



# Estimating the prevalence of disability among adults in the USA who smoke cigarettes, 2019–2023

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## ABSTRACT

**Background** Cigarette smoking is associated with adverse health outcomes in people with and without disabilities. However, little is known about disability prevalence among people who smoke. The purpose of this study was to estimate the prevalence of disability and severity of functional difficulties among adults who smoke cigarettes.

**Methods** Univariate testing was used to analyse data from the 2019–2023 National Health Interview Survey (NHIS) to estimate the prevalence of disability and severity of functional difficulties — including vision, hearing, mobility, self-care, and communication — among adults who currently smoke, formerly smoked, or never smoked cigarettes — and analyse disability prevalence among adults who currently smoke by age, sex, race/ethnicity, and education.

**Results** During 2019–2023, estimates for any disability were significantly higher for adults who currently and formerly smoked compared with those who never smoked ( $p < 0.05$ ). The prevalence of reporting a disability was more than twice as high among adults who currently smoke (14.1%) compared with those who never smoked (6.8%) and 1.5 percentage points higher compared with those who formerly smoked (12.6%). The prevalence of vision, hearing, mobility and cognitive disability were 2.0 to 2.4 times higher among adults who currently smoke compared with those who never smoked. Disability prevalence among adults who currently smoke was 16.5% among women and 12.1% among men. Among age groups, prevalence ranged from 21.6% among adults 65+ to 8.7% among adults 25–44. For race and ethnicity, it ranged from 19.0% among non-Hispanic Others to 11.1% among Hispanics. By educational level, prevalence ranged from 21.4% among those with less than a high school degree to 7.6% among college graduates.

**Conclusion** Given that one in seven people who currently smoke has a disability, public health programmes might consider the needs of those with disabilities when designing smoking prevention and treatment programmes.

## INTRODUCTION

Previous studies investigating the prevalence of cigarette smoking as a health risk behaviour among people with disabilities found that people with a disability are more likely to smoke cigarettes than those without a disability.<sup>1–3</sup> While cigarette smoking has decreased overall among US adults, the decline in current cigarette smoking has been slower for people with disabilities.<sup>1 4–6</sup> People with disabilities experience higher rates of chronic

## WHAT IS ALREADY KNOWN ON THIS TOPIC

- ⇒ Cigarette smoking is a leading cause of preventable death.
- ⇒ Conventional smoking cessation interventions might not meet the needs of individuals with a disability and may need to be modified to better reach individuals with disabilities.
- ⇒ People with a disability who smoke cigarettes report improved health outcomes after quitting.

## WHAT THIS STUDY ADDS

- ⇒ Little is known about the prevalence and degree of functional difficulty overall and by type of difficulty among adults who currently smoke cigarettes, formerly smoked, or never smoked.

## HOW THIS STUDY MIGHT AFFECT RESEARCH, PRACTICE OR POLICY

- ⇒ This study is the first to estimate disability prevalence and severity by smoking status and select demographic characteristics. Having up-to-date disability information regarding adults who smoke may help public health practitioners identify or design appropriate interventions to reduce smoking that may be effective for people with specific disabilities.

disease, including diabetes, asthma, cancer, and stroke.<sup>6</sup> They may also experience difficulties in accessing healthcare and may have unmet healthcare needs.<sup>6–9</sup>

In 2019, smoking was the third leading risk factor for disability in the United States.<sup>10</sup> A longitudinal study using 2003–2015 data from the Panel Study of Income Dynamics found that cigarette smoking contributed to roughly 8.5–19% of disability incidence.<sup>11</sup> Van Oyen assessed the effect of smoking on disability using data from the Belgian Health Interview Survey 1997 and 2001. They reported that compared with people who have never smoked, those who formerly smoked have a shorter life expectancy and more years lived with disability. They also reported that smoking contributes to more years lived with disability in younger age groups.<sup>12</sup>

In 2021, about 1 in 9 (11.5%) US adults currently smoked commercial cigarettes.<sup>13</sup> Commercial refers to tobacco products that are made and sold by tobacco companies. It does not include traditional tobacco used by Indigenous groups for religious or ceremonial purposes. The prevalence of smoking varies among specific demographic groups, for example, smoking is more prevalent



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among men (13.1%) compared with women (10.1%); among adults aged 45–64 (14.9%) compared with those aged 25–44 (12.6%), aged over 65 (8.3%), and aged 18–24 (5.3%); among Other non-Hispanic (NH) adults (14.9%) compared with NH White (12.9%), NH Black adults (11.7%), Hispanic adults (7.7%), and NH Asian adults (5.4%); and among those with less than a high school (HS) education (21.2%) compared with those with a HS diploma (17.1%) or GED (30.7%), and college degree (5.3%).<sup>13</sup>

