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Sentinel Event Notification Systems for Occupational Risks

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LIST OF ABBREVIATIONS

ACGIH	American Conference of Governmental Industrial Hygienists
ACOEM	American College of Occupational and Environmental Medicine
AOEC	Association of Occupational and Environmental Clinics
BRFSS	Behavioral Risk Factor Surveillance System
CC	Coordinating Committee
CDC	Centers for Disease Control and Prevention
CDRS	Communicable Disease Reporting System
COSS	Consortium of Occupational State-based Surveillance
CPWR	Center for Protection of Workers' Rights
CSTE	Council of State and Territorial Epidemiologists
DC	Death Certificate
DCC	Data Coordination Center
DPW	Departments of Public Works
DWC	Division of Workers' Compensation
ED	Emergency Department
EDD	Emergency Department Data
ELASTIC	Latex Allergy Victims Advocacy Group
eLCOSH	Electronic Library of Construction Occupational Safety and Health
EOHSI	Environmental and Occupational Health Sciences Institute
FROI	First Report of Illness or Injury
HDD	Hospital Discharge Data
HDD	Hospital Discharge Data
IARC	International Agency for Research on Cancer
ICD-9	International Classification of Diseases, 9th Revision
LINCS	Local Information Network and Communications System
MOA	Memorandum of Agreement
NCHS	National Center for Health Statistics
NEDSS	National Electronic Disease Surveillance System
NESCAUM	Northeast States Coordinated Air Use Management

NHLBI	National Heart, Lung, and Blood Institute
NIH	National Institutes of Health
NIOSH	National Institute for Occupational Safety & Health
NJDEP	NJ Department of Environmental Protection
NJDHSS	New Jersey Department of Health & Senior Services
NJDLWD	New Jersey Department of Labor & Workforce Development
NJDOT	New Jersey Department of Transportation
NJPIES	New Jersey Poison Information and Education System
NJSFDA	New Jersey State Funeral Directors Association
NOES	National Occupational Exposure Survey
NRL	natural rubber latex
OHS	Occupational Health Surveillance
OSHA	Occupational Safety and Health Administration
PA	Physician Assistant
PEL	Permissible Exposure Limit
PEOSH	Public Employees Occupational Safety & Health
PNOAB	Physician and Nurse Outreach Advisory Board
RADS	reactive airways dysfunction syndrome
RDSS	NIOSH Respiratory Disease Surveillance System
REL	Recommended Exposure Limit
SENSOR	Sentinel Event Notification System for Occupational Risks
SIC	Standard Industrial Classification
SOAR	Silica Outreach and Research
TB	Pulmonary tuberculosis
TC	Tungsten Carbide
TLV	Threshold Limit Value
WCD	Workers' Compensation Data
WoRLD	Worker Health Chart book and Work-Related Lung Disease
WRA	Work Related Asthma
WTC	World Trade Center

ABSTRACT

Under NIOSH-funded SENSOR grants, NJDHSS conducted surveillance and intervention activities for silicosis and work-related asthma (WRA), which are among the 13 priority health conditions identified for surveillance by the NIOSH-States Surveillance Planning Work Group (NIOSH, 2001). Selection by the work group was based on the criteria of magnitude, severity, intervention potential, effectiveness/preventability, emergent conditions, public concern, economic impact, and feasibility of surveillance.
Nationally, a total of 16,131 silicosis-associated deaths were recorded during 1968-2001 (CDC, 2003). Statistics show that more than 250 workers die each year from silicosis in the U.S. (Mahoney, 1999). However, due to underreporting and underrecognition, these numbers may actually be higher. A 1995 study found that the potential average years of life lost associated with silicosis was 22.1 years and the potential cumulative years of work lost due to silicosis was 983,185 years (Zhong, 1995).
The American Thoracic Society estimates that 15% of adults with asthma have acquired asthma from a workplace exposure, and applying this estimate to New Jersey BRFSS data (450,000 adults with asthma) suggests that there are approximately 67,500 adults in New Jersey who may have asthma caused or aggravated by their job (NJDHSS 2003). These data can also be used to assess the burden of WRA to plan and target diverse intervention activities at the state level.

