Prevalence and Trends in Cigarette Smoking With and Without Tobacco Use Disorder Among Adults in the United States: 2010–2021

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Abstract

Objective: Few national estimates are available on the prevalence of tobacco use disorder (TUD) in the United States (US), and most trials exclusively assess daily smoking rather than TUD. We examined the prevalence and trends in cigarette smoking with vs without TUD among adults.

Methods: Data came from the 2010–2021 National Survey on Drug Use and Health (n = 483,982), a cross-sectional, US representative dataset. A TUD composite variable was created based on established definitions (eg, *DSM-5* symptoms). Weighted prevalence of past 30-day cigarette smoking, daily smoking (30/30 days) and nondaily smoking (<30/30 days) with and without TUD, was calculated annually.

Results: In 2021, the prevalence of past 30-day overall cigarette smoking was 17%; 11% reported daily cigarette smoking, whereas 6% reported nondaily cigarette smoking. Only 1% of the population reported daily smoking without TUD, whereas 10% reported daily smoking with TUD. Two percent of the population reported nondaily smoking without TUD, and 4% of the population reported nondaily smoking with TUD. Daily smoking with TUD and nondaily smoking with and without TUD decreased significantly from 2010 to 2021 (all *P*'s < .001). US adults reporting TUD symptoms (vs not) were more likely to be older, identify as White, have lower income and less education, and have a substance use disorder.

Conclusions: The prevalence of daily cigarette smoking with TUD was 10× higher than the prevalence of daily cigarette smoking without TUD. Twice as many US adults with nondaily smoking reported TUD than no TUD, illustrating that daily smoking is not necessary for TUD.

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Commercial tobacco smoking ("tobacco smoking") is a leading cause of preventable death worldwide.[1] Tobacco use disorder (TUD) is a clinical diagnosis outlined in the *Diagnostic and Statistical Manual of Mental Disorders,* Fifth Edition (*DSM-5*), which includes a set of 11 symptoms (eg, craving, tolerance, withdrawal, and unsuccessful efforts to cut down; an individual must meet criteria for at least 2 symptoms) that reflect a problematic pattern of tobacco use leading to clinically significant impairment or distress across a 12-month period.[2] While the prevalence of tobacco smoking is well characterized among adults globally and in the United States (US),[3] recent prevalence estimates of TUD are lacking, likely because many epidemiological studies do not measure TUD; most studies assess only daily smoking or heaviness of smoking.[4]

To our knowledge, the most recent US prevalence estimates of TUD based on the *DSM-5* criteria come from the 2012–2013 National Epidemiologic Survey on Alcohol and Related Conditions-III (NESARC) (N = 36,309), which reported the prevalence of past 12-month and lifetime TUD of 20.0% and 27.9%, respectively.[5] It is critical to quantify the recent prevalence of TUD in adults and to determine whether these estimates may differ from the prevalence of past 30-day smoking (the more commonly assessed outcome). This is especially timely in light of the current controversy and debate around the term "preaddiction"[6] and discussions around the clinical utility of distinguishing between substance use vs a substance use disorder (SUD). It is also important to quantify TUD prevalence over and above the prevalence of tobacco use because TUD more directly assesses the

Clinical Points

- Recent prevalence estimates of tobacco use disorder (TUD) are lacking, likely because studies generally only assess daily smoking or heaviness of smoking.
- Most adults who smoke cigarettes daily also have TUD, and thus, clinicians should continue to assess daily smoking. However, even intermittent, or nondaily smoking, can produce or sustain TUD signaling a potential need for tobacco treatment in adults who smoke cigarettes both daily and nondaily.
- Clinicians should assess daily and nondaily smoking of cigarettes as well as the use and couse of other noncigarette tobacco products (eg, e-cigarettes) among adult patients.

