

Trends in the Prevalence of Tobacco Use in the United States, 1991–1992 to 2004–2005

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Objective: This study examined changes in the prevalence of daily tobacco use in the United States between 1991–1992 and 2004–2005 by sociodemographic characteristics and psychiatric disorders. **Methods:** Secondary analyses were performed using data from the National Longitudinal Alcohol Epidemiologic Survey, conducted in 1991–1992 (N=41,612), and wave 2 of the National Epidemiologic Survey on Alcohol and Related Conditions, conducted in 2004–2005 (N=34,653). **Results:** Although the overall prevalence of past-year daily tobacco use decreased significantly, the reduction was not uniform across all segments of the population. In both surveys, past-year daily tobacco use was higher among respondents with a drug use disorder, an alcohol use disorder, and major depressive disorder and among individuals from socioeconomically disadvantaged groups. Declines in use were slower among individuals with a lifetime alcohol use disorder or major depressive disorder. The prevalence of past-year daily tobacco use did not decrease among Native Americans. **Conclusions:** Individuals with substance use disorders or major depressive disorder and Native Americans reported higher rates of past-year daily tobacco use than the general population. These findings suggest the need to emphasize specific interventions for these groups. (*Psychiatric Services* 64:458–465, 2013; doi: 10.1176/appi.ps.002852012)

Tobacco smoking is the leading preventable cause of premature death worldwide (1). The societal costs in terms of smoking-attributable productivity losses and smoking-related health care are substantial (2). Over the past few years, intensive educational campaigns aimed

at raising awareness of the health consequences of tobacco smoking, increased taxes on tobacco (3), and legal restrictions on the locations where smoking is permitted (4–6) have contributed to a significant decline in the prevalence of smoking in the United States.

Little is known, however, about the extent to which smoke-free legislation and media campaigns have in the aggregate differentially influenced tobacco use across subpopulations (7,8). Smoking prevalence and trends are related to socioeconomic status, and socioeconomic status is linked in complex ways to sociodemographic correlates that are associated with health disparities (9,10). However, minority groups are often underrepresented in research, which has limited the ability to examine differences between and within racial-ethnic groups (10). A better understanding of smoking trends can help clinicians and policy makers identify groups for whom prevention and smoking cessation programs have been successful and groups that may need more targeted efforts. In particular, it is important to know whether the prevalence of smoking has declined among individuals with psychiatric disorders, who are at increased risk of smoking (11,12).

To fill this gap in knowledge, we examined changes in the prevalence of smoking from 1991–1992 to 2004–2005 stratified by sociodemographic characteristics and presence or absence of specific psychiatric disorders. We drew on data from two large, nationally representative samples of U.S. adults, the National Longitudinal Alcohol Epidemiologic Survey (NLAES), conducted in 1991–1992 (13), and

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wave 2 of the National Epidemiologic Survey on Alcohol and Related Conditions (NESARC), conducted in 2004–2005 (14).

Methods

Samples

The NLAES, conducted in 1991–1992, and its successor, the NESARC, conducted in 2001–2002 with a follow-up (wave 2) in 2004–2005, obtained data from nationally representative samples of the U.S. adult population, as described elsewhere (15,16). The target population for each survey was the U.S. general population age 18 years and older. Face-to-face interviews were conducted with 41,612 respondents in NLAES and with 34,653 respondents in NESARC wave 2. The NLAES response rate was 90%, and the NESARC wave 2 response rate was 86.7% (15–17). In both surveys, data were weighted to adjust for oversampling of certain groups (for example, age 18–24) and for missing data. The weighted data are representative of the U.S. adult population at the time of the survey.

Respondents in both surveys were informed in writing about the nature of the survey, the statistical uses of the survey data, the voluntary aspect of participation, and the federal laws regarding the strict confidentiality of the identifiable survey information. Respondents who consented to participate after receiving this information were interviewed (15). The research protocols, including informed consent procedures, received full human subjects review and approval from the U.S. Census Bureau and U.S. Office of Management and Budget (15).

