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Idiopathic Pulmonary Fibrosis Mortality by Industry and Occupation — United States, 2020–2022

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Abstract

Idiopathic pulmonary fibrosis (IPF), a progressive lung disease characterized by scarring and worsening lung function, has a poor prognosis. A recent systematic review estimated that 21% of IPF deaths might be attributable to occupational exposures. To describe IPF mortality among U.S. residents aged ≥15 years who were ever employed, by industry and occupation, CDC conducted an exploratory analysis of 2020–2022 multiple cause-of-death data. During 2020–2022, a total of 67,843 (39,712 [59%] male and 28,131 [41%] female) decedents had IPF, suggesting that during this 3-year period, 8,340 IPF deaths in males and 5,908 deaths in females might have been associated with occupational exposures. By industry group, the highest proportionate mortality ratios among males were among those employed in utilities (1.15) and among females, were among those employed in public administration (1.12). By occupation group, the highest IPF mortality rates among males were among community and social services workers (1.23) and among females among farming, fishing, and forestry workers (1.24). Estimates of elevated IPF mortality among workers in specific industries and occupations warrant confirmation, control of known exposure-related risk factors, and continued surveillance to better understand the full range of occupational exposures that might increase risk for developing IPF.

Introduction

Idiopathic pulmonary fibrosis (IPF) is characterized by progressive scarring of lung tissue and declining lung function, with a median survival of 3–5 years after diagnosis (*1*). Typically, the disease presents with unexplained, progressive shortness of breath, often accompanied by a nonproductive cough and a radiographic pattern of usual interstitial pneumonia on high-resolution computed tomography (*1*,*2*). Treatment options are noncurative and include pharmacotherapies (i.e., pirfenidone and nintedanib to slow progression) and lung transplantation (*1*,*2*).

In 2017, the overall IPF age-adjusted death rate (IPF deaths per 100,000 persons) was 5.4 (7.2 for men and 4.0 for women) (*3*). Although the exact IPF etiology remains unknown, studies have indicated associations with cigarette smoking, genetic mutations, viral infections (e.g., Epstein-Barr virus and hepatitis C), and occupational exposures to pesticides, and wood (pine) and metal (brass, lead, and steel) dust (*1*,*2*,*4*,*5*). The proportion of IPF cases associated with occupational exposures (the population attributable fraction) has been previously estimated to be 21% (95% CI = 15%–28%)* (*6*). To describe IPF

* The estimate was made in a meta-analysis using data from 11 studies from the following countries: United Kingdom (three), South Korea (two), Japan (one), Sweden (one), Mexico (one), Italy (one), Australia (one), and Pakistan (one). Applicability of the estimate to U.S. workers should be interpreted with caution.

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mortality among U.S. residents aged ≥15 years by industry and occupation and to examine associations among IPF deaths and industry and occupation, CDC analyzed 2020–2022 multiple cause-of-death data.

Methods

Data Source

Deaths were identified from the National Vital Statistics System's (NVSS) public-use multiple cause-of-death files,[†] which include 10,038,112 records for U.S. residents aged ≥15 years who died during 2020–2022, the most recent years the jurisdictions[§] provided information on decedents' usual[¶] industry and occupation. The NVSS mortality files include coded industry (23 major groups) and occupation (26 major groups) information for 9,738,271 decedents.[**]

Case Definition

IPF decedents were defined as persons whose death record listed the *International Classification of Diseases, Tenth Revision* (ICD-10) code J84.1 (other interstitial pulmonary diseases with fibrosis) as the underlying[††] or a contributing cause of death. Following previous reports (*3*), death records listing ICD-10 codes for conditions that might be associated with nonidiopathic pulmonary fibrosis[§§] were excluded from the analysis (3,033 [4.3%] of 70,876 death certificates listing ICD-10 code J84.1).

[†] https://www.cdc.gov/nchs/data_access/vitalstatsonline.htm#Mortality_Multiple

[§] Forty-seven jurisdictions submitted industry and occupation information (Arizona, North Carolina, Rhode Island, and the District of Columbia did not) in 2020, a total of 49 jurisdictions (Rhode Island and the District of Columbia did not) in 2021. Iowa participated in the program in 2020, but because of differences in the method of data collection, the data were inconsistent with those from other jurisdictions and were excluded. All jurisdictions participated in 2022. Foreign residents, decedents aged <15 years, persons with missing age, and decedents from the nonparticipating or excluded jurisdictions were not included in industry and occupation coding, resulting in 9,738,271 records. https://ftp.cdc.gov/pub/Health_Statistics/NCHS/Dataset_Documentation/DVS/mortality/Industry-and-Occupation-data-mortality-2020.pdf

[¶] Industry (the business activity of a person's employer or, if self-employed, their own business) and occupation (a person's job or the type of work they do) are used to categorize employment. Usual occupation and industry recorded on the death certificate is the occupation and industry in which the decedent spent a majority of their working life.

[**] https://www.bls.gov/cps/definitions.htm#occupation

[††] The underlying cause of death is the disease or injury that initiated the chain of events that led directly and inevitably to death. https://www.cdc.gov/nchs/icd/icd-10-cm/

[§§] Underlying connective tissue diseases: M05–M08.9, M32–M35.0, M35.1, M35.5, M35.8–M36; radiation fibrosis: J70.1; sarcoidosis: D86–D86.9; pneumoconiosis: J60–J65; and hypersensitivity pneumonitis: J67–J67.9.

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Data Analyses

Death rates (deaths per 100,000 persons aged ≥15 years) were based on postcensal population estimates as of July 1 of the corresponding year and were age-adjusted using the 2000 U.S. Census Bureau standard population.[¶¶] Because some occupations are dominated by either male (e.g., mechanics, carpenters, and electricians) or female (e.g., preschool and kindergarten teachers, childcare workers, and administrative assistants) workers,[***] and because the IPF-related mortality is higher in males than in females (*3*), proportionate mortality ratios (PMRs),[†††] adjusted by 10-year age groups, race and ethnicity, and 95% CIs assuming Poisson distribution of the data were calculated by industry and occupation for males and females. One occupation might be listed under multiple industries. Analyses were conducted using SAS software (version 9.4; SAS Institute). This activity was reviewed by CDC, deemed not research, and was conducted consistent with applicable federal law and CDC policy.[§§§]

Results

IPF Deaths and Death Rates

During 2020–2022, a total of 67,843 deaths with IPF listed as the underlying (38,869; 57.3%) or a contributing (28,974; 42.7%) cause of death among U.S. residents aged ≥15 years were reported (Table 1), accounting for 0.7% of 9,738,271 deaths from all causes. Among IPF deaths, 45,646 (67.3%) occurred among persons aged ≥75 years, 39,712 (58.5%) occurred among males, 61,356 (90.4%) among White persons, and 60,793 (89.6%) among non-Hispanic persons. Overall, the annualized age-adjusted IPF death rate was 7.1 per 100,000 persons. The highest IPF death rates were among adults aged ≥75 years (67.6 per 100,00 persons), males (7.7), non-Hispanic (7.7), and White persons (8.2). Based on an estimate that 21% of IPF deaths might be related to occupational exposures, during this 3-year period, 8,340 (95% CI = 5,957–11,119) IPF deaths in males and 5,908 (95% CI = 4,220–7,877) deaths in females might have resulted from occupational exposures.

Industry

By industry, the highest number of IPF deaths occurred among males in the manufacturing industry (7,525; 18.9% of IPF deaths in males) and among females in the health care and social assistance industry (4,277; 15.2% of IPF death in females) (Table 2). The highest significantly elevated PMRs were among males working in utilities[¶¶¶] (1.15; 95% CI = 1.08–1.24) and public administration[****] (1.15; 95% CI = 1.11–1.19) and among females working in public administration industries (1.12; 95% CI = 1.06–1.18). In addition, among both male and female workers, the elevated PMRs were found in health care and social assistance (1.11; 95% CI = 1.05–1.17 and 1.10; 95% CI = 1.07–1.13, respectively), and educational services industries (1.07; 95% CI = 1.02–1.12 and 1.09; 95% CI = 1.05–1.13).

Occupation

By occupation, the highest number of IPF deaths occurred among males in management (5,715; 14.4% of IPF deaths in males) and among female office and administrative support workers (4,521; 16.1% of IPF deaths in females). The highest significantly elevated PMRs were among male community and social services workers (1.23; 95% CI = 1.14–1.32) and among female farming, fishing, and forestry workers (1.24; 95% CI = 1.01–1.53). Among both male and female workers, the elevated PMRs were found in the health care practitioners and technical occupations (1.13; 95% CI = 1.06–1.21 and 1.21; 95% CI = 1.16–1.27, respectively).

