



Occupational Disease Surveillance: Developing a Periodic Surveillance Report on Occupational Illness

CSTE Occupational Health Subcommittee
October 2023

Financial Disclosure Statement

This report and associated CSTE Occupational Health Subcommittee Spring Meeting was funded through the National Institute for Occupational Safety and Health (NIOSH) and supported by Cooperative Agreement Number U24OH011874-04: Enhancing State and County-based Occupational Safety and Health Surveillance, Collaboration, Education, and Translation to Reduce Worker-Related Injury and Illness.

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Occupational Disease Surveillance – Developing a periodic surveillance report on occupational illness

The Council of State and Territorial Epidemiologists (CSTE) Occupational Health Subcommittee met with the National Institute for Occupational Safety and Health (NIOSH) in Cincinnati, Ohio on April 20-21, 2022 and subsequently prepared this report to take the initial steps to implement Recommendation B in the 2018 National Academies (NAS) report: *A Smarter National Surveillance System for Occupational Safety and Health in the 21st Century*. Recommendation B calls on NIOSH to work with the state occupational safety and health surveillance programs and across divisions within the agency to develop a methodology and coordinated system for surveillance of both fatal and nonfatal occupational disease using multiple data sources (Appendix 1).

Specifically, the meeting and this document addresses the NAS sub-recommendation that NIOSH “combine information from the existing focused occupational disease surveillance systems (e.g., Adult Blood Lead and Epidemiology Surveillance (ABLES), pesticide illness, silicosis surveillance, and National Occupational Respiratory Mortality System (NORMS) and mesothelioma from cancer registries and other relevant occupational health indicators to provide a more comprehensive annual (or periodic) report on the extent of occupational illness morbidity and mortality that can be released in conjunction with data from the Survey of Occupational Injuries and Illnesses. Methods for extrapolating from available data to generate national estimates should be explored.”

This working meeting brought together a group of state and NIOSH colleagues to propose a model approach to developing a periodic national report that summarizes findings from existing occupational disease surveillance systems/data sources. Health outcomes to be included were selected based on the severity of the condition, frequency of occurrence and the availability of surveillance data. The health conditions selected for inclusion are listed below. By developing an approach for these initial conditions, we have identified and addressed challenges in generating national estimates and synthesizing data across multiple systems. The suggested approach can also be used by states to generate similar reports at the state level, although for certain conditions (e.g. hearing difficulty and pneumoconiosis) the data is only available at the national level. Through this process, we also identified critical gaps in occupational disease surveillance and potential recommendations to address these gaps to be considered by the CSTE Occupational Health Subcommittee and NIOSH going forward. Nineteen “How-to Guidance” documents for generating (and interpreting) estimates of incidence, prevalence, mortality, and occupational attributable fraction were developed for eleven health conditions. Measures included depend on both the condition and available data sources. The next steps are for NIOSH to pilot these guidance documents on a national level and for individual states to pilot the documents with state data.

Health Conditions Selected for inclusion in a Periodic National Surveillance Report on Occupational Disease

1. Work-Related Cancer, Nine Selected Diseases – a. Incidence, and b. Mortality:
Mesothelioma, Lung and bronchus, Leukemia, Melanoma of the skin, Laryngeal,
Sino nasal, Urinary bladder, Kidney/Renal pelvis, and Liver
2. Elevated Blood Lead Levels among Adults – Prevalence and incidence
3. Hearing Difficulty among Workers - Prevalence
4. Work-Related Heat-Related Illness – a. Incidence, and b. Mortality
5. Work-Related Tuberculosis among Healthcare Workers - Incidence
6. Asbestosis – a. Prevalence, and b. Mortality
7. Coal Workers' Pneumoconiosis – a. Prevalence, and b. Mortality
8. Silicosis – a. Prevalence, and b. Mortality
9. Work-Related Asthma – a. Incidence, and b. Mortality
10. Work-Related Chronic Obstructive Pulmonary Disease (COPD) – a. Prevalence, and
b. Mortality
11. Acute work-related pesticide-associated illnesses and injuries - Incidence

The individuals involved with this effort and their email addresses are shown in **Appendix II: Workgroup Contributors**.

The “How-To-Guidance” for each of the eleven conditions follow.

1a. Incidence of Selected Work-Related Cancers	
Rationale (for including this condition in occupational disease report):	Exposure to carcinogens occur in a wide range of workplaces. More timely national estimates of the incidence of occupational cancers are needed to monitor burden, establish research and intervention priorities, and evaluate the progress and effectiveness of prevention efforts. Cancer sites included here are those with well-established occupational causes and for which estimates of the proportion of the workforce exposed to carcinogens found to be associated with these cancers are available.
Population at Risk (include age and if whole U.S. population or limited to current or ever worked):	US adults ≥ 30 years.
Data Sources:	National Cancer Registry Program, available via CDC Wonder https://wonder.cdc.gov/cancer.html Occupational attributable fractions (OAFs) for selected cancer sites (Groenewold M, Brown L, Smith E, Haring Sweeney M, Pana-Cryan R, Schnorr T. Burden of occupational morbidity from selected causes in the United States overall and by NORA industry sector, 2012: A conservative estimate. Am J Ind Med 2019; 62: 1117-1134.) U.S. Population Estimates from the American Community Survey
Case Definition:	Newly diagnosed cases of cancer at selected cancer sites, among resident adults ≥ 30 years, attributed to occupational exposure: mesothelioma (C45), cancers of the lung and bronchus (C34), leukemia (C91-95), melanoma of the skin (C43), laryngeal cancer (C32), sino nasal cancer (C30-31, C11), urinary bladder cancer (C67), kidney and renal pelvis cancer (C64-65), liver cancer (C22.7) obtained from the national cancer registry.
Determination of Work-Relatedness:	The estimated annual count and rate rely on assumptions embedded in the OAF method (Groenewold et. al. 2019) rather than direct attribution of individual cancer cases to occupational causes.
Measures of Burden:	Case counts: Estimated annual count, presented as a range, of new cancers due to occupational exposures for each of the selected cancer sites and all sites combined. Incidence rate: Estimated annual incidence rate of cancer per 100,000 due to occupational exposure for each of the selected cancer sites and all sites combined. Attributable Fraction: The percent of selected cancers and all sites combined attributed to occupation.
Rate Denominator:	US population ≥ 30 years American Community Survey).