Assessment

The sample design and field methods of the NLAES and the NESARC were nearly identical, as previously described (16). Both the NLAES and NESARC used the Alcohol Use Disorder and Associated Disabilities Interview Schedule–IV (*DSM-IV* version) (AUDADIS-IV), a fully structured diagnostic interview designed to be conducted in households and developed to advance measurement of substance use disorders and mental disorders in large-scale surveys (18–20). The AUDADIS-IV was administered

in the NLAES with use of a paper-and-pencil instrument, whereas the AUDADIS-IV was computerized for the NESARC and responses were entered directly into laptop computers (15,20).

Tobacco use was assessed by the following question: “About how often did you usually (smoke/use) (name of tobacco category) in the last 12 months?” Daily smokers were defined as respondents who reported use of any tobacco product daily within the past 12 months.

Lifetime and past-year *DSM-IV* axis I disorders assessed by the AUDADIS-IV and examined in this study were major depression and alcohol and other substance abuse and dependence. AUDADIS-IV methods to diagnose these disorders have been described in detail elsewhere (21–24). The good-to-excellent test–retest reliability and the good-to-excellent convergent, discriminant, and construct validity of AUDADIS-IV substance use disorder diagnoses have been documented in general population and clinical samples, as described in detail elsewhere (18,21,25–27).

To be consistent with previous reports (28), estimated rates of alcohol or drug treatment utilization included treatment by both mental health professionals and non-mental health professionals. The former included outpatient visits to a physician, psychologist, or any other mental health professional; inpatient treatment in a drug detoxification or rehabilitation unit or hospital ward; and treatment in an emergency department. Non-mental health professionals included members of the clergy, employee assistance programs, family and social services, halfway houses, therapeutic communities, crisis centers, and self-help groups.

Sociodemographic measures included sex, age, race-ethnicity, nativity, education, marital status, and personal income (29).

Statistical analysis

We examined the prevalence and correlates of past-year daily tobacco use (anyone who used any tobacco product daily within the past 12 months) in each survey and compared them across the surveys. Prevalence of past-year

daily tobacco use was computed separately for the NLAES and the NESARC wave 2, stratified by sociodemographic and clinical characteristics. Odds ratios were calculated to examine differences within strata (for example, men versus women) in each survey, as well as over time (for example, changes in prevalence among women in the NLAES and wave 2 of the NESARC). The effect of clinical risk factors, such as alcohol use disorders, was also examined after adjustment for differences in sociodemographic variables. A series of logistic regression models were used, in which past-year daily tobacco use was the outcome and the predictors were each covariate (for example, gender), the survey (NLAES versus NESARC), and their interaction. All analyses, including calculation of standard errors and 95% confidence intervals, were conducted with SUDAAN to adjust for the complex design used in both surveys (16).

Results

Prevalence of tobacco use

Past-year daily tobacco use was reported by 25.9% of NLAES respondents and 18.5% of NESARC respondents ($p < .001$). In both surveys, the odds of past-year daily tobacco use were significantly greater for males; younger individuals; individuals who were widowed, separated, or divorced (compared with those married or cohabiting); those with a lifetime or past-year drug or alcohol use disorder, lifetime or past-year major depressive disorder, or a family history of an alcohol use disorder; and those who had sought treatment for alcohol or drug use disorders during the year preceding the interview (Table 1).

In both surveys, the odds of past-year daily tobacco use were significantly lower for Asians and Hispanics, compared with whites; foreign-born individuals; those with at least some college, compared with those with less than a high school education; and those with an income greater than \$35,000, compared with those with an income less than \$19,999. Furthermore, in the NLAES, the odds of past-year daily tobacco use were lower for individuals with an income between \$20,000 and \$34,999, compared with those with an

Table 1

Respondents reporting past-year daily tobacco use in the NLAES and NESARC wave 2, by sociodemographic and clinical characteristics^a