Discussion

During 2020–2022, 67,843 deaths (39,712 in males and 28,131 in females) among ever-employed persons aged ≥15 years were associated with IPF. Based on an estimate that 21% of IPF deaths might be related to occupational exposures (*6*), approximately 14,248 deaths (8,340 in males and

[¶¶] For calculation of death rates, numerators were the sum of IPF deaths that occurred during 2020–2022, and denominators were the sum of 2020, 2021, and 2022 midpoint populations (for 2020 and 2021 population data for jurisdictions that did not provide industry and occupation information were removed from denominators). Age-adjusted death rates were calculated by applying age-specific death rates to the 2000 U.S. Census Bureau standard population age distribution. https://wonder.cdc.gov/wonder/help/mcd-expanded.html#Age-Adjusted%20Rates

[***] https://www.dol.gov/agencies/wb/data/Employment-and-Earnings-by-Occupation

[†††] PMR was defined as the observed number of deaths from IPF in a specified industry or occupation, divided by the expected number of deaths from IPF. The expected number of deaths was the total number of deaths in an industry or occupation of interest multiplied by a proportion defined as the number of IPF deaths in all industries or occupations, divided by the total number of deaths in all industries or occupations. The IPF PMRs were adjusted by 10-year age groups, sex, race, and ethnicity.

[§§§] 45 C.F.R. part 46; 21 C.F.R. part 56; 42 U.S.C. Sect. 241(d), 5 U.S.C. Sect. 552a, 44 U.S.C. Sect. 3501 et seq.

[¶¶¶] Of all 364 occupations in the utilities industry, 119 were associated with IPF deaths; four occupations had 50 or more IPF deaths and include electrical power-line installers and repairers; managers, all other; first-line supervisors of production and operating workers; and electricians.

[****] Of all 497 occupations in the public administration industry, 263 were associated with IPF deaths; 16 occupations had 50 or more IPF deaths and include police and sheriff's patrol officers; managers, all other; secretaries and administrative assistants; office clerks, general; firefighters; supervisors of protective service workers, all other; accountants and auditors; first-line supervisors of police and detectives; detectives and criminal investigators; social workers; compliance officers; engineers, all other; janitors and building cleaners; general and operations managers; and maintenance and repair workers, general.

TABLE 1. Characteristics of idiopathic pulmonary fibrosis decedents* and age-adjusted idiopathic pulmonary fibrosis death rates† among ever-employed§ persons aged ≥15 years, by sex (N = 67,843) — selected U.S. jurisdictions,¶ 2020–2022

Characteristic	Males		Females		Total	
	No. of deaths (% of IPF deaths)	Death rate (95% CI)	No. of deaths (% of IPF deaths)	Death rate (95% CI)	No. of deaths (% of IPF deaths)	Death rate (95% CI)
Total (% of all IPF deaths)	**39,712 (58.5)**	**7.7 (7.6–7.9)**	**28,131 (41.5)**	**6.2 (6.0–6.3)**	**67,843 (100.0)**	**7.1 (7.0–7.2)**
Age group, yrs**						
15–34	74 (0.2)	0.06 (0.05–0.07)	67 (0.2)	0.05 (0.04–0.07)	**141 (0.2)**	**0.05 (0.04–0.06)**
35–44	165 (0.4)	0.26 (0.2–0.3)	148 (0.5)	0.2 (0.20–0.27)	**313(0.5)**	**0.2 (0.2–0.3)**
45–54	635 (1.6)	1.08 (1.0–1.2)	589 (2.1)	1.0 (0.9–1.1)	**1,224 (1.8)**	**1.0 (1.0–1.1)**
55–64	3,236 (8.1)	5.3 (5.2–5.5)	2,034 (7.2)	3.20 (3.1–3.3)	**5,270 (7.8)**	**4.2 (4.1–4.4)**
65–74	9,639 (24.3)	21.1 (20.6–21.5)	5,610 (19.9)	10.9 (10.6–11.1)	**15,249 (22.5)**	**15.6 (15.4–15.9)**
≥75	25,963 (65.4)	91.9 (90.8–93.0)	19,683 (70.0)	50.1 (49.4–50.8)	**45,646 (67.3)**	**67.6 (67.0–68.2)**
Race††						
American Indian or Alaska Native	352 (0.9)	4.2 (3.2–5.1)	265 (0.9)	3.6 (3.3–4.0)	**617 (0.9)**	**3.8 (3.1–4.5)**
Asian or other Pacific Islander	1,201 (3.0)	2.8 (2.5–3.0)	928 (3.3)	2.0 (1.8–2.2)	**2,129 (3.1)**	**2.4 (2.2–2.6)**
Black or African American	1,748 (4.4)	2.6 (2.0–3.1)	1,707 (6.1)	1.4 (1.2–3.0)	**3,455 (5.1)**	**2.5 (2.3–2.7)**
White	36,253 (91.3)	8.9 (8.8–9.1)	25,103 (89.2)	7.2 (7.0–7.3)	**61,356 (90.4)**	**8.2 (8.1–8.4)**
Multiple	158 (0.4)	—	128 (0.5)	—	**286 (0.4)**	—
Ethnicity						
Hispanic or Latino	3,873 (9.8)	3.4 (3.1–3.6	3,177 (11.3)	3.2 (3.0–3.4)	**7,050 (10.4)**	**3.4 (3.2–3.6)**
Non-Hispanic	35,839 (90.2)	8.3 (8.1–8.4)	24,954 (88.7)	7.0 (6.9–7.2)	**60,793 (89.6)**	**7.7 (7.6–7.8)**

Source: National Vital Statistics System public use multiple cause files 2020–2022. https://www.cdc.gov/nchs/data_access/vitalstatsonline.htm#Mortality_Multiple
Abbreviations: ICD-10 = *International Classification of Diseases, Tenth Revision*; IPF = idiopathic pulmonary fibrosis.

* Death records with ICD-10 code J84.1 (other interstitial pulmonary diseases with fibrosis) listed as the underlying or contributing causes of death and no ICD-10 codes for any condition that might be associated with pulmonary fibrosis including underlying connective tissue diseases (M05–M08.9, M32–M35.0, M35.1, M35.5, M35.8–M36), radiation fibrosis (J70.1), sarcoidosis (D86–D86.9), pneumoconiosis (J60–J65), and hypersensitivity pneumonitis (J67–J67.9).

† Age-adjusted death rates (deaths per 100,000 persons) were calculated by applying age-specific death rates to the 2000 U.S. Census Bureau standard population age distribution. https://wonder.cdc.gov/wonder/help/mcd.html#Age-Adjusted%20Rates

§ Decedents with information on their usual industry and occupation.

¶ Starting in 2020, CDC's National Center for Health Statistics and the National Institute for Occupational Safety and Health began a collaboration to translate industry and occupation information, which was submitted by jurisdictions to National Center for Health Statistics as part of their death certificate data, to U.S. Census Bureau industry and occupation codes. Forty-seven jurisdictions participated (Arizona, North Carolina, Rhode Island, and the District of Columbia did not participate) in this program in 2020. Iowa participated in the program in 2020, but because of differences in the method of data collection, the data were inconsistent with those from other jurisdictions and were excluded. In 2021, a total of 49 jurisdictions participated (Rhode Island and the District of Columbia did not participate). All jurisdictions participated in the program in 2022. https://www.cdc.gov/nchs/data/dvs/Industry-and-Occupation-data-mortality-2020.pdf

** Age-specific IPF death rates (deaths per 100,000 persons).

†† Race and Hispanic origin are reported separately on the death certificate. The American Indian or Alaska Native race category includes North, Central, and South American Indians, Eskimos, and Aleuts. The Asian or other Pacific Islander race category includes Chinese, Filipino, Hawaiian, Japanese, and other Asian or other Pacific Islanders (https://wonder.cdc.gov/wonder/help/mcd.html). Race and ethnicity on death certificates might be misclassified. Persons of Hispanic or Latino (Hispanic) origin might be of any race but are categorized as Hispanic. Classification is highly accurate for both White and Black or African American populations and accurate for the Asian or other Pacific Islander and Hispanic populations. The quality of reporting for the American Indian or Alaska Native population might be poor. https://www.cdc.gov/nchs/data/series/sr_02/sr02_172.pdf

5,908 deaths in females) might have been job-related. However, the estimate was based on non-U.S. reports and might not be directly applicable to the U.S. workforce.

Elevated IPF death rates among persons aged ≥75 years and males are consistent with previous reports of increased mortality in these groups (*3*). In contrast to findings from a previous study, the overall age-adjusted IPF death rate of 7.1 per 100,000 persons over the 3 years of this study was higher than that reported for 2017 (5.3 per 100,000) and the rates in White and non-Hispanic persons (8.2 and 7.7 per 100,00, respectively) were higher than average annual rates reported for 2004–2017 (6.1 and 6.2 per 100,000, respectively) (*3*). These differences could be partially explained by differences in research methodologies, improved precision in diagnostic criteria, and increasing implementation of recommendations for diagnosing IPF (*1*), and differences over time in the prevalences of known IPF-associated risk factors (*6,7*). The decrease in cigarette smoking (*7*) (known to be associated with IPF) among adults highlights the potentially increasing proportionate role of environmental and occupational exposures in the development of IPF (*4–6*).