harms, impairment, and distress associated with tobacco use and because TUD provides additional important information about vital outcomes such as the likelihood of future cessation and withdrawal magnitude.[7,8] Further, data are lacking on trends in TUD prevalence over time. It is important to understand how patterns of TUD may have changed across the past decade, especially as the legal and regulatory tobacco landscape has shifted considerably over the years since earlier TUD estimates were published (eg, before the rise of nicotine vaping). There is also a need to determine whether TUD trends align with or diverge from the promising declines in past 30-day smoking that have been observed in the US general population.[9] For instance, declines in smoking that are unaccompanied by declines in TUD may have implications for the likelihood of future declines in smoking prevalence and could also suggest that declines in smoking prevalence are not corresponding to declines in the number of US adults who are in need of TUD treatment.[10]

With tobacco smoking, it is generally understood that there is no safe level of cigarette smoking[1]; however, recent research has begun to better characterize daily vs nondaily smoking patterns and has highlighted differences in mortality risk and comorbidities such as depression across daily and nondaily smoking statuses.[11,12] There is also evidence that nondaily smoking has increased in the past decade, is heavily concentrated among marginalized and underserved populations, and is associated with substantial health risks.[13–15] However, to our knowledge, no work has used nationally representative data to examine the relationship between daily cigarette smoking status (daily vs nondaily) and TUD status (TUD vs no TUD) to characterize the prevalence of TUD among nondaily smokers and how this differs from TUD prevalence among daily smokers. This is an important research question which would provide a better understanding of the optimal assessment of tobacco use in clinical practice and research and help guide treatment planning and development for those with TUD.

Using nationally representative, cross-sectional survey data from US adults, we aimed to (1) characterize the prevalence of past 30-day cigarette smoking (daily and nondaily smoking) with and without TUD in the most recent survey year available (2021) and trends across the past decade (from 2010 to 2021) and (2) examine demographic, psychiatric, nicotine and tobacco use, and substance use factors associated with daily and nondaily smoking with and without TUD in 2021.

METHODS

Data came from the 2010–2021 National Survey on Drug Use and Health (NSDUH) (N = 597,070), a cross-sectional, nationally representative dataset that assessed US individuals aged ≥12 years.[16,17] Given our interest in adult tobacco use and TUD, the analytic sample was restricted to adults aged 18 years and above (n = 483,982). This study was exempt from IRB review as NSDUH data are publicly available.

Primary Exposures: Cigarette Smoking With and Without TUD

The 2 main outcomes examined were cigarette smoking and TUD. Overall, past 30-day cigarette smoking was defined as any cigarette use in the past month (yes/no). Among those with past 30-day smoking, past 30-day daily cigarette smoking was defined as smoking all 30 days in the past month, and past 30-day nondaily smoking was defined as smoking <30 days in the past month using a previously established definition.[14]

TUD (yes/no) was calculated by creating a composite variable using Baker and colleagues[18] recommended TUD criteria (eg, time to first cigarette and heaviness of smoking) and all available *DSM-5* TUD criteria in the NSDUH (see Table 1). This definition of TUD was selected based on critiques of the existing *DSM-5* criteria for TUD and calls to revise the *DSM-5* criteria to include validated measures of nicotine dependence such as time to first cigarette upon waking and heaviness of smoking (neither of which were included as criteria in the *DSM-5*).[18] Thus, we sought to be as inclusive as possible with our TUD variable and include multiple established TUD symptoms. Specifically, in our analyses, participants were considered to have TUD if they reported meeting at least 2 of the TUD criteria (from either *DSM-5* items or Baker's TUD items) consistent with the diagnostic recommendations in the *DSM-5*.[2] Participants were considered to not have TUD if they reported fewer than 2 of the TUD criteria.

Taken together, our primary exposure of interest was the national US prevalence of past 30-day cigarette

Table 1.

