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Asthma in New Jersey

Chapter 2: Work-related Asthma

Work-related asthma (WRA) is a potentially debilitating lung disease with symptoms of chest tightness, cough, shortness of breath, and/or wheezing that develop following exposure to chemicals or other substances at work.¹ Work-related asthma is an increasingly important cause of respiratory impairment and the disease can persist for years, even after cessation of workplace exposures. The primary intervention for WRA is prevention from exposure to the causative agent, either by removal or by effective engineering controls. Identification of WRA can also lead to the recognition of affected coworkers, the identification and correction of inadequate workplace exposure control measures, and the discovery of new causes of WRA.

Work-related asthma includes work-aggravated asthma, which is pre-existing asthma that is exacerbated by occupational exposures. It also involves new-onset cases including two distinctive sub-types. Allergic, or immunologically mediated, asthma develops after a period of exposure to a sensitizing agent while reactive airways dysfunction syndrome (RADS), or irritant-induced asthma, is a non-immunologic type that is typically caused by a single exposure to high levels of an irritating vapor, gas, fume or smoke.

The number of agents that have been shown to cause work-related asthma is large and continually growing. More than 400 substances have been associated with WRA, affecting workers in a variety of industries and occupations,² including

- Chemical dusts or vapors from plasticizers, polyurethane paints, insulation, foam products, and other materials used in manufacturing and processing operations.
- Animal substances such as hair, dander, mites, small insects, and bacterial or protein dusts. Exposed workers at risk include farmers, animal handlers, shepherds, grooms, jockeys, veterinarians, and pet shop and kennel workers.
- Organic dusts such as flour, cereals, grains, coffee dust, tea dust, and papain dust from meat tenderizer. These substances can cause asthma in millers, bakers, and other food processors.
- Metals such as platinum, chromium, and nickel, as well as soldering fumes of exposures of concern in refining and manufacturing operations workers.
- Microbial agents such as mold, fungus, and bacteria found in damp or poorly maintained buildings.
- Latex products and cleaning/disinfection agents used by janitorial workers and others in health-care facilities and office environments.

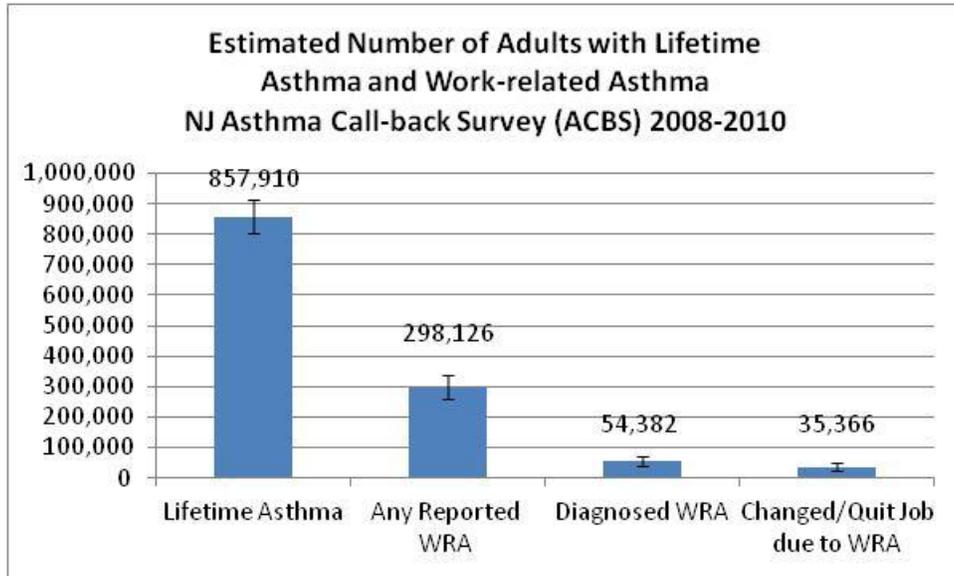
Section 1

New Jersey Asthma Call-back Survey

The New Jersey Department of Health (NJDOH) monitors asthma prevalence using the New Jersey Behavioral Risk Factor Survey (NJBRFS), an ongoing population based telephone survey of non-institutionalized adult residents aged 18 years and older. The NJBRFS represents a geographical subset of the national Behavioral Risk Factor Surveillance System (BRFSS), which was established in 1984 and is currently implemented across all 50 states, the District of Columbia, Puerto Rico, the U.S. Virgin Islands, and Guam where it is being used to monitor and improve the health of residents.³ The Asthma Call-back Survey (ACBS) was later developed by the CDC Air Pollution and Respiratory Health Branch as a comprehensive asthma related extension of the BRFSS. Respondents who report a lifetime asthma history on the BRFSS are then called back in approximately two weeks to complete the ACBS, which was designed to collect detailed information about people living with asthma. In 2008, New Jersey joined 35 other states in administering the ACBS among respondents reporting a lifetime asthma history on the BRFSS. This section describes adults with work-related asthma as derived from the 2008-2010 ACBS surveys.