Higher proportions of IPF deaths were observed among ever-employed persons in several industries and occupations. Among both male and female workers, the highest significantly elevated PMRs were found in the public administration, health care and social assistance, and educational services industries as well as in the health care practitioners and technical occupations. Workers in some of these industries and occupations

TABLE 2. Industries and occupations with idiopathic pulmonary fibrosis* deaths and proportionate mortality ratio† among ever-employed§ persons aged ≥15 years, by sex (N = 67,843) — selected U.S. jurisdictions,¶ 2020–2022

Characteristic	Males			Females		
	No. of deaths from all causes	IPF		No. of deaths from all causes	IPF	
		No. of deaths	PMR (95% CI)		No. of deaths	PMR (95% CI)
Total	**5,117,769**	**39,712**	—	**4,620,502**	**28,131**	—
Industry						
Accommodation and food services	163,661	773	0.84 (0.78–0.90)	193,325	885	0.85 (0.79–0.90)
Administrative and support and waste management and remediation services	160,749	864	0.87 (0.81–0.93)	69,993	419	1.05 (0.96–1.16)
Agriculture	174,627	1,386	0.87 (0.82–0.92)	34,335	248	1.08 (0.95–1.23)
Arts, entertainment, and recreation	81,121	499	0.87 (0.79–0.95)	49,635	292	0.98 (0.87–1.10)
Construction	688,686	4,553	0.94 (0.91–0.96)	32,698	205	1.06 (0.92–1.22)
Education services	200,752	1,952	1.07 (1.02–1.12)**	439,689	3,013	1.09 (1.05–1.13)**
Finance and insurance	118,280	1,181	1.10 (1.04–1.16)**	162,592	1,065	1.04 (0.98–1.11)
Health care and social assistance	166,684	1,393	1.11 (1.05–1.17)**	677,526	4,277	1.10 (1.07–1.13)**
Information	92,531	867	1.06 (0.99–1.14)	81,266	469	0.92 (0.84–1.01)
Management of companies and enterprises	6,347	62	1.03 (0.80–1.34)	7,648	46	0.93 (0.70–1.27)
Manufacturing	829,308	7,525	1.05 (1.03–1.08)**	374,764	2,331	0.98 (0.94–1.02)
Mining	66,531	600	1.04 (0.96–1.13)	3,806	26	1.08 (0.74–1.66)
Other services (except public administration)	272,497	2,060	1.00 (0.95–1.04)	186,852	1,101	1.02 (0.96–1.08)
Professional, scientific, and technical services	221,537	2,147	1.12 (1.07–1.17)**	141,938	927	1.06 (0.99–1.13)
Public administration	275,268	2,800	1.15 (1.11–1.19)**	179,848	1,220	1.12 (1.06–1.18)**
Real estate and rental and leasing	60,854	558	1.08 (1.00–1.18)**	59,421	412	1.08 (0.98–1.19)
Retail trade	352,893	2,853	1.00 (0.97–1.04)	329,300	2,009	1.01 (0.97–1.05)
Transportation and warehousing	430,807	3,154	0.95 (0.92–0.99)	81,278	455	0.98 (0.90–1.08)
Utilities	79,485	817	1.15 (1.08–1.24)**	17,266	111	1.02 (0.84–1.23)
Wholesale trade	71,483	594	0.99 (0.91–1.07)	18,889	137	1.17 (0.99–1.39)
All other industries††	603,668	3,074	0.85 (0.82–0.89)	1,478,433	8,483	0.92 (0.90–0.94)
Occupation						
Architecture and engineering	207,191	2,193	1.11 (1.06–1.16)**	15,170	91	0.97 (0.79–1.20)
Arts, design, entertainment, sports, and media	86,384	604	0.91 (0.84–0.98)	64,529	398	0.99 (0.90–1.09)
Building and grounds cleaning and maintenance	178,878	1,048	0.88 (0.83–0.94)	116,842	618	0.98 (0.90–1.06)
Business and financial operations	127,425	1,283	1.12 (1.06–1.18)**	118,245	795	1.10 (1.03–1.18)**
Community and social services	67,772	711	1.23 (1.14–1.32)**	63,789	407	1.09 (0.99–1.20)
Computer and mathematical	64,785	570	1.17 (1.08–1.27)**	21,043	106	0.88 (0.72–1.07)
Construction and extraction	643,120	4,271	0.93 (0.91–0.96)	11,205	60	1.02 (0.79–1.34)
Education, training, and library	121,243	1,243	1.08 (1.02–1.14)**	298,528	2,014	1.07 (1.02–1.12)**

See table footnotes on the next page.

would be anticipated to have frequent exposure to secondhand smoke†††† (*8*); vapors, gas, dust, and fumes§§§§ (*8*); biologic (e.g., bioaerosols in indoor environments) (*2,9,10*); chemical (e.g., pesticides) (*5*); and other hazards in the workplace (*5–10*). However, for some industries and occupations at increased risk, potential sources of increased risk are unclear and might be related to either work exposures or factors not directly related to work that were not fully addressed by the study design.

Limitations

The findings in this report are subject to at least eight limitations. First, no ICD-10 code is specific to IPF, and IPF might be underreported on death certificates (*3*). Second, the IPF diagnosis might be affected by access to specialty care and chest computed tomography, both to identify interstitial lung disease and exclude other known causes of interstitial lung disease. However, access to care information was not available, and IPF deaths were not validated using medical records. Third, because of the cross-sectional study design, no temporal relationship between IPF death and work could be measured. Fourth, information on smoking status and workplace exposures are not recorded on death certificates. Therefore, these

†††† For example, the proportions of nonsmoking workers exposed to secondhand smoke in the utilities industry, public administration industry and health care and social assistance industry have been estimated at 15.2%, 10.5%, and 8.0%, respectively; these proportions among health care practitioners and technical workers, and health care support workers have been estimated at 6.3% and 11%, respectively.

§§§§ For example, the proportion of workers reporting frequent exposure to vapors, gas, dust, or fumes at work in the public administration industry and health care and social assistance industry has been estimated at 21.6% and 13.4%, respectively; this proportion among health care practitioners and technical workers, and health care support workers has been estimated at 14.2% and 15.0%, respectively.

TABLE 2. (*Continued*) Industries and occupations with idiopathic pulmonary fibrosis* deaths and proportionate mortality ratio† among ever-employed§ persons aged ≥15 years, by sex (N = 67,843) — selected U.S. jurisdictions,¶ 2020–2022

Characteristic	Males			Females		
	No. of deaths from all causes	IPF		No. of deaths from all causes	IPF	
		No. of deaths	PMR (95% CI)		No. of deaths	PMR (95% CI)
Farming, fishing, and forestry	56,836	363	0.79 (0.71–0.87)	11,011	97	1.24 (1.01–1.53)**
Food preparation and serving related	108,956	399	0.78 (0.70–0.86)	176,195	819	0.84 (0.79–0.90)
Health care practitioners and technical	88,465	864	1.13 (1.06–1.21)**	277,318	2,014	1.21 (1.16–1.27)**
Health care support	13,810	58	0.82 (0.64–1.08)	152,238	770	0.97 (0.91–1.05)
Installation, maintenance, and repair	332,080	2,578	0.98 (0.95–1.02)	12,376	77	1.06 (0.85–1.34)
Legal	36,873	356	1.02 (0.91–1.13)	21,895	142	1.09 (0.92–1.29)
Life, physical, and social science	45,297	484	1.16 (1.06–1.26)**	18,111	109	0.97 (0.80–1.18)
Management	562,616	5,715	1.12 (1.09–1.15)**	250,981	1,701	1.10 (1.05–1.15)**
Office and administrative support	168,359	1,248	0.97 (0.92–1.03)	682,562	4,521	1.05 (1.02–1.08)**
Personal care and service	50,357	313	0.94 (0.84–1.05)	167,819	951	1.00 (0.93–1.06)
Production	483,066	3,994	0.99 (0.96–1.02)	257,524	1,585	0.96 (0.92–1.01)
Protective service	145,912	1,296	1.11 (1.05–1.17)**	26,955	151	1.07 (0.91–1.26)
Sales and related	374,101	3,393	1.04 (1.01–1.08)**	299,727	1,866	1.02 (0.98–1.07)
Transportation and material moving	572,375	3,577	0.89 (0.86–0.92)	106,746	556	0.93 (0.85–1.01)
All other occupations§§	581,868	3,151	0.88 (0.85–0.91)	1,449,693	8,283	0.92 (0.90–0.94)

Source: National Vital Statistics System public use multiple cause files 2020–2022. https://www.cdc.gov/nchs/data_access/vitalstatsonline.htm#Mortality_Multiple
Abbreviations: ICD-10 = *International Classification of Diseases, Tenth Revision*; IPF = idiopathic pulmonary fibrosis; NCHS = National Center for Health Statistics; NIOSH = National Institute for Occupational Safety and Health; PMR = proportionate mortality ratio.

