

The Burden of Chronic Obstructive Pulmonary Disease in the US: A Systematic Review of Nationally Representative Health Surveys

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Background: COPD prevalence estimates from US national surveys vary widely, likely reflecting differences in diagnostic criteria and measurement approaches. This review aimed to systematically characterize variability in COPD prevalence estimates across nationally representative US surveys, with emphasis on differences by diagnostic criteria and across key population subgroups.

Methods: We searched OVID Medline, OVID Embase and PubMed from inception through October 7th, 2025, for observational studies reporting COPD prevalence in the US general population using nationally representative survey data. Estimates were summarized by diagnostic criteria (spirometry, self-reported) and key subgroups (smoking status, sex and race/ethnicity). Risk of bias (RoB) was assessed using the National Institutes of Health (NIH) Quality Assessment Tool for Observational Cohort and Cross-Sectional Studies.

Results: We included 22 studies from four surveys: The National Health and Nutrition Examination Survey (NHANES); The National Health Interview Survey (NHIS); The Behavioral Risk Factor Surveillance System (BRFSS); and The Population Assessment of Tobacco and Health (PATH). RoB scores ranged between 7 and 8 out of a total of 11 points. Six studies used spirometry and 16 used self-reported diagnosis. Spirometry estimates were consistently higher (12.5–13.8%) than self-reported estimates (3.0–7.2%), with NHIS (1997–2020) showing the highest self-reported estimates. When using spirometry, prevalence was highest in males (17.9%–23.7%), but when using self-reported data, prevalence was highest in females (3.0%–8.5%). Current smokers had the highest prevalence in both spirometry (21.2%–25.7%) and self-report (6.3%–16.7%). Prevalence was highest among Non-Hispanic Whites using spirometry (13.8%–17.5%), but it was highest among “Other” when using self-report (1.9%–11.2%). Among the studies that reported prevalence by COPD severity level, most were classified as mild to moderate obstruction.

Conclusion: Consistent assessment methods across surveys are necessary to better understand and address the real burden of COPD across the diverse US population, supporting more effective surveillance while informing public health policy and prevention efforts.

Keywords: systematic review, COPD, smoking, trends, epidemiology, USA, National Health Surveys

Introduction

Chronic obstructive pulmonary disease (COPD) is a heterogeneous chronic respiratory disease characterized by persistent, often progressive, airflow limitation and respiratory symptoms, resulting from airway abnormalities (bronchitis, bronchiolitis) and/or alveolar damage (emphysema), ranging in severity from mild to very severe.^{1,2} The main conditions that primarily fall under COPD are chronic bronchitis (CB) and emphysema (E).¹ As of 2024, the US Centers for Disease Control and Prevention (CDC) reports that COPD affects more than 15 million Americans and accounts for approximately 150,000 deaths per year.^{2,3} Beyond its impact on mortality, patients with COPD are at an increased risk of other diseases such as cardiovascular disease and lung cancer.⁴ Additionally, COPD presents a significant healthcare and

economic burden in the US with direct medical expenses and lost productivity contributing to billions of dollars in annual healthcare expenses.⁵ It is estimated that between 2019–2035 COPD will be responsible for approximately 45 million quality-adjusted life years.⁶

While cigarette smoking is the leading risk factor for COPD, the disease also affects many adults who never smoked.^{7–9} This includes demographic groups like older adults, and individuals with a history of asthma.⁹ Moreover, environmental and occupational exposures such as long-term exposure to biomass fuel, indoor and outdoor air pollution, secondhand smoke, and occupational dust and chemicals are also important contributors to COPD development.^{1,10}

Although estimates from US national data suggest that overall COPD prevalence has remained relatively stable in recent years, important subgroup differences persist,⁸ making ongoing surveillance a critical priority. Looking beyond overall national prevalence estimates helps us see which communities carry a heavier burden of the disease, and understanding these differences is key to designing prevention efforts, directing resources where they are needed most, and ultimately reducing the impact of COPD. However, measuring COPD is not always straightforward. Changes in survey design, diagnostic criteria, and even question wording can make prevalence appear to change in ways that do not reflect real trends in disease burden.^{11,12} These differences make it harder to compare results across studies or over time and can blur our understanding of who is most affected, which has important implications for surveillance and population health strategies. To the best of our knowledge, there is currently no comprehensive synthesis examining variability in COPD prevalence estimates across US nationally representative surveys and diagnostic criteria. Therefore, this review aims to summarize and compare COPD prevalence estimates across nationally representative US surveys by diagnostic criteria (spirometry vs self-reported), smoking status, sex, and race/ethnicity.

Methods

Study Protocol

This systematic review examined observational studies on COPD trends in the general adult US population using nationally representative data, focusing on differences by smoking status, sex, and race/ethnicity. COPD diagnoses were based on the definitions used from National Health Surveys – whether based on (1) spirometry values and/or (2) self-reported data. Data collection and reporting followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines ([Supplementary Table 1](#)).¹³ This study was registered in the National Institute for Health Research (NIHR) International Prospective Register of Systematic Reviews (PROSPERO ID CRD42023399386).¹⁴

Search Strategy & Search Terms

Three electronic databases of peer-reviewed articles (OVID Medline, OVID Embase, and PubMed) were searched for articles published in English from the earliest available study through October 7th, 2025. The search strategy was developed with the support of a research librarian. We developed a search string utilizing keywords and Medical Subject Headings that comprised the fields of (1) COPD, (2) Prevalence, (3) Tobacco, and (4) US population. Detailed description of the search terms used can be found [Supplementary Material A](#).

Inclusion and Exclusion Criteria

We included observational studies that reported COPD prevalence in the US general adult population, overall and across subgroups when available (tobacco product use, sex, and race/ethnicity). Eligible studies were cross-sectional or cohort studies providing cross-sectional results, published in English, and based on nationally representative US health surveys. Studies could be limited to smokers or nonsmokers or include both groups. We excluded studies that 1) did not define the outcome as COPD (eg, reported only emphysema or chronic bronchitis); 2) were based on non-US populations; 3) focused exclusively on individuals with major comorbid conditions (eg, HIV, COVID-19, cancer, or hospitalized patients); 4) examined recreational substance use; or 5) were clinical trials, simulation models, case reports, systematic reviews, conference abstracts, or study protocols ([Supplementary Table 2](#)).

Article Screening and Selection

Duplicate records were removed prior to screening using Zotero¹⁵ and RefWorks.¹⁶ The studies identified from the search were then imported into Rayyan¹⁷ and Covidence¹⁸ for further duplicate checks and for title/abstract and full-text screening. Two reviewers (PO-N and MEV-F) independently screened titles and abstracts for relevance using the predefined exclusion criteria. Full texts of potentially eligible studies were then independently assessed by the same reviewers to determine inclusion for data extraction. Any disagreements between them were reviewed and corrected by a third author (LMS-R).

Data Extraction

Data extraction of the included studies was conducted independently among three authors (PO-N, MEV-F, and MR). Studies' data was collected in a Google Docs form. Data included bibliographic information (title, first author's surname, and journal), survey name, study design (cross-sectional or longitudinal), sample size, and whether results were stratified by participants' characteristics, including smoking status, sex, and race/ethnicity. Additional data included population type (eg, youth or adults), age range, smoking status definition, COPD diagnostic criteria, and prevalence estimates.

Risk of Bias Assessment

The risk of bias of each included observational study was independently evaluated by two authors (LMS-R and MR) using the National Institutes of Health (NIH) Quality Assessment Tool for Observational Cohort and Cross-sectional Studies.¹⁹ Although the NIH quality assessment tool is not intended to generate an overall numerical score, we summarized the number of criteria met for each study to facilitate transparency and comparability consistent with previous reviews.^{20–22} Each article was independently reviewed using the 14-item checklist, which addresses potential risks of selection, information, and confounding bias. The results of the quality assessment are shown in [Supplementary Table 3](#).

