**Work-Related Asthma Surveillance   
Massachusetts, 2014 – 2022**

Cases of work-related asthma (WRA) are sentinel health events – that is, an illness, injury, or death that indicates further investigation and intervention may be needed to prevent similar cases.1 The National Institute for Occupational Safety and Health funds Massachusetts to conduct surveillance to identify cases of WRA and describe industries, occupations, and exposures that require attention. For surveillance purposes, a case of WRA is defined as an individual with a health care provider’s diagnosis of asthma and an association between asthma symptoms and work.

**Work-Related Asthma Surveillance Classification**

1. Work-aggravated asthma
2. New-onset asthma
   1. Occupational asthma
   2. Reactive airways dysfunction syndrome (RADS)

WRA can be classified into two main categories:   
1) **Work-aggravated asthma**: Pre-existing asthma worsened by workplace exposures, and   
2) **New-onset asthma**: Newly diagnosed asthma caused by sensitizers or irritants in the workplace. Reactive Airways Dysfunction Syndrome (RADS) is a subset of new-onset asthma distinguished by persistent asthma symptoms caused by a one-time high level irritant exposure.

**Data Sources**

In Massachusetts, all health care providers are required by public health regulations to report confirmed and suspected cases of WRA to the Massachusetts Department of Public Health (DPH). Health care providers (HCPs) are key partners in prevention; timely, detailed HCP reports are a critical source of information about WRA in the state. These reports are further supplemented by other data sources that DPH’s Occupational Health Surveillance Program (OHSP) uses to identify individuals with potential WRA, including statewide emergency department (ED) visit data, workers’ compensation claims, and information from other Massachusetts state and federal agencies.

OHSP staff conduct follow-up telephone interviews with workers with probable WRA to learn more about their job environment and to confirm the association of asthma with work. For select workers that OHSP staff are unable to reach, case confirmation is attempted based on the medical record. Information from interviews and/or medical records is used to identify suspected asthma-causing agents and to inform intervention activities at both an individual worksite level and more broadly.

**Work-Related Asthma Cases at a Glance**

Between January 2014 and October 2022, OHSP identified 493 Massachusetts workers with probable WRA — an average of 62 per year. Of the workers with probable WRA, 275 (55.8%) met the surveillance case definition2 for confirmed WRA. The following are summary findings on the 275 confirmed cases.

Table showing the distribution of confirmed work-related asthma cases by industry among Massachusetts workers from 2014 to 2022.

The Health Care and Social Assistance Industry had 89 cases, which was 32.4% of all confirmed cases. Overall Massachusetts workforce in this industry was 16.1%. Within the Health Care and Social Assistance industry, there were 49 cases in Hospitals, 15 cases in Ambulatory Health Care Services, 13 cases in Nursing and Residential Care Facilities, 10 cases in Social Assistance and 2 cases in all other.

The Manufacturing industry had 30 cases, which was 10.9% of all confirmed cases. Overall Massachusetts workforce in this industry was 9.0%. Within the manufacturing industry, there were 9 cases in food manufacturing, and 21 cases in all other.

The Public Administration industry had 23 cases, which was 8.4% of all confirmed cases. Overall Massachusetts workforce in this industry was 3.8%. Within the public administration industry, there were 8 cases in fire protection, 6 cases in police protection, and 9 cases in all other.

The Transportation and Warehousing industry had 16 cases, which was 5.8% of all confirmed cases. Overall Massachusetts workforce in this industry was 3.5%. Within the transportation and warehousing industry, there were 8 cases in urban transit systems and 8 cases in all other.

The Retail trade industry had 15 cases, which was 5.5% of all confirmed cases. Overall Massachusetts workforce in this industry was 9.9%.

The Accommodation and Food Services industry had 14 cases, which was 5.1% of all confirmed cases. Overall Massachusetts workforce in this industry was 5.8%. Within the accommodation and food services industry, there were 11 cases in food services and drinking places and 3 cases in all other.

All other industries had 88 cases, which was 32.0% of all confirmed cases. Overall Massachusetts workforce for all other industries was 51.9%
**WRA Cases by Data Source**  
There has been a large decline in the number of WRA cases reported by HCPs to DPH over the years, and a significant proportion of cases have instead been identified through supplemental data sources. HCP reports accounted for less than a fifth (17.8%) of probable cases during the seven-year period, while ED data accounted for the majority (62.2%), workers’ compensation data for 19.6%, and collaboration with other Massachusetts state and federal agencies for 0.4%.  
 **WRA Cases by Select Demographics and Workers’ Compensation Status**  
Workers with confirmed WRA had a median age of 45 years and were predominantly female (55.3%) and White, non-Hispanic (70.5%). Of those with information on race/ethnicity, 70.5% were White, non-Hispanic; 14.4% were Hispanic; and 12.7% were Black, non-Hispanic. It is worth noting that 20% of all cases with confirmed WRA had unknown or refused to provide race/ethnicity. It is important to note that overall, Black, non-Hispanic and Hispanic Massachusetts residents consistently had substantially higher age-adjusted rates of asthma-related ED and hospitalization visits than those who were White, non-Hispanic.3-4 There are known racial and ethnic disparities across industries and occupations, in which workers of color most often work in high-risk jobs, but their injuries and illnesses often go unreported.5-7 A majority of workers (63.6%) with confirmed WRA applied for workers’ compensation.  
  
