Prevalence of Asthma, Asthma Attacks, and Emergency Department Visits for Asthma Among Working Adults — National Health Interview Survey, 2011–2016

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In 2010, an estimated 8.2% of U.S. adults had current asthma, and among these persons, 49.1% had had an asthma attack during the past year (1). Workplace exposures can cause asthma in a previously healthy worker or can trigger asthma exacerbations in workers with current asthma (2). To assess the industry- and occupation-specific prevalence of current asthma, asthma attacks, and asthma-related emergency department (ED) visits among working adults, CDC analyzed 2011–2016 National Health Interview Survey (NHIS) data for participants aged ≥18 years who, at the time of the survey, were employed at some time during the 12 months preceding the interview. During 2011–2016, 6.8% of adults (11 million) employed at any time in the past 12 months had current asthma; among those, 44.7% experienced an asthma attack, and 9.9% had an asthma-related ED visit in the previous year. Current asthma prevalence was highest among workers in the health care and social assistance industry (8.8%) and in health care support occupations (8.8%). The increased prevalence of current asthma, asthma attacks, and asthma-related ED visits in certain industries and occupations might indicate increased risks for these health outcomes associated with workplace exposures. These findings might assist health care and public health professionals in identifying workers in industries and occupations with a high prevalence of current asthma, asthma attacks, and asthma-related ED visits who should be evaluated for possible work-related asthma. Guidelines intended to promote effective management of work-related asthma are available (2,3).

The NHIS is an annual survey that collects health information from a nationally representative sample of the noninstitutionalized U.S. civilian population through personal interviews.1 Survey participants were considered to be working in the last 12 months if they reported having a job or business at any time during the past 12 months. For analyses, information on respondents’ current industry (21 major groups/79 detailed industries) and occupation (23 major groups/94 detailed occupations) were used. Industry and occupation information that employed sample adults had during the week before the interview. Additional information on the industry and occupation coding schemes can be found at ftp://ftp.cdc.gov/pub/Health_Statistics/NCHS/Dataset_Documentation/NHIS/2014/srvydesc.pdf.

387 Phosphine Exposure Among Emergency Responders — Amarillo, Texas, January 2017
390 State Medicaid Coverage for Tobacco Cessation Treatments and Barriers to Accessing Treatments — United States, 2015–2017
396 Vital Signs: Containment of Novel Multidrug-Resistant Organisms and Resistance Mechanisms — United States, 2006–2017
402 Notes from the Field: Pharmacy Needs After a Natural Disaster — Puerto Rico, September–October 2017
405 QuickStats

1 Work-related asthma is defined as either occupational asthma (i.e., new-onset asthma caused by factors related to work) or work-exacerbated asthma (i.e., preexisting or concurrent asthma worsened by factors related to work).
2 https://www.cdc.gov/nchs/nhis/quest_data_related_1997_forward.htm.

Continuing Education examination available at https://www.cdc.gov/mmwr/cme/conted_info.html#weekly.
least one asthma attack in the past year, or at least one asthma-related ED visit in the past year were identified by affirmative responses to questions “During the past 12 months, have you had an episode of asthma or an asthma attack?” and “During the past 12 months, have you had to visit an emergency room or urgent care center because of asthma?,” respectively.

Data were weighted to produce nationally representative estimates using sample weights, and variance estimates were calculated to account for the clustered survey design. Estimates with a relative standard error (standard error of the estimate divided by the estimate) ≥30% were not reported. The Rao-Scott chi-square test was used to determine statistically significant differences (p<0.05) between groups. Data were analyzed using statistical software.

During 2011–2016, an estimated (annual average) 160.7 million adults were working at any time during the past 12 months (Table 1), 6.8% (11.0 million) of whom had current asthma. Current asthma prevalence was highest among workers aged 18–24 years (8.5%), females (8.9%), non-Hispanic blacks (8.2%), those with higher than a high school education (7.2%), those categorized as “poor”** (8.7%), those having health insurance (7.1%), and those living in the Northeast (7.6%).

Among workers with current asthma, 44.7% (4.9 million) had at least one asthma attack, and 9.9% (1.1 million) had at least one asthma-related ED visit in the past 12 months (Table 1). The proportion of workers with current asthma who had at least one asthma attack was highest among workers aged 45–64 years (47.4%), females (48.4%), non-Hispanic whites (45.4%), those with higher than a high school education (45.2%), those categorized as poor (49.2%), those with no health insurance (47.5%), and those living in the South (46.1%). The proportion of workers with current asthma who had at least one asthma-related ED visit was highest among workers aged 18–24 years (10.5%), females (11.7%), non-Hispanic blacks (17.6%), those with less than high school education (13.3%), those categorized as poor (17.0%), those with no health insurance (14.5%), and those living in the South (11.3%).

By major industry, current asthma prevalence was highest among workers in the major industry groups of health care and social assistance (8.8%) followed by educational services (8.2%) (Table 2); these groups also had the first and second highest numbers of workers with asthma attacks (860,000 and 602,000, respectively) and asthma-related ED visits (212,000 and 102,000, respectively). The highest prevalence of asthma attacks was among workers with asthma in the transportation and warehousing (51.7%) industries, and the highest prevalence of asthma-related ED visits was among workers in retail trade (12.4%).