Each item of the risk-of-bias (RoB) was assigned to the individual criteria for each study using one of five options: “Yes,” “No,” “Not Applicable (N/A),” “Not Reported (NR),” or “Cannot Determine (CD),” depending on the information available. Because only cross-sectional studies were included, questions pertaining to temporality and repeated exposure assessment (Items 6, 7, and 10) and those requiring follow-up or blinded outcome assessment (Items 12 and 13) were classified as N/A. Accordingly, each study was scored on a maximum of 11 items. Quality ratings were categorized using thresholds commonly applied in previous systematic reviews^{20–22} using this tool: poor (0–3); fair (4–7); and good (8–11). RoB scoring over a total of 11 points was based on the precedent from Homagarani et al (2023),²⁰ which also included mainly cross-sectional studies. All scoring and judgments were made independently and finalized through consensus.

Synthesis

We narratively synthesized the studies organizing findings from the included studies by (1) type of COPD diagnostic criteria (spirometry, self-report or both), and (2) population subgroups (eg, smoking status, sex, race/ethnicity). We presented prevalence results graphically to illustrate overall and within subgroup patterns and variability across studies. All figures were generated using R Studio (4.5.1).²³ This approach allows for comparison of estimates while preserving the contextual differences inherent to each dataset. Meta-analysis was not conducted due to substantial heterogeneity across studies in terms of diagnostic criteria (spirometry vs self-report), outcome definitions, time-period, age groups, timing of bronchodilator spirometry (pre or post),²⁴ and subgroup reporting formats. These methodological inconsistencies made statistical pooling inappropriate as it could produce unreliable or non-comparable estimates.

Race and ethnicity categorization also varied across studies, with some surveys presenting only broad categories (eg, “Other,” “Asian/Other”) or combining smaller racial groups due to sample size limitations. To maintain consistency across studies for results description, we aligned categories, when necessary, by retaining the most reported groups (Non-Hispanic White, Non-Hispanic Black, Hispanic) and combining residual categories (eg, Asian, Native American, multi-racial) into an “Other” group. As our synthesis focuses on comparative interpretation and no statistical pooling was performed, this approach allowed us to interpret prevalence patterns across studies while acknowledging limitations in the original reporting.

Characteristics of Included Studies

The electronic database search resulted in 3,472 studies. After removing 1,467 duplicates, 2,005 titles and abstracts were screened for relevance of which 224 full texts were reviewed. A total of 22 studies^{25–46} were included in the analysis (Figure 1). Table 1 presents the characteristics of the included studies, including study ID, sample size, data collection period, survey source, diagnostic criteria, subgroups analyzed, and overall risk of bias.

Results were extracted from four nationally representative US population surveys. The National Health and Nutrition Examination Survey (NHANES), a cross-sectional survey conducted since 1971 and continuous since 1999 in two-year cycles, assesses health and nutrition through interview and examinations; spirometry data was collected for adults aged 18 and older only during 1988–1994 and 2007 to 2012.^{48,49} The National Health Interview Survey (NHIS), an annual cross-sectional survey conducted since 1957, collects information on health conditions, health behaviors, and access to care among adults aged 18 and older through at-home interviews.⁵⁰ The Behavioral Risk Factor Surveillance System (BRFSS) started in 1984 and is a telephone survey of adults aged 18 and older that monitors chronic conditions, health behaviors, and preventive service use.⁵¹ The Population Assessment of Tobacco and Health (PATH) study is a longitudinal study established in 2013 that follows youth aged 12 and older and adults across multiple waves (years) to assess tobacco use patterns, related health outcomes, and behaviors.^{52–54}