**WRA Cases by Classification Type**  
New-onset asthma accounted for 29.1% of confirmed WRA cases, of which 3.8% were RADS. Work-aggravated asthma accounted for another 26.6% of cases. Notably, 44.7% of confirmed WRA cases had insufficient information to classify them further, the majority of which (82.8%) were from ED data. The high proportion of cases that are unable to be classified highlights the important role that providers play in [recognizing and reporting WRA](https://www.mass.gov/how-to/report-an-occupational-disease-or-injury) due to the timely detail and nature of their reports. **WRA Cases by Industry**  
As shown in **Table 1**, nearly a third (32.4%) of all workers with confirmed WRA were employed in the Health Care and Social Assistance industry sector, mostly in hospitals. Manufacturing accounted for 10.9% of all cases, with cases distributed among many different industries within this sector. Public Administration employed another 8.4% of cases, followed by Transportation and Warehousing (5.8%), Retail Trade (5.5%), and Accommodation and Food Services (5.1%). Comparison with the distribution of the Massachusetts workforce (**Table 1**) suggests that workers in Health Care and Social Assistance, Manufacturing, Public Administration, and Transportation and Warehousing are overrepresented among the confirmed WRA cases. However, given the nature of the case-based surveillance system and the small number of cases identified, it is unknown whether these patterns reflect increased risks or better recognition and reporting of cases in these industries.



**WRA Cases by Occupation  
Table 2** presents the occupation groups of workers with confirmed WRA; example occupations in each group are provided. The largest proportion (24.0%) worked in a broad range of Service occupations. Within Service, over a third (37.9%) worked in Protective Service roles, most frequently law enforcement (48.0%). Nearly a fifth (17.5%) worked in Healthcare Support roles, the majority of whom were nurses (58.6%).

Table showing the distribution of confirmed work-related asthma cases by occupation among Massachusetts workers from 2014 to 2022.

The service occupation group had 66 cases, which was 24.0% of all confirmed cases. Within the service occupation group, protective services had 25 cases, healthcare support had 15 cases, building and grounds cleaning and maintenance had 11 cases, food preparation and serving related had 9 cases, and personal care and service had 6 cases.

The professional and related occupation group had 48 cases, which was 17.5% of all confirmed cases. Within the professional and related occupation group, healthcare practitioners and technical had 29 cases, education, training and library had 8 cases, and all other had 11 cases.

The production occupation group had 26 cases, which was 9.5% of all confirmed cases.

The construction, extraction, maintenance and repair occupation group had 20 cases, which was 7.3% of all confirmed cases.

The office and administrative occupation group had 16 cases, which was 5.8% of all confirmed cases.

The transportation and material moving occupation group had 14 cases, which was 5.1% of all confirmed cases.

The management, business and financial occupation group had 9 cases, which was 3.3% of all confirmed cases.

The sales and related occupation group had 8 cases, which was 2.9% of all confirmed cases.

All other occupation groups had 68 cases, which was 24.7% of all confirmed cases.


**WRA Cases by Type of Exposure**  
Suspected exposures associated with the workers’ breathing problems were identified during interviews or through ED data notes (**Figure 1**). Up to three suspected agents were recorded for each individual. A total of 464 exposures were recorded, with 54.0% of individuals reporting more than one exposure. Worth noting, interviewed workers and/or information from ED medical record notes often did not identify a specific agent of concern (e.g., quaternary ammonium compounds), and instead reported general exposure categories (e.g., cleaning product). The most frequently reported exposures were cleaning/disinfecting products (15.3%) and indoor air pollutants (12.1%). Mineral and inorganic dusts, pyrolysis products, and mold and other microorganisms were also commonly reported. The distribution of WRA classification varied by exposure category (**Figure 1**). Known asthmagens (asthma-causing agents) were identified using criteria developed by the [Association of Occupational and Environmental Clinics](http://www.aoec.org/tools.htm). Reported asthmagens commonly included bleach, mixture of hydrogen peroxide and peroxyacetic acid, diesel exhaust, hydrochloric acid, epoxy resins, formaldehyde, and diisocyanates.