Time Period:	Calendar year
Data Available to Assess Burden by Industry/Occupation:	Industry and occupation data for cancer cases not available
Data Available to Assess Inequities:	Analysis by race/ethnicity not feasible with currently available information.
Limitations:	Cancer cases are not directly attributed to occupational causes, rather occupational attribution is estimated via the OAF method (Groenewold et al. 2019). This method uses estimates of workers exposed to specific known carcinogens; these estimates may be underestimates if other workplace exposures, not accounted for in the occupational attributable fraction method, also cause these cancers. This method uses estimates of workers exposed to specific carcinogens based on data primarily from Canada and Europe, and assumes the estimates are representative of the current US population. Many of these estimates are from years ago. The methodology used to calculate the occupational attributable fractions relies on updated periodic literature review in order to incorporate estimates of relative risk based on updated research. The methodology used to calculate the occupational attributable fractions does not support estimation of rates stratified by race, gender, age, etc. The selected cancer sites included are limited to nine sites with well-established occupational causes/exposures. Other sites without well-established causes for which there is scientific evidence of work-relatedness e.g., brain cancer, breast cancer are not included, which will result in underestimation of the burden. No information on exposures or specific tasks performed at work are available.
Recommendations for Working with the Data:	Update literature review periodically to generate updated estimate of relative risks.
Recommendations to Improve Assessing Disease Burden:	Consider new sites for inclusion (e.g., breast cancer) as research findings becomes available. Rate calculations by race and ethnicity, gender, etc. are needed to contribute to documentation of inequities in occupational risk by demographic characteristics. These are not possible with existing occupational attributable fraction data. However, more generally, estimates of occupational cancer can contribute to raising awareness of the hazards of work in jobs exposed to carcinogens, which are frequently borne disproportionately by racial and ethnic minorities. Improvement in the collection of industry and occupation (I/O) and future availability of I/O data for cancer cases could allow for estimating the burden (count) of occupational cancers by industry and occupation and also help elucidate disparities.

1b. Mortality of Selected Work-Related Cancers	
Rationale (for including this condition in occupational disease report):	Exposure to carcinogens occur in a wide range of workplaces. More timely national estimates of mortality from occupational cancers are needed to monitor burden, establish research and intervention priorities, and evaluate the effects of changes in workplace exposures. Cancer sites included here are those with well-established occupational causes and for which estimates of the proportion of workforce exposed to carcinogens found to be associated with these cancers are available.
Population at Risk (include age and if whole U.S. population or limited to current or ever worked):	US adults ≥ 30 years.
Data Sources:	NCHS Underlying Cause of Death data, available via CDC Wonder https://wonder.cdc.gov/cancer.html Occupational attributable fractions (OAFs) for selected cancer sites (Groenewold M, Brown L, Smith E, Haring Sweeney M, Pana-Cryan R, Schnorr T. Burden of occupational morbidity from selected causes in the United States overall and by NORA industry sector, 2012: A conservative estimate. Am J Ind Med 2019; 62: 1117-1134.) U.S. Population Estimates from the American Community Survey
Case Definition:	Death from select cancers, among individuals ≥ 30 years, attributed to occupational exposure: mesothelioma (C45), cancers of the lung and bronchus (C34), leukemia (C91-95), melanoma of the skin (C43), laryngeal cancer (C32), sino nasal cancer (C30-31, C11), urinary bladder cancer (C67), kidney and renal pelvis cancer (C64-65), liver cancer (C22.7).
Determination of Work-Relatedness:	The estimated annual count and rate rely on assumptions of work relatedness embedded in the OAF method (Groenewold et. al. 2019) rather than direct attribution of individual cancer cases to occupational causes.
Measures of Burden:	Estimated annual count of deaths, presented as a range of estimates, due to occupational exposures for each of the selected cancer sites and all sites combined. Estimated annual mortality rate of cancer due to occupational exposure for each of the selected sites and all sites combined
Rate Denominator:	All US population ≥ 30 years (American Community Survey).
Time Period:	Calendar year (latest year available)

Data Available to Assess Burden by Industry/Occupation:	Industry and occupation data for cancer deaths not currently available.
Data Available to Assess Inequities:	Analysis by race/ethnicity not feasible with currently available information.
Limitations:	Cancer deaths are not directly attributed to occupational causes. Occupational attribution is estimated via OAF method (Groenewold et al. 2019) This method uses estimates of workers exposed to specific known carcinogens; these estimates may be underestimates if other workplace exposures, not accounted for in the OAF method, also cause these cancers. This method uses estimates of workers exposed to specific carcinogens based on data primarily from Canada and Europe. The OAF approach assumes the estimates are representative of the current US population. This method uses estimates, many of which are from a number of years ago. OAF methodology relies on updated periodic literature review in order to incorporate most updated research. OAF methodology does not support estimation of rates stratified by race, gender, age, etc. The selected cancer sites included are limited to sites with well-established occupational causes/exposures. Some other sites without well-established causes for which there is scientific evidence of work-relatedness e.g., brain cancer, breast cancer – are not included – which will result in underestimation of the burden. No information on exposures or specific tasks performed at work are available.
Recommendations for Working with the Data:	Update literature review periodically to generate updated estimate of RRs.
Recommendations to Improve Assessing Disease Burden:	New sites should be considered for inclusion (e.g., breast cancer) as research findings becomes available. Rate calculations by race and ethnicity, gender etc. are needed to contribute to documentation of inequities in occupational risk by demographic characteristics. This is not possible with existing OAF data. However, more generally, estimates of occupational cancer can contribute to raising awareness of the hazards of work in jobs exposed to carcinogens, which are frequently borne disproportionately by racial and ethnic minorities. Future availability of I/O data for cancer deaths would allow for estimating the burden (count) of occupational cancers by industry and occupation and also help elucidate disparities. Include industry and occupation information in CDC WONDER query system.

2. Elevated Blood Lead Levels among Adults	
Rationale (for including this condition in occupational disease report):	Exposure to lead is preventable. The geometric mean blood lead level (BLL) for the general US adult population is less than 1 µg/dL and only 2.5% of adults have BLLs ≥3.5 µg/dL. Occupational lead exposure, with blood leads allowed up to 60 µg/dL, continues to be an important health hazard to workers in specific jobs in construction, manufacturing, mining, and firearm related activities.
Population at risk (include age and if whole U.S. population or limited to current or ever worked):	US adults ≥ 16 years
Data Sources:	Reports of elevated BLLs from clinical laboratories reported to state Lead Registries and reported to the CDC Adult Blood Lead Epidemiology and Surveillance Program (ABLES)
Case Definition:	All reported state residents ≥16 years, with blood lead level of: 1. ≥ 5 µg/dL, 2. ≥ 10 µg/dL 3. ≥ 25 µg/dL 4. ≥ 40 µg/dL
Determination of Work-Relatedness:	Approximately 80% of elevated BLLs among persons over 16 years of age are work-related.
Measures of Burden:	Case counts: Number of residents ≥16 years with elevated BLLs (prevalent cases) and number of incident cases of residents ≥16 years with elevated BLLs. Incidence and Prevalence rates: Reported number of prevalent and incident cases ≥16 years per 100,000 employed persons. Attributable fraction: 80% of elevated BLLs reported.
Rate Denominator:	Employed population ≥16 years from Current Population Survey – Geographic Profile of Employment and Unemployment.
Time Period:	Calendar year
Data Available to Assess Burden by Industry/Occupation:	States have varying resources to determine if an elevated BLL is from a work exposure and the occupation and industry of the case.
Data Available to Assess Health Inequities:	Generally, data on race and ethnicity are missing
Limitations:	Laboratory reporting of BLLs for adults does not occur in all 50 states, the number of states participating has varied over time. Thirty-eight states currently compile BBL data, although different states require labs to report different BLLs. So, the numbers compiled are incomplete.