Measurement of Tobacco Use and TUD in NSDUH Across *DSM-5* Criteria

DSM-5 criteria (past 12 mo)[a]	Corresponding item(s) from NSDUH (past 30 d)	Established measure or scale NSDUH item corresponds to	Baker et al[18] suggested TUD criteria (suggested timeframe of items not specified)[b]
1. Tobacco taken in larger amounts	Since you started smoking, the amount you smoke has increased	NDSS	
2. Desire or unsuccessful effort to quit or cut down			
3. Time spent to obtain nicotine			
4. Craving/desire to use	When you don't smoke for a few hours, you start to crave cigarettes	NDSS	Strong and bothersome craving both during ongoing smoking and when quitting or reducing smoking
5. Failure to fulfill major obligations due to use			
6. Continued use despite problems			
7. Give up regular activities due to tobacco use	a. You tend to avoid places that don't allow smoking, even if you would otherwise enjoy them b. Even if you're traveling a long distance, you'd rather not travel by airplane because you wouldn't be allowed to smoke c. There are times when you choose not to be around your friends who don't smoke because they won't like it if you smoke	NDSS	
8. Recurrent use in situations when physically hazardous			
9. Recurrent use despite physical or psychiatric problems or illness due to use			
10. Tolerance	a. Compared to when you first started smoking, you need to smoke a lot more now in order to be satisfied b. Compared to when you first started smoking, you can smoke much, much more now before you start to feel anything	NDSS	
11. Withdrawal	After not smoking for a while, you need to smoke in order to feel less restless and irritable	NDSS	Significant withdrawal symptoms, including craving, during smoking cessation or reduction.
	On the days that you smoke, how soon after you wake up do you have your first cigarette? (past 30 d)	FTCD	Latency to smoke upon awakening.
	Cigarettes smoked per day in the last 30 d <1 cigarette per day 1 cigarette per day 2 to 5 cigarettes per day 6 to 15 cigarettes per day (about $\frac{1}{2}$ pack) 16 to 25 cigarettes per day (about 1 pack) 26 to 35 cigarettes per day (about $1\frac{1}{2}$ packs) More than 35 cigarettes per day (about 2 packs or more)		Smoking heaviness; average number of cigarettes smoked/day on a typical day of smoking.

[a]Per *DSM-5*, TUD is defined as "a problematic pattern of tobacco use leading to clinically significant impairment or distress as manifested by at least 2 of the following symptoms." (2) While *DSM-5* defines TUD in the past 12 mo, the NSDUH NDSS items assess the past 30-d timeframe.
[b]Baker and colleagues[18] recommend that *DSM-5* TUD be assessed using the following criteria: craving, withdrawal, time to first cigarette, and heaviness of smoking/cigarettes per day.
Abbreviations: *DSM-5* = *Diagnostic and Statistical Manual for Mental Disorders*, Fifth Edition, FTCD = Fagerström Test for Cigarette Dependence, HSI = Heaviness of Smoking Index, NDSS = Nicotine Dependence Severity Scale, NSDUH = National Survey on Drug Use and Health, TUD = tobacco use disorder.

smoking (daily and nondaily) with vs without TUD. Thus, we had 4 mutually exclusive cigarette smoking status outcome variables: nondaily smoking without TUD, nondaily smoking with TUD, daily smoking without TUD, and daily smoking with TUD.

Correlates: Demographic, Psychiatric, Nicotine and Tobacco Use, and Substance Use Factors in 2021

We selected demographic, psychiatric, nicotine and tobacco use, and substance use correlates from the

2021 survey a priori based on their associations with tobacco smoking in the empirical literature.[1]

Demographic. Demographic characteristics included sex/gender (male, female), age (18–25, 26–34, 35–49, and 50 and above), race/ethnicity [non-Hispanic (NH) Black, NH White, NH other race (non-Alaskan or Alaskan Native, Native Hawaiian/Pacific Islander, Asian, and more than 1 race), Hispanic], annual income (<$20,000, $20,000-$49,999, $50,000-$74,999, and $75,000+), and education level (high school degree/equivalent, some college, and college degree or higher).