According to the 2020 Surgeon General's Report on smoking cessation, "More than three out of five U.S. adults who have ever smoked cigarettes have quit".<sup>14</sup> Evidence-based interventions for smoking cessation include behavioural counselling and cessation medication interventions, both of which are more effective than self-help materials or no treatment and more effective when used in combination.<sup>14</sup> Also effective are quitlines, alone or in combination with cessation medications; short text message services; and web-based interventions.<sup>14</sup> However, people with disabilities have reported having difficulties accessing or using conventional resources that provide help with quitting.<sup>9</sup>

Collecting disability information is not always a standard practice in investigating smoking cessation interventions, nor have adaptations for people with disabilities been routinely investigated or captured consistently in studies.<sup>15</sup> Many studies evaluating tobacco cessation interventions have not explicitly included people with disabilities in their research.<sup>15</sup> Limited studies have evaluated a smoking cessation intervention specifically tailored for people with disabilities — Living Independently From Tobacco (LIFT),<sup>16 17</sup> a behavioural counselling approach that teaches coping skills to mitigate the negative effects of nicotine withdrawal. Studies on LIFT have reported on the effectiveness of providing counselling to increase the use of coping strategies to reduce smoking.<sup>16 17</sup> However, the LIFT studies largely included small sample sizes that may not be representative of all disability populations. Having accurate disability data may help to guide the development of tobacco cessation interventions and help the adults who currently smoke and report having a disability or some difficulty in one or more disability domains to quit.

To our knowledge, no national cross-sectional study in the United States has estimated the prevalence of disability by type and degree of difficulties with functioning among adults who currently smoke, formerly smoked or never smoked cigarettes. Our study estimates the prevalence of disability status, type and degree of functional difficulties among US adults who currently smoke, formerly smoked or never smoked cigarettes by select demographic characteristics.

## METHOD

We analysed data from the 2019–2023 National Health Interview Survey (NHIS).<sup>18</sup> The National Center for Health Statistics (NCHS) administers the NHIS, a national in-person household survey of the non-institutionalised civilian population in the United States.<sup>18</sup> Sample sizes ranged from 21 153 (2020) to 31,997 (2019); response rates ranged from 47.0% (2023) to 59.1% (2019). Pooled sample size was 150 220. The data were weighted to account for differential probability of selection and, in part, to adjust for non-response. NHIS is conducted per Department of Health and Human Services regulations (45 CFR 46) to protect human subjects.<sup>19</sup> Study outcome variables include measurements of prevalence in the type and severity of functional difficulty and disability overall by smoking status and select demographic characteristics.

## Smoking status measures

Cigarette smoking status was defined as current, former, or never. Respondents were assigned current smoking status if they responded "yes" to the question: "Have you smoked at least 100 cigarettes in your entire life?" and "every day" or "some days" to the question: "Do you now smoke cigarettes every day, some days or not at all?" Respondents were assigned former smoking status if they reported smoking more than 100 cigarettes in their lifetime but reported "not at all" to the question, "Do you now smoke cigarettes every day, some days, or not at all?" Respondents were assigned never smoking status if they reported "No" to having smoked at least 100 cigarettes in their lifetime.

## Disability status measures

NHIS uses the Washington Group–Short Set (WG-SS) to collect disability data. WG-SS measures the amount of difficulty respondents report in six core areas of functional difficulty — including vision, hearing, mobility, selfcare, and communication. Respondents provide ordinal responses — no difficulty, some difficulty, a lot of difficulty, and cannot do at all — to six questions. These questions are: (1) Do you have difficulty seeing, even when wearing glasses? (vision); (2) Do you have difficulty hearing, even when using a hearing aid? (hearing); (3) Do you have any difficulty walking or climbing steps? (mobility); (4) Using your usual language, do you have difficulty communicating, for example, understanding or being understood? (communication); (5) Do you have difficulty remembering or concentrating? (cognitive); (6) Do you have difficulty with self-care, such as washing all over or dressing? (self-care).<sup>20</sup> The Washington Group recommends the cut-off for defining disability as anyone reporting "a lot of difficulty" or "cannot do at all" in at least one of the core areas. Thus, individuals were considered to have "any disability" overall if they reported having "a lot of difficulty" or "cannot do at all" to one or more of the six core areas of functional difficulty. Individuals were considered to have a disability in a specific domain if their response to a corresponding core functional domain question was "a lot of difficulty" or "cannot do at all".<sup>21</sup> Prevalence of any disability and disability type (with 95% confidence intervals) were estimated by smoking status.

