity. NSDUH allows for a refined investigation of this moderation (e.g., examining six racial/ethnic groups and three levels of MI) because of its large sample size and national representativeness. Better understanding of these associations in specific subpopulations may help treatment and service providers identify those most at need for additional prevention and cessation services and may help future researchers identify etiological mechanisms.

MATERIALS AND METHODS

Sample

This secondary data analysis examines data from the 2008–2012 NSDUHs. NSDUH is an annual, cross-sectional survey of the civilian, noninstitutionalized U.S. population aged 12 or older sponsored by the Substance Abuse and Mental Health Services Administration (SAMHSA), U.S. Department of Health and Human Services. The design comprises an independent multistage area probability sample for each of the 50 states and the District of Columbia. Approximately 68,000 interviews of adolescents and adults are completed annually; interviews are administered in households using face-to-face and audio computer-assisted self-interviewing methods. Respondents include residents of households and noninstitutional group quarters, and civilians living on military bases. Respondents provide consent for participation after hearing a complete study description and are provided \$30 upon completion. NSDUH procedures were approved by the contracting organization's Institutional Review Board. More information on NSDUH study design can be found in the 2008–2012 methodological resource books (25-29). Data on having past year MI in NSDUH are only available for adult respondents; therefore, all analyses were restricted to the approximately 230,000 respondents aged 18 or older.

Measures

These analyses focus on cigarette smoking, rather than other forms of nicotine use and dependence such as cigars, pipes, and smokeless tobacco to reduce the heterogeneity in the analyses (30). Three cigarette smoking-related outcomes are examined: nicotine (cigarette) dependence (henceforth referred to as “cigarette dependence”) among all adults, cigarette dependence among past-month (cigarette) smokers (henceforth referred to as “current smokers”), and successful quitting among those who reported smoking at least 100 cigarettes in their lifetime and reported smoking daily at some point in their lifetime (henceforth referred to as “ever daily smokers”). Cigarette dependence among all adults and

among current smokers was measured using the Nicotine Dependence Syndrome Scale (NDSS) (31) and the Fagerstrom Test of Nicotine Dependence (FTND) (32), which are both widely used measures of the symptoms of physiological dependence (e.g. difficulty abstaining, withdrawal) and have good to excellent psychometric properties across diverse samples (32-34). The NDSS is a multidimensional scale of nicotine dependence that includes 17 items scored on 5 point Likert scale. Dependence according to NDSS required a score of 2.75 or higher based on prior research that showed this score best differentiated chippers (nondependent smokers) and heavy (dependent) smokers. The FTND defined dependence as smoking the first cigarette of the day within 30 minutes of waking, which prior research has shown to best discriminate dependent from nondependent smokers (35). Respondents who met dependence criteria for either assessment were classified as cigarette dependent. For our analyses, successful quitting was defined as not smoking cigarettes in the past month among ever daily smokers.

Past year MI in NSDUH is measured based on a statistical model developed from the Mental Health Surveillance Study (MHSS), which used trained clinical interviewers to administer the Structured Clinical Interview for DSM-IV-TR Axis I Disorders, Research Version, Non-patient Edition (SCID-I/NP) (36). These interviews were conducted via telephone on a subsample of just under 5,700 adult respondents who had completed the main NSDUH interview from 2008 to 2012. In the MHSS clinical interview subsample, adults were defined as having past year any mental illness (AMI) if they were determined to have at least one of the past year mental disorders assessed by the MHSS (bipolar I disorder, major depressive disorder, dysthymic disorder, posttraumatic stress disorder, panic disorder with and without agoraphobia, agoraphobia without history of panic disorder, social phobia, specific phobia, obsessive compulsive disorder, generalized anxiety disorder, anorexia nervosa, bulimia nervosa, adjustment disorder, or intermittent explosive disorder). Respondents with a past year substance use disorder without another one of the aforementioned mental disorders were not classified as having past year AMI. MHSS respondents determined to have past year AMI were further classified as having SMI if their functional impairment score assessed by the Global Assessment of Functioning (GAF) scale was indicative of serious functional impairment (≤ 50).

These data, collected from the clinical subsample, were then used to create a predictive model for clinical classification with variables collected as part of the main NSDUH survey. Three criteria guided the creation of the model: 1) model parsimony, 2) reduction in misclassification of MI, and 3) reduction in significant biases in MI estimates within subpopulations (i.e., false positive and false negative rates were nearly equal within different levels of gender, race/ethnicity, etc.). The model selected as best fitting the data included variables measuring psychological distress, functional impairment, past year serious thoughts of suicide, past year major depressive episode, and age from the main NSDUH. Cutpoints for the predicted value yielded by this model were selected to identify respondents with AMI and respondents with SMI that minimized misclassification and equalized false positive and false negative rates for the overall subsample and within various subpopulations. The classification error rate of SMI was 3.84 percent (1.92 percent false positives and 1.93 percent false negatives) and of AMI was 15.47 percent (7.70 percent false positives and 7.77 false negatives). Among the 64 tests of subpopulation-specific bias, only

one had a significantly biased estimate of AMI (respondents living in the South region of the U.S.).