By detailed industry sector, current asthma prevalence was highest among workers in electronics and appliance stores (11.9%) (Table 2). Among persons with current asthma, the

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** Poverty index is based on family income and family size using the U.S. Census Bureau's poverty thresholds for the previous calendar year. Persons categorized as “poor” have family incomes <100% of the poverty threshold, “near poor” have family incomes ≥100% to <200% of the poverty threshold, “not poor” have family incomes ≥200% of the poverty threshold. ftp://ftp.cdc.gov/pub/Health_Statistics/NCHS/Dataset_Documentation/NHIS/2016/srvydesc.pdf, https://www.census.gov/data/tables/time-series/demo/income-poverty/historical-poverty-thresholds.html.

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The highest asthma attack prevalence was among workers in wood products manufacturing (57.3%), followed by the plastics and rubber products manufacturing (56.7%), and the highest prevalence of asthma-related ED visits was among workers in private households (22.9%). The highest numbers of asthma attacks (307,000) and asthma-related ED visits (75,000) were among persons working in ambulatory health care services.

By major occupation group, current asthma prevalence was highest among workers in health care support (8.8%), followed by personal care and service (8.6%) occupations (Table 3). Among those with current asthma, the highest prevalence of asthma attacks was among workers in the education, training, and library (51.5%) major occupations; the highest prevalence of asthma-related ED visits was among workers in personal care and service (17.4%) occupations. The highest numbers of workers with asthma attacks (711,000) and asthma-related ED visits (137,000) were in the office and administrative support major occupation.
TABLE 2. Current asthma* prevalence and proportion of adults working at any time in the past 12 months† with current asthma who had at least one asthma attack§ or emergency department (ED) visit for asthma¶ in the past 12 months (annual average), by industry** — National Health Interview Survey, 2011–2016