	Additional reasons this indicator underestimates the true burden of lead exposure: - Reports from laboratories are incomplete. - Not all employers offer BLL testing to employees, even if employees are exposed to lead. BLLs reflect the contributions of acute external exposure to lead as well as the release of internal bone lead stores into the blood. For persons without significant lead body burden, a BLL is a good indicator of recent (preceding 3-5 weeks) external lead exposure. Approximately 10-20% of elevated adult BLLs come from non-occupational exposures. No information on exposure to lead or specific tasks performed at work are available.
Recommendations for Working with the Data:	Use reports from states that have reporting of elevated BLLs to impute values for the non-participating states, so as to estimate the burden in all 50 states. Since not all workers are exposed to lead, calculating industry-specific rates for lead using industries will provide a better estimate of risk in different industries and will provide more reliable imputation of data from states that do not provide BLLs.
Recommendations to Improve Assessing Disease Burden:	Provide resources for all states to collect and report clinical laboratory reports of elevated BLLs among persons ≥ 16 years

3. Prevalence of Hearing Difficulty among Workers	
Rationale (for including this condition in occupational disease report):	Occupational hearing loss is preventable but is often not recognized. It can have adverse effects on the worker, including difficulty hearing speech and warning signals, increased risk for injury, and social isolation. Hearing loss is also associated with cognitive (mental) decline and cardiovascular disease.
Population at Risk (include age and if whole U.S. population or limited to current or ever worked):	Currently employed U.S. workers ≥ 18 years.
Data Sources:	National Health Interview Survey Adult Sample 2014
Case Definition:	Adults employed in the last 12 months who did not report excellent or good hearing.
Determination of Work-Relatedness	Statistical calculation based on self-reported hearing difficulty and self-reported exposure to loud or very loud noise at work.
Measures of Burden:	Case Counts: Estimated number of workers employed in the last 12 months reporting hearing difficulty. Prevalence: Percent of workers employed in the last 12 months reporting hearing difficulty among all workers employed in the last 12 months. Attributable Fraction: Calculated based on the risk of hearing difficulty among workers reporting exposure to loud/very loud noise at work vs. among workers not reporting exposure to loud/very loud noise at work..
Rate Denominator:	All adults employed in the last 12 months who answered the self-reported hearing ability question
Time Period:	Calendar year
Data Available to Assess Burden by Industry/Occupation:	Occupation/Industry data are self-reported by survey respondents
Data Available to Assess Health Inequities:	Race and ethnicity data are available.
Limitations:	The measures of burden are both an over and an underestimate: only a portion of hearing difficulty among workers is work-related; and the calculated attributable fraction is not the total percent of hearing difficulty possibly attributable to work, as it does not include hearing difficulty caused or exacerbated by ototoxic chemical exposures. While this is a representative sample of the U.S. non-institutionalized population, it may not be completely representative of each industry and occupation group, and does not include active duty service members, prisoners, and those living in group homes.

	Self-report may underestimate hearing loss (individuals sometimes under-report hearing difficulty, especially when the hearing loss primarily affects the higher frequencies or is mild). Calculating this estimate requires a hearing supplement in the NHIS, which are periodic and there may be several years between available supplements. These supplements must be timed with NHIS coding industry and occupation. However, most hearing loss develops gradually over time and the overall prevalence estimate is quite stable and changes very slowly. Noise exposure is self-reported. No noise exposure measurements are available.
Recommendations for Working with the Data:	The NHIS uses a complex sampling strategy, and it is important that the proper weights as specified on the NHIS website are incorporated before any generalization of results can be made beyond the study sample. It is also critical that the relative standard error be calculated and reviewed to ensure the stability of each estimate.
Recommendations to Improve Assessing Disease Burden:	The NHIS should re-introduce the question assessing un-aided hearing ability (which identifies difficulty) into the annual core survey. NHIS should also include key questions on tinnitus, occupational noise exposure, exposure to workplace ototoxicants, and the use of hearing protection into the annual core survey. In the absence of introducing the above questions into the annual core survey, funds should be allocated to fund regular hearing supplements in the NHIS. Since the NHIS is not structured in a way to allow for state-specific estimates, interested states should sponsor hearing-related questions in the Behavioral Risk Factor Surveillance System (BRFSS). States who wish to compare their state-specific prevalence to the national estimate should use the validated question used in the NHIS.

4a. Incidence of Acute Work-Related Heat Illness	
Rationale (for including this condition in occupational disease report):	Work-Related heat illness is preventable. Tracking occupational heat illness using emergency department and inpatient hospitalization data helps establish a baseline for epidemiologists to understand the magnitude of the burden of heat illness among workers and to support prevention measures.
Population at risk (include age and if whole U.S. population or limited to current or ever worked):	Currently employed U.S. adults ≥ 16 years.
Data Sources:	Nationwide Emergency Department Sample (NEDS) National Hospital Discharge Survey (NHDS)
Case Definition:	Emergency department (ED) visits or hospital discharges for persons ≥ 16 years with a primary or contributing diagnosis of heat-related illness (ED visits resulting in hospitalization are recorded at the highest level of care)
Determination of Work-Relatedness:	Insurance payer workers' compensation and/or work-related E-code.
Measures of Burden:	Case counts: Number of ED visits and hospital for discharges of work-related heat-illness for persons ≥ 16 years. Incidence rate: Number of ED visits and hospital discharges of work-related heat-illness per 100,000 employed persons ≥ 16 years Attributable fraction: Percent of work-related heat-illness ED visits and hospitalizations among all heat-illness ED visits and hospitalizations among individuals ≥ 16 years.
Rate Denominator:	Employed population ≥ 16 years from Current Population Survey – Geographic Profile of Employment and Unemployment.
Time Period:	Calendar year
Data Available to Assess Burden by Industry/Occupation:	Not available in emergency and hospital data sets.