Characteristic	NLAES (N=41,612)				NESARC wave 2 (N=34,653)			
	%	SE	OR	95% CI	%	SE	OR	95% CI
Total	25.93	.28			18.50	.43		
Sex								
Male	28.12	.42	1.24	1.18–1.31	20.28	.52	1.25	1.17–1.34
Female (reference)	23.91	.32			16.87	.49		
Age								
20–34	29.01	.49	1.84	1.71–1.97	21.86	.74	1.89	1.71–2.08
35–54	28.93	.46	1.83	1.71–1.95	21.07	.68	1.80	1.64–1.97
≥55 (reference)	18.21	.40			12.92	.36		
Race-ethnicity								
White (reference)	27.03	.32			19.72	.40		
Black	26.99	.77	1.00	.92–1.09	18.18	.69	.90	.82–.99
Native American	31.78	3.57	1.26	.90–1.75	32.41	2.46	1.95	1.56–2.45
Asian	14.32	1.33	.45	.36–.56	10.22	1.18	.46	.35–.60
Hispanic	17.03	.87	.55	.49–.63	11.74	.95	.54	.45–.65
Nativity								
U.S. born (reference)	27.22	.30			19.88	.38		
Foreign born	16.48	.70	.53	.47–.59	9.96	.50	.45	.40–.50
Education								
Less than high school (reference)	31.28	.68			25.13	1.31		
High school	31.59	.47	1.01	.94–1.09	23.75	.61	.93	.82–1.06
At least some college	20.28	.34	.56	.52–.60	14.45	.39	.50	.44–.57
Marital status								
Married or cohabiting (reference)	24.61	.36			16.00	.43		
Widowed, separated, or divorced	31.13	.58	1.38	1.30–1.48	23.64	.74	1.62	1.50–1.76
Never married	25.55	.65	1.05	.97–1.14	22.10	.89	1.49	1.35–1.64
Personal income								
\$0–\$19,999 (reference)	30.32	.51			21.15	.56		
\$20,000–\$34,999	28.50	.65	.92	.85–.99	20.07	.65	.94	.86–1.02
\$35,000–\$69,999	22.21	.73	.66	.60–.72	16.24	.59	.72	.66–.79
≥\$70,000	23.73	.81	.71	.65–.79	9.57	.66	.39	.34–.46
Lifetime drug use disorder								
Yes	55.96	3.72	3.69	2.72–4.99	41.46	1.08	3.90	3.58–4.24
No (reference)	25.63	.28			15.37	.39		
Lifetime alcohol use disorder								
Yes	40.72	.67	2.34	2.20–2.49	28.67	.71	2.66	2.44–2.89
No (reference)	22.66	.30			13.14	.38		
Lifetime major depression								
Yes	27.94	.99	1.12	1.01–1.24	22.25	.83	1.33	1.22–1.44
No (reference)	25.77	.29			17.76	.42		
Past-year drug use disorder								
Yes	58.92	2.74	4.20	3.34–5.28	51.22	2.13	4.88	4.10–5.82
No (reference)	25.46	.28			17.70	.43		
Past-year alcohol use disorder								
Yes	45.29	1.17	2.56	2.32–2.82	34.31	1.12	2.58	2.34–2.86
No (reference)	24.45	.29			16.81	.42		
Past-year major depression								
Yes	39.33	1.54	1.89	1.66–2.17	24.36	1.29	1.45	1.27–1.66
No (reference)	25.49	.29			18.15	.42		
Family history of alcohol use disorder								
Yes	32.60	.48	1.64	1.56–1.73	23.96	.64	1.70	1.59–1.82
No (reference)	22.77	.32			15.63	.40		
Past-year treatment for an alcohol use disorder								
Yes	69.50	3.34	3.06	2.21–4.24	55.94	4.00	2.62	1.89–3.64
No (reference)	42.66	1.18			32.62	1.12		
Past-year treatment for a drug use disorder								
Yes	78.78	5.56	2.79	1.43–5.46	74.50	5.01	3.32	1.84–5.99
No (reference)	57.07	2.79			46.80	2.43		
Past-year treatment for a drug or alcohol use disorder								
Yes	69.86	3.12	3.04	2.23–4.13	59.49	3.20	2.90	2.20–3.82
No (reference)	43.29	1.15			33.65	1.04		