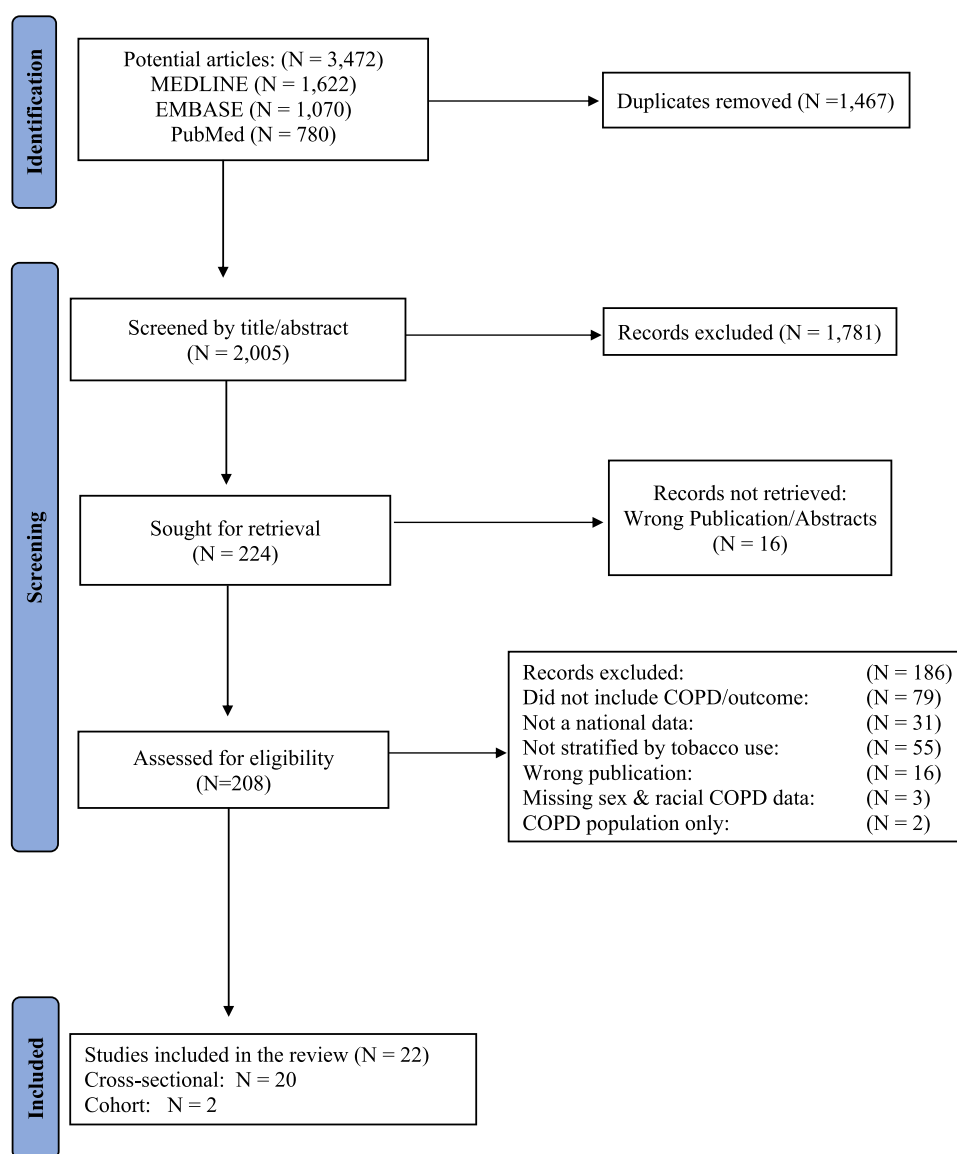


Figure 1 PRISMA flow diagram of the selection.⁴⁷

Table 1 Characteristics of Included Studies

Study	Sample Size (n)	Dates of Data Collection	Survey Source	Diagnostic Criteria (Spirometry vs. Self-Reported)	Subgroups Analyzed	Overall Risk of Bias
Bang, K.M et al 1993 ²⁵	585	1971–1975	NHANES	Spirometry (COPD was defined as an FEV1 less than 65% of the predicted value)	Sex and Race	Good
Doney, B. et al 2015 ²⁶	7,667	1988–1994	NHANES	Spirometry (ATS and GOLD criteria, Pre-Bronchodilator)	Sex, Smoking Status and Race	Good
	5,476	2007–2010	NHANES			
Ford, E.S. et al 2013 ²⁷	14,360	1988–1994	NHANES	Spirometry (GOLD criteria)	Sex, Smoking Status and Race	Good
	9,024	2007–2010	NHANES			
Wang et al 2023 ²⁸	7,784	2007–2012	NHANES	Spirometry (GOLD criteria)	Sex	Fair
Cadham et al 2024 ²⁹	13,328	2007–2012	NHANES	Spirometry (GOLD criteria)	Sex Smoking Status, Race	Good
	4237	2007–2008	NHANES			
	4783	2009–2010	NHANES			
	4308	2011–2012	NHANES			
Kurth, L. et al 2019 ³⁰	13,044	2007–2010	NHANES	Spirometry (ATS/ERS criteria, Pre-Bronchodilator)	Sex Smoking Status, Race	Good
	15,777	2007–2010	NHANES	Self-reported	Sex, Smoking Status, Race	
Díaz-Guzmán, E. et al 2011 ³¹	15,203	1988–1994	NHANES	Self-reported	N/A	Fair
Tilert, T. et al 2018 ³²	10,219	2007–2012	NHANES	Self-reported	Sex, Smoking Status, Race	Good
Dirisanala et al 2023 ³³	178,300	2015–2018	NHANES	Self-reported	N/A	Fair
Schiller, J. S. et al 2005 ³⁴	11,238	1997–2002	NHIS	Self-reported	N/A	Good
Bang, K. M. et al 2009 ³⁵	127,624	1997–2004	NHIS	Self-reported	Sex, Smoking Status, Race	Fair
Bang, K. M. et al 2013 ³⁶	62,255	1997–2004	NHIS	Self-reported	Nonsmokers	Fair
	59,165	1997–2000	NHIS			
	65,346	2001–2004	NHIS			
Doney, B. et al 2014 ³⁷	73,799	2004–2011	NHIS	Self-reported	Sex, Smoking Status, Race	Good
Ward, B. W. et al 2017 ³⁸	105,779	2012–2014	NHIS	Self-reported	Sex, Smoking Status, Race	Good
Steinberg A.W. et al 2025 ³⁹	23,028	2020	NHIS	Self-reported	Sex	Fair
Ford E.S. et al 2013 ⁴⁰	30,801	1999	NHIS	Self-reported	Sex, Race	Good
	32,374	2000	NHIS			
	33,326	2001	NHIS			
	31,044	2002	NHIS			
	30,852	2003	NHIS			
	31,326	2004	NHIS			
	31,428	2005	NHIS			

(Continued)

Table 1 (Continued).

Study	Sample Size (n)	Dates of Data Collection	Survey Source	Diagnostic Criteria (Spirometry vs. Self-Reported)	Subgroups Analyzed	Overall Risk of Bias
	24,275	2006	NHIS			
	23,393	2007	NHIS			
	21,781	2008	NHIS			
	27,731	2009	NHIS			
	27,157	2010	NHIS			
	33,014	2011	NHIS			
	475,616	2011	BRFSS			
Kosacz, N. M. et al 2012 ⁴¹	489,225	2011	BRFSS	Self-reported	Sex, Smoking Status, Race	Good
Cunningham, T. J. et al 2015 ⁴²	405,856	2011	BRFSS	Self-reported	Smoking Status	Good
Liu et al 2023 ⁴³	478,788	2011	BRFSS	Self-reported	Sex, Smoking Status, Race	Fair
	386,439	2021	BRFSS	Self-reported	Sex, Smoking Status, Race	
Liu, Y. et al 2019 ⁴⁴	408, 774	2016	BRFSS	Self-reported	N/A	Fair
Wheaton, A.G. et al 2019 ⁴⁵	418,378	2017	BRFSS	Self-reported	Sex, Smoking Status, Race	Fair
Paulin, L. M. et al 2022 ⁴⁶	13,752	Wave 1–5 (2013–2014)	PATH	Self-reported	Sex, Smoking Status, Race	Fair

Abbreviations: NHANES, National Health and Nutrition Examination Survey; NHIS, National Health Interview Survey; BRFSS, Behavioral Risk Factor Surveillance System; PATH: Population Assessment of Tobacco and Health; COPD, chronic obstructive pulmonary disease; FEV₁, forced expiratory volume in one second; FVC, forced vital capacity; GOLD, Global Initiative for Chronic Obstructive Lung Disease; ATS, American Thoracic Society; ERS, European Respiratory.

However, the included study analyzed PATH data cross-sectionally. [Supplementary Material B](#) provides a detailed description of the surveys' methods.

Risk of Bias (RoB) Assessment

Overall, the quality of the 22 included articles was either fair or good, with RoB scores ranging between 7 and 8 out of a total of 11 points. The most identified issues were participation rates of eligible people under 50% (or participation rate not disclosed) and a lack of adjustment of the statistical analyses for relevant covariates ([Table 1](#) and [Supplementary Table 3](#)).

COPD Measurements Across Studies

Among the 22 included studies, six^{25–30} reported COPD prevalence based on **spirometry** values, all using NHANES data from 1988–1994, 2007–2010, or 2007–2012. COPD definitions followed either the Global Initiative for Chronic Obstructive Lung Disease (GOLD) criteria, defined as post-bronchodilator spirometry value of forced expiratory volume in one second (FEV₁)/forced vital capacity (FVC) <0.70 ratio,^{55,56} or the American Thoracic Society (ATS) criteria, defined as spirometry values below the lower fifth percentile (LLN) of the FEV₁/FVC ratio from the general population.⁵⁷ In the retrieved studies, these criteria were applied to either pre-bronchodilator or post-bronchodilator values. One study²⁶ reported prevalence using both the ATS and the GOLD definition, while another²⁵ defined COPD as a forced expiratory volume in one second (FEV₁) less than 65% of the predicted value. Of those six studies, two reported only overall COPD prevalence,^{25,28} one prevalence by severity level,²⁶ and three reported both.^{27,29,30}

Of these studies, Kurth et al (2019, RoB: Good) used NHANES 2007–2010 data and reported overall and by severity prevalence estimates based on spirometry (ATS criteria) and overall COPD from self-reported diagnosis of chronic

bronchitis or emphysema³⁰ Similarly, Cadham et al (2024, RoB: Good) used NHANES 2007–2012 data and applied the GOLD criteria to spirometry values, reporting overall and by severity prevalence, and overall COPD prevalence based on self-reported data.²⁹

The remaining 16 studies^{31–46} reported COPD prevalence based on **self-reported** data, drawing from a mix of national surveys including NHIS, BRFSS, PATH, and NHANES. These studies used survey questions about whether a healthcare provider had ever diagnosed participants with chronic obstructive pulmonary disease (COPD), chronic bronchitis (CB), or emphysema (E). Question wording varied slightly, but structure was generally consistent. However, reporting timeframes differed across surveys. For example, NHIS included questions on both lifetime diagnosis (eg, “Have you ever been told...”) and recent diagnosis (eg, “During the past 12 months...”) Also, studies differed in which measure they reported^{34–40} BRFSS used a yes/no format to assess whether participants had ever been diagnosed with COPD, chronic bronchitis, or emphysema^{40–45} In the PATH study (Wave 1, 2013–2014) participants reported the presence of respiratory conditions using a checklist that included COPD, chronic bronchitis, emphysema, asthma, or other lung diseases.⁴⁶ NHANES studies from 1988–1994³¹ and 2007–2012³² defined COPD based on a yes to the questions “Has a doctor ever told you that you have emphysema?” or “Do you still have chronic bronchitis?”, while a more recent study³³ from 2015–2018 relied on a direct question asking “Have you ever been told that you have COPD?”.