This prediction model and cutpoints were then applied to all adult NSDUH respondents to classify each as having SMI or AMI. More information on the modeling methodology can be found in other reports (Appendix B.4.3 of Results from the 2012 National Survey on Drug Use and Health: Mental Health Findings; 25-29, 37, 38). To evaluate the role of severity of MI in the analyses, MI was categorized into three mutually exclusive levels: SMI, AMI but no SMI, and no MI. No MI serves as the reference category in all models.

Moderating variables were selected based on research suggesting that they may affect the relationship between MI and cigarette dependence. These variables included age (18–25, 26–49, and 50 or older), gender (male or female), and race/ethnicity (non-Hispanic white, black, American Indian/Alaska Native, Asian and other, and Hispanic) (11, 23, 24).

Additional covariates included education level, current employment status, household income, U.S. census region, metropolitan status, and urbanicity (21).

Analyses

Descriptive statistics were computed to describe the characteristics of all adults, those who were current smokers, and those who had ever been daily smokers. Prevalence estimates and chi-square tests were computed to compare the percentages of cigarette dependence among all adults and current smokers, and of successful quitting among ever daily smokers between those with no MI, AMI but no SMI, and SMI, as well as across levels of each other correlate. Significant pairwise comparisons are noted at $p < .05$ and, in the tables, at $p < .01$.

To examine whether the association between MI and cigarette dependence differed by age group, gender, or race while controlling for potential confounders, moderation analyses were conducted among all adults and among current smokers using logistic regression models.. Similar logistic regression models were used to examine the association between MI and successful quitting. Multiplicative interaction terms selected for investigation for each outcome included MI by age group, MI by gender, and MI by race/ethnicity. Interaction terms significant at an alpha of .05 were retained in the final model. Contrast statements were used to produce stratum-specific odds ratios for the significant age group, gender, and race/ethnicity interactions.

Multicollinearity between correlates was assessed prior to finalizing each model; no problematic multicollinearity was identified. All analyses were conducted using SUDAAN® to account for the complex sample design and sampling weights of NSDUH (39). Moreover, an adjusted sampling weight was constructed by dividing the annual analysis weight for the adult sample by 5 to account for the 5 years of pooled data, thereby producing estimates representing annual averages for 2008 to 2012 among adults aged 18 or older.

RESULTS

Sample Description

Nearly one-quarter (24.5%) of all adults reported past month cigarette smoking, and 14.1% had cigarette dependence (Table 1). Thus, 57.4% of all past month cigarette smokers were currently dependent. Less than half of ever daily cigarette smokers had successfully quit (47.6%). Among all adults, 3.9% had SMI in the past year and 14.2% had AMI but no SMI in the past year. Among current cigarette smokers, 6.9% had SMI and 19.2% had AMI but no SMI in the past year, and 5.5% and 16.6% of ever daily smokers had SMI and AMI but no SMI, respectively.

Other sample characteristics mirrored those found in the household, noninstitutionalized U.S. population. For example, slightly more than half of the sample was female, most respondents were non-Hispanic white, and a slight majority were employed full time.

Smoking Prevalence

MI was significantly associated with each of the three smoking outcomes (cigarette dependence among all adults, cigarette dependence among current smokers, and successful quitting among ever daily smokers) in our unadjusted analyses (Table 2). These associations were significant in the total samples examined as well as for every subgroup (i.e., covariate level) examined. For example, among males, smokers with SMI, and smokers with AMI but not SMI were more likely to be cigarette dependent (73.7% and 65.0% vs. 53.7%) and ever daily smokers were less likely to have successfully quit smoking compared to their male counterparts with no MI (30.4% and 37.3% vs. 51.7%).

Moderation Analyses

Cigarette dependence among current smokers—As shown in Table 3, the final adjusted cigarette dependence model among current smokers contained one significant interaction term: MI by age group (Wald $F=5.89$, $df=4$, $p<.001$). The other two interaction terms tested, MI by gender and MI by race/ethnicity, were not statistically significant. Thus, contrasts were examined to determine how the direction or strength of the association between MI and cigarette dependence differed between current smokers across age groups. Current smokers in each age group had similar associations between MI and cigarette dependence in terms of *significance* and *direction*. Smokers with SMI and AMI but no SMI were more likely to have cigarette dependence than smokers with no MI, and the magnitude of the MI-cigarette dependence was greater for smokers with SMI versus smokers with AMI but no SMI across all age groups.