| Industry | Workers (x 1,000)†† | No. (x 1,000)†† | % (95% CI) | % (95% CI) | % (95% CI) |
|----------|---------------------|----------------|------------|------------|------------|
| Health care and social assistance | 21,270 | 1,878 | 8.8 (8.3–9.4) | 45.8 (42.8–49.1) | 11.3 (9.3–13.2) |
| Ambulatory health care services | 8,135 | 710 | 8.7 (7.9–9.6) | 43.2 (38.2–48.1) | 10.5 (7.4–13.6) |
| Hospitals | 6,693 | 551 | 8.2 (7.3–9.2) | 51.7 (46.0–57.4) | 10.1 (6.6–13.7) |
| Nursing and residential care facilities | 2,978 | 262 | 8.8 (7.4–10.2) | 45.2 (36.0–54.3) | 13.8 (8.0–19.6) |
| Social assistance | 3,463 | 355 | 10.3 (8.8–11.8) | 42.9 (34.5–50.5) | 12.3 (8.1–16.5) |
| Education services | 15,237 | 1,243 | 8.2 (7.5–8.8) | 48.4 (44.5–52.3) | 8.2 (6.0–10.4) |
| Arts, entertainment, and recreation | 3,569 | 287 | 8.1 (6.7–9.4) | 50.0 (40.3–59.7) | — §§ |
| Performing arts, spectator sports, and related | 1,030 | 96 | 9.3 (6.5–12.1) | 47.5 (31.0–64.0) | — |
| Museums, historical sites, and similar institutions | 415 | 30 | 7.2 (3.6–10.7) | — | — |
| Amusement, gambling, and recreation | 2,124 | 162 | 7.6 (5.9–9.4) | 54.2 (41.7–66.6) | — |
| Accommodation and food services | 11,233 | 864 | 7.7 (6.9–8.5) | 40.1 (34.8–45.3) | 11.0 (7.9–14.2) |
| Accommodation | 1,737 | 151 | 8.7 (6.6–10.9) | 51.3 (38.0–64.6) | — |
| Food services and drinking places | 9,496 | 712 | 7.5 (6.7–8.4) | 37.7 (32.2–43.1) | 11.0 (7.5–14.5) |
| Finance and insurance | 7,186 | 539 | 7.5 (6.6–8.5) | 38.3 (32.4–44.2) | 6.0 (3.1–9.0) |
| Monetary authorities — central bank | 2,122 | 140 | 6.6 (5.1–8.1) | 31.9 (20.1–43.7) | — |
| Credit intermediation and related activities | 1,197 | 83 | 6.9 (5.0–8.9) | 46.0 (31.5–60.4) | — |
| Securities, commodity contracts, and other financial investments and related activities | 1,163 | 80 | 6.9 (4.6–9.2) | 34.8 (18.9–50.6) | — |
| Insurance carriers and related activities | 2,704 | 237 | 8.8 (7.1–10.5) | 40.6 (31.3–49.9) | — |
| Retail trade | 16,714 | 1,247 | 7.5 (6.9–8.1) | 46.4 (42.3–50.0) | 12.4 (9.6–15.2) |
| Motor vehicle and parts dealers | 1,807 | 114 | 6.3 (4.7–7.9) | 44.4 (30.3–58.6) | — |
| Furniture and home furnishings stores | 471 | 29 | 6.2 (3.1–9.4) | — | — |
| Electronics and appliance stores | 2,124 | 162 | 7.6 (5.9–9.4) | 54.2 (41.7–66.6) | — |
| Building material and garden equipment and supplies dealers | 1,277 | 77 | 6.0 (4.1–8.0) | 46.6 (30.1–63.1) | — |
| Food and beverage stores | 3,241 | 215 | 6.7 (5.4–7.9) | 45.8 (36.1–55.4) | 14.1 (7.2–21.0) |
| Health and personal care stores | 1,241 | 87 | 7.0 (4.9–9.1) | 47.0 (31.7–62.4) | — |
| Gasoline stations | 608 | 71 | 7.5 (6.7–8.4) | 37.7 (32.2–43.1) | 11.0 (7.5–14.5) |
| Clothing and clothing accessories stores | 1,446 | 103 | 7.3 (5.3–9.2) | 41.7 (29.0–58.4) | — |
| Sporting goods, camera, hobby, book and music stores | 763 | 67 | 10.9 (7.8–13.9) | 44.8 (28.8–60.7) | — |
| General merchandise stores | 3,115 | 237 | 7.6 (6.1–9.2) | 52.8 (43.4–62.2) | 13.1 (6.0–20.1) |
| Miscellaneous store retailers | 1,140 | 102 | 9.0 (6.5–11.5) | 50.4 (35.9–64.9) | — |
| Nonstore retailers and non-specified retail trade | 1,057 | 64 | 6.0 (4.0–8.0) | 45.1 (28.2–61.9) | — |
| Public administration | 7,737 | 569 | 7.4 (6.5–8.2) | 45.6 (39.1–52.1) | 11.6 (6.4–16.7) |
| Information | 3,438 | 228 | 6.6 (5.5–7.8) | 48.8 (39.6–57.9) | 13.1 (6.0–20.1) |
| Publishing industries (except internet) | 702 | 48 | 6.9 (4.0–9.7) | 51.2 (35.3–67.1) | — |
| Motion picture and sound recording industries | 470 | 28 | 6.0 (3.5–8.5) | 38.5 (17.1–60.0) | — |
| Broadcasting and telecommunications | 1,742 | 106 | 6.1 (4.5–7.6) | 49.1 (36.1–62.0) | — |
| Information services and data processing | 524 | 45 | 8.7 (5.3–12.0) | 51.8 (28.4–75.3) | — |
| Professional, scientific, and technical services | 11,399 | 738 | 6.5 (5.8–7.2) | 49.2 (44.2–54.1) | 8.0 (5.2–10.7) |
| Administrative & support and waste management & remediation services | 7,323 | 471 | 6.4 (5.6–7.2) | 46.5 (40.4–52.6) | 11.6 (8.0–15.3) |
| Mining | 960 | 59 | 6.1 (3.9–8.3) | 40.2 (21.6–58.8) | — |
| Oil and gas extraction | 102 | — | — | — | — |
| Mining (except oil and gas) | 211 | — | — | — | — |
| Support activities for mining | 648 | 40 | 6.2 (3.4–9.0) | — | — |
| Other services (except public administration) | 8,024 | 491 | 6.1 (5.4–6.9) | 41.7 (35.3–48.2) | 11.1 (7.4–14.9) |
| Repair and maintenance | 2,287 | 121 | 5.3 (3.8–6.8) | 33.6 (20.5–46.8) | — |
| Personal services (barber shops, beauty salons, nail salons, laundry, funeral homes and cemeteries) | 2,219 | 117 | 5.3 (4.1–6.5) | 37.4 (26.4–48.3) | 16.5 (8.4–24.6) |
| Religious, grantmaking, civic, labor, professional, and similar organizations | 2,486 | 162 | 6.5 (5.3–7.8) | 44.1 (33.8–55.0) | — |
| Private households | 1,032 | 91 | 8.9 (6.3–11.4) | 53.2 (37.6–68.7) | 22.9 (9.6–36.3) |
| Utilities | 1,390 | 82 | 5.9 (4.3–7.6) | 34.9 (20.3–49.4) | — |

See table footnotes on the next page.
### TABLE 2. (Continued) Current asthma* prevalence and proportion of adults working at any time in the past 12 months† with current asthma who had at least one asthma attack§ or emergency department (ED) visit for asthma¶ in the past 12 months (annual average), by industry** — National Health Interview Survey, 2011–2016