Psychiatric. Psychiatric characteristics assessed included anxiety (frequency of feeling nervous in the past 30 days with responses ranging from "none of the time" to "all of the time") and past-year major depressive episode (defined as having a history of lifetime major depression [5 of 9 symptoms met with 1 being depressed mood or loss of interest or pleasure in daily activities] plus the presence of depression symptoms the past 2 weeks [eg, felt worthless and depressed mood]).[2] Past 30-day serious psychological distress (Kessler-6 total score ≥13)[19] and suicidal ideation in the past 12 months (seriously thinking about killing self; yes/no) were also assessed as markers of psychiatric symptom severity.

Nicotine and tobacco use. We assessed past 30-day use of other noncigarette nicotine and tobacco products (nicotine vaping, cigars, smokeless tobacco, and pipe tobacco; yes/no to each).

Substance use. Substance use assessment included any past 12-month SUD (cocaine, hallucinogens, heroin, inhalants, marijuana, methamphetamine, prescription pain relievers, sedatives, stimulants, and tranquilizers), opioid use disorder (heroin and prescription pain relievers), stimulant use disorder (cocaine, methamphetamine, and prescription stimulants), tranquilizer or sedative use disorder, cannabis use disorder, and alcohol use disorder, all per *DSM-5* criteria, among those using these substances in the past year.

Statistical Methods

Weighted proportions were generated to assess the past 30-day prevalence of daily and nondaily cigarette smoking with and without TUD. Trend analyses were used to examine changes in the 4 groups (nondaily smoking with TUD, nondaily smoking without TUD, daily smoking with TUD, and daily smoking without TUD) across survey years using χ^2 tests for independent observations.[20] Demographic, psychiatric, nicotine and tobacco use, and substance use characteristics were compared across cigarette smoking and TUD status outcomes (daily vs nondaily smoking and TUD vs no TUD) using χ^2 applying the Bonferroni correction to adjust for multiple comparisons[21,22], and P values of .002561 (approximately 0.05/20) or less were considered statistically significant. Given interest in the effects of COVID-19 on TUD, and nationally representative data in the literature demonstrating a decrease in the prevalence of cigarette smoking in the US after the pandemic onset,[23] we conducted a post hoc exploratory analyses comparing the proportions of participants reporting TUD during survey years 2010–2019 (pre-COVID-19 onset) vs 2020–2021 (post-COVID-19 onset) to probe the potential effects of COVID-19 onset on all cigarette and TUD exposure variables (ie, any past 30-day cigarette smoking, any daily, any nondaily smoking, daily smoking with TUD and without TUD, and nondaily smoking with TUD and without TUD). All analyses were conducted in Stata version 17 to account for complex sampling.

RESULTS

Prevalence of Past 30-Day Daily and Nondaily Cigarette Smoking With and Without TUD: 2021

In the most recent survey year, 2021, 17% of the US adult population reported past 30-day cigarette smoking; 11% reported daily smoking, and 6% reported nondaily smoking. Of the 11% of adults in the US population reporting daily cigarette smoking, 10% reported daily smoking with TUD and 1% reported daily smoking without TUD. Of the 6% of adults in the US population reporting nondaily smoking, 4% reported nondaily smoking with TUD and 2% reported nondaily smoking without TUD.

Trends in Past 30-Day Daily and Nondaily Cigarette Smoking With and Without TUD: 2010–2021

Figure 1 depicts the prevalence of past 30-day daily and nondaily cigarette smoking with vs without TUD in adults across survey years. From 2010 to 2021, the majority of US adults reporting daily smoking also reported TUD; few US adults in the population reported daily smoking without TUD. Across all years, the prevalence of nondaily smoking with TUD was higher than the prevalence of nondaily smoking without TUD. There was a significant trend of decreased prevalence of daily smoking with TUD, nondaily smoking without TUD, and nondaily smoking with TUD from 2010 to 2021 (all Ps < .0001; Figure 1). There was no change over time (P = .61) in the prevalence of daily smoking without TUD.