Differences in the *magnitude* of the MI-cigarette dependence association, however, were detected across some age group strata. For example, the association between SMI and cigarette dependence appeared to be stronger among smokers aged 50 years or older as compared to smokers aged 18–25 (OR=3.87, 95% CI=2.68–5.58 vs. OR=1.66, 95% CI=1.47–1.88, respectively).

Successful quitting among ever daily smokers—The final adjusted successful quitting model among adults who had ever been daily smokers contained one significant interaction term: MI by age group (Wald $F=9.55$, $df=4$, $p<.001$). The other two interaction terms tested, MI by gender and MI by race/ethnicity, were not significant. Thus, contrasts were examined to determine how the direction or strength of the association between MI and successful quitting differed between ever daily smokers across age groups. Ever daily smokers in each age group had similar associations between MI and successful quitting in terms of *significance* and *direction*. That is, ever daily smokers in each age group with SMI and AMI but no SMI were less likely to have successfully quit than ever daily smokers with no MI. In addition, the strength of the MI-successful quitting association appeared to be greater among ever daily smokers with SMI versus ever daily smokers with AMI but no SMI across each age group. The exception to these associations was seen in the 18–25 age group, where successful quitting was not significantly less likely among those with SMI than those with AMI but no SMI or than those with no MI.

Differences in the *magnitude* of the MI-cigarette dependence association were detected across only some age strata. For example, the association between SMI and successful quitting appeared to be stronger among daily smokers aged 26–49 and aged 50 years or older as compared to daily smokers aged 18–25 (OR=0.55, 95% CI=0.48–0.63 and OR=0.42, 95% CI=0.34–0.52 vs. OR=0.88, 95% CI=0.73–1.05, respectively). This pattern was evident for daily smokers with AMI but no SMI aged 26–49 and aged 50 years or older versus those aged 18–25, as well (OR=0.66, 95% CI=0.61–0.72 and OR=0.66, 95% CI=0.58–0.74 vs. OR=0.84, 95% CI=0.75–0.94, respectively).

DISCUSSION

This study confirms significant associations between MI and cigarette dependence, as well as MI and successful quitting. Current adult smokers with past year MI are more likely to be dependent on cigarettes, and, among ever daily smokers, less likely to successfully quit smoking. The magnitude of these associations increases with severity of MI (e.g., adult current smokers with SMI were more likely to be dependent than those with AMI but no SMI and daily smokers with SMI were less likely to have successfully quit than those with AMI but no SMI). Our final models identified age, but not gender or race/ethnicity, as a significant moderator of each association examined.

These findings are consistent with prior research showing significant associations between MI and cigarette dependence and between MI and successful quitting. The current study identified several new findings regarding moderators of the MI and cigarette dependence, and MI and successful quitting associations. Contrary to race/ethnicity differences in the association between MI and cigarette *smoking* (not necessarily cigarette *dependence*) found in prior research (20), no significant interactions between MI and race/ethnicity on cigarette dependence were found among current smokers in this study. The main effect analyses of the association between race/ethnicity and dependence among current smokers, however, showed that non-Hispanic white smokers were more likely to be dependent than smokers of other race/ethnicities.

Unexpectedly, this study found that the magnitude of the association between MI and cigarette dependence and between MI and successful quitting appeared to be stronger among older adults than among younger adults. One possible explanation is that the stronger association of MI and cigarette dependence may reflect a cohort effect, wherein older individuals (particularly those aged 60 or older) likely started smoking before or around the release of the 1964 Surgeon General's report when per capita cigarette consumption was at its peak (11, 40). These individuals may be more likely to be cigarette dependent than their younger counterparts due to heavier exposure. This coupled with the negative association between MI and successful quit attempts may lead to older adults with MI being more cigarette dependent and less likely to have quit than their younger counterparts. In addition, for some time popular belief held that individuals with MI were not motivated to quit, individuals with MI would not be able to quit, and smoking cessation should not be a priority in this population as it could lead to a worsening of psychiatric symptoms (17, 41). Although these attitudes are changing, this shift has occurred only recently therefore older adults with MI may be less likely to have received smoking cessation messages or support services (42).

Our study should be interpreted with the following caveats. First, our MI variable was obtained via a prediction model rather than direct measurement. Although this variable allows for the examination of differing associations by level of MI severity, using a predictive model adds some potential for misclassification. Second, our study was cross-sectional and does not contain information to permit causal inferences about the relationship between MI and cigarette dependence or between MI and successfully quitting smoking. This is particularly true for the latter association between past year MI and successful quitting, as that analyses does not permit determination of the onset of the mental illness. Despite these limitations, this study is the first formal exploration into whether age, gender, and racial/ethnicity moderate the associations between MI and cigarette dependence and MI and successful quitting using a nationally representative sample. Using NSDUH data allowed us to conduct moderation analyses using a refined mental health variable that incorporated information on severity of MI as well as looking at several groups that are often overlooked (e.g., older adults).