| Industry                                      | Workers (x 1,000)†† | No. (x 1,000)†† | Current asthma | Proportion of persons with current asthma who had ≥1 asthma attack in past 12 months | Proportion of persons with current asthma who had ≥1 asthma ED visit in past 12 months |
|-----------------------------------------------|---------------------|-----------------|----------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Transportation and warehousing               | 6,569               | 383             | 5.8 (5.0–6.7) | 51.7 (43.4–60.0)                                                                   | 11.7 (7.7–15.6)                                                                    |
| Transportation (including support activities  | 4,544               | 245             | 5.4 (4.6–6.2) | 55.1 (46.3–64.0)                                                                   | 14.9 (9.7–20.2)                                                                    |
| for transportation)                          |                     |                 |                |                                                                                     |                                                                                     |
| Postal service, couriers, and messengers     | 1,460               | 108             | 7.4 (4.5–10.4) | 44.4 (23.5–65.3)                                                                   |                                                                                     |
| Warehousing and storage                      | 565                 | 30              | 5.3 (2.8–7.8)  | 49.8 (25.1–74.5)                                                                   |                                                                                     |
| Manufacturing                                | 16,067              | 860             | 5.4 (4.9–5.9)  | 40.0 (35.2–44.8)                                                                   | 6.7 (4.6–8.9)                                                                      |
| Food manufacturing                           | 1,954               | 104             | 5.3 (4.1–6.6)  | 33.1 (21.2–45.0)                                                                   |                                                                                     |
| Beverage and tobacco product manufacturing   | 301                 |                 |                |                                                                                     |                                                                                     |
| Textile mills                                | 98                  |                 |                |                                                                                     |                                                                                     |
| Textile product mills                         | 138                 |                 |                |                                                                                     |                                                                                     |
| Apparel manufacturing                        | 299                 | 24              | 8.0 (3.2–12.7) |                                                                                     |                                                                                     |
| Leather and allied product manufacturing     | 28                  |                 |                |                                                                                     |                                                                                     |
| Wood product manufacturing                   | 447                 | 34              | 7.7 (3.2–12.2) | 57.3 (29.5–85.1)                                                                   |                                                                                     |
| Paper manufacturing                          | 434                 | 22              | 5.1 (2.2–7.9)  |                                                                                     |                                                                                     |
| Printing and related support activities      | 613                 | 36              | 5.9 (3.4–8.4)  | 46.2 (24.1–67.9)                                                                   |                                                                                     |
| Petroleum and coal products manufacturing    | 138                 |                 |                |                                                                                     |                                                                                     |
| Chemical manufacturing                       | 1,365               | 59              | 4.3 (3.1–5.6)  | 54.6 (31.5–77.6)                                                                   |                                                                                     |
| Plastics and rubber products manufacturing   | 549                 | 20              | 3.6 (1.6–5.6)  | 56.7 (30.0–83.3)                                                                   |                                                                                     |
| Nonmetallic mineral product manufacturing    | 446                 | 22              | 4.8 (2.1–7.6)  |                                                                                     |                                                                                     |
| Primary metal manufacturing                  | 572                 | 43              | 7.5 (3.5–11.4) |                                                                                     |                                                                                     |
| Fabricated metal product manufacturing       | 1,228               | 55              | 4.5 (2.9–6.0)  | 34.0 (17.9–50.2)                                                                   |                                                                                     |
| Machinery manufacturing                      | 1,437               | 80              | 5.6 (3.8–7.3)  | 47.2 (32.8–61.6)                                                                   |                                                                                     |
| Computer and electronic product manufacturing| 1,316               | 70              | 5.3 (3.9–6.8)  | 44.1 (30.7–57.5)                                                                   |                                                                                     |
| Electrical equipment, appliance, and component manufacturing | 496 | 32 | 6.5 (3.4–9.6) | |                                                                                     |
| Transportation equipment manufacturing       | 2,323               | 131             | 5.6 (4.4–6.9)  | 33.7 (23.1–44.3)                                                                   |                                                                                     |
| Furniture and related product manufacturing  | 483                 | 26              | 5.5 (2.7–8.2)  |                                                                                     |                                                                                     |
| Miscellaneous manufacturing                  | 1,403               | 67              | 4.8 (3.3–6.3)  | 39.5 (23.9–55.1)                                                                   |                                                                                     |
| Real estate and rental and leasing           | 3,054               | 168             | 5.5 (4.3–6.7)  | 45.9 (34.9–56.9)                                                                   | 12.5 (4.4–20.5)                                                                   |
| Real estate                                  | 2,643               | 142             | 5.4 (4.2–6.6)  | 48.7 (37.1–60.3)                                                                   | 14.0 (5.8–22.1)                                                                   |
| Rental and leasing services                  | 295                 | 24              | 8.0 (3.0–11.6) |                                                                                     |                                                                                     |
| Lessor of nonfinancial intangible assets     | 115                 |                 |                |                                                                                     |                                                                                     |
| Agriculture, forestry, fishing, and hunting  | 2,358               | 123             | 5.2 (4.0–6.5)  | 38.8 (27.8–49.9)                                                                   |                                                                                     |
| Crop production                              | 1,210               | 58              | 4.8 (3.2–6.3)  | 41.4 (26.8–56.1)                                                                   |                                                                                     |
| Animal production                            | 680                 | 44              | 6.5 (3.6–9.5)  |                                                                                     |                                                                                     |
| Forestry and logging                         | 171                 |                 |                |                                                                                     |                                                                                     |
| Fishing, hunting, and trapping               | 68                  |                 |                |                                                                                     |                                                                                     |
| Support activities for agriculture and forestry | 228                |                 |                |                                                                                     |                                                                                     |
| Wholesale trade                              | 3,898               | 192             | 4.9 (4.0–5.9)  | 36.7 (27.2–46.2)                                                                   |                                                                                     |
| Merchant wholesalers, durable goods          | 1,898               | 87              | 4.6 (3.1–5.9)  | 36.6 (21.3–51.9)                                                                   |                                                                                     |
| Merchant wholesalers, nondurable goods       | 1,963               | 104             | 5.3 (3.9–6.8)  | 37.3 (25.9–49.7)                                                                   |                                                                                     |
| Non-specified wholesale trade                | 38                  |                 |                |                                                                                     |                                                                                     |
| Construction                                 | 10,234              | 451             | 4.4 (3.8–5.0)  | 41.0 (33.8–48.1)                                                                   | 11.3 (6.8–15.9)                                                                   |
| Management of companies and enterprises      | 111                 |                 |                |                                                                                     |                                                                                     |
| Armed forces                                 | 360                 |                 |                |                                                                                     |                                                                                     |
| Unknown                                      | 2,578               | 83              | 3.2 (2.4–4.1)  | 46.0 (32.3–59.8)                                                                   |                                                                                     |
| **Total**                                    | **160,709**         | **10,972**      | **6.8 (6.7–7.0)** | **44.7 (43.3–46.1)** | **9.9 (9.1–10.7)** |