* Death records with ICD-10 code J84.1 (other interstitial pulmonary diseases with fibrosis) listed as the underlying or contributing causes of death and no ICD-10 codes for any condition that might be associated with pulmonary fibrosis including underlying connective tissue diseases (M05–M08.9, M32–M35.0, M35.1, M35.5, M35.8–M36), radiation fibrosis (J70.1), sarcoidosis (D86–D86.9), pneumoconiosis (J60–J65), and hypersensitivity pneumonitis (J67–J67.9).

† PMR was defined as the observed number of deaths from IPF in a specified industry, divided by the expected number of deaths from IPF. The expected number of deaths was the total number of deaths in industry of interest multiplied by a proportion defined as the number of IPF deaths in all industries, divided by the total number of deaths in all industries. The IPF PMRs were adjusted by 10-year age groups and race and ethnicity. A PMR >1.0 indicates that there were more deaths associated with IPF in a specified industry than expected.

§ Decedents with information on their usual industry and occupation.

¶ Starting in 2020, CDC's NCHS and NIOSH began a collaboration to translate industry and occupation information which was submitted by jurisdictions to NCHS as part of their death certificate data, to U.S. Census Bureau industry and occupation codes. Forty-seven jurisdictions participated (Arizona, North Carolina, Rhode Island, and the District of Columbia did not participate) in this program in 2020. Iowa participated in the program in 2020, but because of differences in the method of data collection, the data were inconsistent with those from other jurisdictions and were excluded. In 2021, a total of 49 jurisdictions participated (Rhode Island and the District of Columbia did not participate). All jurisdictions participated in the program in 2022. https://www.cdc.gov/nchs/data/dvs/Industry-and-Occupation-data-mortality-2020.pdf

** A 95% CI lower level >1.0 indicates substantially elevated PMR.

†† Military, miscellaneous, or unclassifiable.

§§ Military, miscellaneous, unclassifiable, and homemakers.

exposures could not be evaluated for their association with IPF deaths. Fifth, the decedent's usual industry and occupation information reported on the death certificate might not be the industry and occupation associated with IPF deaths. No work histories are recorded on death certificates to evaluate changes in employment. Sixth, multiple comparisons might identify industries and occupations with elevated PMR by chance and thus these might not actually represent occupational risk. Sixth, small sample sizes for some groups resulted in wide PMR CIs. Seventh, application of a population attributable fraction estimate from a different study population to these data is speculative and should be interpreted with caution. Finally, this was an exploratory analysis with no guiding hypotheses; therefore, these findings should be considered hypothesis-generating.

Implications for Public Health Practice

Estimates of elevated IPF mortality among ever-employed persons in certain industries and occupations suggest areas where targeted studies, and processes to identify and control causative workplace exposures according to the applicable standard might be considered.¶¶¶¶ Primary prevention would involve using the hierarchy of controls (elimination, substitution, engineering controls, administrative controls, and personal protective equipment) to reduce or eliminate exposures to potentially causative work hazards.***** In addition, smoke-free workplace policies and tobacco cessation programs can help reduce or eliminate exposure to tobacco smoke. Continued research to confirm these findings, and surveillance including collection of detailed industry and occupational history and etiologic research to further characterize occupational risk factors for IPF, are essential to guide development and implementation of evidence-based interventions and policies to improve workers' health.

¶¶¶¶ https://www.osha.gov/laws-regs

***** https://www.cdc.gov/niosh/hierarchy-of-controls/about/index.html

Summary

What is already known about this topic?

Idiopathic pulmonary fibrosis (IPF), a progressive lung disease characterized by scarring and worsening lung function, has a poor prognosis. An estimated 21% of IPF deaths might be attributable to occupational exposures.

What is added by this report?

This exploratory analysis of 2020–2022 multiple cause-of-death data identified 67,843 IPF deaths among U.S. workers. By industry, IPF mortality was most significantly elevated among males employed in utilities and among females employed in public administration. By occupation, IPF mortality was most significantly elevated among male community and social services workers and among female farming, fishing, and forestry workers.

What are the implications for public health practice?

Estimates of elevated IPF mortality among workers in some industries and occupations warrant confirmation and continued surveillance to identify occupational exposures that could be targeted to prevent or reduce IPF mortality.

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Notes From the Field

Enhanced Identification of Tobacco Use Among Adult Medicaid Members — King County, Washington, 2016–2023

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In 2021, tobacco use prevalence among Medicaid members nationwide was 28.1%, compared with 16.2% among those with private insurance (*1*). Medicaid members experience a higher prevalence of tobacco-related diseases as well as gaps in receiving effective tobacco cessation therapies (*2*,*3*), which results in Medicaid spending of approximately $68 billion annually on smoking-related diseases (*4*). Identifying Medicaid members who use tobacco and providing cessation interventions can improve health and reduce health care costs.

Investigation and Outcomes

Washington is one of five states* that collect tobacco use data on Medicaid eligibility forms. To examine how linking enrollment data with tobacco use and smoking cessation claims data might improve identification of Medicaid members who use tobacco, self-reported tobacco use data collected through the Washington Health Benefit Exchange (HBE),† an online marketplace for health insurance, were combined with reimbursement claims data to identify a cohort of King County, Washington Medicaid members aged 18–64 years who use tobacco. Those enrolled through HBE§ or with claims related to tobacco use during 2016–2023 were included in this analysis. To ensure adequate time for diagnosis of comorbidities, Medicaid members were required to be enrolled ≥ 7 months in any given year.

The primary outcome was the ascertainment of usage data on tobacco products among Medicaid members. Adults responding affirmatively on the enrollment form to using tobacco products (excluding e-cigarettes and vape products) more than four times weekly during the preceding 6 months were classified as current tobacco users in the HBE data. In claims data, enrollees were considered to use tobacco if they had a diagnosis of tobacco use, an *International Classification of Diseases, Tenth Revision, Clinical Modification* (ICD-10-CM) or procedure code for tobacco cessation services, or a pharmacy claim for nicotine replacement therapy or varenicline.¶ Descriptive analyses compared characteristics of persons identified in claims versus enrollment data. The state of Washington Institutional Review Board review determined that the project meets the criteria delineated in 45 CFR 46.102(l)(2) as surveillance. CDC did not perform an independent institutional review board determination.

Among a Medicaid member population of 511,154, a total of 101,060 (19.8%) were identified as using tobacco based on self-reported HBE data, claims criteria, or both (Table). Neither data source alone identified all Medicaid members who used tobacco: 14,163 (14.0%) were identified only in HBE data, 51,534 (51.0%) were identified only through claims data, and 35,363 (35.0%) were identified in both HBE and claims data.

Characteristics of Medicaid members who used tobacco differed by data source. Compared with the claims-only data, a larger proportion of persons in HBE-only data were aged 25–34 years (35.5% versus 29.3%), male (68.1% versus 55.0%), and had no chronic conditions (52.0% versus 10.8%). Claims-only data identified a larger proportion of Medicaid members who were female (45.6% versus 32.2%), Black or African American (23.2% versus 15.9%), or Hispanic or Latino (13.9% versus 10.1%), and who had physical (55.7% versus 15.9%) or behavioral health conditions (81.5% versus 42.9%).**

* Arkansas, Indiana, Missouri, Utah, and Washington.

† The Washington HBE is a public-private partnership responsible for the operation of Washington Healthplanfinder, an online marketplace to find qualified health plans. https://www.wahbexchange.org

§ Adults eligible for both Medicaid and Medicare, those receiving services via the aged, blind, and disabled pathway, and those receiving long-term care services do not enroll through HBE but through an alternative platform called Washington Connection run by the Washington Department of Social and Human Services. Self-reported tobacco use is not available for these beneficiaries.

¶ ICD-10-CM codes for tobacco use (Z72.0, F17.2xx, O99.33x, T65.21[124], T65.22[124], or T65.29[124]); ICD-10-CM code for tobacco use counselling Z71.6; Current Procedural Terminology (CPT)/Healthcare Common Procedure Coding System (HCPCS) procedure code for tobacco use counseling (99406, 99407, S9453, 4000F, or 4001F); National Drug Codes (NDCs) for nicotine replacement therapy; NDC for varenicline; HCPCS procedure code tobacco screening: G9902, G9906, or G9908. This definition includes adults who currently use tobacco and specifically excludes diagnosis codes for former tobacco use, a history of tobacco use, and exposure to secondhand smoke.