Data Available to Assess Health Inequities:	Race and ethnicity data are available
Limitations:	This indicator likely underestimates the burden of work-related heat illness. First, non-residents of states, or cases with unknown residence are not counted, even if their heat illness occurred while working in the state where care was sought. Patients of unknown age are not counted. Additionally, attribution of payer in ED visit or hospital discharge records may not be accurate. Work-related encounters may not be recognized as such if workers' compensation is not listed as the intended payer at the time of the visit. The majority of individuals with work-related illnesses and injuries do not file for workers' compensation, and the self-employed, contractors and gig workers are not eligible for workers' compensation. This indicator uses ICD-10 CM external cause of injury codes as a supplement to workers' compensation to identify additional work-related cases. However, the effectiveness of external cause codes for identifying work-relatedness is not well established and will vary by code usage within each medical facility. No information on exposure to heat or specific tasks performed at work are available. Assessing health equity is highly dependent on the quality of the race and ethnicity data which can vary at the state and local levels.
Recommendations for Working with the Data:	
Recommendations to Improve Assessing Disease Burden:	

4b. Work-Related Heat-Related Mortality	
Rationale (for including this condition in occupational disease report):	Occupational heat-related mortality is preventable but epidemiological data is not routinely available. Understanding the magnitude of the burden of heat-related deaths among workers will identify and support prevention measures.
Population at Risk (include age and if whole U.S. population or limited to current or ever worked):	Employed US residents ≥ 16 years.
Data Sources:	Bureau of Labor Statistics Census of Fatal Occupational Injuries (CFOI). Number of death certificates with a work-related E-code for a heat-related death.
Case Definition:	A workplace fatality due to heat related illness, includes Deaths identified in CFOI with a primary or contributing cause of heat-related death, or a work-related E-code from hospitalization or ED data.
Measures of Burden:	Case counts: Number of occupational heat-related deaths Mortality rate: Number of occupational heat-related deaths per 100,000 employed persons ≥ 16 years. Attributable fraction: Percent of work-related heat-related deaths among all heat-related deaths.
Rate Denominator:	Employed residents ≥ 16 years from Current Population Survey
Time Period:	Calendar year
Data Available to Assess Burden by Industry/Occupation:	Data on industry and occupation is available in the CFOI database.
Data Available to Assess Health Inequities:	Race and ethnicity data are available in the CFOI database.

Limitations:	This indicator likely underestimates the burden of occupational heat related deaths for several reasons. Work-related encounters may not be recognized as such if the usual occupation or industry listed is not the current occupation or industry which caused the death. For death certificates, the effectiveness of ICD-10 CM external cause codes for identifying work-relatedness is not well established and will vary by code usage within each medical facility. No information on exposure to heat or specific tasks performed at work are available.
Recommendations for Working with the Data:	Calculate the attributable fraction for each racial group and by ethnicity.
Recommendations to Improve Assessing Disease Burden:	Creation of an ICD code for occupational heat-related injury, illness, or syndrome. Include industry and occupation information in CDC WONDER query system.

5. Incidence of Work-Related Tuberculosis among Healthcare Workers	
Rationale (for including this condition in occupational disease report):	Workers in the healthcare industry are at risk of developing Tuberculosis (TB) from exposure to patients with active TB. There is the potential for exposure to TB in other industries and occupations, such as among correction officers or workers in homeless shelters but these workers are not included in this estimate.
Population at risk (include age and if whole U.S. population or limited to current or ever worked):	Healthcare workers Workers in the healthcare industry (e.g., hospitals, long term care, clinics) Workers in healthcare occupations in non-healthcare industries (e.g., school nurses)
Data Sources:	CDC TB surveillance data from the annual surveillance reports https://www.cdc.gov/tb/statistics/reports/2020/table43.htm
Case Definition:	New cases of TB identified as occupational.
Determination of Work-relatedness:	Exposure identified as “occupational”
Measures of Burden:	Case counts: Estimated number new cases of occupational TB Incidence rate: Estimated rate of healthcare workers with TB with a risk behavior/exposure identified as “occupational” per 100,000 workers. Attributable fraction: Percent of total number of TB cases identified as occupational.
Rate Denominator:	Incidence rates: Current Population Survey (CPS) data on healthcare workers.
Time Period:	Five-year period (calendar years)
Data Available to Assess Burden by Industry/Occupation:	A determination that a case is occupational is included in the CDC’s TB surveillance reports. https://www.cdc.gov/tb/statistics/reports/2020/table43.htm
Data available to Assess Health Inequities:	Race and ethnicity data are available in the CDC TB surveillance system.
Limitations:	The proportion of cases with information on occupational exposure is the same for those where the information is missing Although a case may have a health care occupation, it is possible exposure occurred unrelated to work since typically full investigations are not conducted to link the disease to a known workplace exposure incident. There is likely an undercount of occupationally acquired TB, because the surveillance system relies on self-report and inclusion of occupation information during the epidemiological investigation. Often information about industry/occupation is not collected during the investigation for each case. Sometimes the question “Are you a healthcare worker ? (Y/N)” is not asked. In many states, TB lab

	results are sent to the state via the electronic lab reporting system. Industry and occupation information is not transmitted with the electronic laboratory reports even if it is collected in the electronic health record. No information on exposure or specific tasks performed at work are available. Data only includes active disease.
Recommendations for Working with the Data:	Keep the following assumptions in mind when interpreting these findings : All occupational TB cases were assumed to occur among healthcare workers in computing rates.. Exposure proportion was assumed to be the same among cases where exposure status was not recorded. Analyses should be performed by race and ethnicity when possible.
Recommendation to Improve Assessing Disease Burden:	Ensure surveillance data systems including Electronic Laboratory Reporting systems can accommodate inclusion of industry and occupation data. Conduct case follow-up and improve collection of risk factor data including industry and occupation data and workplace exposure in TB surveillance systems. Improve reporting to the CDC/Division of Health Quality Promotion to capture work-related cases of TB among healthcare workers. Have healthcare organizations use NHSN to report cases of TB among healthcare workers.

6a Asbestosis Prevalence	
Rationale (for including this condition in occupational disease report):	Asbestos exposure causes asbestosis, a disabling and sometimes fatal lung disease. Despite availability of workplace exposure controls and OSHA standards, asbestosis still occurs. Estimating the burden of asbestosis morbidity can help target prevention activities.
Population at risk (include age and if whole U.S. population or limited to current or ever worked):	U.S. adults aged ≥ 65 years enrolled in fee-for-service (FFS) Medicare (Medicare Parts A&B) (population often restricted to beneficiaries with continuous FFS enrollment since claims are not available for beneficiaries who receive their insurance through Medicare Part C).
Data Sources:	Medicare claims and enrollment information for Medicare beneficiaries aged ≥ 65 years
Case Definitions	Any claim (claims for inpatient, outpatient, skilled nursing facility, hospice, home health services, and durable medical equipment) that included ICD-10-CM code J61 (Pneumoconiosis due to asbestos and other mineral fibers.)
Determination of Work-Relatedness:	Asbestosis is usually a work-related disease.
Measures of Burden:	Case counts: Number of FFS Medicare beneficiaries with a claim including an asbestosis diagnosis code. Prevalence: Number of people with a claim for asbestosis per 100 000 FFS Medicare beneficiaries ≥ 65 years. Attributable fraction: 100%.
Rate Denominator:	FFS Medicare beneficiaries
Time Period:	Calendar year
Data Available to Assess Burden by Industry/Occupation:	Not available
Data Available to Assess Health Inequities:	Rate and ethnicity data are available.
Limitations:	Access to data requires approval and a fee through the Research Data Assistance Center. Sound knowledge of SAS, Medicare claims data organization, (including settings and components of care), and Medicare enrollment organization data are needed to analyze data. No information on exposure to asbestos or specific tasks performed at work are available. Employment history not available. Claims-based case definitions for asbestosis from an administrative dataset are not validated by medical records. Claims data are not

	collected for the purpose of research, rather they are collected for payment and reimbursement purposes. Pleural thickening from asbestos exposure maybe coded as asbestosis. Information on Medicare claims is influenced by CMS payment, reimbursement, and administrative rules along with other factors. Beneficiaries enrolled in managed care programs (Medicare Part C), non-U.S. citizens, and non-permanent legal residents are not included in analyses. Only includes individuals ≥ 65 unless on permanent disability or enrolled due to end-stage renal disease.
Recommendations for Working with the Data:	Multiple case-definitions can be developed to provide a range to potentially address sensitivity and specificity of the case definition. Incidence can also be estimated.
Recommendations to Improve Assessing Disease Burden:	Adoption of case-based surveillance and/or electronic case reporting of asbestosis cases across the U.S.