Combined data from the New Jersey ACBS from 2008 to 2010 suggest that there are nearly 860,000 adults (18 and older) in New Jersey with a lifetime history of asthma—that is, they have been told by a health professional that they have had asthma at some point during their lifetime. Not all of these individuals report having current asthma. As shown in Figure 1 below, almost 300,000 adult New Jersey residents with a lifetime history of asthma report some indicator of work-related asthma (WRA)—that is, asthma caused or exacerbated by a job, having told a health professional or been told by a health professional that asthma was work-related, or having changed or quit a job because of work-related asthma. About 54,000 adult New Jersey residents with a lifetime asthma history have been diagnosed with work-related asthma by a health professional, and about 35,000 have changed or quit a job due to work-related asthma.

Figure 1



Any Reported WRA—respondent reports that their asthma has been caused or aggravated by their current or a previous job and/or respondent has told a health professional or been told by a health professional that their asthma is work-related.

Diagnosed WRA—respondent has been told by a health professional that their asthma is work-related.

Note: 95% Confidence intervals are 803,267-912,553 for lifetime asthma, 258,092-338,160 for any reported work-related asthma, 39,730-69,034 for a WRA diagnosis, and 22,046-48,687 for those who changed or quit a job due to WRA.

Table 1 below shows estimates of the frequency of work-related asthma among all adults with a lifetime asthma history and then separates it by those who report current asthma versus those who have a lifetime asthma history, but do not currently have asthma (former asthma). These estimates are within the range found in existing research, which is five to 35 percent, depending on how work-related asthma is defined.⁴

Table 1						
Estimates of Work-related Asthma among NJ Adults with Lifetime, Current and Former Asthma NJ Asthma Call-back Survey (ACBS) 2008-2010						
	Lifetime Asthma		Current Asthma		Former Asthma	
	Survey n=1,445		Survey n=1,038		Survey n=399	
	Est. N=857,910		Est. N=571,983		Est. N=282,377	
	Percent	95% CI	Percent	95% CI	Percent	95% CI
Asthma Caused by Any Job*	11.5	7.9-15.2	14.7	9.5-19.8	†	
Asthma Made Worse by Current Job**	n/a		17.8	13.6-22.1	n/a	
Asthma Made Worse by Previous Job	21.7	18.1-25.4	25.2	20.4-29.9	14.9	9.4-20.5
Told by a Health Professional that Asthma was Work-Related	6.4	4.6-8.1	7.3	5.1-9.5	†	
Told to a Health Professional that Asthma was Work-Related	7.0	5.3-8.8	8.4	6.1-10.8	4.2	1.9-6.4
Any Reported Work-related Asthma***	36.5	32.3-40.8	45.2	39.8-50.6	19.5	13.5-25.5
Changed or Quit Job because of Work-Related Asthma****	4.1	2.6-5.7	4.1	2.7-5.4	†	

Note—8 respondents (weighted frequency of 3,550) did not know if they still had asthma and were excluded from the current/former analysis.

*Estimates are for 2010 only because the percentage changed over time—for this, the numbers were: Lifetime, n=472, N=885,915; Current, n=351, N=608,341; Former, n=120, N=276,361

**Only asked of those with current asthma.

***This indicator does not include asthma made worse by current job for those without current asthma because this question is not asked of them (see **).

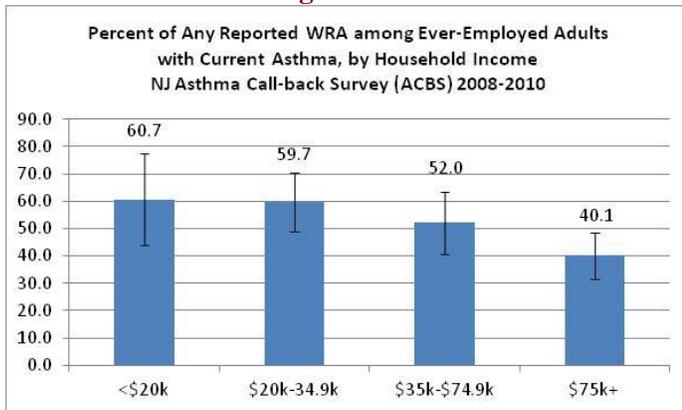
****Only asked of those who reported that their asthma had been caused or made worse by a previous job.