** Physical health conditions were defined by using specifications provided by the Chronic Conditions Data Warehouse (https://www2.ccwdata.org/web/guest/condition-categories-chronic); behavioral health conditions were defined by using adapted specifications provided by the Washington State Department of Health and Social Services for Mental Health Service Rate and Substance Use Disorder Treatment Rate measures. https://www.dshs.wa.gov/ffa/research-and-data-analysis/measure-specifications

TABLE. Characteristics of Medicaid members who use tobacco, identified through self-reported data collected during enrollment in the Health Benefits Exchange* and in reimbursement claims — King County, Washington, 2016–2023

Characteristic	Source of Medicaid member tobacco use data, no. (%)†		
	HBE, claims,§ or both N = 101,060¶	HBE only§ n = 14,163	Claims only§ n = 51,534
Age group, yrs			
18–24	**8,965 (8.9)**	1,506 (10.6)	6,104 (11.8)
25–34	**28,444 (28.1)**	5,026 (35.5)	15,078 (29.3)
35–44	**26,533 (26.3)**	3,494 (24.7)	13,483 (26.2)
45–54	**18,292 (18.1)**	2,168 (15.3)	8,682 (16.8)
55–64	**18,826 (18.6)**	1,969 (13.9)	8,187 (15.9)
Sex			
Female	**41,889 (41.4)**	4,564 (32.2)	23,485 (45.6)
Male	**59,671 (59.0)**	9,647 (68.1)	28,355 (55.0)
Race and ethnicity**			
American Indian or Alaska Native	**6,877 (6.8)**	817 (5.8)	3,425 (6.6)
Asian	**7,705 (7.6)**	1,254 (8.9)	3,993 (7.7)
Black or African American	**20,945 (20.7)**	2,249 (15.9)	11,940 (23.2)
Native Hawaiian or Pacific Islander	**6,253 (6.2)**	935 (6.6)	3,501 (6.8)
White	**60,958 (60.3)**	8,285 (58.5)	29,599 (57.4)
Hispanic or Latino	**11,964 (11.8)**	1,425 (10.1)	7,164 (13.9)
Unknown	**4,271 (4.2)**	920 (6.5)	2,240 (4.3)
Language other than English	**5,024 (5.0)**	659 (4.7)	3,061 (5.9)
Chronic condition††			
No chronic conditions	**16,232 (16.1)**	7,365 (52.0)	5,577 (10.8)
Physical health condition	**51,885 (51.3)**	2,248 (15.9)	28,726 (55.7)
Behavioral health condition	**77,588 (76.8)**	6,075 (42.9)	42,025 (81.5)

Abbreviation: HBE = Health Benefits Exchange.

* The Washington HBE is a public-private partnership responsible for the operation of Washington Healthplanfinder, an online marketplace to find qualified health plans. https://www.wahbexchange.org

† Numbers in each category might not sum to the total because of missing data.

§ Estimates in each category might not sum to 100% because of rounding.

¶ A total of 35,363 members were identifiable by both HBE and claims data.

** Data for some groups are not mutually exclusive; thus, total sums might exceed 100%.

†† Physical health conditions were defined using Centers for Medicare & Medicaid Services Chronic Conditions Data Warehouse algorithms, excluding depression. Behavioral health conditions were defined using measure specifications developed by the Washington State Department of Social and Health Services for Medicaid claims data.

Preliminary Conclusions and Actions

These findings suggest that asking persons about their tobacco use at the time of health insurance enrollment represents an opportunity to proactively intervene with cessation services, most notably for men and persons not yet experiencing a chronic condition to potentially lower their risk for developing these conditions. Using multiple data streams to identify Medicaid members who use tobacco enhances public health surveillance (*5*) and has the potential to improve identification of tobacco users and strengthen and expand cessation treatment.

Summary

What is already known about this topic?

Among adults covered by health insurance, prevalence of tobacco use is highest among Medicaid members. Reimbursement claims data alone can underestimate tobacco use.

What is added by this report?

During 2016–2023, supplementing reimbursement claims data with tobacco use information from Medicaid enrollment identified 14,163 (14.0%) additional Medicaid members, including a higher proportion of men and those who did not have a diagnosed chronic condition.

What are the implications for public health practice?

Identifying tobacco use during Medicaid enrollment enhances public health data collection and provides opportunities to better diagnose and treat tobacco use.

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All authors have completed and submitted the International Committee of Medical Journal Editors form for disclosure of potential conflicts of interest. Amber K. Sabbatini reports membership on the board of the Washington chapter of the American College of Emergency Physicians. No other potential conflicts of interest were disclosed.

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Notes from the Field

Tobacco Product Use Among Adults — United States, 2017–2023

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Cigarette smoking among U.S. adults has declined from 42.4% in 1965 to 11.6% in 2022 (*1*–*3*); however, tobacco use remains the leading cause of preventable death (*1*,*4*). Current e-cigarette use prevalence among youths increased substantially during 2017–2018 (*4*) but subsequently declined (*5*), and some of these youths are now likely included in surveys of adults. This report describes trends in the use of commercial tobacco products,* including combustible tobacco products, smokeless tobacco products, and e-cigarettes (e-cigarettes meet the federal definition of tobacco products) among adults over a 7-year period and how these trends have affected overall tobacco product use.

Investigation and Outcomes

CDC analyzed 2017–2023 tobacco product use data among adults aged ≥18 years from the National Health Interview Survey, an annual cross-sectional household survey of the noninstitutionalized U.S. civilian population. Sample sizes ranged from 21,153 (2020) to 31,997 (2019); response rates ranged from 47.0% (2023) to 59.1% (2019).† Current use§ of tobacco, overall and by type and exclusivity,¶ was assessed overall and by age group (18–24, 25–44, 45–64, and ≥65 years). Weighted prevalences and estimates of the number of persons who use each category of tobacco product (population estimates) and 95% CIs were calculated using SAS-callable SUDAAN software (version 11.0.4; RTI International).** The average annual percent change (AAPC), which measures relative change, in tobacco product use prevalences and population estimates was calculated using the Joinpoint Regression Program (version 5.2.0; National Cancer Institute)†† overall and by age group. Linear trends measured by AAPC were considered statistically significant if Benjamini-Hochberg–adjusted p-values were <0.05. This activity was reviewed by CDC, deemed not research, and was conducted consistent with applicable federal law and CDC policy.§§

From 2017 to 2023, significant declines in current exclusive cigarette smoking prevalence (10.8% to 7.9% [–5.2 AAPC]) and population estimates (26.6 million to 19.8 million [–5.0 AAPC]) were found, along with increases in exclusive e-cigarette use prevalence (1.2% to 4.1% [20.3 AAPC]) and population estimates (2.9 million to 10.1 million [20.4 AAPC]) (Table). Among adults aged 18–24 years, decreases in prevalences of exclusive cigarette and pipe smoking (6.5% to 1.2% [–21.3 AAPC] and 1.0% to 0.1% [–26.2 AAPC], respectively) and population estimates (1.9 million to 350,000 [–21.5 AAPC] and 290,000 to 40,000 [–25.0 AAPC], respectively) were identified. Within this age group, increases in exclusive e-cigarette use prevalence (2.7% to 10.3% [21.0 AAPC]) and population estimates (800,000 to 3.1 million [21.3 AAPC]) were found. Among adults aged 25–44 years, decreases in prevalence of exclusive cigarette smoking (12.0% to 7.6% [–8.2 AAPC]) and population estimates (10.1 million to 6.5 million [–8.2 AAPC]) were identified, along with increases in exclusive e-cigarette use prevalence (1.5% to 6.1% [24.5 AAPC]) and population estimates (1.3 million to 5.2 million [24.7 AAPC]). Among adults aged 45–64 years, an increase in exclusive e-cigarette use in population estimates (690,000 to 1.6 million [11.5 AAPC]) was identified. Among adults aged ≥65 years, decreases in prevalence of exclusive pipe smoking (0.4% to 0.1% [–17.8 AAPC]) and population estimates (190,000 to

* Commercial tobacco refers to tobacco products that are made and sold by companies. This definition does not include traditional tobacco used by some Indigenous groups for religious or ceremonial purposes. In this report, tobacco refers to the following commercial tobacco products: cigarettes, cigars, e-cigarettes, pipes, and smokeless tobacco. E-cigarettes meet the federal definition of tobacco products. https://www.fda.gov/tobacco-products/products-ingredients-components/e-cigarettes-vapes-and-other-electronic-nicotine-delivery-systems-ends

† https://www.cdc.gov/nchs/nhis/documentation/?CDC_AAref_Val=https://www.cdc.gov/nchs/nhis/data-questionnaires-documentation.htm

§ Current use is defined as reported use of cigarettes (ever smoked 100 or more cigarettes during one's lifetime); cigar (ever smoked a regular cigar, cigarillo, or little filtered cigar); pipe (regular pipe, water pipe, or hookah filled with tobacco); e-cigarette or other electronic vaping product; smokeless tobacco (chewing tobacco, snuff, dip, snus, or dissolvable tobacco), and using a tobacco product (cigarettes, cigars, pipes, e-cigarettes, or smokeless tobacco, alone or in any combination) "every day" or "some days" at the time of the survey.

¶ Exclusive use is defined as current use of any listed tobacco product alone (without using any other tobacco product); combination use is defined as 1) current use of two or more tobacco products that includes both cigarettes and e-cigarettes, with or without use of any other tobacco product or 2) current use of two or more tobacco products that does not include a combination of cigarettes and e-cigarettes.

** Data were weighted to account for complex survey design and to adjust for nonresponse. https://support.sas.com/resources/papers/proceedings19/3659-2019.pdf

†† https://surveillance.cancer.gov/joinpoint/

§§ 45 C.F.R. part 46.102(l)(2), 21 C.F.R. part 56; 42 U.S.C. Sect. 241(d); 5 U.S.C. Sect. 552a; 44 U.S.C. Sect. 3501 et seq.