**Abbreviation:** CI = confidence interval.

* Defined as a “yes” response to the questions “Have you ever been told by a doctor or other health professional that you had asthma?” and “Do you still have asthma?”
† Survey respondents who answered “yes” to the question “Did you have a job or business at any time in the past 12 months?”
§ Defined as a “yes” response to the question “During the past 12 months, have you had an episode of asthma or an asthma attack?”
¶ Defined as a “yes” response to the question “During the past 12 months, have you had to visit an emergency room or urgent care center because of asthma?”
** Industry that employed sample adults were working in during the week prior to their interview. ftp://ftp.cdc.gov/pub/Health_Statistics/NCHS/Dataset_Documentation/NHIS/2014/srvydesc.pdf.
†† Weighted to provide national estimates.
§§ Estimates suppressed because relative standard error for the estimate was ≥30%.
TABLE 3. Current asthma* prevalence and proportion of adults working at any time in the past 12 months† with current asthma who had at least one asthma attack§ or emergency department visit for asthma¶ in the past 12 months (annual average), by occupation** — National Health Interview Survey, 2011–2016

| Occupation                                           | Workers (x 1,000)†† | No. (x 1,000)‡‡ | % (95%CI) | % (95%CI) | % (95%CI) |
|------------------------------------------------------|---------------------|-----------------|-----------|-----------|-----------|
| **Health care support**                               |                     |                 |           |           |           |
| Health care support                                   | 3,754               | 331             | 8.8 (7.6–10.0) | 45.5 (38.4–52.6) | 13.5 (9.1–18.0) |
| Nursing, psychiatric, and home health aides           | 2,211               | 192             | 8.7 (7.1–10.2) | 45.0 (35.9–54.2) | 16.0 (9.7–22.3) |
| Occupational and physical therapist assistants and aids | 107                 | —‡§             | —         | —         | —         |
| Other health care support occupations                 | 1,436               | 135             | 9.4 (7.3–11.5) | 46.1 (35.2–57.1) | —         |
| **Personal care and service**                         |                     |                 |           |           |           |
| Supervisors, personal care and service workers        | 167                 | 14              | 8.1 (3.3–12.9) | —         | —         |
| Animal care and service workers                       | 285                 | 26              | 9.0 (4.0–14.1) | —         | —         |
| **Health care practitioners and technical**           |                     |                 |           |           |           |
| Health diagnosing and treating practitioners          | 5,991               | 534             | 8.9 (7.9–10.0) | 49.4 (43.5–55.4) | 8.6 (5.3–11.8) |
| Health technologists and technicians                  | 2,651               | 209             | 7.9 (6.4–9.3) | 48.8 (39.1–58.3) | 8.6 (3.8–13.4) |
| **Education, training, and library**                  |                     |                 |           |           |           |
| Postsecondary teachers                                | 1,623               | 113             | 6.9 (5.4–8.5) | 38.1 (27.7–48.5) | —         |
| Primary, secondary, and special education school teachers | 6,046           | 525             | 8.7 (7.6–9.8) | 51.7 (45.7–57.7) | 8.5 (4.9–12.2) |
| Other teachers and instructors                        | 1,078               | 82              | 7.7 (5.3–10.1) | 48.3 (32.6–64.0) | —         |
| Librarians, curators, and archivists                 | 324                 | —               | —         | —         | —         |
| Other education, training, and library occupations    | 1,162               | 124             | 10.7 (8.0–13.3) | 64.0 (51.7–76.4) | —         |
| **Arts, design, entertainment, sports, and media**    |                     |                 |           |           |           |
| Art and design workers                                | 1,242               | 108             | 8.7 (6.3–11.1) | 52.0 (36.9–67.0) | —         |
| Entertainers and performers, sports and related workers | 794                 | 64              | 8.0 (5.0–11.0) | —         | —         |
| Media and communication workers                       | 1,134               | 217             | 7.6 (6.5–8.8) | 46.0 (37.5–54.4) | 6.3 (2.8–9.7) |
| Media and communication equipment workers             | 3,181               | 281             | 8.9 (6.7–9.6) | 38.1 (29.3–46.9) | 10.4 (5.3–15.6) |
| **Office and administrative support**                 |                     |                 |           |           |           |
| Supervisors, office and administrative support workers | 1,256               | 112             | 8.9 (6.7–11.2) | 38.3 (25.9–50.8) | —         |
| Communications equipment operators                    | 88                  | —               | —         | —         | —         |
| Financial clerks                                      | 2,926               | 199             | 6.8 (5.6–8.0) | 41.1 (30.7–51.5) | 6.1 (2.6–9.5) |
| Information and record clerks                         | 5,427               | 479             | 8.8 (7.7–10.0) | 41.6 (35.3–47.9) | 8.6 (5.3–11.9) |
| Material recording, scheduling, dispatching, and distributing workers | 3,993           | 282             | 7.1 (5.8–8.4) | 44.6 (33.9–55.2) | 6.8 (3.2–10.3) |
| Secretaries and administrative assistants              | 2,907               | 209             | 7.2 (5.9–8.5) | 46.9 (37.7–56.1) | 11.9 (4.9–18.9) |
| Other office and administrative support workers        | 3,181               | 281             | 8.9 (7.6–10.2) | 54.8 (47.6–62.1) | 11.4 (6.5–16.3) |
| **Food preparation and serving related**              |                     |                 |           |           |           |
| Supervisors, food preparation, and serving workers    | 8,771               | 668             | 7.7 (6.7–8.6) | 40.2 (34.2–46.1) | 10.7 (7.2–14.3) |
| **Community and social services**                     |                     |                 |           |           |           |
| Cooks and food preparation workers                    | 3,317               | 232             | 7.0 (5.7–8.3) | 41.2 (32.1–50.4) | 12.7 (6.3–19.2) |
| Food and beverage serving workers                     | 3,617               | 292             | 8.2 (6.7–9.6) | 38.1 (29.3–46.9) | 10.4 (5.3–15.6) |
| Other food preparation and serving related workers     | 887                 | 65              | 7.4 (5.1–9.7) | 30.4 (15.1–45.7) | —         |
| **Religious workers**                                 | 663                 | 44              | 6.7 (4.2–9.1) | 57.5 (38.0–77.1) | —         |
| Business and financial operations                     | 7,710               | 588             | 7.6 (6.7–8.5) | 41.0 (34.9–47.1) | 9.5 (5.9–13.0) |
| Business operations specialists                        | 4,162               | 319             | 7.7 (6.5–8.8) | 37.9 (30.1–45.7) | 8.8 (4.2–13.3) |
| Financial specialists                                 | 3,548               | 269             | 7.6 (6.2–8.9) | 44.8 (35.8–53.7) | 10.3 (4.9–15.7) |