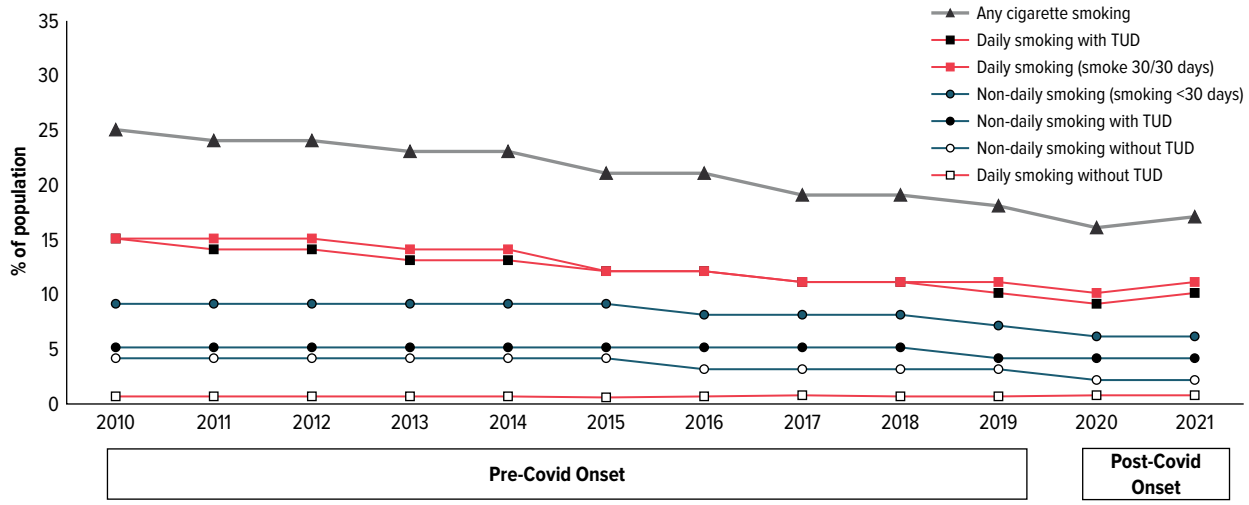
In the exploratory analyses to probe the potential effects of COVID-19 onset on cigarette and TUD outcomes (ie, all outcomes plotted in Figure 1; 2010–2019: unweighted n = 409,521 and 2020–2021: unweighted n = 74,461), for all outcomes except for daily smoking without TUD, there was a statistically higher prevalence of TUD prior to vs after the COVID-19 pandemic onset (Ps < .05; Figure 1).

Correlates of Daily and Nondaily Cigarette Smoking With and Without TUD: 2021

Demographic, psychiatric, nicotine and tobacco use, and substance use correlates are presented by TUD status

Figure 1.

Past 30-Day Prevalence of Tobacco Use Among Adults With and Without Tobacco Use Disorder in the United States: NSDUH 2010–2021 (N = 483,982)[a]



[a]Prevalence estimates plotted represent weighted percentages. For each outcome plotted, except daily smoking without TUD ($P = .61$), there were significant trends across the survey year suggesting a decrease in the outcome across the survey year (all P's < .0001). Plotted data points are connected with lines for ease of viewing trends; however, data presented are cross-sectional in nature. "Onset" of COVID-19 was estimated to start in the survey year 2020. Survey years prior to 2020 are considered to be prior to COVID-19 onset.

Abbreviations: D = day, NSDUH = National Survey on Drug Use and Health, TUD = tobacco use disorder.

and by cigarette smoking status in Table 2. When comparing those reporting TUD (with and without daily smoking) vs those reporting no TUD (with and without daily smoking), individuals with TUD were older, more likely to identify as NH White race, have lower income and less education, and have a SUD (Table 2).

Compared to those reporting daily smoking (with and without TUD), those with nondaily smoking (with and without TUD) were younger; more likely to report identifying as NH Black, NH other, or Hispanic race/ethnicity; and more likely to report use of noncigarette nicotine products (ie, nicotine e-cigarettes, smokeless tobacco, and pipe tobacco) (Table 2). Adults reporting nondaily smoking also had a higher prevalence of alcohol use disorder vs those reporting daily smoking. Of all 4 cigarette smoking and TUD groups, the highest prevalence of SUDs (28%) was observed among adults reporting nondaily smoking with TUD (Table 2).