Our findings suggest several important implications and directions for future research. First, additional inquiry into possible reasons why MI-cigarette dependence and MI-successful quitting associations appear to increase with age is needed to clarify mechanisms of action. Further, because we know that MI, cigarette dependence, and successful quitting are significantly associated with other variables, future studies could examine other potential moderators or mediators of the examined associations with some of the other covariates included in our models as well as other behavioral variables such as drug or alcohol use or misuse, obesity, exercise, and physical activity; we chose to explore age, gender, and race/ethnicity as the first three potential moderators based on research suggesting that they may affect the relationship between MI and cigarette dependence (11, 23, 24). Second, the study and identification of significant moderators of the MI-cigarette dependence and MI-successful quitting associations are important to identify groups of individuals who are at highest risk for needing smoking prevention, cessation, and treatment services. Our results indicate that older adults with MI may require more intensive smoking cessation services than their younger counterparts, however all adults with MI are in greater need of smoking

cessation services than those without MI. Finally, among current smokers and ever daily smokers, there was no moderation by gender or race/ethnicity in the association of MI and cigarette dependence or successful quitting, respectively. This indicates that smoking cessation efforts should target these groups equally, irrespective of gender and race/ethnicity.

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List of abbreviations

AMI	Any Mental Illness
CI	confidence interval
df	degrees of freedom
DSM-IV-TR	Diagnostic and Statistical Manual of Mental Disorders, fourth edition, text revision
GAF	Global Assessment of Functioning
MHSS	Mental Health Surveillance Study
MI	Mental Illness
NSDUH	National Survey on Drug Use and Health
SAMHSA	Substance Abuse and Mental Health Administration
SCID-I/NP	Structured Clinical Interview for DSMIV-TR Axis I Disorders, Research Version, Non-patient Edition
SMI	Serious Mental Illness

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Table 1

Select characteristics among adults aged 18 or older: all adults, current cigarette smokers, and ever daily cigarette smokers, NSDUH 2008–2012

Characteristic	All adults % (SE)	Current cigarette smokers % (SE)	Ever daily cigarette smokers % (SE)
Current cigarette smoking			
Yes	24.5 (0.16)	100.0 (0.00)	52.4 (0.31)
No	75.5 (0.16)	0.0 (0.00)	47.6 (0.31)
Current (cigarette) dependence¹			
Yes	14.1 (0.14)	57.4 (0.35)	34.7 (0.29)
No	85.9 (0.14)	42.6 (0.35)	65.3 (0.29)
Ever daily cigarette smoking²			
Yes	39.0 (0.20)	N/A	100.0 (0.00)
Successfully quit ³			
Yes (no past month cigarette smoking)	N/A	N/A	47.6 (0.31)
No (had past month cigarette smoking)	N/A	N/A	52.4 (0.31)
Past year mental illness			
SMI ⁴	3.9 (0.07)	6.9 (0.16)	5.5 (0.12)
AMI ⁵ but no SMI	14.2 (0.12)	19.2 (0.25)	16.6 (0.20)
No MI	81.9 (0.13)	73.9 (0.28)	77.9 (0.23)
Age group in years			
18–25	14.7 (0.12)	20.6 (0.20)	10.1 (0.10)
26–49	43.0 (0.22)	50.3 (0.32)	41.6 (0.28)
50 or older	42.3 (0.25)	29.1 (0.36)	48.3 (0.32)
Gender			
Male	48.2 (0.16)	53.4 (0.31)	53.9 (0.27)
Female	51.8 (0.16)	46.6 (0.31)	46.1 (0.27)
Race/ethnicity			
Non-Hispanic	85.9 (0.19)	87.9 (0.26)	91.5 (0.19)
White	67.6 (0.26)	70.8 (0.36)	78.2 (0.29)
Black	11.6 (0.17)	11.9 (0.27)	8.8 (0.20)