During the course of conducting occupational health surveillance projects, NJDHSS investigators:
1) Identified, evaluated, and utilized various available sources of data on occupational diseases. Data sources appropriate to the condition under surveillance were selected and developed.

2) Designed timely, simple, and acceptable surveillance systems for accurately collecting occupational health data. Staff created registries and database systems for tracking and following up on reports silicosis and work-related asthma. Databases were also developed for managing information from case-based interventions, as well as industry-wide hazard surveillance studies.

3) Conducted analysis of data to estimate the burden of occupational disease in New Jersey and describe the epidemiology of specific diseases, implemented strategies for intervention, and targeted specific industries for educational outreach, exposure characterization, and exposure reduction.

4) Developed and carried out industry-wide interventions for silicosis in foundries, potteries, sand mines, highway construction, dental laboratories, and monument builders; and for work-related asthma in health care facilities, funeral homes, and dialysis centers. On-site industrial hygiene evaluations of specific workplaces identified through surveillance were conducted and reports were issued with recommendations for controlling exposure to the causal agent of the targeted condition. Voluntary participation and cooperation from employers and employees was obtained to help achieve surveillance project goals.

5) Issued alerts and educational bulletins to specific industries as a result of surveillance project findings. Published surveillance findings in annual newsletters, special reports, and articles in the peer-reviewed literature. Educational materials for employers, employees, and their physicians were developed. A complete list of educational materials on occupational health developed by the NJDHSS is included in the Appendix. NJDHSS developed and gave presentations on general surveillance activities, specific occupational health conditions, specific workplace evaluations, and industry-wide studies at national public health, industrial hygiene, and epidemiology meetings. A list of publications and presentations is included in the Appendix.

6) Evaluated the effectiveness of surveillance and intervention activities by comparing completeness of data sources used to identify cases, and by performing follow-up industrial hygiene evaluations at previously inspected workplaces to assess compliance with original recommendations.

NJDHSS accomplished increased recognition of occupational asthma and silicosis; increased numbers and reporting of identified cases; improved case processing; and conducted more effective interventions, information dissemination, and evaluation.

Collection, management, and analysis of occupational health surveillance data following the SENSOR model is vital to directing interventions aimed at reducing the morbidity associated with the occupational diseases, work-related asthma and silicosis.

The New Jersey Occupational Health Surveillance System is structured in such a way as to be adoptable by other states interested in establishing occupational health surveillance.

Data Sources
The OHS Program began to obtain emergency department data (EDD) in 2004 from NJDHSS Hospital Financial Reporting Support Division. Since most adults who present hospital emergency departments with symptoms of asthma associated with work are not admitted, they do not show up in hospital discharge data. EDD, therefore, has proven to be a rich data source for identifying potential cases of work-related asthma.

Physician/Advanced Practice Nurse Reporting
Physicians have been required by NJ regulation to report occupational and environmental injuries, poisonings, and diseases, including WRA and silicosis, since 1985. In 2003, a revision to the reporting regulation required that advanced practice nurses also report occupational diseases. In 2005, NJDHSS entered into a formal agreement with the NJ Association of Physician Assistants to promote voluntary reporting of WRA and other occupational diseases.

Industrial Hygiene Interventions
OHS Program industrial hygienists conducted hundreds of initial and follow-up on-site evaluations of workplaces, either as a result of sentinel cases identified through surveillance, or as a result of industry-wide interventions conducted on the basis of analysis of aggregate surveillance data. These evaluations consisted of wall-to-wall walkthroughs of identified facilities, assessment of exposures and exposure control methods, and a report of findings with recommendations that is sent to the employer, patient, local health department, and, if applicable, the reporting physician/nurse. The NJDHSS collaborated with partners and stakeholders to conduct industry-wide intervention projects involving silicosis and WRA in specific industries, users of a particular asthmagen, or especially affected populations, such as Hispanics.