TABLE. Trends in percentage and number of U.S. adults reporting types of current commercial tobacco* product use, by age and product use pattern — National Health Interview Survey, United States, 2017–2023

Age group/Current tobacco or nicotine-containing product use	Prevalence			Estimated no.† of persons who use tobacco products		
	2017	2023		2017	2023	
	% (95% CI)	% (95% CI)	AAPC (95% CI)	No. (95% CI)	No. (95% CI)	AAPC (95% CI)
All age groups						
Any tobacco product use§	19.3 (18.6 to 20.0)	19.5 (18.9 to 20.2)	−0.3 (−2.3 to 1.9)	474.3 (452.3 to 496.3)	485.9 (465.0 to 506.9)	−0.1 (−2.8 to 2.5)
Exclusive cigarette smoking¶	10.8 (10.3 to 11.3)	7.9 (7.5 to 8.4)	−5.2 (−7.2 to −3.2)**	265.9 (251.7 to 280.0)	197.9 (186.4 to 209.5)	−5.0 (−6.9 to −3.1)**
Exclusive cigar smoking††	1.9 (1.7 to 2.1)	2.0 (1.8 to 2.2)	0.5 (−2.3 to 3.5)	46.7 (40.9 to 52.5)	49.7 (44.6 to 54.8)	0.6 (−2.7 to 4.1)
Exclusive pipe smoking§§	0.4 (0.3 to 0.5)	0.3 (0.2 to 0.3)	−0.8 (−6.0 to 5.2)	9.7 (7.1 to 12.2)	6.8 (5.2 to 8.3)	−2.1 (−11.7 to 9.2)
Exclusive e-cigarette use¶¶	1.2 (1.0 to 1.4)	4.1 (3.7 to 4.4)	20.3 (14.0 to 28.9)**	29.1 (24.3 to 34.0)	101.2 (92.5 to 110.0)	20.4 (14.1 to 28.7)**
Exclusive smokeless tobacco use***	1.3 (1.2 to 1.5)	1.4 (1.2 to 1.5)	−1.3 (−5.9 to 3.6)	32.8 (28.5 to 37.0)	33.7 (29.6 to 37.8)	−1.5 (−5.5 to 2.6)
Two or more tobacco product use (cigarette and e-cigarette combinations)†††	1.4 (1.2 to 1.6)	1.8 (1.6 to 2.0)	3.7 (−3.4 to 11.9)	34.1 (30.0 to 38.2)	45.1 (39.9 to 50.2)	3.9 (−3.7 to 12.7)
Two or more tobacco product use (other product combinations)§§§	2.3 (2.0 to 2.5)	2.1 (1.9 to 2.3)	−1.8 (−4.4 to 1.0)	55.8 (49.4 to 62.2)	51.3 (45.8 to 56.7)	−1.8 (−5.8 to 2.4)
18–24 yrs						
Any tobacco product use§	18.3 (16.3 to 20.4)	16.8 (14.9 to 18.9)	−0.2 (−3.7 to 3.6)	53.6 (46.7 to 60.5)	50.1 (43.5 to 56.8)	−0.2 (−3.5 to 3.2)
Exclusive cigarette smoking¶	6.5 (5.3 to 7.9)	1.2 (0.7 to 1.9)	−21.3 (−26.2 to −16.1)**	19.0 (15.1 to 22.9)	3.5 (1.9 to 5.1)	−21.5 (−25.9 to −16.8)**
Exclusive cigar smoking††	1.4 (1.0 to 2.1)	1.0 (0.6 to 1.7)	−6.5 (−15.8 to 3.0)	4.2 (2.5 to 5.9)	2.9 (1.3 to 4.6)	−6.9 (−13.0 to −0.9)
Exclusive pipe smoking§§	1.0 (0.6 to 1.6)	0.1 (0.0 to 0.4)	−26.2 (−41.5 to −14.9)**	2.9 (1.5 to 4.3)	0.4 (0.0 to 0.9)	−25.0 (−39.9 to −12.5)**
Exclusive e-cigarette use¶¶	2.7 (1.9 to 4.0)	10.3 (8.7 to 12.0)	21.0 (8.1 to 42.1)**	8.0 (4.9 to 11.1)	30.6 (25.4 to 35.8)	21.3 (9.7 to 39.2)**
Exclusive smokeless tobacco use***	1.4 (0.9 to 2.2)	0.3 (0.1 to 0.8)	−18.7 (−37.2 to −2.3)	4.2 (2.3 to 6.0)	0.9 (0.0 to 1.8)	−19.8 (−39.3 to −1.9)
Two or more tobacco product use (cigarette and e-cigarette combinations)†††	1.7 (1.2 to 2.3)	1.8 (1.3 to 2.5)	2.0 (−5.6 to 10.6)	4.9 (3.2 to 6.5)	5.3 (3.4 to 7.1)	2.2 (−5.2 to 10.6)
Two or more tobacco product use (other product combinations)§§§	3.5 (2.7 to 4.5)	2.1 (1.5 to 3.0)	−5.8 (−13.2 to 1.6)	10.3 (7.6 to 12.9)	6.3 (4.0 to 8.5)	−5.9 (−13.3 to 1.6)
25–44 yrs						
Any tobacco product use§	22.5 (21.4 to 23.7)	24.4 (23.2 to 25.6)	0.3 (−2.3 to 3.0)	189.1 (177.2 to 177.2)	206.4 (194.6 to 218.2)	0.4 (−2.2 to 3.1)
Exclusive cigarette smoking¶	12.0 (11.2 to 12.9)	7.6 (7.0 to 8.3)	−8.2 (−11.5 to −4.7)**	101.0 (93.1 to 108.9)	64.5 (58.4 to 70.7)	−8.2 (−11.4 to −4.9)**
Exclusive cigar smoking††	2.4 (2.1 to 2.9)	2.6 (2.2 to 3.0)	1.4 (−2.2 to 5.1)	20.5 (16.8 to 24.2)	21.6 (18.0 to 25.1)	0.8 (−2.6 to 4.3)
Exclusive pipe smoking§§	0.4 (0.2 to 0.6)	0.6 (0.4 to 0.7)	8.8 (−1.8 to 20.4)	3.1 (1.6 to 4.7)	4.6 (3.3 to 5.9)	8.1 (−2.5 to 19.8)
Exclusive e-cigarette use¶¶	1.5 (1.2 to 1.9)	6.1 (5.5 to 6.8)	24.5 (19.5 to 31.2)**	12.5 (9.7 to 15.2)	51.6 (46.1 to 57.2)	24.7 (19.4 to 32.2)**
Exclusive smokeless tobacco use***	1.4 (1.2 to 1.7)	1.5 (1.3 to 1.8)	−1.5 (−9.6 to 7.9)	11.9 (9.6 to 14.2)	12.8 (10.5 to 15.1)	−1.5 (−8.1 to 5.8)
Two or more tobacco product use (cigarette and e-cigarette combinations)†††	1.9 (1.5 to 2.2)	3.0 (2.6 to 3.6)	6.4 (−2.4 to 16.3)	15.5 (12.7 to 18.3)	25.7 (21.5 to 29.9)	7.0 (−2.6 to 18.0)
Two or more tobacco product use (other product combinations)§§§	2.9 (2.4 to 3.4)	3.0 (2.6 to 3.5)	−0.9 (−8.7 to 8.3)	24.3 (20.0 to 28.6)	25.2 (21.5 to 29.0)	−0.9 (−9.0 to 8.5)

See table footnotes on the next page.

TABLE. (*Continued*) Trends in percentage and number of U.S. adults reporting types of current commercial tobacco* product use, by age and product use pattern — National Health Interview Survey, United States, 2017–2023