6b. Asbestosis Mortality	
Rationale (for including this condition in occupational disease report):	Asbestos exposure causes asbestosis, a disabling and sometimes fatal lung disease. Despite availability of workplace exposure controls and OSHA standards, asbestosis still occurs. Estimating the burden of asbestosis mortality can help target prevention activities.
Population at risk (include age and if whole U.S. population or limited to current or ever worked):	U.S. population ≥ 15 years.
Data Sources:	Death Certificates from CDC WONDER with asbestosis listed as the underlying and/or contributing cause of death ICD-10-CM code J61 (Pneumoconiosis due to asbestos and other mineral fibers.)
Case Definitions	All deaths with asbestosis as the underlying and/or contributing cause of death
Determination of Work-Relatedness:	Asbestosis is usually a work-related disease.
Measures of Burden:	Case counts: Number of deaths with asbestosis as the underlying and/or contributing cause of death. Mortality rate: Number of deaths with asbestosis as the underlying and/or contributing cause of death per 1,000,000 persons ≥ 15 years. Attributable fraction: 100%.
Rate Denominator:	General population ≥ 15 years (mid-year pop)(US Census Bureau).
Time Period:	Calendar year
Data Available to Assess Burden by Industry/Occupation:	Not available in CDC WONDER online database query system.
Data Available to Assess Health Inequities:	Race and ethnicity data are available.
Limitations:	No information on exposure to asbestos or specific tasks performed at work are available on death certificates. The state issuing death certificate might not always be the state in which decedent's exposures occurred. Usual industry and occupation data are available only for certain states and certain years in a publicly available file from NCHS. Publicly available file does not include information on decedent's state. Complete lists of all industries and occupations worked during life not available.

	The industries and occupations represent the usual industries and occupations entered on each death certificate, which might not be the industry and occupation in which the decedent's exposure occurred. Undercount or overcount because of the known error with cause of deaths listed on death certificates. Asbestos-related pleural thickening maybe coded as asbestosis.
Recommendations for Working with the Data:	This is one of the few conditions where equity can be assessed, and it is recommended that analyses by race and ethnicity be performed when there is a sufficient number of cases. Analyses by industry and occupation can be done using publicly available files from NCHS (Data Access - Vital Statistics Online (cdc.gov)).
Recommendations to Improve Assessing Disease Burden:	Include industry and occupation information in CDC WONDER query system.

7a. Coal Workers' Pneumoconiosis Prevalence	
Rationale (for including this condition in occupational disease report):	Coal exposure causes Coal Workers' Pneumoconiosis (CWP), a disabling and sometimes fatal lung disease. Despite availability of workplace exposure controls and MSHA standards, CWP still occurs. Estimating the burden of CWP morbidity can help target prevention activities.
Population at risk (include age and if whole U.S. population or limited to current or ever worked):	U.S. adults aged ≥ 65 years enrolled in fee-for-service (FFS) Medicare (Medicare Parts A&B) (population often restricted to beneficiaries with continuous FFS enrollment since claims are not available for beneficiaries who receive their insurance through Medicare Part C).
Data Sources:	Medicare claims and enrollment information for Medicare beneficiaries aged ≥ 65 years
Case Definitions	Any claim (claims for inpatient, outpatient, skilled nursing facility, hospice, home health services, and durable medical equipment) that included ICD-10-CM code J60 (Coal workers' pneumoconiosis)
Determination of Work-Relatedness:	CWP is a work-related disease.
Measures of Burden:	Case counts: Number of FFS Medicare beneficiaries with a claim including a CWP diagnosis code. Prevalence: Number of people with a claim for CWP per 100 000 FFS Medicare beneficiaries ≥ 65 years. Attributable fraction: 100%.
Rate Denominator:	FFS Medicare beneficiaries
Time Period:	Calendar year
Data Available to Assess Burden by Industry/Occupation:	Not available
Data Available to Assess Health Inequities:	Rate and ethnicity data are available.
Limitations:	Access to data requires approval and a fee through the Research Data Assistance Center. Sound knowledge of SAS, Medicare claims data organization (including settings and components of care), and Medicare enrollment organization data are needed to analyze data. No information on exposure to coal or specific tasks performed at work are available. Employment history not available. Claims-based case definitions for CWP from an administrative dataset are not validated by medical records. Claims data are not collected for the purpose of research, rather they are collected for payment and reimbursement purposes.

	Information on Medicare claims is influenced by CMS payment, reimbursement, and administrative rules along with other factors. Beneficiaries enrolled in managed care programs (Medicare Part C), non-U.S. citizens, and non-permanent legal residents are not included in analyses. Only includes individuals ≥ 65 unless on permanent disability or enrolled due to end-stage renal disease.
Recommendations for Working with the Data:	Multiple case-definitions can be developed to minimize bias. Incidence can also be estimated.
Recommendations to Improve Assessing Disease Burden:	Adoption of case-based surveillance and/or electronic case reporting of CWP cases across the U.S.

7b. Coal Workers' Pneumoconiosis Mortality	
Rationale (for including this condition in occupational disease report):	Coal exposure causes coal workers' pneumoconiosis (CWP), a disabling and sometimes fatal lung disease. Despite availability of workplace exposure controls and MSHA standards, CWP still occurs. Estimating the burden of CWP mortality can help target prevention activities.
Population at risk (include age and if whole U.S. population or limited to current or ever worked):	U.S. population ≥ 15 years.
Data Sources:	Death Certificates from CDC WONDER with asbestosis listed as the underlying and/or contributing cause of death ICD-10-CM code J60 (Coal workers' pneumoconiosis)
Case Definitions	All deaths with CWP as the underlying and/or contributing cause of death
Determination of Work-Relatedness:	CWP is a work-related disease.
Measures of Burden:	Case counts: Number of deaths with CWP as the underlying and/or contributing cause of death. Mortality rate: Number of deaths with CWP as the underlying and/or contributing cause of death per 1,000,000 persons ≥ 15 years. Attributable fraction: 100%.
Rate Denominator:	General population ≥ 15 years (mid-year pop) (US Census Bureau).
Time Period:	Calendar year
Data Available to Assess Burden by Industry/Occupation:	Not available in CDC WONDER online database query system.
Data Available to Assess Health Inequities:	Race and ethnicity data are available.
Limitations:	No information on exposure to coal or specific tasks performed at work are available on death certificates. The state issuing death certificate might not always be the state in which decedent's exposures occurred. Usual industry and occupation data are available only for certain states and certain years in a publicly available file from NCHS. Publicly available file does not include information on decedent's state. Complete lists of all industries and occupations worked during life not available.