DISCUSSION

We used nationally representative repeated cross-sectional annual US data from 2010 to 2021 to investigate the prevalence of cigarette use (daily and nondaily) with and without TUD among US adults and factors associated with TUD in the most recent survey year (2021). Adults reporting daily smoking were 10 times more likely to report TUD (10%) than no TUD in 2021 (1%). In essence, daily smoking rarely occurs in the absence of TUD. Interestingly, twice as many adults reporting nondaily smoking also reported TUD symptoms (4%) vs not reporting TUD (2%) in 2021, demonstrating that a significant number of people with nondaily smoking also meet criteria for TUD. This finding suggests that even intermittent smoking can produce or sustain TUD and thus may signal a need for treatment. Additionally, compared to adults reporting daily smoking (with and without TUD), those with nondaily smoking (with and without TUD) were more likely to report the use of noncigarette nicotine products (ie, nicotine e-cigarettes, smokeless tobacco, and pipe tobacco), suggesting higher levels of dual use of cigarettes and noncigarette nicotine products in the nondaily (vs daily) smoking population. This use pattern may need to be addressed as part of tobacco treatment.

Our prevalence estimates of TUD in 2021 (10% of adults with daily smoking and 4% of adults with nondaily smoking) are lower than the estimates previously reported by Chou and colleagues[5] using the 2012–2013 NESARC data (20% for past 12-month prevalence). This is consistent with the significant decrease in daily and nondaily smoking with TUD across survey years in the past decade that we observed. Important to note, however, is that the prior study assessed the past 12-month prevalence of TUD, whereas our NSDUH TUD items assessed past 30-day TUD symptoms. Additionally, the prior study assessed all

Table 2.

Demographic, Nicotine and Tobacco Use, Psychiatric, and Substance Use Characteristics Associated With Past 30-d Cigarette Smoking With and Without TUD in Adults: NSDUH 2021 (n = 7,262)[a]