Self-Reported COPD with Severity Classification

Among studies that used self-reported data, two studies of NHANES further characterized COPD severity by assessing lung function with spirometry. Diaz-Guzman et al (2011, RoB: Fair), using pre-bronchodilator values from 1988–1994, categorized participants with self-reported CB or E into obstructed, restricted, symptomatic with normal function, normal, or missing spirometry³¹ Tilert et al (2018, RoB: Good), during 2007–2012, defined COPD based on self-reported physician diagnosis and applied ATS criteria to identify airflow obstruction, reporting severity as no obstruction, mild, moderate or worse based on FEV₁ % predicted.³²

Results

Overall Prevalence of COPD

COPD prevalence was consistently higher when assessed by spirometry than with self-reported data. In US adults, estimates from NHANES 1988–2012 have generally ranged from 12.5%–13.8%,^{27,29} though prevalence was lower (1.6%) in a subpopulation of younger adults aged 20–50.²⁸ Across the 4 studies (1988–2012)^{26,27,29,30} that reported prevalence by COPD severity levels, mild airflow obstruction (AO) was more prevalent (7.3%–16.6%), followed by moderate AO (4.4%–9.0%) and severe AO (0.7%–2.2%). One study²⁷ also reported restrictive impairment (PRISm; FEV₁/FVC $\geq$ 0.70 and FVC < 80% predicted) with prevalence estimates of 7.6% in 1988–1994 and 6.5% in 2007–2010 ([Supplementary Tables 4–7](#)).

In contrast to spirometry-based estimates, self-reported COPD prevalence was generally lower and varied across surveys. Results from studies utilizing NHIS data reported the highest prevalence, ranging from 3.0–7.2% (1997–2020).^{34–40} Estimates from BRFSS ranged from 6.0%–6.7% (2011–2021),^{40,41,43–45} NHANES from 4.3%–6.7% (1988–2012),^{29,31–33} and PATH Wave 1 reported 5.1% (2013–2014).⁴⁶

A clear example of the differences in prevalence between spirometry and self-reported measures was observed from Kurth et al (2019, RoB: Good)³⁰ Using NHANES 2007–2010, the author reported a COPD prevalence of 12.4% using spirometry values from adults 18–79 years, but of 3.5% when using self-reported data from adults 20–79 years.³⁰ A similar pattern was observed in Cadham et al (2024, RoB: Good), using NHANES 2007–2012, the author reported a prevalence of 13.8% for spirometry and 5.9% for self-reported in a population of adults aged 20–79 years.²⁹ [Figure 2](#) shows overall COPD prevalence by survey type and assessment method ([Supplementary Table 4](#)).

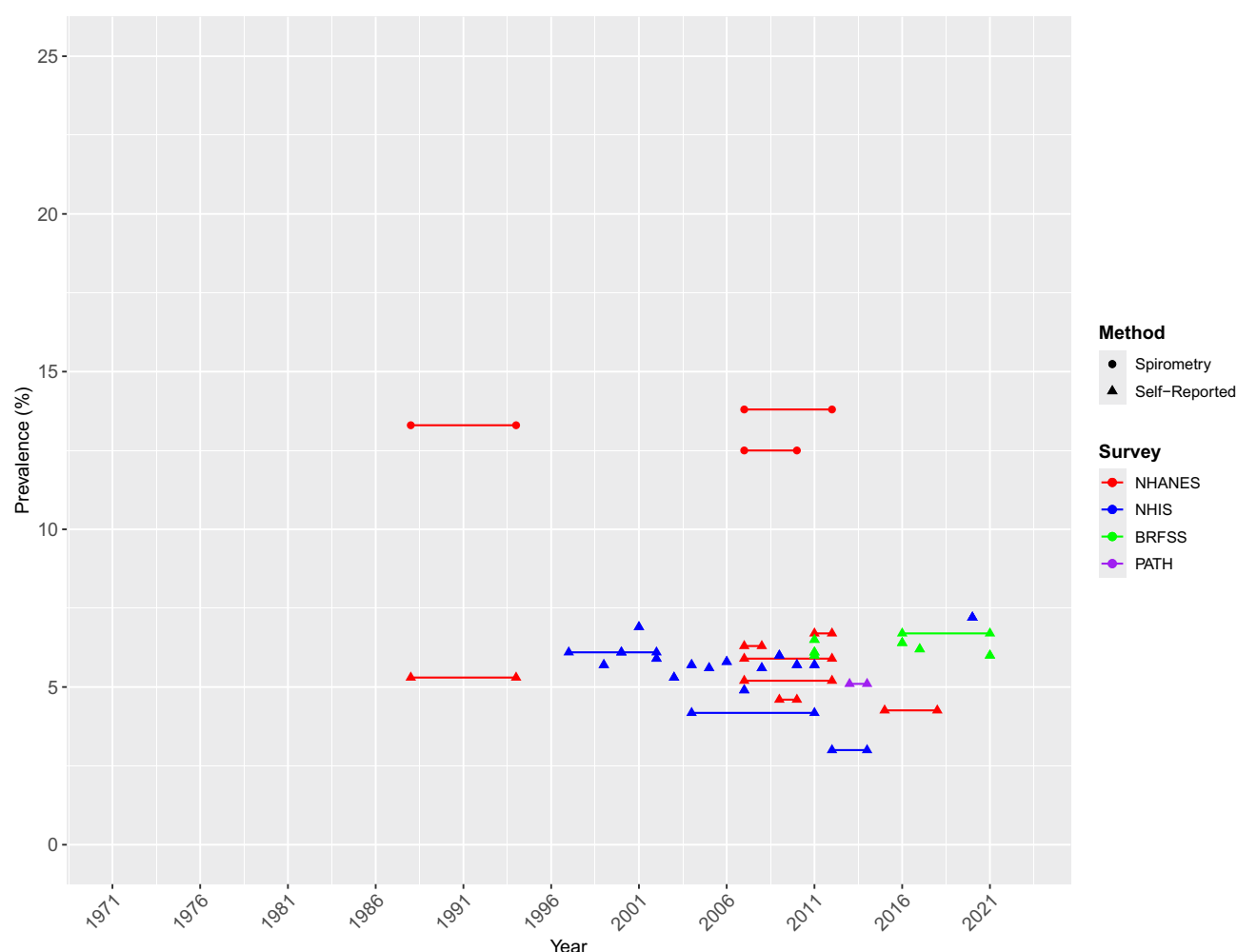


Figure 2 Overall Trends in COPD Prevalence. Points connected by a single line represent pooled estimates across two or more survey periods.

COPD Prevalence by Smoking Status

Of the 22 included studies, 17 studies reported COPD prevalence among adults who smoke.^{25–27,29,30,32,35–39,41–43,45,46} Of these, 5 reported estimates based on spirometry,^{25–27,29,30} 11 on self-reported data,^{32,35–39,41–43,45,46} and one on both methods.³⁰ Figure 3 presents the COPD prevalence by smoking status, survey and assessment method ([Supplementary Tables 4](#) and [6](#)).