^a NLAES, National Longitudinal Alcohol Epidemiologic Survey, conducted in 1991–1992; NESARC, National Epidemiologic Survey on Alcohol and Related Conditions, conducted in 2001–2002 with a follow-up (wave 2) in 2004–2005.

income of \$19,999 or less, but this effect was not present in the NESARC. The odds of past-year daily tobacco use were higher for Native Americans and individuals who were never married and lower for blacks only in the NESARC.

After adjustment for sociodemographic characteristics, the effects of all clinical factors remained unchanged (data not shown), except for major depression in the NLAES, which was no longer a significant predictor of daily use.

Trends in the prevalence of tobacco use

The prevalence of past-year daily tobacco use significantly decreased across most sociodemographic and clinical groups between 1991–1992 and 2004–2005. The only exceptions were the lack of significant changes in the prevalence of past-year daily tobacco use among Native Americans and among those who had sought treatment for a drug use disorder during the year preceding the interview (Table 2).

The interaction terms of prevalence of past-year daily tobacco use with some sociodemographic and clinical correlates were significant (Table 2). The prevalence of past-year daily use between 1991–1992 and 2004–2005 decreased at a faster rate among whites than among Native Americans and among foreign-born persons than among those born in the United States. The prevalence of past-year daily tobacco use decreased at a faster rate among those married or cohabitating than among those never married, widowed, separated, or divorced. It also decreased at a faster rate among those with personal income of at least \$70,000 compared with those with an income below \$20,000. Furthermore, the prevalence decreased faster among individuals with no lifetime alcohol use disorder than among those with a lifetime alcohol use disorder and among those without lifetime or past-year major depression than those with lifetime or past-year major depression.

Discussion

To our knowledge, this is the first study to examine changes in the prevalence of tobacco use in the United State stratified by sociodemographic

Table 2

Logistic regression analyses of predictors of past-year daily tobacco use among respondents in the NLAES and the NESARC wave 2^a

Variable	Time effect within group		Sociodemographic or clinical variable × time interaction term ^b	
	OR	95% CI	OR	95% CI
Total				
Sex				
Male	.65	.60–.70	1.01	.93–1.10
Female (reference)	.65	.60–.70		
Age				
20–34	.68	.62–.76	1.03	.91–1.16
35–54	.66	.60–.72	.98	.88–1.10
≥55 (reference)	.67	.61–.72		
Race-ethnicity				
White (reference)	.66	.62–.70		
Black	.60	.53–.68	.90	.80–1.03
Native American	1.02	.69–1.52	1.54	1.03–2.30
Asian	.68	.48–.95	1.02	.72–1.45
Hispanic	.65	.52–.81	.98	.79–1.22
Nativity				
U.S. born (reference)	.66	.63–.70		
Foreign born	.56	.48–.65	.84	.73–.98
Education				
Less than high school (reference)	.74	.63–.86		
High school	.67	.62–.73	.92	.79–1.06
At least some college	.66	.62–.72	.90	.77–1.05
Marital status				
Married or cohabiting (reference)	.58	.54–.63		
Widowed, separated, or divorced	.69	.62–.76	1.17	1.06–1.30
Never married	.83	.73–.94	1.42	1.25–1.61
Personal income				
\$0–\$19,999 (reference)	.62	.57–.67		
\$20,000–\$34,999	.63	.57–.70	1.02	.91–1.14
\$35,000–\$69,999	.68	.60–.77	1.10	.96–1.26
≥\$70,000	.34	.29–.41	.55	.46–.66
Lifetime drug use disorder				
Yes	.56	.41–.76	1.06	.77–1.45
No (reference)	.53	.49–.56		
Lifetime alcohol use disorder				
Yes	.59	.54–.64	1.13	1.02–1.26
No (reference)	.52	.48–.56		
Lifetime major depression				
Yes	.74	.64–.85	1.19	1.04–1.35
No (reference)	.62	.58–.66		
Family history of alcohol use disorder				
Yes	.65	.60–.71	1.04	.95–1.13
No (reference)	.63	.59–.67		
Past-year drug use disorder				
Yes	.73	.55–.97	1.16	.87–1.55
No (reference)	.63	.59–.67		
Past-year alcohol use disorder				
Yes	.63	.55–.72	1.01	.88–1.16
No (reference)	.62	.58–.67		
Past-year major depression				
Yes	.50	.41–.60	.77	.64–.92
No (reference)	.65	.61–.69		
Past-year treatment for an alcohol use disorder				
Yes	.56	.35–.87	.86	.54–1.36
No (reference)	.65	.57–.75		