†Standard errors were too large to report estimates.

Demographics

We restricted the analysis to those with current asthma who have ever been employed outside the home and looked for a relationship between work-related asthma and respondent's sex, age, race/ethnicity, but these associations were not significant. Any report of work-related asthma did vary with income and with education—ever-employed adults with current asthma and with higher levels of household income and education had less reported work-related asthma of any kind, as shown in Figures 2a and 2b below. The sample size was insufficient to look at factors associated with work-related asthma as diagnosed by a health professional.

Figure 2a

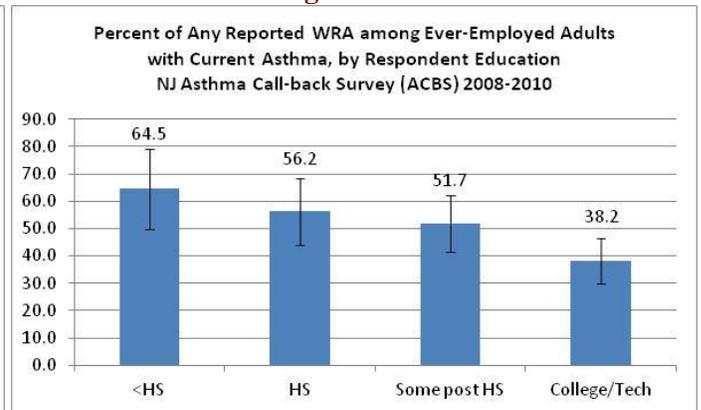


*Rao-Scott Chi Square, $p=.0287$

*Any Reported WRA—respondent reports that their asthma has been caused or aggravated by their current or a previous job and/or respondent has told a health professional or been told by a health professional that their asthma is work-related.

*11% of ever-employed respondents with current asthma reported an unknown income or refused the income question and these respondents are excluded from the analysis.

Figure 2b



*Rao-Scott Chi Square, $p=.0116$

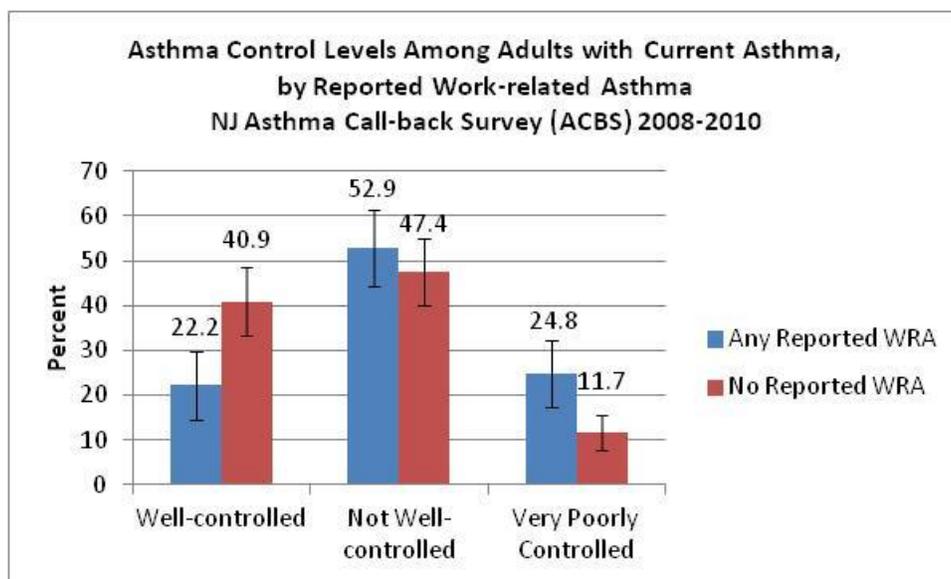
*Any Reported WRA—respondent reports that their asthma has been caused or aggravated by their current or a previous job and/or respondent has told a health professional or been told by a health professional that their asthma is work-related.

Asthma Control

In New Jersey, as in several other states, adults with any type of current, work-related asthma report that their asthma is less well-controlled than do adults with current, non-work-related asthma.⁵ New Jersey adults with current, work-related asthma of any kind are about twice as likely to report very poorly controlled asthma and almost half as likely to report well-controlled asthma as are New Jersey adults with current asthma that is not work-related in any way. Restricting the definition of work-related asthma to only cases diagnosed by a health care professional as work-related leads to a smaller and statistically insignificant difference in the level of control.⁶ Associations found between poor asthma control and WRA should be interpreted with caution. For example, poor asthma control could result from workers being more susceptible to aggravation from workplace exposures or WRA could just be more difficult to control. It is also possible that the observed association is confounded by demographic factors such as education or income levels.