See table footnotes on page 384.
| Occupation                                      | Workers (x 1,000)†† | No. (x 1,000)†† | % (95%CI) | % (95%CI) | % (95%CI) |
|------------------------------------------------|---------------------|----------------|-----------|-----------|-----------|
| **Legal**                                      |                     |                |           |           |           |
| Lawyers, judges, and related workers           | 1,791               | 136            | 7.6 (5.8–9.4) | 38.6 (27.1–50.1) | —         |
| Legal support workers                          | 1,109               | 97             | 8.7 (6.2–11.3) | 34.6 (20.7–48.5) | —         |
| **Sales and related**                          |                     |                |           |           |           |
| Supervisors, sales workers                     | 3,985               | 234            | 5.9 (4.9–6.9) | 43.7 (34.6–52.8) | —         |
| Retail sales workers                           | 7,364               | 644            | 8.8 (7.8–9.7) | 44.1 (38.4–49.9) | 15.4 (11.2–19.6) |
| Sales representatives, services                | 1,911               | 121            | 6.3 (4.6–8.1) | 34.2 (21.6–46.7) | —         |
| Sales representatives, wholesale and manufacturing | 1,392         | 61             | 4.4 (2.9–5.8) | 41.0 (25.3–56.6) | —         |
| Other sales and related workers                | 1,614               | 92             | 5.7 (4.1–7.3) | 45.3 (31.4–59.3) | —         |
| **Protective service**                         |                     |                |           |           |           |
| First-line supervisors/managers, protective service workers | 3,272            | 232            | 7.1 (5.7–8.5) | 40.4 (30.3–50.4) | —         |
| **Management**                                 |                     |                |           |           |           |
| Chief executives; general and operations managers; legislators | 2,172           | 138            | 6.3 (5.0–7.7) | 36.3 (24.6–48.1) | —         |
| Advertising, marketing, promotions, public relations, and sales managers | 1,068           | 61             | 5.7 (3.8–7.5) | 49.8 (33.8–65.8) | —         |
| Operations specialties managers                | 2,911               | 171            | 5.9 (4.7–7.1) | 38.8 (28.1–49.4) | —         |
| Other management occupations                   | 9,108               | 588            | 6.5 (5.7–7.2) | 51.4 (45.4–57.3) | 7.3 (3.8–10.7) |
| **Architecture and engineering**               |                     |                |           |           |           |
| Architects, surveyors, and cartographers       | 3,301               | 175            | 5.3 (4.2–6.4) | 38.4 (27.9–49.0) | —         |
| **Computer and mathematical**                  |                     |                |           |           |           |
| Computer specialists                           | 4,774               | 276            | 5.8 (4.8–6.8) | 45.9 (37.4–54.3) | —         |
| **Building and grounds cleaning and maintenance** |                 |                |           |           |           |
| Supervisors, building and grounds cleaning and maintenance workers | 6,518           | 364            | 5.6 (4.8–6.4) | 51.0 (43.9–58.1) | 15.1 (10.1–20.1) |
| Building cleaning and pest control workers     | 4,552               | 307            | 6.8 (5.8–7.8) | 51.7 (43.9–59.5) | 16.7 (10.9–22.5) |
| Grounds maintenance workers                    | 1,456               | 28             | 1.9 (1.1–2.7) | 38.9 (16.1–61.8) | —         |
| **Installation, maintenance, and repair**      |                     |                |           |           |           |
| Supervisors of installation, maintenance, and repair workers | 5,513           | 312            | 5.7 (4.7–6.7) | 39.1 (30.2–48.0) | —         |
| **Electrical and electronic equipment mechanics, installers, and repairers** | 681              | 33             | 4.8 (2.8–6.9) | —         | —         |
| Vehicle and mobile equipment mechanics, installers, and repairers | 2,076           | 100            | 4.8 (3.3–6.4) | 28.7 (15.4–42.0) | —         |
| Other installation, maintenance, and repair occupations | 2,441           | 143            | 5.9 (4.3–7.4) | 46.7 (33.8–59.7) | —         |
| **Farming, fishing, and forestry**             |                     |                |           |           |           |
| Supervisors, farming, fishing, and forestry workers | 1,278           | 68             | 5.4 (3.6–7.1) | 43.8 (26.4–61.2) | —         |
| Agricultural workers                           | 1,084               | 67             | 6.2 (4.2–8.2) | 43.5 (25.8–61.1) | —         |
| Fishing and hunting workers                    | 45                  | —              | —         | —         | —         |
| Forest, conservation, and logging workers      | 90                  | —              | —         | —         | —         |