Bar graph showing the top ten most frequently reported exposures among confirmed cases by work-related asthma classification among Massachusetts workers from 2014 to 2022.

Cleaning and disinfecting products comprised of 15.3% of reported exposures, in which 4.7% were classified as work-aggravated asthma, 5.0% were classified as occupational asthma, and 5.6% were confirmed but not classified.

Indoor air pollutants comprised of 12.1% of reported exposures, in which 4.1% were classified as work-aggravated asthma, 5.2% were classified as occupational asthma, and 2.8% were confirmed but not classified.

Mineral and inorganic dusts comprised of 11.4% of reported exposures, in which 3.7% were classified as work-aggravated asthma, 4.7% were classified as occupational asthma, and 3.0% were confirmed but not classified.

Pyrolysis products comprised of 8.4% of reported exposures, in which 2.8% were classified as work-aggravated asthma, 1.7% were classified as occupational asthma, and 3.9% were confirmed but not classified.

Mold and other microorganisms comprised of 7.3% of reported exposures, in which 2.2% were classified as work-aggravated asthma, 3.5% were classified as occupational asthma, and 1.7% were confirmed but not classified.

Physical factors comprised of 6.9% of reported exposures, in which 1.9% were classified as work-aggravated asthma, 1.7% were classified as occupational asthma, and 3.2% were confirmed but not classified.

Miscellaneous chemicals comprised of 6.5% of reported exposures, in which 1.5% were classified as work-aggravated asthma, 2.6% were classified as occupational asthma, and 2.4% were confirmed but not classified.

Ergonomic factors comprised of 5.2% of reported exposures, in which 1.1% were classified as work-aggravated asthma, 0.7% were classified as occupational asthma, and 3.5% were confirmed but not classified.

Plant materials comprised of 4.5% of reported exposures, in which 0.9% were classified as work-aggravated asthma, 1.1% were classified as occupational asthma, and 2.6% were confirmed but not classified.

Acids, bases, and oxidizing agents comprised of 3.7% of reported exposures, in which 1.3% were classified as work-aggravated asthma, 0.9% were classified as occupational asthma, and 1.5% were confirmed but not classified.


**Prevention Efforts are Needed**

Note: Exposures coded according to Association of Occupational and Environmental Clinics criteria. At least one exposure reported for each case: a maximum of three reported per case. All other exposure categories accounted for 18.9% (n=87) of reported exposures.

Work-related asthma is common. Approximately 17% of new-onset adult asthma cases are related to workplace exposures, and regardless of cause, it is estimated 22% to 58% of adults with asthma suffer work-related exacerbations.8 In 2021, an estimated 44.8% of ever-employed MA residents with asthma reported that their asthma had been caused or made worse by exposures at their job.9

It is well recognized that due to under-recognition and under-reporting, only a small proportion of Massachusetts workers with WRA are identified by our surveillance system. Given this, findings from sentinel WRA surveillance may not represent all WRA cases in Massachusetts, particularly among workers of color. Despite this, the leading industries, occupations, and exposures provide important information about where workers are at risk for WRA, and which workplace exposures/conditions need to be addressed. WRA surveillance findings have informed the development of prevention efforts by employers, enforcement agencies, policy makers, and other partners.

**Here are two recent examples of how WRA cases have led to prevention recommendations for external partners:**

* OHSP identified and heightened awareness of new and existing hazards, such as cannabis dust, mold, and cleaning/disinfecting products in the relatively new legalized cannabis (medical and recreational marijuana) industry in MA. We shared this information and recommendations with health care providers:
  + [Death of Cannabis Production Worker Highlights the Under-Recognition of Work-Related Asthma: Healthcare Providers are Key Partners in Prevention](https://www.mass.gov/doc/fall-2023-death-of-cannabis-production-worker-highlight-the-under-recognition-of-work-related-asthma-healthcare-providers-are-key-partners-in-prevention-pdf/download) (Fall 2023 issue of the *Bulletin*)

Cannabis production worker trimming marijuana leaves from dry buds

* OHSP conducted worksite investigations and made referrals to other agencies for worksite follow-up. We collaborated with multiple partners on reducing asthma hazards associated with cleaning, sanitizing, and disinfecting products across industries. We shared this information and recommendations in a webinar to local boards of health and the Massachusetts Facilities Management Association:
  + Cleaning and Disinfecting Products: Resources for Prevention ([slides](https://www.mass.gov/doc/safer-use-of-disinfectants-post-covid-pandemic-presentation/download) / [recorded webinar](https://www.youtube.com/watch?v=96bkEXdXM9g)) (Winter 2024)