WG-SS guidance also recommends that the least restrictive cut-off, "no difficulty" vs "any difficulty" is applicable for identifying people who may benefit from universal design.<sup>21</sup> Because adults with "any" or "some" difficulty would benefit from universal design, we also estimated the prevalence of some difficulty (ie, respondents who reported only "some difficulty" to at least one functional domain) by smoking status. Individuals who reported no difficulty to all six questions were defined as having no difficulty. Individuals that responded "Refused," "Don't know," or "Not ascertained" to one or more of the six disability questions and "No difficulty" to the remaining disability questions were omitted from the analysis.

## Demographic measures

The prevalence of disability by current smoking status was stratified by age (18–24 years, 25–44 years, 45–64 years, 65+ years), sex (male, female), and race/ethnicity (Hispanics, non-Hispanic (NH)-White, NH-Blacks, NH-AIAN (NH-American Indian or Alaskan Native), NH-Asians, NH-Multiple), and education (less than high school; high school, including some college and associate degree; and college degree or more).

**Table 1** Pooled prevalence of disability, disability type, and degree of functional limitation among adults in the USA by cigarette smoking status, 2019–2023 NHIS

	Currently smoke		Formerly smoked		Never smoked		Total	
	(n=17 598; weighted %=12.1%)		(n=37 509; weighted %=22.6%)		(n=91 077; weighted %=65.3%)		(n=1 46 184; 100.0%)	
	%	95% CI	%	95% CI	%	95% CI	%	95% CI
Any Disability*†‡**	14.1	13.5 to 14.7	12.6	12.2 to 13.0	6.8	6.6 to 7.0	9.0	8.9 to 9.2
Some Difficulty†‡§**	39.8	38.9 to 40.7	41.3	40.6 to 41.9	30.7	30.3 to 31.1	34.1	33.8 to 34.5
No Difficulty†‡¶**	46.2	45.2 to 47.1	46.2	45.5 to 46.8	62.5	62.1 to 63.0	56.9	56.5 to 57.2
Disability†‡by Type								
Vision	2.6	2.3 to 2.9	1.9	1.8 to 2.1	1.1	1.0 to 1.2	1.5	1.4 to 1.6
Hearing	2.2	2.0 to 2.5	2.5	2.3 to 2.6	1.1	1.0 to 1.2	1.6	1.5 to 1.6
Mobility	8.0	7.5 to 8.5	7.9	7.6 to 8.2	3.7	3.6 to 3.9	5.2	5.1 to 5.4
Cognitive	4.4	4.0 to 4.8	3.1	2.9 to 3.3	1.9	1.8 to 2.1	2.5	2.4 to 2.6
Self-Care	1.0	0.9 to 1.2	1.4	1.2 to 1.5	1.0	0.9 to 1.1	1.1	1.1 to 1.2
Communication	1.0	0.8 to 1.2	0.8	0.7 to 0.9	0.8	0.7 to 0.9	0.8	0.8 to 0.9

\*"Any Disability" includes adults who reported having "a lot of difficulty" or "cannot do this at all" to at least one of the six disability questions.

†Based on t-test results, estimates for disability were significantly higher for adults who currently smoked compared with those who never smoked ( $p<0.05$ ).

‡Based on t-test results, estimates for disability were significantly higher for adults who formerly smoked compared with those who never smoked ( $p<0.05$ ).

§"Some Difficulty" includes adults who reported only "some difficulty" to one or more disability questions.

¶"No difficulty" includes eight individuals who reported either "Refused," "Don't know," or "Not ascertained" to one or more of the six disability questions and "No difficulty" to the remaining disability questions.

\*\*Any disability, some difficulty and no difficulty estimates may not sum to 100 due to rounding.

††"Disability" includes adults who reported having "a lot of difficulty" or "cannot do this at all" to the individual question relating to each type of disability.

## Statistical analyses

The study used pooled NHIS data from 2019 to 2023 to obtain national estimates of disability prevalence by type and degree among respondents who currently smoke, formerly smoked or never smoked. Age adjustment to the 2020 US standard population did not substantially change the results. Therefore, we present unadjusted estimates instead of age-adjusted estimates. Data reporting criteria are based on methods from the National Centre of Health Statistics.<sup>22 23</sup> We tested for statistically significant differences,  $p$ -value $<0.05$ , in estimates for "any disability," "some difficulty," and "no difficulty" by smoking status (currently and formerly smoked vs never smoked) using a t-test.