Characteristic	All adults % (SE)	Current cigarette smokers % (SE)	Ever daily cigarette smokers % (SE)
American Indian/Alaska Native	0.5 (0.02)	0.8 (0.05)	0.6 (0.04)
Asian	4.6 (0.12)	2.2 (0.11)	2.0 (0.11)
Other non-Hispanic	1.6 (0.05)	2.1 (0.10)	1.9 (0.08)
Hispanic	14.1 (0.19)	12.1 (0.26)	8.5 (0.19)
Education			
Less than high school	15.0 (0.15)	21.0 (0.28)	17.4 (0.23)
High school graduate	30.3 (0.18)	36.7 (0.32)	35.1 (0.28)
Some college	26.0 (0.17)	27.5 (0.29)	27.0 (0.25)
College graduate	28.7 (0.23)	14.8 (0.25)	20.5 (0.28)
Employment			
Employed full time	50.9 (0.20)	52.0 (0.34)	49.2 (0.30)
Employed part time	13.9 (0.12)	13.4 (0.20)	12.2 (0.17)
Unemployed	5.7 (0.08)	9.6 (0.16)	6.5 (0.12)
Other ⁶	29.5 (0.21)	25.0 (0.32)	32.1 (0.30)
Household income			
< \$20,000	18.3 (0.19)	25.9 (0.33)	19.3 (0.25)
\$20,000–\$49,999	32.9 (0.21)	37.5 (0.34)	35.8 (0.30)
\$50,000–\$74,999	17.2 (0.14)	15.4 (0.24)	17.6 (0.23)
> \$75,000	31.6 (0.26)	21.2 (0.30)	27.4 (0.30)
U.S. census region			
Northeast	18.4 (0.19)	17.6 (0.28)	18.6 (0.26)
Midwest	21.8 (0.19)	23.8 (0.30)	23.7 (0.27)
South	36.7 (0.27)	38.7 (0.39)	37.4 (0.34)
West	23.1 (0.26)	19.9 (0.36)	20.2 (0.31)
Metropolitan status			
Large metropolitan	53.3 (0.32)	49.6 (0.43)	48.9 (0.39)
Small metropolitan	30.5 (0.31)	31.3 (0.40)	31.9 (0.38)
Nonmetropolitan	16.2 (0.25)	19.2 (0.36)	19.2 (0.33)
Urbanicity⁷			

Characteristic	All adults % (SE)	Current cigarette smokers % (SE)	Ever daily cigarette smokers % (SE)
Urban	82.5 (0.33)	81.0 (0.41)	79.5 (0.41)
Rural	17.5 (0.33)	19.0 (0.41)	20.5 (0.41)

SMI = serious mental illness; AMI = any mental illness; no MI = no mental illness; N/A=not applicable.

Source: SAMHSA, Center for Behavioral Health Statistics and Quality, National Survey on Drug Use and Health, 2008–2010 (revised March 2012) and 2011–2012.

¹ Nicotine (cigarette) dependence is based on criteria derived from the Nicotine Dependence Syndrome Scale (NDSS) or the Fagerstrom Test of Nicotine Dependence (FTND) (see Section B.4.2 in Appendix B of 43).

² Ever daily cigarette smoking is defined as respondents who reported ever smoking cigarettes daily and reported smoking 100 or more cigarettes in their lifetime.

³ Successfully quit is defined as respondents who reported ever daily cigarette smoking and who reported no past month cigarette use.

⁴ SMI is defined as having a diagnosable mental, behavioral, or emotional disorder, other than a developmental or substance use disorder that met the criteria found in the 4th edition of the *Diagnostic and Statistical Manual of Mental Disorders* (DSM-IV) and resulted in serious functional impairment. Serious mental illness estimates in 2011 may differ from previously published estimates due to revised estimation procedures (for details on the methodology, see Section B.4.3 in Appendix B of 44).

⁵ AMI is defined as having a diagnosable mental, behavioral, or emotional disorder, other than a developmental or substance use disorder that met the criteria found in DSM-IV. Any mental illness estimates in 2011 may differ from previously published estimates due to revised estimation procedures (for details on the methodology, see Section B.4.3 in Appendix B of 44).

⁶ The other employment category includes retired persons, disabled persons, homemakers, students, or other persons not in the labor force.

⁷ The Census classifies as urban all blocks located within urbanized areas (UA) and urban clusters (UC). UAs and UCs generally consist of core census block groups or blocks that have a population density of at least 1,000 people per square mile and surrounding census blocks that have an overall density of at least 500 people per square mile. In addition, under certain conditions, less densely settled territory may be part of each UA or UC. In the NSDUH sample, if one or more of the blocks within a segment is urban, the segment is defined as urban. If one hundred percent of the blocks are rural, the segment is defined as rural. This definition was used when forming segments to ensure that segments meet the minimum dwelling unit requirement (100 dwelling units in rural areas and 150 dwelling units in urban areas).

Annual average percentages of current nicotine (cigarette) dependence among current cigarette smokers and successful quitting among former daily cigarette smokers by past year mental illness, NSDUH 2008–2012