Definitions of smoking status were generally consistent across national surveys (focused on cigarette use), with a broader range of combustible tobacco products included in the PATH study (cigarettes, traditional cigars, cigarillos, filtered cigars, pipe tobacco, hookah, snus pouches, moist snuff, chewing tobacco, and e-cigarettes). NHIS, BRFSS, and NHANES defined *current smokers* as individuals who had smoked at least 100 cigarettes in their lifetime and currently smoked every day or on some days; one study³² included a serum cotinine level of >10 ng/mL to classify as smoking. *Former smokers* were defined as those who had smoked at least 100 cigarettes but were not currently smoking. The PATH definition of current and former users was based on any past 30-day use and lifetime quantity or frequency of all listed tobacco products.⁴⁶ Specifically, lifetime quantity refers to having smoked at least 100 cigarettes in one's lifetime, whereas lifetime frequency refers to having ever used other tobacco products. Participants who reported using any product within the past 30 days were classified as current users (eg, exclusive past-30-day cigarette use). Those who had previously used tobacco products regularly but reported no use in the past 30 days were classified as former users. *Never smokers* were typically defined as those who had never smoked or had smoked fewer than 100 cigarettes in their lifetime. PATH's definition included individuals who had never regularly used any tobacco products (combustible and

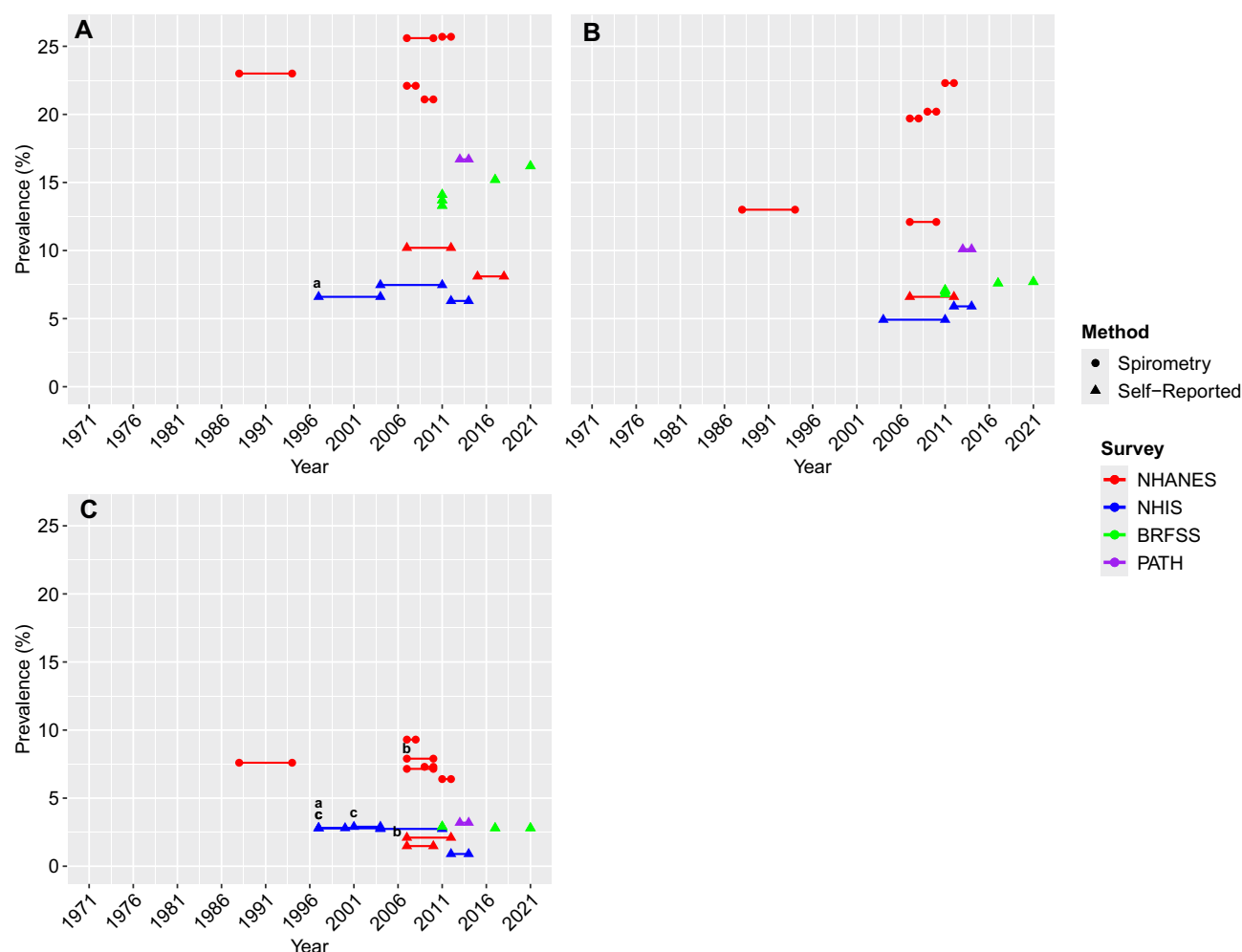


Figure 3 Trends in COPD Prevalence by Smoking Status. (A) Current smokers, (B) Former smokers, and (C) Never smokers. (a) adult workers; (b) ever-employed adults; and (c) nonsmokers. Points connected by a single line represent pooled estimates across two or more survey periods.

noncombustible) or had smoked fewer than 100 cigarettes in their lifetime (never or former experimental users).⁴⁶ Six studies did not provide their smoking status definition.^{26,28,37,40,41,43}

Overall COPD prevalence was highest among current smokers and the lowest among never smokers. Among studies that estimated prevalence using NHANES spirometry data from 1988–2012, prevalence ranged from 21.2%–25.7% among current smokers, 12.1%–22.3% among former smokers, and 6.4%–9.3% among never smokers.^{27,29}

Across all smoking groups, spirometry prevalence was consistently higher for mild airflow obstruction (AO) compared to moderate or severe, with current smokers showing the highest prevalence across all severity levels (Supplementary Table 5).^{26,27,29,30} Among current smokers, prevalence of mild obstruction ranged from 8.8%–40.4%, moderate obstruction from 5.7%–24.0%, and severe obstruction from 0.7%–5.8%. Former smokers showed lower values, mild AO ranged from 8.8%–22.5%, moderate AO from 4.5%–9.4%, and severe AO 0.7%–1.8%, while never smokers had the lowest prevalence, with mild AO ranges of 3.4%–11.8%, moderate AO from 1.1%–3.9%, and severe AO from 0.3%–0.8% (severe AO). The prevalence of restrictive impairment was 8.3%, 6.0%, and 8.2% among current, former, and never smokers, respectively, during 1988–1994, and 7.2%, 6.1%, and 6.5%, respectively, in 2007–2010.²⁷

Self-reported COPD prevalence estimates among current smokers ranged from 6.3%–7.5% in NHIS (1997–2014),^{35,37,38} 13.3%–16.2% in BRFSS (2011–2021),^{41–43,45} 10.2% in NHANES (2007–2012)³² and 16.7% in PATH (2011–2021).⁴⁶ Among former smokers, estimates ranged from 4.4%–5.9% in NHIS,^{35,37,38} 5.1%–7.7% in BRFSS,^{41–43,45} 6.6% in NHANES,³² and 10.1% in PATH.⁴⁶ Among never smokers, reported prevalence ranged from 0.9%–2.9% in NHIS,^{35–38}

2.8%–2.9% in BRFSS,^{41–43,45} 2.1% in NHANES,³² and 3.2% in PATH.⁴⁶ Notably, PATH reported the highest prevalence across all smoking categories.⁴⁶

Kurth et al (2019, RoB: Good) using NHANES 2007–2010, reported COPD prevalence among never and ever smokers using both spirometry and self-reported diagnosis. For never smokers, prevalence was 72% using spirometry and 15% using self-report. Among ever smokers, prevalence was 18.5% using spirometry and 5.6% using self-report.³⁰