## RESULTS

During 2019–2023, among adults who currently smoke cigarettes, 14.1% reported having a disability compared with 12.6% of adults who formerly smoked and 6.8% of adults who never smoked (table 1). The most prevalent disabilities among adults who currently smoke, formerly smoked, or never smoked were mobility (8.0%, 7.9%, and 3.7%, respectively) and cognitive difficulty (4.4%, 3.1%, and 1.9%, respectively). Among adults who currently smoke, 53.9% reported on having "some," "a lot of," or "cannot do at all" for at least one disability type. The prevalence of vision, hearing, mobility and cognitive disability was 2.0 to 2.4 times higher among adults who currently smoke compared with those who never smoked. Based on t-test results, estimates for disability were significantly higher for adults who currently smoked compared with those who never smoked ( $p<0.05$ ) with the exception of those with self-care disability; and significantly higher for adults who formerly smoked compared with those who never smoked ( $p<0.05$ ) with the exception of those with communication disability. Disability prevalence among adults who currently smoke was 16.5% among women and 12.1% among men. Disability prevalence ranged from 21.6% among adults aged 65+ to 8.7% among adults aged 25–44. For race and ethnicity, prevalence ranged from 19.0% among non-Hispanic Others to 11.1% among Hispanics. By educational

level, prevalence ranged from 21.4% among those with less than a high school degree to 7.6% among college graduates (table 2).

## DISCUSSION

This study is among the first to use nationally representative data to estimate the prevalence of disability and type of disability among adults in the USA who currently or formerly smoke cigarettes compared with those who never smoked. Our pooled analysis revealed that of the estimated 25 million adults who currently smoke, about 40% experienced at least some level of functional difficulty. The percentage of adults who currently smoke who reported having a disability was more than two times higher compared with adults who never smoked (14.1% vs 6.8%). Our findings add to a very limited literature assessing disability among people who smoke.<sup>11 12</sup>

Recognising disabilities experienced by people who smoke can help public health practitioners identify potential challenges or barriers to effectively implementing tobacco cessation and prevention strategies. For tobacco cessation purposes, it is important to note that disability prevalence is not equally shared among all groups or proportionate to the share of adults who smoke. For example, while smoking cigarettes is more prevalent among men,<sup>13</sup> women who smoke have a higher prevalence of disability; adults with less than a high school diploma have both a high prevalence of cigarette smoking<sup>13</sup> and high prevalence of disability (21.4%) compared with those with a high school or GED education (13.3%) or college degree (7.6%) who smoke; and, as would be expected, older adults aged 65+ who smoke have a high disability prevalence (21.6%) compared with younger adults aged 18–44 who smoke (8.7–8.9%).

In the USA, people with disabilities experience health barriers that affect their healthcare,<sup>24 25</sup> including accessing healthcare services, receiving preventive care,<sup>26 27</sup> and experience more chronic health conditions<sup>27 28</sup> than those without disabilities.

Interventions providing tobacco cessation services might not meet the needs of persons with a disability and may need to be modified to better reach people with specific disabilities.<sup>29</sup> For

**Table 2** Pooled prevalence of disability and degree of functional limitation among adults in the USA who currently smoke by select characteristics, 2019–2023 NHIS

	Any Disability*		Some Difficulty†		No Difficulty‡	
	%	95% CI	%	95% CI	%	95% CI
Age (n=17 574)						
18–24	8.9	6.1 to 12.4	40.4	35.7 to 45.3	50.7	45.7 to 55.7
25–44	8.7	7.9 to 9.6	34.0	32.5 to 35.5	57.3	55.7 to 58.8
45–64	17.0	16.0 to 18.0	41.9	40.6 to 43.2	41.1	39.8 to 42.5
65+	21.6	20.0 to 23.4	48.1	46.2 to 50.0	30.2	28.5 to 32.0
Sex (n=17 593)						
Male	12.1	11.3 to 13.0	38.4	37.1 to 39.6	49.5	48.2 to 50.9
Female	16.5	15.6 to 17.5	41.4	40.2 to 42.7	42.0	40.7 to 43.4
Race and Ethnicity (n=17 594)						
Hispanics	11.1	9.4 to 13.0	35.2	32.2 to 38.0	53.7	50.9 to 56.5
NH§-White	14.5	13.8 to 15.3	41.6	40.5 to 42.7	43.9	42.8 to 45.0
NH-Blacks	15.3	13.5 to 17.3	37.4	34.9 to 39.9	47.3	44.6 to 49.9
NH-AIAN	18.1	12.1 to 25.5	38.3	29.5 to 47.6	43.6	34.4 to 53.2
NH-Asians	¶		26.2	21.6 to 31.2	69.8	64.5 to 74.7
NH-Other¶	19.0	14.1 to 24.6	38.4	32.3 to 44.7	42.7	36.3 to 49.2
Education (n=17 475)						
Less than HS	21.4	19.5 to 23.4	40.6	38.2 to 43.0	38.0	35.6 to 40.4
HS/GED**	13.3	12.6 to 14.1	40.0	38.9 to 41.1	46.7	45.5 to 47.8
College Graduate	7.6	6.6 to 8.9	37.4	35.0 to 39.4	55.0	52.8 to 57.3