Figure 3 shows levels of asthma control among adults with and without work-related asthma with definitions of control based on Expert Panel Report 3 (EPR3): Guidelines for the Diagnosis and Management of Asthma.⁷

Figure 3



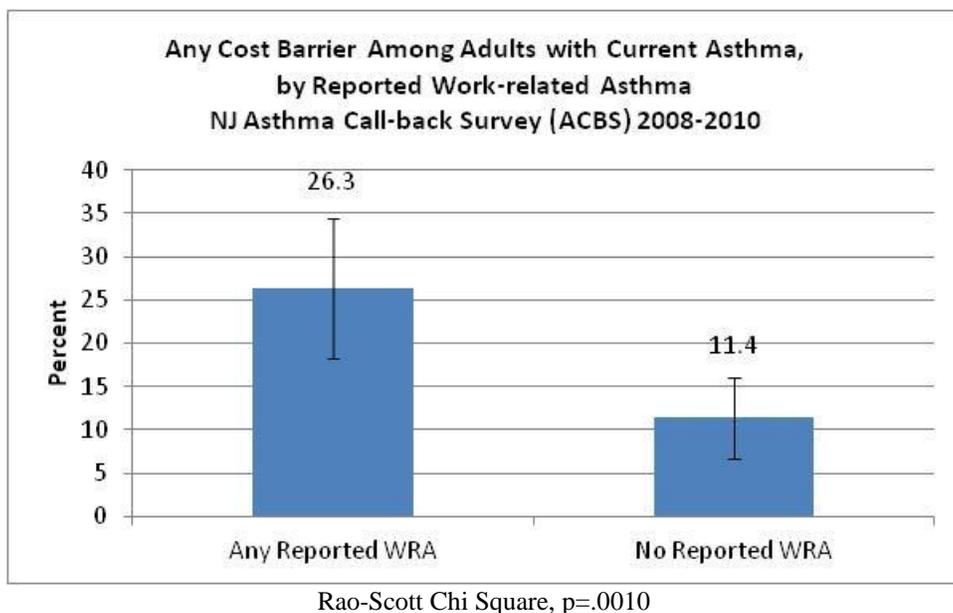
*Rao-Scott Chi Square, $p=.0002$

**Well-controlled means symptoms on eight or fewer of the previous 30 days, difficulty sleeping on two or fewer of the previous 30 days, and no limitation of usual activities due to asthma in the past year. Not well-controlled means any of the following: symptoms on nine or more of the previous 30 days, trouble sleeping on three to 12 of the previous 30 days, or little or moderate limitation of activities in the past year. Very poorly controlled asthma means symptoms throughout each day of the previous 30 days, trouble sleeping on 13 or more of the previous 30 days, or a lot of activity limitation in the past year due to asthma. Respondents were classified based upon the most severe symptom reported.⁸

Cost Barriers

Adult respondents with current asthma were asked if there was a time in the past 12 months when they needed primary care, specialist care, or medications for their asthma but were unable to access them because of the cost. An analysis of 2006-2008 BRFSS data in 37 states and the District of Columbia showed that adults with current, work-related asthma were more likely to experience financial barriers to care.⁹ This was true in the New Jersey ACBS data from 2008-2010 as well, as shown below in Figure 4—26 percent (95% confidence interval 18 to 34 percent) of adults with any type of current, work-related asthma reported one or more cost barriers to care for their asthma whereas only 11 percent (95% confidence interval 7 to 16 percent) of adults with current asthma not related to work in any way. This is not surprising given the association that has been observed between income levels and work-related asthma.

Figure 4



Section 2

New Jersey Work-Related Asthma Surveillance and Intervention Project

Background

Work-related asthma has become the most common work-related lung disease in the United States.¹⁰ Research studies estimate that 10-25% of adult cases are due to occupational exposures.¹¹ Work-related asthma includes work-aggravated asthma, which is pre-existing asthma exacerbated by workplace exposures and new-onset work-related asthma which includes:

- allergic, or immunologically mediated, asthma which develops after a period of exposure to a sensitizing agent, and
- reactive airways dysfunction syndrome (RADS), or irritant-induced asthma, which is a nonimmunologic asthma that is typically caused by a single exposure to high levels of an irritating vapor, gas, fume, or smoke

Diagnosis of Work-related Asthma

Work-related asthma is suspected on the basis of temporal associations between symptoms and time spent at and away from work. The following patterns of association between asthma symptoms and work are used to suggest the diagnosis of work-related asthma:

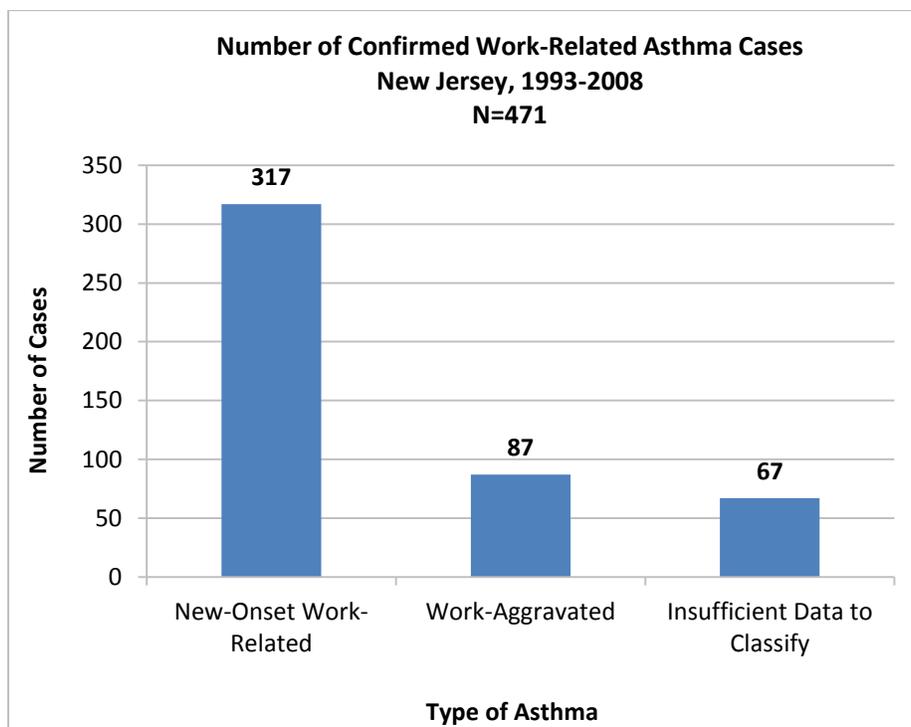
- asthma symptoms develop or worsen with a new job or introduction of new materials
- asthma symptoms can develop within minutes of specific activities or exposures at work
- delayed symptoms occur hours after exposure or during the evening on work days
- no symptoms or fewer symptoms occur on days away from work and on vacation
- symptoms worsen on return to work after being away

Surveillance for Work-related Asthma

The Occupational Health Surveillance (OHS) Unit within the NJDOH conducts surveillance for work-related asthma under an occupational health surveillance grant funded by the National Institute for Occupational Safety and Health (NIOSH). The components of the New Jersey work-related asthma surveillance and intervention project include case ascertainment and follow-up, worksite intervention, summary data analysis, and broad-based intervention activities. Cases of work-related asthma are identified primarily through health care providers' (physicians, physician assistants, and advanced practice nurses) reports, and hospital and emergency department discharge data.

The New Jersey work-related asthma surveillance and intervention project identified and confirmed 471 cases of work-related asthma between the years 1993 to 2008. Low numbers over the past years is attributable to under recognition and/or underreporting of asthma cases. Figure 5 shows the number of confirmed cases of new-onset work-related asthma, work aggravated asthma, and cases that could not be classified due to insufficient data. Sixty-seven percent of the cases are new-onset, 18% are work aggravated, and 14% cannot be classified.