See table footnotes on page 384.
TABLE 3. (Continued) Current asthma* prevalence and proportion of adults working at any time in the past 12 months† with current asthma who had at least one asthma attack§ or emergency department visit for asthma¶ in the past 12 months (annual average), by occupation** — National Health Interview Survey, 2011–2016

| Occupation | Workers (x 1,000)†† | No. (x 1,000)†† | % (95%CI) | % (95%CI) | % (95%CI) |
|------------|-------------------|----------------|----------|----------|----------|
| Transportation and material moving | 9,240 | 494 | 5.4 (4.7–6.1) | 49.3 (42.8–55.8) | 11.6 (8.3–14.9) |
| Supervisors, transportation and material moving workers | 171 | — | — | — | — |
| Air transportation workers | 236 | 17 | 7.0 (3.2–10.8) | 56.7 (29.7–83.7) | — |
| Motor vehicle operators | 4,390 | 211 | 4.8 (4.0–5.7) | 45.1 (36.8–53.5) | 15.5 (9.5–21.5) |
| Rail transportation workers | 100 | — | — | — | — |
| Water transportation workers | 60 | — | — | — | — |
| Other transportation workers | 327 | — | — | — | — |
| Material moving workers | 3,957 | 226 | 5.7 (4.6–6.9) | 48.9 (38.4–59.3) | 9.4 (5.1–13.6) |
| Production | 9,490 | 484 | 5.1 (4.5–5.8) | 36.3 (30.6–42.0) | 10.2 (6.9–13.5) |
| Supervisors, production workers | 821 | 55 | 6.7 (3.9–9.4) | 39.5 (19.0–60.1) | — |
| Assemblers and fabricators | 1,409 | 71 | 5.0 (3.4–6.7) | 37.9 (20.4–55.5) | — |
| Food processing workers | 776 | 43 | 5.6 (3.4–7.7) | 32.7 (15.0–50.3) | — |
| Metal workers and plastic workers | 1,938 | 115 | 5.9 (4.2–7.7) | 30.2 (17.5–42.9) | — |
| Printing workers | 288 | — | — | — | — |
| Textile, apparel, and furnishings workers | 682 | 26 | 3.9 (1.8–5.9) | 37.7 (15.7–59.6) | — |
| Woodworkers | 155 | — | — | — | — |
| Plant and system operators | 274 | — | — | — | — |
| Other production occupations | 3,148 | 132 | 4.2 (3.3–5.1) | 40.8 (30.0–51.6) | — |
| Construction and extraction | 8,139 | 324 | 4.0 (3.4–4.6) | 37.5 (30.3–44.8) | 8.2 (4.6–11.7) |
| Supervisors, construction and extraction workers | 649 | 26 | 4.0 (1.9–6.1) | — | — |
| Construction trades workers | 6,789 | 264 | 3.9 (3.2–4.6) | 35.4 (27.7–43.0) | 8.8 (4.7–12.9) |
| Helpers, construction trades | 59 | — | — | — | — |
| Other construction and related workers | 402 | — | — | — | — |
| Extraction workers | 240 | — | — | — | — |
| Military | 367 | — | — | — | — |
| Refused, not ascertained, don't know | 2,653 | 92 | 3.5 (2.5–4.5) | 36.2 (16.4–59.1) | — |
| Total | 160,672 | 10,957 | 6.8 (6.7–7.0) | 44.7 (43.3–46.1) | 9.9 (9.1–10.7) |

Abbreviation: CI = confidence interval.

* Defined as a "yes" response to the question "Have you ever been told by a doctor or other health professional that you had asthma?" and "Do you still have asthma?"
† Survey respondents who answered "yes" to the question "Did you have a job or business at any time in the past 12 months?"
‡ Defined as a "yes" response to the question "During the past 12 months, have you had an episode of asthma or an asthma attack?"
§ Defined as a "yes" response to the question "During the past 12 months, have you had to visit an emergency room or urgent care center because of asthma?"
** Occupation that employed sample adults had during the week prior to their interview. ftp://ftp.cdc.gov/pub/Health_Statistics/NCHS/Dataset_Documentation/ NHIS/2014/srvydesc.pdf.
†† Weighted to provide national estimates.
 §§ Estimates suppressed because relative standard error for the estimate was ≥30%.