Bang et al (1993, RoB: Good), using NHANES 1971–1975 spirometry data ($FEV_1 < 65\%$ predicted) in a subpopulation of Black adults, classified participants as current, former, or never smokers, but reported combined estimates for current and former smokers. Among males, COPD prevalence was higher in current and former smokers (54%) than in never smokers (0%), whereas among females, prevalence was higher in never smokers (84%) than in current and former smokers (5.0%).²⁵ Another study by Steinberg et al (2025, RoB: Fair), using NHIS 2020, classified participants as never or ever smokers based on self-reported smoking history COPD was higher among ever smokers than never smokers, with females showing higher prevalence than males (32% vs 1.7% for never smokers; 15.9% vs. 11.5% for ever smokers).³⁹

COPD Prevalence by Sex

COPD prevalence by sex was assessed in 16 studies.^{25–30,32,35,37–41,43,45,46} Of these, 5 used spirometry,^{25–29} 10 used self-report,^{32,35,37–41,43,45,46} and one used both methods.³⁰ Figure 4 shows COPD prevalence by sex, survey type, and assessment method ([Supplementary Tables 4 and 7](#)).

COPD prevalence based on spirometry was higher in males than females. Using NHANES data from 1988–2012 in ages 20–79 years, prevalence ranged from 17.9%–23.7% in males compared with 10.4%–12.3% in females.^{27,29} In a subpopulation of younger adults aged 20–50 years from 2007–2012, Wang et al (2023, RoB: Fair), using GOLD criteria, reported a lower prevalence of 26% in males and 072% in females.²⁸ Bang et al (1993, RoB: Good), analyzing spirometry data ($FEV_1 < 65\%$ pred) in a subpopulation of Black adults, reported a COPD prevalence of 3.7% for males and 6.7% for females.²⁵

Across both sexes, males showed the highest prevalence across all COPD spirometry severity levels using NHANES 1988–2012 data ([Supplementary Table 5](#)).^{26,27,29,30} Males' estimates ranged from 8.6%–24.0% for mild obstruction, from 4.5%–9.4% for moderate obstruction, and from 0.5%–3.4% for severe obstruction, while among females, prevalence ranged from 4.4%–16.3%, 4.2%–8.6%, and 0.7%–2.7%, across severity levels, respectively. The prevalence of restrictive impairment was 6.5% in males and 8.5% in females during 1988–1994, and 6.9% in males and 6.1% in females during 2007–2010.²⁷

In contrast, self-reported data showed higher prevalence in females than males. Among males, NHIS estimates ranged from 2.8%–7.8% (1997–2020)^{35,37–40} while BRFSS estimates ranged from 5.2%–6.5% (2011–2021).^{40,41,43,45} NHANES reported a prevalence of 4.8% in 2007–2012³² and PATH Wave 1 (2013–2014) of 6.6%.⁴⁶ Among females, NHIS (1997–2014) estimates ranged from 3.0%–8.1%,^{35,37–40} BRFSS (2011–2021) ranged from 6.5%–7.3%,^{40,41,43,45} NHANES reported 5.6%,³² and PATH reported the highest estimate at 8.5%.⁴⁶

Kurth et al (2019, RoB: Good) compared both spirometry and self-reported measures in NHANES 2007–2010. Prevalence using spirometry was 13.6% in males and 11.3% in females, while self-reported prevalence was 3.1% in males and 3.9% in females.³⁰

COPD Prevalence by Race and Ethnicity

Racial/ethnic patterns in COPD prevalence were reported in 14 studies.^{25–27,29,30,32,35,37–39,41,43,45,46} Because of the limited number of observations among populations that were not Black or White, as well as overlap with categories (eg, Asians being classified as Asian and Asian/Pacific Islander), for this study we categorized the prevalence estimates in 4 categories: 1) non-Hispanic White; 2) non-Hispanic Black; 3) Hispanics (comprised of Hispanic, Mexican-American, and Other, Hispanic); and 4) Other (comprised of Other, Asian, Native Hawaiian/Pacific Islander, American Indian/Alaskan Native, Other, non-Hispanic, Other/Multiracial, and Asian/Pacific Islander) Figure 5 presents COPD prevalence by race and ethnicity, survey type, and assessment method ([Supplementary Tables 4 and 7](#)).

Four studies using spirometry data from 1988–2012^{25–27,29} found that non-Hispanic Whites showed the highest prevalence of COPD across all racial and ethnic groups, ranging from 13.8%–17.5%. Estimates for non-Hispanic Blacks



Figure 4 Trends in COPD Prevalence by Sex. Panels represent sex groups: **(A)** Males and **(B)** Females. (a) adult workers; (b) ever-employed adults; (c) adults aged 20–50 years; and (d) Black individuals ($FEV_1 < 65\%$ predicted). Points connected by a single line represent pooled estimates across two or more survey periods.

ranged from 9.3%–11.9%, for Hispanics from 3.8%–8.3%, for the “Other” category from 6.7%–11.7%. In earlier NHANES data (1971–1976) focused on Black adults and using $FEV_1 < 65\%$ predicted COPD prevalence was estimated at 5.4%.²⁵

Among racial and ethnic groups, non-Hispanic Whites showed the highest prevalence across all spirometry severity levels in NHANES 1988–2012 ([Supplementary Table 5](#)).^{25–27,29} Non-Hispanic White adults’ mild severity ranged from 8.2%–21.9%, moderate from 4.7%–9.8%, and severe from 0.6%–3.5%. For non-Hispanic Black adults, prevalence of mild severity ranged from 1.5%–16.2%, moderate from 4.2%–8.1%, and severe from 0.9%–3.0%. Among Hispanic adults, mild severity ranged from 2.2%–12.7%, moderate from 1.2%–4.0%, and severe from 0.1%–0.8%. Adults classified as “Other” reported mild COPD prevalence from 2.1%–5.2%, moderate from 3.3%–5.8%, and severe from 0.7%–1.5%. The prevalence of restrictive impairment during 1988–1994 was 6.5% among non-Hispanic White adults, 9.5% among non-Hispanic Black adults, 6.7% among Mexican Americans, and 17.7% among adults classified as “Other”. In 2007–2020, prevalence was 5.2%, 7.3%, 6.2%, and 15.2%, respectively.²⁷

Across 9 self-reported studies,^{32,35,37,38,40,41,43,45,46} the “Other” category reported the highest COPD prevalence, followed by non-Hispanic Whites, non-Hispanic Blacks, and Hispanics. Prevalence for non-Hispanic Whites ranged from 3.8%–7.5% in NHIS (1997–2014),^{35,37,38,40} 6.3%–6.9% in BRFSS (2011–2021),^{40,41,43,45} 5.9% in NHANES (2007–2012),³² and 8.5% in PATH Wave 1 (2013–2014).⁴⁶ Among non-Hispanic Blacks, estimates ranged from 2.1%–6.3% in NHIS,^{35,37,38,40} 6.1%–6.6% in BRFSS,^{40,41,43,45} 4.6% in NHANES,³² and 6.9% in PATH.⁴⁶ PATH reported the highest prevalence for both racial/ethnic groups.⁴⁶