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Table 2*Continued from previous page*

Variable	Time effect within group		Sociodemographic or clinical variable $\times$ time interaction term ^b	
	OR	95% CI	OR	95% CI
Past-year treatment for a drug use disorder				
Yes	.79	.34–1.84	1.19	.49–2.90
No (reference)	.66	.49–.89		
Past-year treatment for a substance use disorder				
Yes	.63	.43–.94	.95	.63–1.44
No (reference)	.66	.58–.76		

^a NLAES, National Longitudinal Alcohol Epidemiologic Survey, conducted in 1991–1992; NESARC, National Epidemiologic Survey on Alcohol and Related Conditions, conducted in 2001–2002 with a follow-up (wave 2) in 2004–2005

^b NLAES is the reference group for the time component of the interaction.

characteristics and clinical correlates. We have emphasized four major results. First, although the prevalence of past-year daily tobacco use decreased significantly from 1991–1992 to 2004–2005, the reduction was not uniform across all segments of the population. Second, in both time periods, past-year daily use was higher among individuals with lifetime and past-year drug or alcohol use disorders and major depressive disorder. Third, for individuals with a lifetime alcohol use disorder or lifetime or past-year major depressive disorder, the decline in past-year daily tobacco use was slower than for individuals without these disorders. Fourth, in both surveys, the odds of past-year daily tobacco use were greater among individuals from socioeconomically disadvantaged groups, such as those with lower income or educational attainment. Furthermore, the prevalence of past-year daily use did not decrease between the two periods among Native Americans.

Consistent with findings from previous studies (30,31), the overall prevalence of past-year daily tobacco use in the United States decreased between 1991–1992 and 2004–2005. A number of changes in public policies, including progressively more stringent laws restricting smoking in the workplace and in public places (30,32–35), increases in the price of cigarettes (33), and continued anti-smoking media campaigns (36,37),

appear to have had a synergistic effect in decreasing tobacco use.

Despite the general decline in tobacco use, the reduction was not uniform across all sociodemographic groups. Consistent with data from clinical (38) and community (12,39,40) studies, past-year daily tobacco use was higher among persons with drug use disorders and with alcohol use disorders. Several factors may contribute to the high prevalence of daily smoking among individuals with a substance use disorder. Tobacco smoking by individuals with another drug use disorder may indicate a shared genetic vulnerability (41), more severe nicotine addiction (42), or an abnormal response to alternative rewarding activities due to an activation of the prefrontal cortex and glutamatergic drive to the nucleus accumbens (43), all of which may increase the difficulty of quitting (44,45). In addition, smokers who have a drug use disorder may underestimate the risk of tobacco use compared with smokers who do not have a drug use disorder. Some individuals may use nicotine in an attempt to relieve their psychiatric symptoms (46). Furthermore, some drugs, such as cannabis, are commonly smoked, and cannabis users may be more likely to be cigarette smokers and vice versa. The use of one substance may trigger the use of the others either through associated environmental factors, such as cues or peer use, or by shared pharmacological mechanisms (47).