	The industries and occupations represent the usual industries and occupations entered on each death certificate, which might not be the industry and occupation in which the decedent's exposure occurred. Undercount or overcount because of the known error with cause of deaths listed on death certificates.
Recommendations for Working with the Data:	This is one of the few conditions where equity can be assessed, and it is recommended that analyses by race and ethnicity be performed when there is a sufficient number of cases. Analyses by industry and occupation can be done using publicly available files from NCHS (Data Access - Vital Statistics Online (cdc.gov)).
Recommendations to Improve Assessing Disease Burden:	Include industry and occupation information in CDC WONDER query system.

8a. Silicosis Prevalence	
Rationale (for including this condition in occupational disease report):	Respirable crystalline silica exposure causes silicosis, a disabling and sometimes fatal lung disease. Despite availability of exposure controls and adoption of more stringent silica standards by OSHA, exposure control and medical surveillance for silicosis remain challenging. Estimating the burden of silicosis morbidity can help target prevention activities.
Population at risk (include age and if whole U.S. population or limited to current or ever worked):	U.S. adults aged ≥ 65 years enrolled in fee-for-service (FFS) Medicare (Medicare Parts A&B) (population often restricted to beneficiaries with continuous FFS enrollment since claims are not available for beneficiaries who receive their insurance through Medicare Part C).
Data Sources:	Medicare claims and enrollment information for Medicare beneficiaries aged ≥ 65 years
Case Definitions	Any claim (claims for inpatient, outpatient, skilled nursing facility, hospice, home health services, and durable medical equipment) that included ICD10-CM code J62.8 (Pneumoconiosis due to other dust containing silica).
Determination of Work-Relatedness:	Silicosis is a work-related disease.
Measures of Burden:	Case counts: Number of FFS Medicare beneficiaries with a claim including a silicosis diagnosis code. Prevalence: Number of people with a claim for silicosis per 100 000 FFS Medicare beneficiaries ≥ 65 years. Attributable fraction: 100%.
Rate Denominator:	Fee-for-service Medicare beneficiaries
Time Period:	Calendar year
Data Available to Assess Burden by Industry/Occupation:	Not available
Data Available to Assess Health Inequities:	Rate and ethnicity data are available.
Limitations:	Access to data requires approval and a fee through the Research Data Assistance Center. Sound knowledge of SAS, Medicare claims data organization (including settings and components of care), and Medicare enrollment organization data are needed to analyze data. No information on exposure to crystalline silica or specific tasks performed at work are available. Employment history not available. Claims-based case definitions for silicosis from an administrative dataset are not validated by medical records. Claims data are not

	collected for the purpose of research, rather they are collected for payment and reimbursement purposes. Information on Medicare claims is influenced by CMS payment, reimbursement, and administrative rules along with other factors. Beneficiaries enrolled in managed care programs (Medicare Part C), non-U.S. citizens, non-permanent legal residents are not included in analyses. Only includes individuals ≥ 65 unless on permanent disability or enrolled due to end-stage renal disease.
Recommendations for Working with the Data:	Multiple case-definitions can be developed to minimize bias Incidence can also be estimated.
Recommendations to Improve Assessing Disease Burden:	Adoption of case-based surveillance and/or electronic case reporting of silicosis cases across the U.S.

8b. Silicosis Mortality	
Rationale (for including this condition in occupational disease report):	Respirable crystalline silica exposure causes silicosis, a disabling and sometimes fatal lung disease. Despite availability of exposure controls and adoption of more stringent silica standards by OSHA, exposure control and medical surveillance for silicosis remain challenging. Estimating the burden of silicosis mortality can help target prevention activities.
Population at risk (include age and if whole U.S. population or limited to current or ever worked):	U.S. population ≥ 15 years.
Data Sources:	Death Certificates from CDC WONDER with silicosis listed as the underlying and/or contributing cause of death (ICD-10-CM code J62.8; Pneumoconiosis due to other dust containing silica).
Case Definitions	All deaths with silicosis as the underlying and/or contributing cause of death
Determination of Work-Relatedness:	Silicosis is a work-related disease.
Measures of Burden:	Case counts: Number of deaths with silicosis as the underlying and/or contributing cause of death. Mortality rate: Number of deaths with silicosis as the underlying and/or contributing cause of death per 1,000,000 persons ≥ 15 years. Attributable fraction: 100%.
Rate Denominator:	General population ≥ 15 years (mid-year pop) (US Census Bureau).
Time Period:	Calendar year
Data Available to Assess Burden by Industry/Occupation:	Not available in CDC WONDER online database query system.
Data Available to Assess Health Inequities:	Race and ethnicity data are available.
Limitations:	No information on exposure to crystalline silica or specific tasks performed at work are available on death certificates. The state issuing death certificate might not always be the state in which decedent's exposures occurred. Usual industry and occupation data are available only for certain states and certain years in a publicly available file from NCHS. Publicly available file does not include information on decedent's state. Complete lists of all industries and occupations worked during life not available.

	The industries and occupations represent the usual industries and occupations entered on each death certificate, which might not be the industry and occupation in which the decedent's exposure occurred. Undercount or overcount because of the known error with cause of deaths listed on death certificates.
Recommendations for Working with the Data:	This is one of the few conditions where equity can be assessed, and it is recommended that analyses by race and ethnicity be performed when there is a sufficient number of cases. Analyses by industry and occupation can be done using publicly available files from NCHS (Data Access - Vital Statistics Online (cdc.gov)).
Recommendations to Improve Assessing Disease Burden:	Include industry and occupation information in CDC WONDER query system.