Table 2

Characteristic	Current nicotine (cigarette) dependence ¹ among current cigarette smokers			Successful quitting among ever daily (cigarette) smokers ^{2,3}		
	SMI ⁴	AMI but no SMI ⁵	No MI	SMI ⁴	AMI but no SMI ⁵	No MI
Total	73.3 ^b	64.2 ^b	54.2	29.0 ^b	37.3 ^b	51.1
Age group						
18–25	53.2 ^b	48.5 ^b	41.0	13.7	13.4 ^b	15.3
26–49	73.7 ^b	64.0 ^b	54.4	23.8 ^b	28.7 ^b	38.3
50 or older	87.0 ^b	76.3 ^b	63.2	44.4 ^b	55.1 ^b	67.6
Gender						
Male	73.7 ^b	65.0 ^b	53.7	30.4 ^b	37.3 ^b	51.7
Female	73.1 ^b	63.6 ^b	54.9	28.2 ^b	37.3 ^b	50.3
Race/ethnicity						
Non-Hispanic	75.1 ^b	66.7 ^b	57.5	28.5 ^b	37.9 ^b	51.4
White	76.4 ^b	67.4 ^b	59.0	28.8 ^b	39.0 ^b	53.4
Black	68.0 ^b	64.4 ^b	54.8	27.3 ^a	27.3 ^b	37.0
American Indian/Alaska Native	*	58.8	50.7	*	*	34.1
Asian	*	51.0 ^b	32.9	*	39.8 ^a	54.0
Other non-Hispanic	73.9 ^b	71.9 ^b	52.5	22.3 ^b	36.8	40.5
Hispanic	54.9 ^b	42.3 ^b	32.2	35.1 ^b	30.9 ^b	47.3
Education						
Less than high school	79.4 ^b	75.2 ^b	64.9	21.4 ^b	28.9 ^b	38.8
High school graduate	79.3 ^b	68.6 ^b	59.7	24.0 ^b	33.5 ^b	46.8
Some college	71.3 ^b	61.7 ^b	48.3	28.9 ^b	36.7 ^b	50.8

Characteristic	Current nicotine (cigarette) dependence ¹ among current cigarette smokers			Successful quitting among ever daily (cigarette) smokers ^{2,3}		
	SMI ⁴	AMI but no SMI ⁵	No MI	SMI ⁴	AMI but no SMI ⁵	No MI
College graduate	52.0 ^b	42.6 ^b	35.8	48.0 ^b	53.9 ^b	68.3
Employment						
Employed full time	64.3 ^b	59.6 ^b	51.8	31.3 ^b	35.4 ^b	46.9
Employed part time	63.5 ^b	56.6 ^b	47.5	32.5 ^b	35.6 ^b	50.8
Unemployed	74.0 ^b	65.1 ^b	59.2	18.7 ^a	20.5 ^a	26.0
Other ⁶	83.4 ^b	74.3 ^b	62.3	28.7 ^b	44.0 ^b	63.0
HOUSEHOLD INCOME						
< \$20,000	78.7 ^b	68.3 ^b	58.3	22.6 ^b	26.9 ^b	34.1
\$20,000–\$49,999	74.1 ^b	68.2 ^b	57.3	27.4 ^b	34.7 ^b	47.1
\$50,000–\$74,999	66.3 ^b	58.1 ^b	52.8	34.8 ^b	42.4 ^b	55.6
> \$75,000	63.3 ^b	53.2 ^b	45.9	41.4 ^b	50.7 ^b	62.6
U.S. census region						
Northeast	70.7 ^b	62.8 ^b	54.0	33.5 ^b	40.3 ^b	54.4
Midwest	73.9 ^b	67.2 ^b	58.1	25.0 ^b	34.9 ^b	49.1
South	76.3 ^b	67.0 ^b	56.6	25.8 ^b	36.5 ^b	48.5
West	69.8 ^b	56.7 ^b	44.9	34.7 ^b	38.8 ^b	55.2
Metropolitan status						
Large metropolitan	71.4 ^b	59.1 ^b	49.5	30.8 ^b	38.5 ^b	52.4
Small metropolitan	73.8 ^b	66.0 ^b	55.8	27.6 ^b	37.5 ^b	51.2
Nonmetropolitan	77.4 ^b	74.0 ^b	64.2	27.0 ^b	34.1 ^b	47.5
Urbanicity⁷						
Urban	72.3 ^b	62.6 ^b	51.7	29.8 ^b	37.0 ^b	51.2

Characteristic	Current nicotine (cigarette) dependence ¹ among current cigarette smokers			Successful quitting among ever daily (cigarette) smokers ^{2,3}		
	SMI ⁴	AMI but no SMI ⁵	No MI	SMI ⁴	AMI but no SMI ⁵	No MI
Rural	77.8 ^b	71.2 ^b	64.7	25.4 ^b	38.8 ^b	50.7

SMI = serious mental illness; AMI = any mental illness; no MI = no mental illness

Source: SAMHSA, Center for Behavioral Health Statistics and Quality, National Survey on Drug Use and Health, 2008–2010 (revised March 2012) and 2011–2012.

* =low precision; no estimate reported.

^a Difference between no MI estimate and estimate is statistically significant at the .05 level.

^b Difference between no MI estimate and estimate is statistically significant at the .01 level.