Many substance abuse treatment programs do not incorporate smoking cessation into treatment (48), and some programs may even encourage patients to delay smoking cessation for fear that it might precipitate relapse into drug use (12,49). This approach may contribute to the high rates of smoking seen among individuals in substance abuse treatment (12). Concerns about relapse to drug use after smoking cessation have not been supported by most studies (48,50,51), and evidence suggests that smoking cessation may facilitate abstinence from other drugs and alcohol (48,52–54). Given the high prevalence of tobacco use among patients seeking substance abuse treatment, smoking cessation interventions should be part of any comprehensive approach to addiction treatment (54,55).

Past-year daily tobacco use was higher among individuals with major depressive disorder, and the decline in past-year daily tobacco use was slower among those with major depressive disorder. Research has documented a strong association between depression and nicotine dependence and between depression and daily and occasional smoking (47,56–59). Although some evidence suggests the presence of a causal relationship between smoking and depression, the direction of the relationship remains unclear (60). Some population studies suggest that a substantial component of the association between smoking and depression is noncausal and that the association might be due to common predisposing factors (60) or might arise because the risk factors and life processes associated with the development of smoking and depression are correlated and tend to overlap (61).

Health care providers should consider encouraging patients who have significant depressive symptoms or depression histories to seek smoking cessation services that include both typical smoking cessation treatments and behavioral mood management (62).

Taken together, these results suggest that individuals with drug use disorders and depression benefit less from traditional public policies and antismoking media campaigns. Our findings, underscore the importance

of developing innovative prevention and treatment strategies directed at curtailing tobacco use in these populations (63,64).

In both surveys, the odds of past-year daily tobacco use were greater among individuals from disadvantaged groups, such as those with lower income or educational attainment. Moreover, past-year daily tobacco use did not decrease among Native Americans, contrary to trends among most other sociodemographic groups. The association between tobacco use and low educational attainment and income is a consistent finding in epidemiologic and clinical studies (9,65–70), although the causal direction is unclear. Familial vulnerability (67), differential valuations of the health consequences of smoking (71), and differences in access to and effectiveness of cessation treatments (72,73) may explain the prevalence of tobacco use among those with low educational attainment and income. Also, there is evidence that marketing tactics of the tobacco industry target low-income and minority communities to influence smoking-uptake patterns (74) and that some types of smoking cessation media messages may have greater impact on quit attempts among populations with more education (75). These findings suggest the need for specific interventions to reduce the incidence of smoking in these vulnerable groups (44,66,76). Other studies have demonstrated increased rates of smoking among Native Americans (77–80). Our findings indicate that this health disparity may be increasing among Native Americans. Longitudinal research using data from NESARC waves 1 and 2 could examine prospective associations to examine health disparities among high-risk subgroups of the population.

This study had several limitations. First, information on tobacco use was based on self-report and not confirmed with biological measures. Therefore, reporting bias, such as social desirability, cannot be ruled out. However, prior analyses of the NLAES and NESARC that focused on less socially acceptable behaviors (for example, shoplifting) have found prevalence estimates similar to those documented by other studies (81), suggesting that

the effect of social desirability bias may not be large. Second, because the NLAES and NESARC sampled only persons age 18 and older in civilian households and group quarters, information was unavailable on groups such as adolescents or prisoners, for whom rates of tobacco use may differ. Third, because the NLAES did not assess nicotine dependence, the study focused on daily tobacco use. However, NESARC data indicated that 86.7% of individuals with nicotine dependence smoked daily, suggesting a high degree of overlap between these two categories. Fourth, our study focused on daily smoking. Future research should examine trends in non-daily smoking because research has shown that this pattern of smoking is associated with substance use disorders and other psychiatric disorders (82).

Conclusions

Although the overall prevalence of tobacco use in the United States decreased from 1991–1992 to 2004–2005, vulnerable populations reported disproportionately higher rates of use. Individuals with drug or alcohol use disorders or with major depressive disorder and Native Americans continued to report rates of daily smoking that were higher than rates in the general population. We hope that this information can help guide clinicians and policy makers in developing and implementing interventions that will continue to reduce tobacco-related illness.

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