9a. Incidence of Work-Related Asthma	
Rationale (for including this condition in occupational disease report):	Work-related asthma is preventable but often undiagnosed. Work-related asthma can have adverse effects on the worker, including increased morbidity, adverse socioeconomic impacts and difficulty getting and sustaining work. Estimating the incidence of work-related asthma can help target prevention activities.
Population at risk (include age and if whole U.S. population or limited to current or ever worked):	Ever-employed U.S. adults ≥ 18 years.
Data Sources:	Behavioral Risk Factor Surveillance System (BRFSS) (50 states) and Asthma Call-Back Survey, 2006-2019 (30-35 states).
Case Definition:	Ever-employed adults, with current asthma, whose asthma was caused or made worse by exposure(s) at work.
Determination of Work-Relatedness:	Self-Reported by survey respondents.
Measures of Burden	Case counts: Estimated number of ever employed adults with current asthma who report that their asthma was caused or made worse by exposure(s) at work. Incidence rate: Estimated number of adults with current asthma who report asthma caused or made worse by exposure(s) at work per 100,000 ever employed workers with no lifetime asthma and asthma diagnosed in the 12 months prior to the interview. Attributable fraction: Estimated percent of ever-employed adults with current asthma who report that their asthma was caused or made worse by exposures at work.
Rate Denominator:	Ever-employed adults, ≥ 18 years with no lifetime asthma and those with asthma diagnosed in the 12 months prior to the interview.
Time Period:	Calendar year
Data Available to Assess Burden by Industry/Occupation:	Industry and occupation data are limited to those states that implement the BRFSS Industry and Occupation Optional Module each year, 21–30 states (2013–2020).
Data Available to Assess Health Inequities:	Race and ethnicity data are available.
Limitations:	The data represent a population-based estimate of incident work-related asthma and are subject to measurement, nonresponse, and sampling errors. Beginning with the 2011 survey, cellular telephone samples were added to the traditional landline phone samples. The Asthma Call-back Survey also began new weighting methods in 2011 and the

	wording and order of questions changed in 2012, therefore any trend analysis would need to be restricted to 2012 forward. BRFSS also began releasing landline and cell phone combined files (LLCP) in 2015 instead of separate files. The diagnosis of asthma and association with work designation is based on self-reporting and not by review of medical records. Data on industry and occupation are limited to those states that implement the BRFSS Industry and Occupation Optional Module each year. Asthma Call-back Survey data are not collected by all 50 states. No information on exposures or specific tasks performed at work are available.
Recommendations for Working with the Data:	It is recommended that analyses by race and ethnicity be performed when there is a sufficient number of cases. If analysis of the data is done by subgroups, do not first stratify by subgroup and analyze each subgroup separately. Doing so will yield incorrect confidence intervals, standard errors, and tests of significance. Instead, use the whole dataset and then perform a domain analysis, which will result in reliable confidence intervals, standard errors, and tests of statistical significance. Analyses by industry and occupation can be done by merging Asthma Call-back Survey data with BRFSS Industry and Occupation Optional Module data.
Recommendations to Improve Assessing Disease Burden:	Expand Asthma Call-back Survey to all 50 states. Expand collection of Occupation/Industry to all 50 states. Adoption of electronic case-reporting of work-related asthma cases.

9b. Work-Related Asthma Mortality	
Rationale (for including this condition in occupational disease report):	Work-related asthma is preventable but often undiagnosed. Work-related asthma can be fatal. Estimating the burden of work-related asthma mortality can help target prevention activities.
Population at risk (include age and if whole U.S. population or limited to current or ever worked):	U.S. adults ≥ 15 years.
Data Sources:	Death Certificates from CDC WONDER with asthma listed as the underlying and/or contributing cause of death (ICD-10-CM codes J45–J46).
Case Definition:	Attributable fraction of asthma considered work-related based on medical literature rather than direct attribution of individual asthma deaths to occupational causes.
Determination of Work-Relatedness:	Attributable fraction of 16% from the joint 2019 American Thoracic Society (ATS) and European Respiratory Society (ERS) consensus document (Blanc PD, Annesi-Maesano I, Balmes JR, et al. The Occupational Burden of Nonmalignant Respiratory Diseases. An Official American Thoracic Society and European Respiratory Society Statement. Am J Respir Crit Care Med 2019;199:1312-1334.)
Measures of Burden:	Case counts: 16% of the total number of death certificates with underlying and/or contributing cause of death listed as asthma for individuals ≥ 15 years. Mortality rate: Estimated case count of work-related asthma ≥ 15 years per 1,000,000 ever employed adults ≥ 15 years. Attributable fraction: 16% for cases counts, rate and attributable fraction from the joint 2019 ATS and ERS document.
Rate Denominator:	General population ≥ 15 years (mid-year pop).
Time Period:	Calendar year
Data Available to Assess Burden by Industry/Occupation:	Industry and occupation data are not available in CDC WONDER online database query system.
Data Available to Assess Health Inequities:	Although it is possible to perform analyses by race and ethnicity, this is not recommended because of concern about whether the attributable fraction is the same for different race and ethnicity groups.
Limitations:	The data represent a population-based estimate of work-related asthma mortality and are subject to misclassification of cause of death on death certificates. The determination of work-related asthma

	is based on a literature review of the estimated percentage of adult asthma that is work-related and is not based on review of the individual death certificate or medical record. The attributable fraction of work-related asthma for mortality may differ from incidence or prevalence cases. No information on exposure or specific tasks performed at work are available.
Recommendations for Working with the Data:	Subgroup analyses are not recommended, because the attributable fraction was established based on the total adult population and may not be accurate for certain subgroups.
Recommendations to Improve Assessing Disease Burden:	Create an ICD code for work-related asthma. Include industry and occupation information in CDC WONDER query system.

10a. Prevalence of Work-Related COPD	
Rationale(for including this condition in occupational disease report)::	Work-related COPD is preventable but often undiagnosed. Work-related COPD can have adverse effects on the worker, including increased morbidity, adverse socioeconomic impacts and difficulty getting and sustaining work. Estimating the burden of the prevalence of work-related COPD can help target prevention activities.
Population at risk (include age and if whole U.S. population or limited to current or ever worked):	Ever-employed US adults ≥ 45 years.
Data Sources:	Behavioral Risk Factor Surveillance System (BRFSS).
Case Definition:	Attributable fraction of COPD considered work-related based on medical literature rather than direct attribution of individual COPD cases to occupational causes.
Determination of Work-Relatedness:	Attributable fraction of 14% from the 2019 joint American Thoracic Society (ATS) and European Respiratory Society (ERS) consensus document (Blanc PD, Annesi-Maesano I, Balmes JR, et al. The Occupational Burden of Nonmalignant Respiratory Diseases. An Official American Thoracic Society and European Respiratory Society Statement. Am J Respir Crit Care Med 2019;199:1312-1334.)
Measures of Burden:	Case Counts: 14% of the total number of ever employed respondents ≥ 45 years. with COPD. Prevalence rate: Estimated case counts of ever employed respondents ≥ 45 years with work-related COPD per 100,000 ever employed adults ≥ 45 years. Attributable fraction: 14% for case counts, rate and attributable fraction from the 2019 joint ATS and ERS consensus document
Rate Denominator:	Ever employed adults ≥ 45 years.
Time Period:	Calendar year
Data Available to Assess Burden by Industry/Occupation:	Not available
Data Available to Assess Health Inequities:	Race and ethnicity data are available; however, analysis by race and ethnicity is not recommended because of concern about whether the attributable fraction is the same for different race and ethnicity groups.
Limitations:	The data represent a population-based estimate of the prevalence of work-related COPD and are subject to measurement, nonresponse, and sampling errors. Beginning with the 2011 survey, cellular telephone samples were added to the traditional landline phone samples; therefore, any trend analysis would need to be restricted to 2011 forward. BRFSS also began releasing landline and cell phone combined files (LLCP) in

	2015 instead of separate files. COPD designation is based on self-reporting and not by review of medical records. No information on exposure or specific tasks performed at work are available.
Recommendations for Working with the Data:	Subgroup analyses are not recommended, because the attributable fraction was established based on the total adult population and may not be accurate for certain subgroups.
Recommendations to Improve Assessing Disease Burden:	Addition of questions to BRFSS about whether COPD is work-related. Adoption of electronic case-reporting of work-related COPD cases.