	Nondaily smoking without TUD (unweighted n = 1,317) Wgt %, SE	Nondaily smoking with TUD (unweighted n = 1,807) Wgt %, SE	Daily Smoking without TUD (unweighted n = 244) Wgt %, SE	Daily smoking with TUD (unweighted n = 3,894) Wgt %, SE	Daily vs nondaily smoking *P* value[b]	TUD vs no TUD *P* value[b]
Demographic characteristics						
Gender					.11	.87
Female	47%, 2.3	44%, 2.3	49%, 7.8	48%, 1.2		
Male	53%, 2.3	56%, 2.3	51%, 7.8	52%, 1.2		
Age, y					**<.0001**	**<.0001**
18–25	22%, 1.8	14%, 0.8	4%, 1.1	4%, 0.4		
26–34	24%, 2.4	20%, 1.4	16%, 3.5	16%, 0.8		
35–49	27%, 3.0	28%, 1.6	17%, 3.1	31%, 1.4		
50 and above	27%, 3.4	38%, 2.3	63%, 5.4	49%, 1.5		
Race/ethnicity					**<.0001**	**<.0001**
NH White	53%, 3.1	57%, 2.6	75%, 4.3	74%, 1.4		
NH Black	15%, 1.7	19%, 1.7	9%, 2.5	11%, 0.9		
NH other race[c]	8%, 2.1	7%, 0.8	2%, 1.0	6%, 0.6		
Hispanic	24%, 2.5	17%, 1.9	14%, 3.3	8%, 1.0		
Income					.72	**.0003**
<$20,000	24%, 2.7	35%, 2.8	21%, 4.5	29%, 1.2		
$20,000–$49,999	30%, 3.1	36%, 2.1	40%, 7.6	36%, 1.4		
$50,000–$74,999	14%, 1.9	13%, 1.7	16%, 4.3	15%, 1.0		
$75,000+	31%, 2.8	15%, 1.4	23%, 7.0	20%, 1.3		
Education					**.0002**	**<.0001**
<High school	14%, 2.0	23%, 1.8	10%, 2.3	18%, 1.2		
High school degree/equivalent	27%. 2.4	34%, 2.3	50%, 6.0	41%, 1.3		
Some college	36%. 2.7	33%, 1.9	34%, 5.1	30%, 1.4		
College degree or higher	24%, 1.9	10%, 1.1	5%, 3.1	10%, 1.0		
Nicotine and tobacco use characteristics						
Noncigarette tobacco products used in the past 30 d						
Nicotine vaping	52%, 4.4	55%, 3.8	18%, 10.2	28%, 2.1	**<.00001**	.0036
Cigars[d]	<1%[c]	<1%[c]	0%[c]	<1%[c]	not reported[c]	not reported[c]
Smokeless tobacco	6%, 0.9	7%, 1.0	2%, 0.9	4%, 0.5	**.0015**	.63
Pipe tobacco	17%, 7.5	20%, 3.2	6%, 3.4	9%, 1.7	**.0023**	.76
Psychiatric characteristics						
Suicide ideation (past 12 mo)	10%, 1.9	8%, 0.8	2%, 0.9	7%, 0.8	.13	.35
Serious psychological distress (past 30 d)[e]	10%, 1.8	15%, 1.3	5%, 1.4	12%, 1.0	.41	.02
Major depression (past 12 mo)	12%, 1.8	11%, 0.9	3%, 1.2	11%, 0.9	.39	.64
Anxiety: felt nervous (past 30 d)	58%, 2.7	62%, 2.0	28%, 5.0	60%, 1.5	.53	.004
Substance use disorder characteristics						
Any drug use disorder (past 12 mo)	18%, 1.8	28%, 2.0	11%, 3.0	22%, 1.0	.10	**<.0001**
Opioid use disorder	2%, 0.9	7%, 0.9	5%, 1.8	7%, 0.7	.14	.0057
Stimulant use disorder	1%, 0.6	2%, 0.4	1%, 0.6	1%, 0.2	.0036	.53
Alcohol use disorder	25%, 2.4	29%, 1.8	3%, 1.2	18%, 1.2	**<.0001**	.70
Cannabis use disorder	13%, 1.4	19%, 1.5	3%, 1.5	13%, 1.0	.0034	.02
Tranquilizer or sedative use disorder	1%, 0.7	3%, 0.6	2%, 0.9	2%, 0.4	.59	.28

[a]Percentages represent column percentages; thus, values within a column sum to 100% for a given variable (or <100% due to rounding). The n's presented are unweighted/raw counts and standard errors, and *P* values are percentages, and *P* values come from weighted procedures.

[b]*P* values adjust for multiple comparisons using the Bonferroni correction. Specifically, we consider a *P* value of $\alpha = 0.002561$ or less to be statistically significant. Bolded values denote statistical significance using the Bonferroni correction.

[c]This category includes non-Alaskan or Alaskan Native, Native Hawaiian/Pacific Islander, Asian, and more than 1 race.

[d]Per the NSDUH Methodological Summary and Definitions manual, *P* values are not presented for this variable, and readers should interpret cell values with caution as the estimated prevalence rate is close to 0%.[23]

[e]Kessler K6 scores ≥13.[19]

Abbreviations: AUD = alcohol use disorder, CUD = cannabis use disorder, NSDUH = National Survey on Drug Use and Health, OUD = opioid use disorder, TUD = tobacco use disorder, Wgh = weighted.

forms of TUD, including TUD from noncigarette products (eg, cigars, pipes, and e-cigarettes), whereas the present study assessed only TUD from cigarettes based on the NSDUH design.