¹ Nicotine (cigarette) dependence is based on criteria derived from the Nicotine Dependence Syndrome Scale (NDSS) or the Fagerstrom Test of Nicotine Dependence (FTND) (see Section B.4.2 in Appendix B of 43).

² Ever daily cigarette smoking is defined as respondents who reported ever smoking cigarettes and reported smoking 100 or more cigarettes in their lifetime.

³ Successful quitting is defined as respondents who reported Ever daily Cigarette Smoking and who reported no past month cigarette use.

⁴ SMI is defined as having a diagnosable mental, behavioral, or emotional disorder, other than a developmental or substance use disorder that met the criteria found in the 4th edition of the *Diagnostic and Statistical Manual of Mental Disorders* (DSM-IV) and resulted in serious functional impairment. Serious mental illness estimates in 2011 may differ from previously published estimates due to revised estimation procedures (for details on the methodology, see Section B.4.3 in Appendix B of 44).

⁵ AMI is defined as having a diagnosable mental, behavioral, or emotional disorder, other than a developmental or substance use disorder that met the criteria found in DSM-IV. Any mental illness estimates in 2011 may differ from previously published estimates due to revised estimation procedures (for details on the methodology, see Section B.4.3 in Appendix B of 44).

⁶ The other employment category includes retired persons, disabled persons, homemakers, students, or other persons not in the labor force.

⁷ The Census classifies as urban all blocks located within urbanized areas (UA) and urban clusters (UC). UAs and UCs generally consist of core census block groups or blocks that have a population density of at least 1,000 people per square mile and surrounding census blocks that have an overall density of at least 500 people per square mile. In addition, under certain conditions, less densely settled territory may be part of each UA or UC. In the NSDUH sample, if one or more of the blocks within a segment is urban, the segment is defined as urban. If one hundred percent of the blocks are rural, the segment is defined as rural. This definition was used when forming segments to ensure that segments meet the minimum dwelling unit requirement (100 dwelling units in rural areas and 150 dwelling units in urban areas).

Adjusted⁷ odds ratios of current nicotine (cigarette) dependence among current cigarette smokers and successful quitting among former daily cigarette smokers by past year mental illness, NSDUH 2008–2012

Table 3

Characteristic	Current nicotine (cigarette) dependence ² among current cigarette smokers ³		Successful quitting among ever daily (cigarette) smokers ^{4,5,6}	
	OR (95% CI)		OR (95% CI)	
Age group				
18–25				
SMI ⁷	1.66 (1.47–1.88)		0.88 (0.73–1.05)	
AMI but no SMI ⁸	1.40 (1.30–1.50)		0.84 (0.75–0.94)	
No MI	1.00		1.00	
26–49				
SMI ⁷	2.07 (1.78–2.40)		0.55 (0.48–0.63)	
AMI but no SMI ⁸	1.44 (1.31–1.57)		0.66 (0.61–0.72)	
No MI	1.00		1.00	
50 or older				
SMI ⁷	3.87 (2.68–5.58)		0.42 (0.34–0.52)	
AMI but no SMI ⁸	1.80 (1.46–2.22)		0.66 (0.58–0.74)	
No MI	1.00		1.00	
Gender				
Male				
SMI ⁷	1.00		1.00	
AMI but no SMI ⁸	*		*	
No MI	*		*	
Female				
SMI ⁷	0.95 (0.90–1.01)		0.90 (0.85–0.94)	
AMI but no SMI ⁸	*		*	
No MI	*		*	

Characteristic	Current nicotine (cigarette) dependence ² among current cigarette smokers ³		Successful quitting among ever daily (cigarette) smokers ^{4,5,6}	
	OR (95% CI)		OR (95% CI)	
Race/ethnicity				
No MI		*		*
Non-Hispanic				
White	1.00		1.00	
SMI ⁷	*		*	
AMI but no SMI ⁸	*		*	
No MI	*		*	
Black	0.67 (0.61–0.74)		0.73 (0.66–0.82)	
SMI ⁷	*		*	
AMI but no SMI ⁸	*		*	
No MI	*		*	
American Indian/Alaska Native	0.56 (0.44–0.71)		0.72 (0.53–0.97)	
SMI ⁷	*		*	
AMI but no SMI ⁸	*		*	
No MI	*		*	
Asian	0.61 (0.49–0.78)		0.93 (0.75–1.16)	
SMI ⁷	*		*	
AMI but no SMI ⁸	*		*	
No MI	*		*	
Other non-Hispanic	0.81 (0.67–0.97)		0.73 (0.59–0.90)	
SMI ⁷	*		*	
AMI but no SMI ⁸	*		*	
No MI	*		*	
Hispanic	0.31 (0.28–0.35)		1.25 (1.12–1.39)	