Age group/Current tobacco or nicotine-containing product use	Prevalence			Estimated no.† of persons who use tobacco products		
	2017	2023		2017	2023	
	% (95% CI)	% (95% CI)	AAPC (95% CI)	No. (95% CI)	No. (95% CI)	AAPC (95% CI)
45–64 yrs						
Any tobacco product use§	21.3 (20.1 to 22.5)	21.0 (19.9 to 22.1)	−0.6 (−2.1 to 1.0)	177.3 (166.0 to 188.6)	164.0 (153.8 to 174.1)	−1.6 (−3.2 to 0.0)
Exclusive cigarette smoking¶	13.2 (12.3 to 14.2)	11.2 (10.4 to 12.1)	−2.6 (−4.8 to −0.4)	110.0 (101.6 to 118.4)	87.7 (80.5 to 95.0)	−3.5 (−7.2 to 0.5)
Exclusive cigar smoking††	2.0 (1.7 to 2.4)	2.1 (1.8 to 2.5)	0.6 (−3.7 to 5.4)	16.6 (13.3 to 19.8)	16.5 (13.7 to 19.2)	−0.1 (−4.3 to 4.5)
Exclusive pipe smoking§§	0.2 (0.1 to 0.3)	0.1 (0.1 to 0.2)	2.6 (−17.6 to 29.1)	1.6 (0.7 to 2.5)	0.9 (0.3 to 1.4)	−1.4 (−16.3 to 16.9)
Exclusive e-cigarette use¶¶	0.8 (0.6 to 1.1)	2.0 (1.7 to 2.4)	12.4 (2.8 to 23.0)	6.9 (5.1 to 8.6)	15.7 (13.0 to 18.4)	11.5 (4.3 to 20.8)**
Exclusive smokeless tobacco use***	1.5 (1.3 to 1.9)	2.0 (1.7 to 2.4)	3.5 (−2.7 to 10.1)	12.7 (10.2 to 15.2)	15.5 (12.7 to 18.3)	2.0 (−3.3 to 7.5)
Two or more tobacco product use (cigarette and e-cigarette combinations)†††	1.5 (1.2 to 1.8)	1.6 (1.3 to 1.9)	0.8 (−9.3 to 12.1)	12.1 (9.5 to 14.7)	12.4 (10.1 to 14.6)	−0.1 (−10.1 to 11.0)
Two or more tobacco product use (other product combinations)§§§	2.1 (1.7 to 2.4)	1.9 (1.6 to 2.3)	−2.3 (−7.4 to 3.0)	17.1 (14.3 to 20.0)	15.1 (12.2 to 17.9)	−2.6 (−8.3 to 3.5)
≥65 yrs						
Any tobacco product use§	11.0 (10.1 to 11.9)	11.6 (10.9 to 12.4)	0.3 (−1.7 to 2.6)	54.1 (49.5 to 58.8)	65.3 (60.8 to 69.8)	2.4 (−0.1 to 5.3)
Exclusive cigarette smoking¶	7.2 (6.5 to 8.1)	7.5 (6.9 to 8.1)	0.7 (−0.7 to 2.3)	35.7 (31.8 to 39.7)	42.0 (38.3 to 45.6)	2.7 (0.9 to 4.8)**
Exclusive cigar smoking††	1.1 (0.8 to 1.4)	1.5 (1.3 to 1.8)	3.2 (−3.2 to 10.0)	5.3 (3.9 to 6.7)	8.6 (7.0 to 10.2)	6.0 (−0.1 to 12.6)
Exclusive pipe smoking§§	0.4 (0.2 to 0.6)	0.1 (0.1 to 0.3)	−17.8 (−28.2 to −8.4)**	1.9 (1.0 to 2.7)	0.8 (0.3 to 1.2)	−11.4 (−19.1 to −3.3)**
Exclusive e-cigarette use¶¶	0.3 (0.2 to 0.5)	0.6 (0.4 to 0.8)	8.0 (−1.4 to 20.2)	1.7 (1.0 to 2.4)	3.1 (2.2 to 4.1)	8.8 (0.4 to 19.1)
Exclusive smokeless tobacco use***	0.8 (0.6 to 1.1)	0.8 (0.6 to 1.0)	−4.0 (−9.1 to 1.7)	3.8 (2.5 to 5.1)	4.4 (3.2 to 5.6)	−2.0 (−8.8 to 6.4)
Two or more tobacco product use (cigarette and e-cigarette combinations)†††	0.3 (0.2 to 0.5)	0.3 (0.2 to 0.4)	2.5 (−14.8 to 25.4)	1.5 (0.8 to 2.1)	1.6 (0.9 to 2.3)	2.4 (−10.0 to 16.7)
Two or more tobacco product use (other product combinations)§§§	0.8 (0.6 to 1.1)	0.8 (0.6 to 1.1)	−2.9 (−8.2 to 3.0)	4.0 (2.7 to 5.2)	4.5 (3.4 to 5.7)	−0.1 (−4.5 to 4.7)

Abbreviation: AAPC = average annual percent change.

* Commercial tobacco refers to tobacco products that are made and sold by companies. This definition does not include traditional tobacco used by some Indigenous groups for religious or ceremonial purposes. In this report, tobacco refers to the following commercial tobacco products: cigarettes, cigars, e-cigarettes, pipes, and smokeless tobacco.

† Multiplied by 100,000 and rounded down to the nearest 10,000.

§ Current use of cigarettes, cigars, pipes, e-cigarettes, or smokeless tobacco alone or in any combination.

¶ Ever smoked 100 or more cigarettes during one's lifetime and smoking every day or some days at the time of the survey without use of any other tobacco product.

** Significant Benjamini-Hochberg adjusted p-values with a false discovery rate set at 0.05 for average AAPC different from zero from Joinpoint regression for linear trend.

†† Ever smoked a regular cigar, cigarillo, or little filtered cigar during one's lifetime and reported smoking every day or some days at the time of the survey without use of any other tobacco product.

§§ Ever smoked a pipe filled with tobacco (either a regular pipe, water pipe, or hookah) during one's lifetime and reported smoking every day or some days at the time of survey without use of any other tobacco product.

¶¶ Ever use of an e-cigarette or other electronic vaping product during one's lifetime and reported using such a product every day or some days at the time of the survey without use of any other tobacco product.

*** Ever use of a smokeless tobacco product (chewing tobacco, snuff, dip, snus, or dissolvable tobacco) during one's lifetime and reported using every day or some days at the time of the survey without use of any other tobacco product.

††† Current use of e-cigarettes and current smoking of cigarettes with or without use of any other tobacco product.

§§§ Current use of any other combination of tobacco products without concurrent use of cigarettes and e-cigarettes.

Summary

What is already known about this topic?

Although adult cigarette smoking prevalence remains at its lowest level in 60 years, tobacco use is the leading cause of preventable death in the United States. Change in use of other commercial tobacco products by U.S. adults affects overall tobacco use.

What is added by this report?

During 2017–2023, the approximate 6.8 million-person decrease in the number of adults who currently exclusively smoke cigarettes was offset by an approximate 7.2 million-person increase in the number who currently exclusively use e-cigarettes.

What are the implications for public health practice?

While current cigarette smoking has decreased to the lowest level in 60 years, current tobacco product use among adults has not changed since 2017. Comprehensive strategies, such as price increases, smoke-free policies, high-impact media campaigns, and cessation support, are critical to preventing and reducing tobacco product use, nicotine addiction, and their associated adverse health outcomes.

80,000 [−11.4 AAPC]), along with an increase in population estimates of exclusive cigarette smoking (3.6 million to 4.2 million [2.7 AAPC]) were identified.¶¶

¶¶ Caution is warranted when comparing changes during 2019–2023 with earlier years of National Health Interview Survey (NHIS) data because of changes in weighting and design methodology (https://www.cdc.gov/nchs/data/nhis/earlyrelease/EReval202009-508.pdf). NHIS quarterly estimates during 2019–2023 indicate decreases in current cigarette smoking and increases in current e-cigarette use, which is different from what the forecasting models predicted. https://wwwn.cdc.gov/NHISDataQueryTool/ER_Quarterly/index_quarterly.html

Preliminary Conclusions and Actions

The decrease in number of adults who currently exclusively smoke cigarettes by approximately 6.8 million persons was offset by the increase in the number who currently use e-cigarettes exclusively (approximately 7.2 million). This increase was primarily driven by increases among adults aged 18–24 and 25–44 years (approximately 2.3 million and 3.9 million, respectively), leading to no net change in overall current adult tobacco product use.

Continued surveillance and use of comprehensive tobacco control strategies, such as price increases, smokefree policies, high-impact media campaigns, and cessation support, are important for preventing and reducing tobacco product use, nicotine addiction, and their associated adverse health outcomes (*1*,*4*).

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Notes from the Field

Detection of Vaccine-Derived Poliovirus Type 2 in Wastewater — Five European Countries, September–December 2024

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Poliovirus is highly contagious and can cause flu-like illness and in rare cases, acute flaccid paralysis (AFP) and, since 1988, has been targeted by all countries for eradication. Vaccine-derived polioviruses (VDPVs) are rare pathogenic strains of poliovirus that can emerge through genetic mutations in the oral polio vaccine strain, from prolonged circulation in under-immunized populations (*1*). The World Health Organization (WHO) European Region has been free from endemic polio since 2002, but importation of VDPVs from other settings can lead to local circulating VDPVs (cVDPVs) if they are introduced into undervaccinated communities.* Circulation of type 2 cVDPV (cVDPV2) occurred in the United Kingdom in 2022, linked to transmission in Israel, United States, and Canada.† Because most polio infections are asymptomatic and polioviruses are shed in stool, many countries in Europe supplement syndromic AFP and enterovirus surveillance by conducting environmental surveillance (ES) for polioviruses through the systematic sampling of wastewater. During weeks ending September 22–December 22, 2024 (as of January 24, 2025), type 2 VDPV (VDPV2) was detected in wastewater samples collected in five European countries (Spain, Poland, Germany, the United Kingdom, and Finland) with high national coverage with inactivated poliovirus vaccine (IPV).