Although a proportion of the nondaily smoking population met criteria for self-reported TUD, there is limited information on the effectiveness of existing cessation treatments for individuals with nondaily smoking, despite existing research demonstrating low cessation rates among individuals with nondaily smoking.[10,24] More research is sorely needed to test current TUD treatments for adults who do not smoke cigarettes daily and, if needed, potentially develop novel and targeted TUD treatments for these adults. One promising pilot study testing a mobile health intervention for adults with nondaily smoking demonstrated the initial feasibility and acceptability of a positive psychology-based mobile application for smoking cessation in this population.[25] More work is needed in this research area and will need to take into account that adults with nondaily smoking (with and without TUD) are more likely to report other tobacco product use and some SUDs. It may be that nondaily smoking cessation treatment would need to focus on a broad array of substance and mental health issues, rather than focusing exclusively on cigarette smoking behavior.

In terms of clinical implications, nontobacco SUDs are generally assessed in research and clinical practice with a clinician-administered diagnostic assessment using *DSM-5* SUD criteria.[26] However, the assessment of current tobacco use typically assesses only the presence of daily smoking (ie, frequency of smoking) and not the *DSM-5* TUD criteria. However, the current findings illustrate that the frequency of smoking (ie, daily vs nondaily smoking) does not fully capture the population of people who use cigarettes and meet criteria for TUD. Indeed, we found that intermittent or nondaily smoking can produce or sustain TUD signaling a need for tobacco treatment in this population. Future studies should harness psychometric analyses of TUD measures and constructs to determine the optimal methods for assessing TUD in ways that are compatible with clinical practice and that complement the assessment of smoking occurrence per se.

The present study was limited in that our data were cross-sectional, and causality cannot be inferred. The NSDUH did not assess every TUD criterion from the *DSM-5*; however, many of the TUD criteria not assessed in NSDUH appear to have low face validity for TUD (eg, time spent obtaining tobacco and recurrent use in situations when physically hazardous) and may be more appropriate items for assessment of general SUD or illicit substances vs tobacco. Future measurement studies should investigate the reliability and validity of *DSM-5* TUD measures and determine optimal symptoms to include in the *DSM-5* TUD diagnostic criteria.[18] Our dichotomous TUD variable did not allow us to examine the magnitude or severity of TUD between daily and nondaily smoking groups which is an important distinction for future research.[27] Further, the NSDUH TUD items generally assessed use in the past 30 days vs the *DSM-5* criteria recommended assessment of TUD in the past year, though, as previously mentioned, these *DSM-5* TUD criteria have been critiqued,[18] and more psychometric research is needed on this topic.

As several items assessing TUD mentioned "smoking" or "cigarettes" specifically (see Table 1), this study focused on cigarette use and TUD. Future research should examine noncigarette or multiproduct TUD using TUD items that capture the range of possible nicotine and tobacco products. The NSDUH assessment of gender was also binary and does not assess nonbinary gender identities as has been recommended.[28] Future research should also examine differences in TUD and trends in TUD among those with daily and nondaily cigarette use for key subgroups of adults (eg, demographics, psychiatric comorbidities, and substance use comorbidities) to better understand factors related to the TUD trends observed in the present data. Research also needs to take into account national events and changes in policy (eg, changes in cigarette taxes). For example, we found a reduction in the prevalence of TUD following the onset of the COVID-19 pandemic. Research should continue to examine changes in TUD trends as more years pass since the COVID-19 pandemic onset.

Limitations notwithstanding, this is the most recent study (since 2013) to quantify the prevalence of TUD in US adults using nationally representative data. This is also the first study using nationally representative data to examine TUD across daily and nondaily cigarette smoking statuses in adults. The majority of US adults reporting daily smoking in the past 30 days, a commonly used clinical metric of TUD, were classified as having TUD, suggesting that assessment of daily smoking captures many adults with TUD. However, there were also adults with nondaily smoking who met criteria for TUD, suggesting that the assessment of daily smoking alone is not sufficient for identifying all adults with TUD. Adults with nondaily smoking may also benefit from TUD treatment as well as treatment to address dual diagnoses of other risk factors such as SUDs.

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