Characteristic	Current nicotine (cigarette) dependence ² among current cigarette smokers ³		Successful quitting among ever daily (cigarette) smokers ^{4,5,6}	
	OR (95% CI)		OR (95% CI)	
SMI ⁷	*		*	
AMI but no SMI ⁸	*		*	
No MI	*		*	
Education				
Less than high school	3.79 (3.38–4.24)		0.43 (0.39–0.48)	
High school graduate	2.75 (2.50–3.03)		0.51 (0.47–0.55)	
Some college	1.87 (1.70–2.06)		0.61 (0.56–0.66)	
College graduate	1.00		1.00	
Employment				
Employed full time	1.00		1.00	
Employed part time	0.89 (0.83–0.96)		1.36 (1.26–1.47)	
Unemployed	1.28 (1.17–1.41)		0.70 (0.63–0.78)	
Other ⁹	1.21 (1.11–1.31)		1.65 (1.54–1.76)	
Household income				
< \$20,000	1.00		1.00	
\$20,000–\$49,999	0.98 (0.91–1.06)		1.60 (1.48–1.73)	
\$50,000–\$74,999	0.81 (0.74–0.89)		2.22 (2.02–2.44)	
> \$75,000	0.74 (0.67–0.80)		2.72 (2.48–2.97)	
U.S. census region				
Northeast	1.00		1.00	

Characteristic	Current nicotine (cigarette) dependence ² among current cigarette smokers ³	Successful quitting among ever daily (cigarette) smokers ^{4,5,6}
	OR (95% CI)	OR (95% CI)
Midwest	0.99 (0.91–1.07)	0.91 (0.85–0.98)
South	0.99 (0.91–1.07)	0.88 (0.82–0.95)
West	0.78 (0.71–0.86)	1.07 (0.97–1.17)
Metropolitan status		
Large metropolitan	0.83 (0.76–0.90)	1.04 (0.97–1.12)
Small metropolitan	0.88 (0.81–0.96)	1.07 (0.99–1.15)
Nonmetropolitan	1.00	1.00
Urbanicity¹⁰		
Urban	1.00	1.00
Rural	1.11 (1.02–1.19)	1.04 (0.97–1.12)

OR=odds ratio; 95% CI=95% confidence interval; SMI=serious mental illness; AMI=any mental illness; no MI=no mental illness

Source: SAMHSA, Center for Behavioral Health Statistics and Quality, National Survey on Drug Use and Health, 2008–2010 (revised March 2012) and 2011–2012.

* =not presented because variable had no significant interaction with mental illness in final model; however, these analyses do adjust for mental illness by itself.

¹Model simultaneously adjusts for displayed covariates as well as interaction terms that remained significant in the final model after starting with three interaction terms in the model (mental illness*age group, mental illness*gender, and mental illness*race/ethnicity) as well as other displayed covariates.

²Nicotine (cigarette) dependence is based on criteria derived from the Nicotine Dependence Syndrome Scale (NDSS) or the Fagerstrom Test of Nicotine Dependence (FTND) (see Section B.4.2 in Appendix B of 43).

³Final model included significant age group ($p<.001$) by mental illness interaction.

⁴Ever daily cigarette smoking is defined as respondents who reported ever smoking cigarettes and reported smoking 100 or more cigarettes in their lifetime.

⁵Successful quitting is defined as respondents who reported ever daily cigarette smoking and who reported no past month cigarette use.

⁶Final model included significant age group ($p<.001$) by mental illness interaction.

⁷ SMI is defined as having a diagnosable mental, behavioral, or emotional disorder, other than a developmental or substance use disorder that met the criteria found in the 4th edition of the *Diagnostic and Statistical Manual of Mental Disorders* (DSM-IV) and resulted in serious functional impairment. Serious mental illness estimates in 2011 may differ from previously published estimates due to revised estimation procedures (for details on the methodology, see Section B.4.3 in Appendix B of 44).

⁸ AMI is defined as having a diagnosable mental, behavioral, or emotional disorder, other than a developmental or substance use disorder that met the criteria found in DSM-IV. Any mental illness estimates in 2011 may differ from previously published estimates due to revised estimation procedures (for details on the methodology, see Section B.4.3 in Appendix B of 44).

⁹ The other employment category includes retired persons, disabled persons, homemakers, students, or other persons not in the labor force.

¹⁰ The census classifies as urban all blocks located within urbanized areas (UA) and urban clusters (UC). UAs and UCs generally consist of core census block groups or blocks that have a population density of at least 1,000 people per square mile and surrounding census blocks that have an overall density of at least 500 people per square mile. In addition, under certain conditions, less densely settled territory may be part of each UA or UC. In the NSDUH sample, if one or more of the blocks within a segment is urban, the segment is defined as urban. If 100% of the blocks are rural, the segment is defined as rural. This definition was used when forming segments to ensure that segments meet the minimum dwelling unit requirement (100 dwelling units in rural areas and 150 dwelling units in urban areas).