**Health Care Providers Play an Important Role in Preventing Work-Related Asthma**

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| **Have a case to report?** Report in one of four ways: | |
| 1. **Online:** Click [here](https://redcap.ehs.mass.gov/redcap/surveys/?s=CE8RFAH4RPRTC8MJ) or scan this QR code:   QR code to report a case to the Department of Public Health | 1. **Phone:** (617) 624-5632   Or [download this form](https://www.mass.gov/doc/occupational-illness-and-injury-reporting-guidelines-and-confidential-reporting-form-for-faxmail-submission/download) and report by:   1. **Fax:** (857) 323-8376 2. **Mail:** DPH Occupational Health Surveillance Program  250 Washington Street, 4th floor, Boston, MA 02108 |

Health care providers are mandated to report suspected cases of WRA or other work-related respiratory disease to the Department of Public Health (DPH) ([105 CMR 300.180](https://www.mass.gov/regulations/105-CMR-30000-reportable-diseases-surveillance-and-isolation-and-quarantine-requirements)). Data presented here serve as a reminder that providers should ask each adult patient with new or worsening asthma about potential associations between symptoms and work and document that information in the medical record.10-11 By documenting information about work and reporting suspected work-related cases to DPH, health care providers play an important role in protecting public health. DPH can use reported cases to describe the burden of WRA, identify emerging respiratory hazards, protect workers, and promote prevention.  
Read more about reporting cases at [www.mass.gov/how-to/report-an-occupational-disease-or-injury](http://www.mass.gov/how-to/report-an-occupational-disease-or-injury)   
Additional information on WRA is available at [www.mass.gov/work-related-asthma](http://www.mass.gov/work-related-asthma)

**References**

1. Rutstein DD, Mullan RJ, Frazier TM, Halperin WE, Melius JM, Sestito JP. Sentinel health events (occupational): a basis for physician recognition and public health surveillance. *Am J Public Health*. 1983;73(9):1054-1062.
2. Jajosky RA, Harrison R, Reinisch F *et al.* Surveillance of Work-Related Asthma in Selected U.S. States Using Surveillance Guidelines for State Health Departments – California, Massachusetts, Michigan, and New Jersey, 1993-1995. *MMWR* *CDC Surveill Summ.* 1999;48(3):1-20.
3. Asthma-Related Emergency Department Visits in Massachusetts. (2022). Massachusetts Department of Public Health. Available at [mass.gov/doc/asthma-related-emergency-department-visits-in-massachusetts-pdf/download](https://www.mass.gov/doc/asthma-related-emergency-department-visits-in-massachusetts-pdf/download)
4. Asthma-Related Hospitalizations in Massachusetts. (2022). Massachusetts Department of Public Health. Available at <https://www.mass.gov/doc/asthma-related-hospitalizations-in-massachusetts-pdf/download>
5. Davis L, Souza K. Reducing Occupational Health Disparities in Massachusetts: From Data to Action. Occupational Health Surveillance Program. Massachusetts Department of Public Health. Available at <https://www.mass.gov/doc/reducing-occupational-health-disparities-in-massachusetts-from-data-to-action/download>
6. Kyung M, Lee SJ, Dancu C, Hong O. Underreporting of workers’ injuries or illnesses and contributing factors: a systematic review. *BMC Public Heath*. 2023;23(558).
7. Henneberger PK, Kreiss K, Rosenman KD, Reilly MJ, Chang YF, Geidenberger CA. An evaluation of the incidence of work-related asthma in the United States. *Int J Occup Environ Health.*1999;5:1-8
8. Epidemiology and Pathophysiology of Work-related Asthma. 2023. The National Institute for Occupational Safety and Health (NIOSH). <https://www.cdc.gov/niosh/topics/asthma/epidemiology-and-pathophysiology.html>. Accessed on 15 March 2024.
9. A Profile of Health among Massachusetts Adults, 2021 Results from the Behavioral Risk Factor Surveillance System. (2023). Office of Data Management and Outcomes Assessment. Massachusetts Department of Public Health. Available at <https://www.mass.gov/doc/a-profile-of-health-among-massachusetts-adults-2021-0/download>
10. Expert Panel Report 3 (EPR-3) Full Report 2007: Guidelines for the Diagnosis and Management of Asthma National Heart, Lung, and Blood Institute. Available at <http://www.nhlbi.nih.gov/guidelines/asthma/asthgdln.htm>
11. Tarlo SM, Balmes J, Balkissoon R, *et al.* Diagnosis and Management of Work-Related Asthma. American College of Chest Physicians Consensus Statement. *Chest Supplement*. 2008;134(3):1S-41S.

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