Investigations and Outcomes

The first European detection of VDPV2 was in wastewater sampled in the Barcelona, Spain metropolitan area during the week of September 16–22, 2024. During weeks ending October 27–December 22, 2024, ES samples from 16 total additional sites in metropolitan areas of Poland (two sites), Germany (nine), the United Kingdom (four) and Finland (one) tested positive for related polioviruses (Table). Genetic sequence analysis confirmed that these detections were linked (*1*)

*The target immunization coverage for polio is ≥90% of children receiving 3 doses of polio-containing vaccine by age 1 year.

†https://www.who.int/emergencies/disease-outbreak-news/item/2022-DON408

TABLE. Number of wastewater detections of vaccine-derived poliovirus type 2, by date and location (N = 34) — five European countries, weeks ending September 22–December 29, 2024*

Country/City (no. of detections)	Week ending														
	Sep 22	Sep 29	Oct 6	Oct 13	Oct 20	Oct 27	Nov 3	Nov 10	Nov 17	Nov 24	Dec 1	Dec 8	Dec 15	Dec 22	Dec 29
Spain (1)															
Barcelona	X†	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Poland (2)															
Warsaw	—	—	—	—	—	X	—	—	—	—	—	—	—	—	—
Rzeszów	—	—	—	—	—	—	—	—	—	—	—	X	—	—	—
Germany (24)															
Munich	—	—	—	—	—	—	X	—	X	X	—	X	—	—	—
Berlin	—	—	—	—	—	—	—	X	—	—	—	—	—	—	—
Hamburg	—	—	—	—	—	—	—	—	X	—	—	—	—	—	—
Bonn	—	—	—	—	—	—	—	—	X	X	X	X	—	X	—
Cologne	—	—	—	—	—	—	—	—	X	X	X	X	—	X	—
Dresden	—	—	—	—	—	—	—	—	X	—	—	—	—	X	—
Mainz	—	—	—	—	—	—	—	—	X	X	X	—	—	—	—
Düsseldorf	—	—	—	—	—	—	—	—	—	X	—	—	—	—	—
Stuttgart	—	—	—	—	—	—	—	—	—	—	X	X	—	—	—
United Kingdom (6)															
Leeds	—	—	—	—	—	—	—	X	—	X	—	—	—	—	—
London (Beckton)	—	—	—	—	—	—	—	—	X	—	—	—	X	—	—
London (Crossness)	—	—	—	—	—	—	—	—	X	—	—	—	—	—	—
Worthing	—	—	—	—	—	—	—	—	—	X	—	—	—	—	—
Finland (1)															
Tampere	—	—	—	—	—	—	—	—	—	X	—	—	—	—	—

* Data reported to the World Health Organization as of January 24, 2025.
† "X" indicates weeks in which vaccine-derived poliovirus type 2 was detected in a given sampling location. One detection indicates one week in which poliovirus was detected in a given site.

to the cVDPV2 NIE-ZAS-1 emergence[§] that was first detected in Zamfara, Nigeria in July 2020 (*2*), and which continues to circulate in Nigeria in 2024. Spread of cVDPV2 from this emergence group has caused outbreaks of poliomyelitis in 15 other countries in North and West Africa (WHO, unpublished data, 2024) and has been detected by ES in an additional six countries on the African continent (*3*). This activity was reviewed by CDC, deemed not research, and was conducted consistent with applicable federal law and CDC policy.[¶]

Sequencing of the European cVDPV2 isolates identified a divergence in the VP1 capsid protein coding region of 43–50 nucleotides from the Sabin 2 vaccine strain. Overall, 38 of these nucleotide differences were found in all European isolates; they have a common divergence of 13 nucleotide changes from the closest known NIE-ZAS-1 isolates, which were previously detected in Algeria, Guinea, and Mali. The group of viruses detected in these European countries represents a single lineage (i.e., they exhibit a common pattern of nucleotide changes that make them more closely related to each other than to any other non-European isolates from the NIE-ZAS-1 emergence); however, there is a range of genetic differences within the cluster, and contemporaneous isolations from different sites in the same country exhibited substantial divergence from one another (*4*).

Importantly, no human polio cases or asymptomatic infections were reported in association with detection of this group of viruses.

Preliminary Conclusions and Actions

Since circulating polioviruses are known to accumulate mutations at an average of about one nucleotide change per month, (*5*) the common 13-nucleotide difference from the parent cluster suggests approximately 1 year of undetected circulation outside the catchment areas of the European ES network before this detection event. To date, the data (i.e., the diversity of isolates within the same geographic area and the paucity of repeated isolations of closely related virus from a single site) suggest that these importations have not resulted in substantial person-to-person transmission. The affected countries are actively working to prevent establishment of local transmission by vaccinating targeted populations with IPV to close immunity gaps and they have intensified AFP surveillance and ES for poliovirus. This event highlights the ongoing risk from circulating VDPVs worldwide and the need for intensified global efforts to eradicate all polioviruses. Wastewater surveillance is a useful supplement to high quality AFP surveillance to detect importation and monitor potential population risk. High coverage with poliovirus vaccine across all population groups is critical to protecting against AFP and other forms of polio disease and preventing establishment of local circulation following poliovirus importation.

Summary

What is already known about this topic?

A vaccine-derived poliovirus type 2 (VDPV2) lineage that originated in Nigeria has been detected in 21 other countries on the African continent.

What is added by this report?

During the weeks ending September 22—December 22, 2024, VDPVs genetically linked to the Nigeria lineage were detected in wastewater samples in 16 cities in five European countries. No human polio cases or poliovirus infections were reported in association with these detections.

What are the implications for public health practice?

Isolations of VDPV2 from wastewater appear to represent importations of the virus into these countries. Continued circulation of VDPV2 in African countries could result in similar importations and potential transmission in susceptible populations outside of Africa. High coverage with poliovirus vaccines is critical to protect against polio disease and prevent establishment of local circulation following poliovirus importation.

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[§]Emergences of poliovirus are designated by the country and geographic subnational region of the emergence and the number of emergences in each subnational region.

[¶]45 C.F.R. part 46.102(l)(2), 21 C.F.R. part 56; 42 U.S.C. Sect. 241(d); 5 U.S.C. Sect. 552a; 44 U.S.C. Sect. 3501 et seq.

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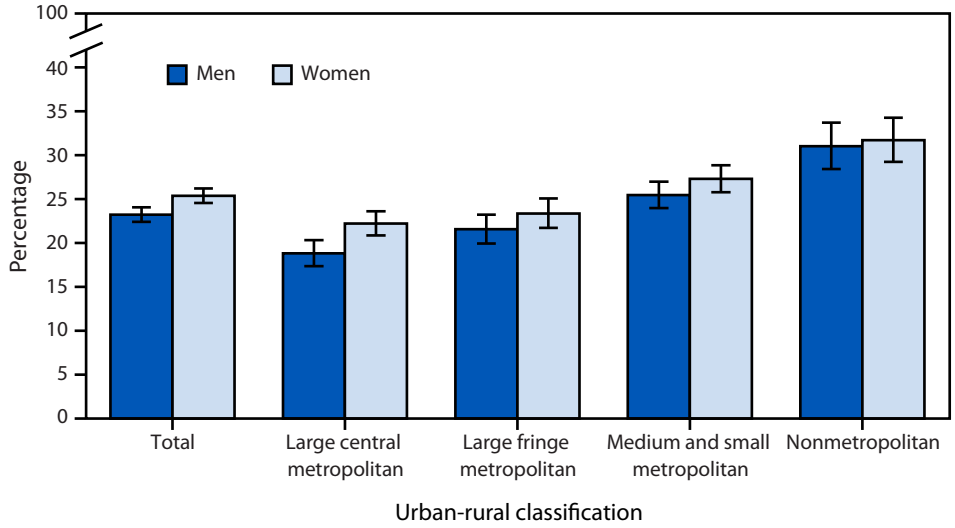
QuickStats

FROM THE NATIONAL CENTER FOR HEALTH STATISTICS

Percentage* of Adults Aged ≥18 Years with Chronic Pain in the Past 3 Months,† by Sex and Urbanization Level§ — United States, 2023



* 95% CIs indicated by bars. Estimates are based on household interviews of a sample of the civilian, noninstitutionalized U.S. population.
† Based on responses of "most days" or "every day" to the survey question, "In the past 3 months, how often did you have pain? Would you say never, some days, most days, or every day?"
§ Metropolitan status and size were determined by the 2013 National Center for Health Statistics Urban-Rural Classification Scheme for counties.

In 2023, the percentage of adults aged ≥18 years with chronic pain in the past 3 months was higher among women (25.4%) than among men (23.2%) overall. A higher percentage of women than men in large central metropolitan areas experienced chronic pain (22.2% versus 18.8%, respectively); differences for the other urbanization levels were not significant. Among both men and women, prevalence of recent chronic pain increased with decreasing urbanicity.

Supplementary Table: https://stacks.cdc.gov/view/cdc/176063

Source: National Center for Health Statistics, National Health Interview Survey, 2023. https://www.cdc.gov/nchs/nhis.htm

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