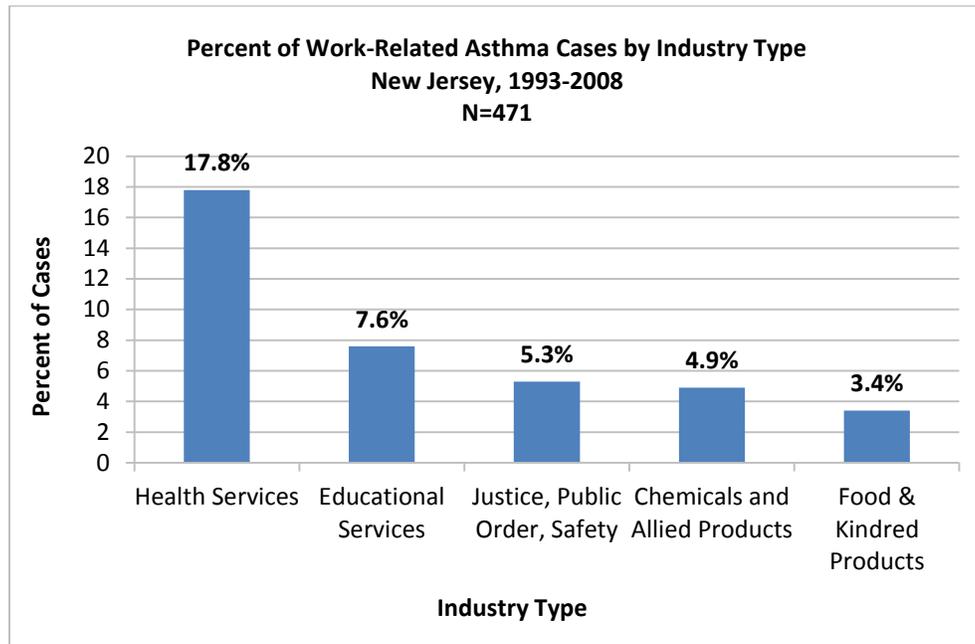
Figure 5



Source: New Jersey Work-Related Asthma Surveillance and Intervention Project
New Jersey Department of Health
Division of Epidemiology, Environmental and Occupational Health
Occupational Health Surveillance Unit

The number of confirmed work-related asthma cases, by industry type, is shown in Figure 6. Cases of work-related asthma were identified in all industry types. Figure 6 shows industries in which more than 15 cases were identified. The largest percentage of cases is in the Health Services industry, which includes medical and surgical hospitals, doctor's offices, and nursing care facilities. The large number of cases in this industry may be due to an increased use of cleaning agents, disinfectants, and latex products.

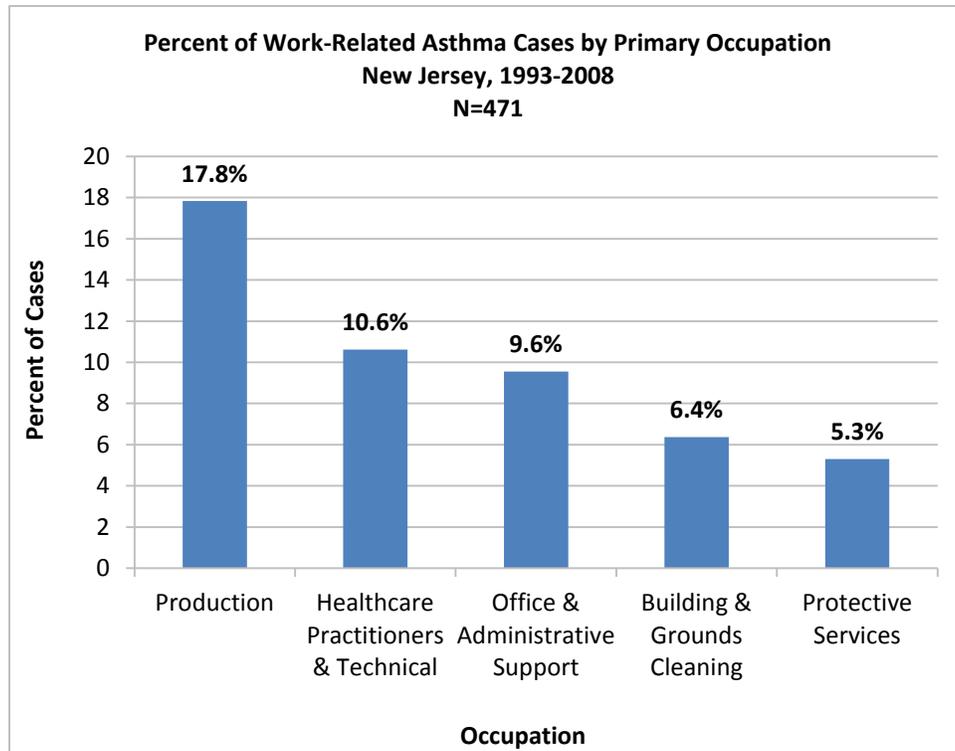
Figure 6



Source: New Jersey Work-Related Asthma Surveillance and Intervention Project
New Jersey Department of Health
Division of Epidemiology, Environmental and Occupational Health
Occupational Health Surveillance Unit

The occupational categories most frequently identified for cases of work-related asthma are shown in Figure 7. Production Occupations represent the largest occupational category, and includes occupations such as machine operators, assemblers, and laborers.