By detailed occupation subgroup, the highest prevalence of current asthma (10.7%) and asthma attack in the past 12 months (64.0%) was among workers in other education, training, and library occupations†† (Table 3). Prevalence of asthma-related ED visits was highest among personal appearance workers§§ (25.0%). The highest number of workers with asthma attacks was among those working in other management occupations¶¶ (302,000), and the highest number of workers with asthma-related ED visits was among retail sales workers (99,000).

† Audio-visual and multimedia collections specialists; farm and home management advisors; instructional coordinators; teacher assistants; miscellaneous education, training, and library workers (25-9000 Other Education, Training, and Library Occupations). https://www.bls.gov/soc/2010/2010_major_groups.htm#25-0000.
‡ Barber; hairdressers, hairstylists and cosmetologists; makeup artists, theatrical and performance; manicurists and pedicurists; shampooers; skin care specialists (39-5000 Personal Appearance Workers). https://www.bls.gov/soc/2010/2010_major_groups.htm#39-0000.
**Summary**

**What is already known about this topic?**

In 2010, an estimated 8.2% of U.S. adults had current asthma; among them, 49.1% reported at least one asthma attack in the past year. Up to 51% of adult asthma might be related to work and could therefore potentially be prevented.

**What is added by this report?**

During 2011–2016, among an estimated 160.7 million working adults, 6.8% had current asthma. Among those with asthma, 44.7% experienced an asthma attack, and 9.9% had an asthma-related emergency department visit in the previous year. The current asthma prevalence was highest among workers employed in the health care and social assistance industry (8.8%) and in health care support occupations (8.8%).

**What are the implications for public health practice?**

This information might assist physicians to identify workers who should be evaluated for possible work-related asthma and could help public health officials identify workplaces where detailed investigations for prevention and control might be appropriate. Guidelines promoting effective management of work-related asthma are available.

**Discussion**

This report provides industry- and occupation-specific prevalence estimates of current asthma, and among those with current asthma, the prevalence of at least one asthma attack and at least one asthma-related ED visit in the past year. The numbers of workers reporting asthma attacks and asthma-related ED visits in specific industries and occupations correlate with the numbers of workers and current asthma prevalence in each group. The increased prevalence of current asthma, asthma attacks, and asthma-related ED visits in certain industries and occupations might indicate increased risks for these health outcomes associated with workplace exposures. The highest prevalence of current asthma was among workers in the health care and social assistance industry and in health care support occupations. New-onset work-related asthma in these workers has been associated with exposure to cleaning and disinfecting products, powdered latex gloves, and aerosolized medications (4). Nearly two thirds of the workers with asthma in the wood products and in the plastics and rubber products manufacturing industries had at least one asthma attack in the past year. Workers in these industries are at increased risk for work-related asthma (5,6), and the high proportion of workers with a history of an asthma attack in this report suggests a high risk for work-related exacerbation of asthma. Education, training, and library workers are also at risk for work-related asthma and adverse health outcomes (7).

NHIS did not collect data on severity of asthma exacerbations and asthma work-relatedness. The subset of patients who experience severe asthma exacerbations have an accelerated decline in lung function, greater health care utilization, and a lower quality of life (3,8). Based on the estimate that approximately 51% of adult asthma might be caused or made worse by work (9), as many as 5.6 million workers might have asthma or asthma outcomes related to work that could be prevented. Physicians should consider work-related asthma in all workers with new-onset or worsening asthma (2,3).

Workplace conditions and exposures associated with asthma include irritant chemicals, dusts, secondhand tobacco smoke, allergens and sensitizers, emotional stress, worksite temperature, and physical exertion (3). A list of asthmarelated agents in the workplace can be facilitated by obtaining safety data sheets.*** Guidelines intended to promote effective management of work-related asthma are available (2,3). The preferred primary strategy to prevent work-related asthma and reduce signs, symptoms, and progression of disease is exposure control (i.e., elimination or substitution of hazardous products, engineering controls, and respiratory protection). However, if these approaches are unsuccessful, removal of the worker from exposure might sometimes be necessary for management of work-related asthma (2,3,10).

The findings in this report are subject to at least four limitations. First, information on asthma, asthma attacks, and asthma-related ED visits was self-reported and not validated by medical records. It is likely that some respondents had misdiagnosed or undiagnosed asthma. Second, no temporal information on asthma onset and exacerbations was available; thus, it was not possible to determine asthma association with work. Third, only workers employed at some time in the past 12 months were included in this study. Those with severe asthma might have left employment in industries and occupations with workplace exposures that exacerbate their asthma; thus, industry and occupation in this report might not accurately identify workers’ industry and occupation where exposures occur. Finally, small sample sizes for some groups resulted in unreliable estimates.

These findings might assist physicians to identify workers who should be evaluated for possible work-related asthma in industries and occupations with a high prevalence of asthma, asthma attacks, and asthma-related ED visits and could help public health officials identify workplaces where detailed investigations for prevention and control might be appropriate. Continued surveillance is important to assess asthma prevalence and trends by respondents’ industry and occupation.

*** https://www.osha.gov/Publications/HazComm_QuickCard_SafetyData.html.
Acknowledgments

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Conflict of Interest

No conflicts of interest were reported.

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