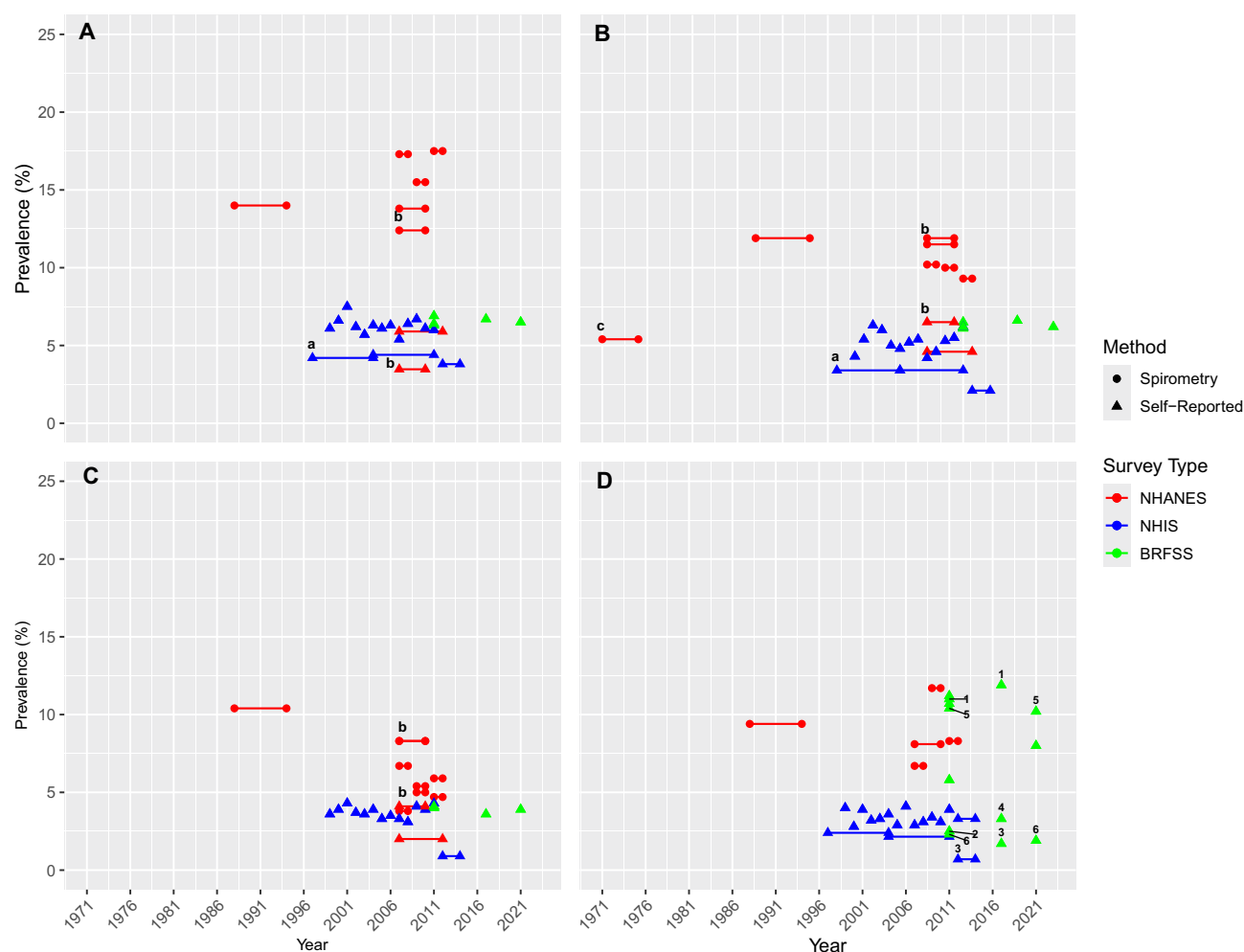


Figure 5 Trends in COPD Prevalence by Race and Ethnicity. **(A)** Non-Hispanic Whites, **(B)** Non-Hispanic Blacks, **(C)** Hispanic individuals, and **(D)** Other racial/ethnic groups. (a) adult workers; (b) ever-employed adults; and (c) Black individuals ($FEV_1 < 65\%$ predicted). In panel D (Other racial/ethnic groups), numeric labels identify specific racial/ethnic subgroups: 1 = American Indian/Alaska Native (AI/AN), 2 = Asian/Pacific Islander (Asian/PI), 3 = Asian, 4 = Native Hawaiian/Pacific Islander (NH Native HI/PI), 5 = American Indian (AI), and 6 = Asian Native. Points connected by a single line represent pooled estimates across two or more survey periods.

Among the “Other” category, BRFSS reported the highest prevalence estimates among all surveys, ranging from 1.9%–11.2% (2011–2021),^{40,41,43,45} with the lowest prevalence from BRFSS observed from non-Hispanic Asian or Pacific Islander adults (1.9%).⁴³ NHIS estimates ranged from 0.7%–4.1% (1997–2014),^{35,37,38,40} with the lowest prevalence reported also from non-Hispanic Asians (0.7% in 2012–14).³⁹ PATH reported a COPD prevalence across adults classified as “Other” of 4.4%.⁴⁶

Among Hispanics, reported prevalence ranged from 0.9%–4.3% in NHIS.^{38,40} The lowest estimate (0.9%) was reported by Ward et al (2017, RoB: Good) in adults aged 18 and older, while the highest (43%) was reported by Ford et al (2013, RoB: Good) in adults aged 25 and older between 1999 and 2011.^{38,40} All other NHIS estimates ranged from 31%–4.3%.⁴⁰ BRFSS estimates ranged from 3.6%–4.1% (2011–2021),^{40,41,43,45} NHANES reported 2.0%,³² and PATH reported the highest prevalence at 4.5%.⁴⁶

Kurth et al (2019, RoB: Good) using NHANES 2007–2010, compared COPD prevalence based on spirometry and self-reported measures. The study found higher prevalence from non-Hispanic Whites across all race/ethnicity groups, regardless of the method of COPD assessment. Using spirometry, prevalence was 13.6% among non-Hispanic Whites, 11.2% among non-Hispanic Blacks, and ~8.0% among Hispanics. Using self-report, prevalence was 3.9% among non-Hispanic Whites, 3.5% among non-Hispanic Blacks, ~2.0% among Hispanics.³⁰

Discussion

Results from this systematic review reveal that COPD prevalence in the US varies across national surveys and is influenced by diagnostic criteria and population characteristics. Studies using spirometry measures consistently found higher COPD prevalence than those relying on self-reported data. These findings align with previous research showing that self-reported data may underestimate COPD burden due to limited healthcare access, underdiagnosis, and variability in symptom recognition.^{58–60} This suggests that reliance on self-reported diagnosis likely captures only a subset of individuals with airflow limitation in the US, underscoring the need for improved diagnostic approaches for population assessment. Across studies reporting COPD prevalence by severity level, mild and moderate COPD cases were more frequently identified than severe ones, reflecting the large proportion of early-stage disease in the population.

Smoking was strongly associated with COPD in both self-reported and spirometry-based methods. In line with previous national public health reports,^{61–64} we found that current smokers had the highest prevalence, followed by former and never smokers. This is consistent with evidence that COPD risk increases with greater smoking exposure.² Nevertheless, our findings also reinforce the need to account for COPD risk in never smokers, among whom prevalence ranged from 0.9% to 3.2% based on self-reported diagnosis and from 6.4% to 7.9% using spirometry data. The literature has shown that between 25 and 45% of COPD cases globally occur among non-smokers, pointing to the need to consider the importance of non-smoking risk factors.^{65,66} Occupational exposures to dust, chemicals, and fumes, as well as environmental pollutants and biomass fuel use, contribute substantially to disease risk.^{66,67} In addition, early-life respiratory infections may further increase susceptibility.