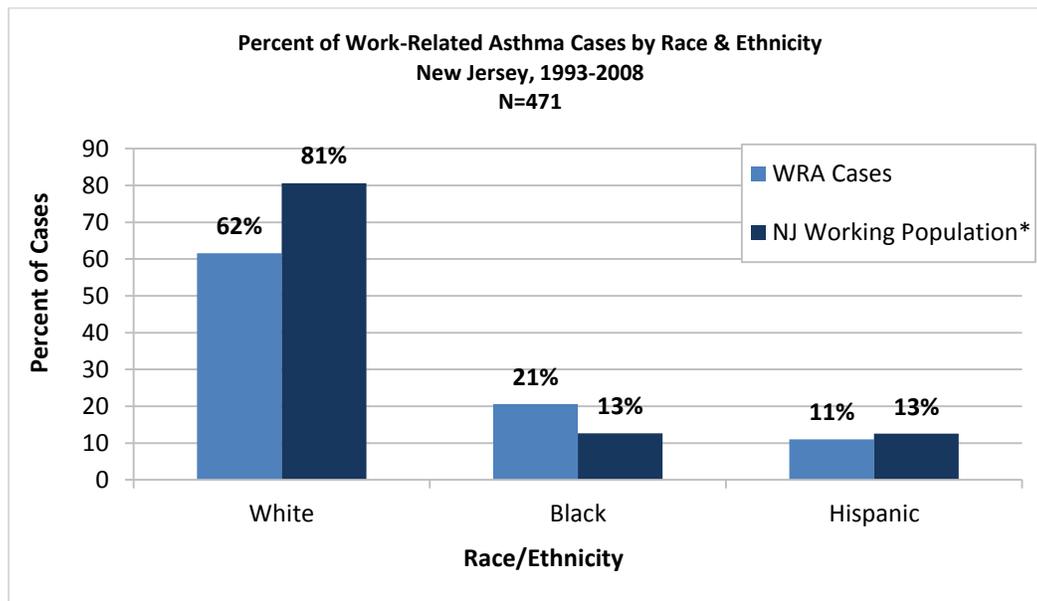
Figure 7



Source: New Jersey Work-Related Asthma and Intervention Surveillance Project
New Jersey Department of Health
Division of Epidemiology, Environmental and Occupational Health
Occupational Health Surveillance Unit

The percentage of identified work-related asthma cases by race and ethnicity compared to the racial/ethnic distribution of all working New Jersey residents are presented in Figure 8. Of the confirmed WRA cases, a higher percentage of Whites (62%) had WRA than Blacks (21%). However, confirmed cases of WRA amongst the Black (21%) population are overrepresented in regards to New Jersey’s working population (13%).

Figure 8



Source: New Jersey Work-Related Asthma and Intervention Surveillance Project
 New Jersey Department of Health
 Division of Epidemiology, Environmental and Occupational Health
 Occupational Health Surveillance Unit
 * Bureau of Labor Statistics; includes ages 16 years and older

The agents most commonly associated with identified cases of work-related asthma are chemicals (not otherwise specified), indoor air pollutants, mold, smoke, and inorganic dusts. These are shown in Table 2.

Table 2
Agents Most Commonly Associated with Confirmed Cases of Work-Related Asthma New Jersey, 1993-2008
Agent
Chemicals, NOS
Indoor Air Pollutants
Mold, NOS
Smoke
Inorganic Dust, NOS
Latex, Natural Rubber
Soluble Halogenated Platinum Compounds, NOS
Solvents, NOS
Diesel Exhaust
Sodium Hypochlorite
Cleaners, Floor Stripper
Glutaraldehyde
Paint, NOS
Chlorine
Welding, NOS
Formaldehyde
Papain
Methylene Bisphenyl Diisocyanate
World Trade Center Pollution
Hydrochloric Acid
Gasoline
Indoor Air Pollutants from Building Renovations
Capsicum
Flour, NOS
Diisocyanates, NOS

*NOS: Not Otherwise Specified

Conclusion

The information presented in this report confirms the substantial burden that asthma places on New Jersey residents. Part 1 of this report describes a chronic condition affecting a considerable number of people in New Jersey. When it is not controlled, the disease may result in disability, emergency department visits, hospitalizations, and even death.

