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RESEARCH ARTICLE

# Socioeconomic Disparities in Smoking Among U.S. Adults With Depression, 2005–2014

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**Introduction:** The purpose of this study is to estimate changes in the cigarette smoking prevalence among U.S. adults with and without depression from 2005 to 2014 by income and education level and overall.

**Methods:** This study examined data from adult respondents (aged ≥18 years) in the National Survey on Drug Use and Health, an annual cross-sectional study of U.S. individuals. Data from the years 2005 to 2014 were analyzed for a total analytic sample of $n$=378,733. The prevalence of past-month cigarette smoking was examined annually from 2005 to 2014 among adults with and without past-year major depression, overall and by income/education, using linear trend analyses. Data analysis occurred in 2017.

**Results:** The prevalence of smoking declined significantly from 2005 to 2014 among those with depression (37.62% to 34.01%; $p < 0.001$) and without depression (23.99% to 19.87%; $p < 0.001$). Yet, smoking remained nearly twice as common among those with depression during this period. Among adults with depression in the lowest income and education groups, the prevalence of smoking was more than double the prevalence of smoking among adults with depression in the highest income and education groups.

**Conclusions:** Disparities in smoking prevalence are pronounced when depression and SES are considered simultaneously. Targeted public health and clinical efforts to reduce smoking among adult smokers of lower SES with depression are needed.

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## INTRODUCTION

Cigarette use remains the leading cause of premature mortality and preventable disease in the U.S.[1] Although there have been substantial declines in smoking during the past several decades in the U.S., evidence suggests that these declines are not distributed equally in the population. Vulnerable groups, such as people with mental disorders, are increasingly overrepresented among current smokers[2–4] and therefore may not have equally benefited from tobacco control efforts.

Major depression is the most common mental disorder in the U.S.[5] The prevalence of smoking among adults with depression is two to three times greater than the U.S. population.[6–8] Adults with depression are more dependent

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on nicotine[9] and depression appears to act as a barrier to smoking cessation.[7,10] Adults with mental illness are more likely to die prematurely from tobacco-related deaths[11] and continued smoking may have an impact on pharmacological treatments for depression.[12] The high prevalence of depression and high prevalence of smoking among people with depression results in a large subgroup of millions of Americans vulnerable to the consequences of smoking.

Relatively little is known about subgroups of people with depression who may differ in their smoking behavior. Specifically, adults with indicators of lower SES (e.g., lower income, less education) are more likely to report depression and cigarette smoking[8,13–16] and lower rates of smoking cessation.[17–20] No prior study has examined recent trends in smoking over time by both depression and SES indicators. Furthermore, no study has examined changes before and after the 2008 recession, which has been associated with increases in depression and suicide.[21–23]

The authors propose that stratifying by both depression and SES simultaneously is essential to identify key sections of the adult U.S. population that bear a disproportionate burden of smoking. The goals of the current study are to use nationally representative data from U.S. adults to begin to fill these gaps. First, the study estimates the prevalence of cigarette smoking among adults with and without past-year depression overall and by income and education level. Second, the study estimates changes in the prevalence of cigarette smoking from 2005 to 2014 among adults with and without depression. Third, the study examines changes in the prevalence of smoking from 2005 to 2014 among adults with and without depression by income and education. Given the differential distribution of smoking by both depression and SES, it is hypothesized that the prevalence of smoking will be higher among adults with both depression and indicators of lower SES. Furthermore, it is hypothesized that there will be three-way interactions between year, depression, and SES such that the magnitude of the decrease in the prevalence of smoking will be attenuated among adults with both depression and indicators of lower SES relative to adults without depression and lower SES indicators.

# METHODS

## Study Population

Data were analyzed from The National Survey on Drug Use and Health (NSDUH) which provides annual cross-sectional national data on the use of tobacco, other substance use, and mental health, and is described in-depth elsewhere.[24] A multistage area probability sample was conducted annually for each of the 50 states and the District of Columbia to represent the U.S. male and female civilian non-institutionalized population aged ≥12 years. Data were collected from respondents by computer-assisted personal interviewing conducted by an interviewer and audio computer-assisted self-interviewing. Measures in the NSDUH demonstrate good reliability and validity for adults (see Center for Behavioral Health Statistics and Quality[25] and Chromy[26] for more details). Data for the years 2005 through 2014 were extracted from the public data portal (www.datafiles.samhsa.gov/) and analyses were conducted in 2017. Response rates for completed surveys during the study period ranged from 71% to 76%. The data sets from each year were concatenated, adding a variable for the survey year. After excluding 3,394 respondents who did not respond to questions about past-year depression and 176,245 respondents who were aged 12 to 17 years, the total analytic sample was $n$=378,733.

## Measures

Current smoking was defined as having smoked >100 lifetime cigarettes and part or all of a cigarette during the past 30 days.

Depression modules were assessed using DSM-IV criteria for major depressive episode (MDE).[27] MDE questions were adapted from the depression section of the National Comorbidity Survey-Replication.[28] Respondents were classified as having a lifetime MDE based on reporting five or more of nine MDE symptoms during the same 2-week period in their lifetime, with at least one symptom being a depressed mood or loss of interest or pleasure in daily activities. Respondents with lifetime MDE were then classified as having past-year MDE if they reported feeling depressed or loss of interest or pleasure in daily activities for ≥2 weeks during the past 12 months, while also having some of the other symptoms for lifetime MDE. Because of changes in the questionnaire in 2008, adjusted past-year MDE variables were developed to allow for comparison for the years between 2005–2007 and 2008–2014.[29]

Income (i.e., total annual family income) was categorized as follows: <$20,000 as reference group; $20,000 to $49,999; and ≥$50,000. Education was categorized as follows: less than high school as reference group, high school graduate, some college, and college graduate.

Demographic variables were categorized as follows: age (18 to 25 years old as reference, ≥26 years), sex (male as reference group, female), and race/ethnicity (non-Hispanic white as reference group, non-Hispanic black, Hispanic, and non-Hispanic all other races, or more than one race).

## Statistical Analysis

All analyses were performed incorporating the NSDUH sampling weights and controlling for the complex clustered sampling using SAS-callable SUDAAN, version 11.0.1.

First, the prevalence of current smoking in 2014 was calculated by depression status and stratified by each demographic characteristic (i.e., age, gender, race/ethnicity, income, education). Logistic regressions tested the association between depression status (past-year depression versus no past-year depression) and current smoking separately by each demographic with and without controlling for all other demographic variables. Differential associations were tested with additional logistic regression models fit including two-way interactions between depression status and