We also identified that COPD prevalence was higher among males in studies using spirometry values but higher among females when using self-reported data. Similar COPD prevalence results from spirometry being higher in males and self-reporting data producing higher estimates from females has been reported by other US population's studies.^{68–70} These differences likely reflect a combination of biological susceptibility, diagnostic bias and healthcare-seeking behavior. Prior studies suggest that females may experience more severe symptoms at lower lung function levels but are less likely to receive a formal COPD diagnosis.^{71–73} An exception was observed in a study of Black adults, where Bang et al (1993) (NHANES 1971–1975, FEV₁ < 65% predicted) reported higher prevalence among females than males.²⁵ These findings underscore how both biological differences and diagnostic practices contribute to observed sex disparities in COPD prevalence and highlight the need for more accurate approaches to COPD diagnosis and management.^{73,74}

When stratified by race and ethnicity, non-Hispanic White adults consistently had the highest COPD prevalence in studies using spirometry data, while self-reported diagnosis led to higher prevalence in the “Other” (included American Indian/Alaska Native, American Indian, Asian, Asian Native, and Native Hawaiian/Pacific Islander) racial/ethnic category. The elevated prevalence observed in this aggregated group likely reflects the high burden among American Indian/Alaska Native adults, who showed the highest prevalence (~11%) within this category. Prior research has noted that aggregation of small populations can mask important differences in how the disease affects each group.⁷⁵ For example, studies have shown that American Indian and Alaska Native adults experience some of the highest rates of COPD-related mortality in the US,^{76,77} yet these trends may be harder to see in national data that does not break down results by specific subgroups.

Of central importance, the results from this review demonstrate that the criteria and method used to diagnose COPD shape our understanding of prevalence patterns and disparities. While national surveillance systems provide essential information, differences in survey design, question wording, and diagnostic definitions introduce variability that must be considered when interpreting and comparing estimates.^{11,78,79} However, this variability alone does not fully explain observed patterns. Structural determinants, including socioeconomic conditions, differential exposure profiles, and access to healthcare, play a critical role in shaping both true disease burden and its detection.⁸⁰ For example, limited access to healthcare and diagnostic testing such as spirometry may contribute to underdiagnosis across vulnerable populations.^{59,80,81} Together, these factors underscore that observed differences in COPD prevalence likely reflect not only methodological variation but also inequities in diagnosis.^{59,81}

This systematic review provides the first comprehensive synthesis of COPD prevalence estimates specific to the US population, addressing a gap in other global and regional analyses. Prior systematic reviews and meta-analyses have primarily focused on international data. For example, Halbert et al year (2006)⁸² found a pooled COPD prevalence of 7.6% using data from US and non-US studies. Olortegui-Rodriguez et al (2022)⁸³ estimated a pooled prevalence of 8.9% in Latin America and the Caribbean, and Jarhyan et al (2022)⁸⁴ reported 11.1% in South Asia. In contrast, our review provides US-specific estimates of overall COPD prevalence and reports on the differences by smoking behavior, sex, and race/ethnicity, contributing to the limited literature directly comparing estimates across multiple national surveys.^{69,82}

This review has several limitations. First, COPD diagnostic criteria and smoking status definitions varied across studies and survey years which limited comparability. An important source of potential misclassification is the use of pre- rather than post-bronchodilator spirometry. Clinical guidelines recommend post-bronchodilator spirometry to confirm persistent airflow limitation, as reliance on pre-bronchodilator values may overestimate COPD prevalence.^{24,56,85} For example, many studies used pre-bronchodilator spirometry, which may overestimate COPD prevalence compared to post-bronchodilator criteria recommended by GOLD and ATS.^{56,85} A study⁸⁵ showed that COPD prevalence was 20.9% when defined using pre-bronchodilator data, compared to 14.0% using post-bronchodilator values, about one-third higher estimate. Other studies have reported similar overestimations of up to 30% when relying solely on pre-bronchodilator values.¹² Definitions of smoking status also vary slightly across national surveys, with some defining current smokers as individuals who have smoked at least 100 cigarettes in their lifetime and currently smoke every day or on some days (NHIS, NHANES, BRFSS), whereas PATH defines current use based on any past 30-day tobacco use across multiple products.^{25–27,29,30,32,35–39,41–43,45,46} Such differences in how smoking status is defined and assessed may contribute to variations in the estimated prevalence of current and former smokers.^{86–88} Moreover, only NHANES collected spirometry data, which restricts our ability to directly compare severity estimates across national surveys. Implementing spirometry in large population surveys is challenging, as it requires trained and certified personnel, and centralized quality control, which can make such efforts resource-intensive and costly.^{89–91} Second, self-reported COPD diagnosis is subject to recall and reporting bias and may be affected by healthcare access or awareness. Third, differences in question phrasing across surveys may also contribute to variation in prevalence estimates. Fourth, limited sample sizes for Asian American, Native Hawaiian, and American Indian populations led to their aggregation into the “Other” category, which restricts meaningful subgroup analysis and may obscure disparities. Fifth, the overall RoB quality of the studies varied particularly due to low participation rates or no disclosed information on participation rates, and limited covariate adjustment, which may affect the prevalence estimates. We did not conduct a meta-analysis as there was substantial heterogeneity in study designs, temporality of the results, and outcome definitions that prevented statistical pooling, limiting our ability to generate summary estimates. Lastly, although evaluating causality was not the aim of our review, the cross-sectional design, and variable reporting timeframe of the included studies limits the ability to assess temporal relationships or disease progression.

Strengthening COPD surveillance in the US is a priority for future research. A critical gap is the limited inclusion of objective measures of airflow obstruction, with spirometry available only in NHANES – and there only up to 2012.^{29,92} This restricts accurate estimation of disease burden and limits early detection.^{1,59} Expanding the use of spirometry or other validated tools⁹³ in nationally representative surveys would improve assessment of disease severity, strengthen surveillance, and inform more effective clinical and public health strategies.

Conclusion

Overall, the findings from our systematic review show that the way we measure and diagnose COPD shapes both what we see and who we see. Because overall estimates based on self-reported diagnosis were lower than those based on spirometry, reliance on self-reported COPD alone is likely to underestimate the true burden of disease and should be interpreted with caution when used for surveillance or population-level assessment. National surveys need consistent diagnostic criteria and should report results by population subgroups so that important patterns are not missed. As cigarette smoking declines, the patterns of COPD prevalence may change. Environmental pollution, workplace exposures, and even lung problems earlier in life are becoming more important, especially for groups that have often been overlooked in research. Closing these gaps will require both clinical and public health efforts. Clinicians can improve

early detection by looking beyond self-reported data and using lung function tests for people at risk, while public health programs can focus on proven measures such as cleaner air, safer workplaces, and better access to care.^{94–96} Combining better measurement with early detection and prevention offers the best chance to lower COPD rates and the persistent differences in how COPD affects different groups.

Abbreviations

COPD, Chronic Obstructive Pulmonary Disease; NHANES, National Health and Nutrition Examination Survey; NHIS, National Health Interview Survey; BRFSS, Behavioral Risk Factor Surveillance System; PATH, Population Assessment of Tobacco and Health; GOLD, Global Initiative for Chronic Obstructive Lung Disease; ATS, American Thoracic Society; FVC, forced vital capacity; % pred, percent predicted; FEV1, forced expiratory volume in one second.

Data Sharing Statement

All the reference from the data included in this study are reported in the article or in the accompany online [Supplementary Materials](#).

Ethics Approval and Informed Consent

This study is a systematic review of existing literature on public health and healthcare resources. No subjects were enrolled in this study. Patients or members of the public were not involved in the development of the research question or choice of outcome measures.

Author Contributions

All authors made a significant contribution to the work reported, whether that is in the conception, study design, execution, acquisition of data, analysis and interpretation, or in all these areas; took part in drafting, revising or critically reviewing the article; gave final approval of the version to be published; have agreed on the journal to which the article has been submitted; and agree to be accountable for all aspects of the work.

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