- ❖ Around 6% (between 39,730 and 69,034) of adults in New Jersey with a lifetime asthma history have been diagnosed with work-related asthma by a health professional. Nearly 37% (between 258,092 and 338,160 adults with a lifetime asthma history) report some kind of work-related asthma, including asthma caused or aggravated by a current or previous job, or having discussed the possibility of work-related asthma with a health professional.
- ❖ Reports of work-related asthma varied with income and with education—ever-employed adults with current asthma and with higher levels of household income and education had less reported work-related asthma of any kind. The sample size was insufficient to look at factors associated with work-related asthma as diagnosed by a health professional.
- ❖ NJ adults with current WRA are about twice as likely to report very poorly controlled asthma and almost half as likely to report well-controlled asthma as are NJ adults with current asthma that is not work-related in any way.
- ❖ NJ adults with any type of current WRA reported one or more cost barriers to care for their asthma whereas only 11 percent of adults with current asthma not related to work in any way reported this. This is not surprising given the association that has been observed between income levels and work-related asthma.
- ❖ About 4% of NJ adults with a lifetime asthma history (between 22,046-48,687 individuals) report that they have changed or quit a job due to work-related asthma.

Work-related asthma is the most common work-related lung disease in New Jersey. Highlights from Part 2 of this report describe a preventable condition that affects a large segment of the New Jersey workforce.

- ❖ NJ work-related surveillance and intervention project has identified only 471 cases of work-related asthma since 1993, indicating that work-related asthma may be greatly underreported.
- ❖ Approximately 70% of the number of confirmed WRA cases is new-onset.
- ❖ The largest percentage of WRA cases in NJ are found in the Health Services industry.
- ❖ About 25% of identified cases of work-related asthma occurred in the non-industrial work environments of health services and educational services.
- ❖ The largest percentage (18%) of WRA cases in NJ are found in Production Occupations.
- ❖ A higher percentage of Whites (62%) had confirmed cases of WRA than Blacks (21%) and Hispanics (11%).

- ❖ The top three agents most associated with identified cases of work-related asthma are non-specific chemicals, indoor air pollutants, and non-specific mold.

Early recognition of asthma and its connection to the workplace is crucial in directing intervention efforts to reduce and eliminate exposure to asthma-causing agents.

For further information, please visit - the Work-Related Asthma web page at:

www.nj.gov/health/eoh/survweb/wra

Acronyms:

ACBS – Asthma Call-back Survey

BRFSS – Behavioral Risk Factor Surveillance System

CI – Confidence Interval

NIOSH – National Institute for Occupational Safety and Health

NJDOH – New Jersey Department of Health

NOS – Not Otherwise Specified

OHS – Occupational Health Surveillance

RADS – Reactive Airways Dysfunction Syndrome

WRA – Work-related Asthma

Definitions:

Lifetime Asthma – Proportion of the population who have ever had an asthma diagnosis (on the NJBRFS, a “Yes” response to “Have you ever been told by a doctor or other health professional that you have asthma?”)

Current Asthma – Proportion of the population who reports having asthma at the time of the survey (on the NJBRFS, a “Yes” response to "Do you still have asthma?")

Ever employed– Proportion of the population ever employed outside the home (on the NJBRFS, a “Yes” response to "Have you ever been employed outside the home?")

Former Asthma– Proportion of the population who reports not having asthma at the time of the survey (on the NJBRFS, a “No” response to "Do you still have asthma?")

Confidence Interval – A range of values within which the actual value is likely to fall

Acknowledgements:

This chapter was developed by the New Jersey Asthma Awareness and Education Program within the NJDOH Chronic Disease Prevention and Control Services and by the New Jersey Work-related Asthma Program within the Environmental and Occupational Health Surveillance Program. The NJDOH Center for Health Statistics administers the NJBRFS and the ACBS. The NJDOH Center for Health Statistics also provided technical assistance and statistical support.

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For more information about the NJ Asthma Awareness and Education Program:

www.nj.gov/health/asthma

For more information about the NJ Work-related Asthma Program:

<http://www.nj.gov/health/eoh/survweb/wra/index.shtml>

For asthma resources from the Pediatric Adult Asthma Coalition of New Jersey (PACNJ):

www.pacnj.org

Funding for this effort was provided by the CDC Cooperative Agreement entitled *Addressing Asthma from a Public Health Perspective* (1U59EH000491-03). The contents are solely the responsibility of the authors and do not necessarily represent the official view of the CDC. Funding for Work-Related Asthma Surveillance was provided by NIOSH (5U60OH008485-08): *Fundamental & Expanded Occupational Health Surveillance*. The contents are solely the responsibility of the authors and do not necessarily represent the official view of the NIOSH.

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⁶ It may be that a more detailed analysis would find a significant difference. An analysis of the 2006-2008 Asthma Call-back Survey in 37 states and the District of Columbia found a significant difference in control levels among people with health professional-diagnosed work-related asthma when they also took into account age, sex, race/ethnicity, education and health insurance status. Knoeller GE, Mazurek JM & Moorman JE. (2011). Work-related asthma, financial barriers to asthma care, and adverse asthma outcomes. *Medical Care* 49(12): 1097-1104.

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