10b. Work-Related COPD Mortality	
Rationale (for including this condition in occupational disease report):	Work-related COPD is preventable but often undiagnosed. Work-related COPD can be fatal. Estimating the burden of COPD mortality can help target prevention activities.
Population at risk (include age and if whole U.S. population or limited to current or ever worked):	U.S. adults ≥ 45 years.
Data Sources:	Death Certificates from CDC WONDER with COPD listed as the underlying and/or contributing cause of death (ICD-10-CM codes J40–J44).
Case Definition:	Attributable fraction of COPD considered work-related based on medical literature rather than direct attribution of individual COPD deaths to occupational causes.
Determination of Work-Relatedness:	Attributable fraction of 14% from the 2019 joint American Thoracic Society (ATS) and European Respiratory Society (ERS) consensus document (Blanc PD, Annesi-Maesano I, Balmes JR, et al. The Occupational Burden of Nonmalignant Respiratory Diseases. An Official American Thoracic Society and European Respiratory Society Statement. Am J Respir Crit Care Med 2019;199:1312-1334.)
Measures of Burden:	Case counts: 14% of the total number of death certificates with underlying and/or contributing cause of death listed as COPD for individuals ≥ 45 years. Mortality rate: Estimated case counts of deaths from work-related COPD ≥ 45 years per 1,000,000 ever employed adults ≥ 45 years. Attributable fraction: 14% for case counts, rate and attributable fraction from the 2019 joint ATS and ERS consensus document.
Rate Denominator:	General population ≥ 45 years (mid-year pop).
Time Period:	Calendar year
Data Available to Assess Burden by Industry/Occupation:	Industry and occupation data are not available in CDC WONDER online database query system.
Data Available to Assess Health Inequities:	Although it is possible to perform analyses by race and ethnicity, this is not recommended because of concern about whether the attributable fraction is the same for different race and ethnicity groups.
Limitations:	The data represent a population-based estimate of COPD mortality and are subject to misclassification of the cause of death on death certificates. The determination of work-related COPD is based on a

	literature review of the estimated percentage of COPD that is work-related and is not based on the review of the individual death certificate or medical record. The attributable fraction of work-related COPD for mortality may differ from incidence or prevalence cases. No information on exposure or specific tasks performed at work are available.
Recommendations for Working with the Data:	Subgroup analyses are not recommended, because the attributable fraction was established based on the total adult population and may not be accurate for certain subgroups.
Recommendations to Improve Assessing Disease Burden:	Create an ICD code for work-related COPD. Include industry and occupation information in CDC WONDER query system.

11. Incidence of Acute Work-Related Pesticide-Associated Injuries and Illnesses	
Rationale (for including this condition in occupational disease report):	Workers who work with or around pesticides are at increased risk for acute poisoning. Data on acute poisonings and chemical exposures are useful to target prevention. These data can be consistently obtained from state Poison Control Centers (PCCs). These data are comparable across states due to the uniformity in case handling by PCCs.
Population at risk (include age and if whole U.S. population or limited to current or ever worked):	Employed adults in the U.S. ≥ 16 years
Data Sources:	American Association of Poison Control Centers (AAPCC) data (https://aapcc.org/national-poison-data-system)
Case Definition:	Reported cases of work-related pesticide poisoning that are consistent with the known toxicology of the pesticide product.
Determination of Work-Relatedness:	Recorded in the AAPCC data as being occupational.
Measures of Burden:	Case counts: Number of adults reported with acute pesticide-related injury and illness Incidence rate: Number of reported cases of adults with acute pesticide-related injury and illness per 100,000 employed adults ≥ 16 years. Attributable fraction: Number of adults reported with acute work-related pesticide-related injury and illness among all pesticide poisoning ≥ 16 years
Rate Denominator:	Employed adults ≥ 16 years for the same calendar year (BLS Geographic Profiles of Employment and Unemployment) (https://www.bls.gov/opub/geographic-profile/archive.htm)
Time Period:	Calendar year
Data Available to Assess Burden by Industry/Occupation:	Not available
Data Available to Assess Health Inequities:	Not available
Limitations:	PCCs capture only a small proportion of acute occupational pesticide-related illness cases (~10%). PCCs do not systematically collect information on industry and occupation, however, cases associated with occupational exposures can be identified. No information on exposure or specific tasks performed at work are available.

Recommendations for Working with the Data:	Age, sex, pesticide class, and severity-specific counts and rates can be used to better define the pattern of acute occupational pesticide-related injury and illness. Industry and occupation should be analyzed where available
Recommendations to Improve Assessing Disease Burden:	PCCs routinely collect industry and occupation data.

Appendix I: 2018 National Academies (NAS) report: A Smarter National Surveillance System for Occupational Safety and Health in the 21st Century: Recommendation B

“Recommendation B (Chapter 4): NIOSH, working with the state occupational safety and health surveillance programs and across divisions within the agency, should develop a methodology and coordinated system for surveillance of both fatal and nonfatal occupational disease using multiple data sources.

The data should be analyzed, interpreted, and presented regularly in a comprehensive public report. The data sources to be considered should include reporting by audiometric providers, disease registries (such as cancer and chronic renal failure), hospitals, laboratories, physicians, poison control centers, and health surveys as well as appropriate exposure databases. It is important that illness data collected by the states and NIOSH be analyzed and released in a timely manner. The data should be released in conjunction with BLS illness data in a manner that does not delay data released by BLS.

In the near term:

- NIOSH should combine information from the existing focused occupational disease surveillance systems (e.g., ABLES, pesticide illness, silicosis surveillance, and NORMS) and mesothelioma from cancer registries and other relevant occupational health indicators to provide a more comprehensive annual report on the extent of occupational illness morbidity and mortality that can be released in conjunction with information from the SOII. Methods for extrapolating from available data to generate national estimates should be explored.
- To enhance surveillance of occupational lung disease, NIOSH should require all B readers to report all chest radiographs interpreted to be positive for all types of pneumoconiosis.
- Increased collaboration between NIOSH and CDC infectious disease surveillance programs, with improved collection of occupational information will be important to improve documentation of endemic and epidemic infectious disease related to work.

In the longer term:

- Gaps identified in the occupational illness surveillance system will need to be addressed through future developments that may involve
 - o New or modified state regulations, requiring close coordination with the states, many of which have already promulgated reporting regulations.
 - o Inference of occupational disease burden and trends that result from enhanced exposure assessment (Recommendation H, see Chapter 6).
 - o Updating the list of occupational sentinel health events, establishing additional criteria for establishing a link between workplace exposures and common diseases.

Appendix II: Workgroup Contributors

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