\*"Any Disability" includes adults who reported having "a lot of difficulty" or "cannot do this at all" to at least one of the six disability questions.

†"Some Difficulty" includes adults who reported only "some difficulty" to one or more disability questions.

‡"No difficulty" includes eight individuals who reported "No difficulty" to all six of the disability questions.

§Based on NCHS data presentation standards, estimates were statistically unreliable ([https://www.cdc.gov/nchs/data/series/sr\\_02/sr02\\_175.pdf](https://www.cdc.gov/nchs/data/series/sr_02/sr02_175.pdf)). SAS MACRO used to suppress criteria check. <https://www.sas.com/content/dam/SAS/support/en/sas-global-forum-proceedings/2019/3659-2019.pdf>.

¶NH-Other—Respondents report multiple race groups or any other race category.

\*\*HS/GED—Includes respondents with some college or an associate degree (occupational, technical, vocational).

example, one study found that people with cognitive and sensory disabilities may not be reached as effectively using smoking cessation programmes designed for people without disabilities.<sup>29</sup>

There is limited information available regarding tailoring smoking cessation interventions for people with disabilities.<sup>15</sup> Our study quantifies the prevalence of disability among adults by smoking status and calls attention to the need to tailor tobacco cessation programmes and interventions to serve a significant proportion of adults who currently smoke and report living with a disability or some difficulty in one or more disability domains. Research focused on cessation interventions for people with disabilities could be enhanced through stratifying by type of disability to help improve successful cessation among this population.<sup>30</sup> Public health practitioners and primary care providers could benefit from education and training on evidence-based cessation programmes tailored for adults with disabilities.<sup>30</sup>

People who smoke cigarettes and live with a disability report improved health outcomes after quitting.<sup>31</sup> Adults with disabilities who quit smoking were also more likely to have less bodily pain, improved mental health, energy and vitality, and overall enhanced perception of their general health.<sup>31</sup> Tobacco prevention efforts with a universal design may be warranted.<sup>32</sup>

### Limitations

Our study has the following limitations. First, causality cannot be determined from a cross-sectional survey. Second, the results are sensitive to the definition of disability used. The NHIS uses the WG-SS, with disability typically defined as reporting "a lot of difficulty" or "cannot do at all." WG-SS questions are frequently used to generate national estimates for disability status and type.

Compared with the American Community Survey (ACS) six-question set, which includes only "yes" and "no" responses to the questions, dichotomising the WG-SS may underestimate the prevalence of disability status.<sup>32 33</sup> People with "some difficulty" could benefit from adaptations that remove barriers to conventional cessation interventions.<sup>32</sup> These data might also provide helpful information for resource allocation and policy planning.<sup>32</sup> Third, smoking and disability measures in the NHIS are self-reported and subject to recall and social desirability bias. Finally, NHIS does not survey institutionalised individuals or military personnel on active duty.

### Future research

Qualitative and longitudinal research could explore barriers to cessation and effective interventions for people who smoke and who have a disability and investigate ways to identify strategies to adapt tobacco control and prevention interventions for people with disabilities.

### CONCLUSION

The prevalence of disability among adults in the USA who currently smoke cigarettes was more than two times higher when compared with those who have never smoked. The most prevalent types of disabilities among adults who currently smoke are mobility and cognitive difficulty. Each disability type may present unique challenges and barriers to using conventional smoking cessation interventions, which can be addressed if considerations relating to universal design are incorporated upfront. Understanding that more than 1 in 7 adults who smoke live with a



disability, and knowing the type, degree of functional difficulties, and demographic characteristics can aid public health officials in designing interventions to reduce smoking that are appropriate and effective for people with disabilities.

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