Educational Outreach
Industry-wide interventions, which are based on analysis of aggregate surveillance data, usually include an educational component. OHS Program staff design and develop educational brochures, alerts, and booklets aimed at increasing awareness about the hazards of specific agents and processes which have been associated with cases of work-related asthma and silicosis identified through surveillance. Surveys are typically included with mass mailings of program materials in order to assess their usefulness and allow for improvement of future educational materials. Educational materials are produced at the lowest reading level as possible, and many are translated into Spanish. One booklet, *To My Doctor: What Physicians Need to Know About Silicosis in Construction, Demolition, and Renovation Workers*, was translated into French, Italian, Polish, Portuguese, Russian, and Spanish languages by a partner, the International Union of Bricklayers and Allied Craftworkers. This partner also published it in their trade magazine, *Bricklayer News*, and made the booklet available to all members of the union.

Examples of Interventions for Work-related Asthma
Latex Allergy Task Force
The Latex Allergy Task Force was formed as a result of feedback received from the NJDHSS Occupational Health Surveillance Advisory Board. Interventions were conducted in three phases: 1) 1998, mailing of the NIOSH *Alert on Latex Allergy in the Workplace* to 2,400 health care facilities; 2) 2000, mailing of the NJDHSS *Latex Allergy - A Guide to Prevention*, *Guidelines: Management of Natural Rubber Latex Allergy*, and *Selecting the Right Glove for the Right Task in Health Care Facilities* to 2,400 health care facilities, and 3) 2000, a *Survey of Latex Allergy Management in New Jersey Hospitals* was developed and distributed to 122 New Jersey health care facilities. A follow-up survey to determine changes in behavior as a result of the NJDHSS Latex Allergy outreach efforts is being sent to all New Jersey health care facilities who received the outreach materials.
Educational Materials Developed:

- Latex Allergy - A Guide to Prevention (included in Appendix)
- *Guidelines: Management of Natural Rubber Latex Allergy* (included in Appendix)
- *Selecting the Right Glove for the Right Task in Health Care Facilities* (included in Appendix)

Glutaraldehyde in Health Care Facilities
Analysis of data in the work-related Asthma Registry revealed that eleven cases of WRA among health care workers were associated with exposure to glutaraldehyde. NJDHSS educated employers and employees about health hazards and exposure control measures, and conducted exposure measurements.

NJDHSS conducted 12 on-site evaluations that included air monitoring for glutaraldehyde vapor during various tasks. Air monitoring results indicated that exposures in some hospital endoscopy units and renal dialysis centers exceeded the new TLV for glutaraldehyde. Findings of the NJDHSS project were introduced by the OSHA Office of Regulatory Analysis into the docket for the promulgation of a new legal permissible exposure limit for glutaraldehyde. A NJDHSS

educational booklet was developed by NJDHSS that addressed health effects of glutaraldehyde; exposure limits; exposure control; storage, use and disposal; air monitoring; medical surveillance; and recordkeeping. The booklet was sent to all New Jersey health care facilities, and was posted on the NJDHSS Web site.

Educational Materials Developed:

- *Glutaraldehyde: Guidelines for Safe Use and Handling in Health Care Facilities* (included in *Appendix*)

Publications

- Schill, D, Valiante D, Coyne M; *Glutaraldehyde in New Jersey Health Care Facilities.* NJDHSS Occupational Health Surveillance Newsletter, February 2001 (included in *Appendix*).

Formaldehyde and Embalmers

WRA surveillance identified embalmers (funeral directors) as a high-risk group for exposure to formaldehyde, a recognized cause of asthma. Four cases of WRA in embalmers were identified in the NJDHSS WRA registry. Additionally, 13 other cases of confirmed WRA were associated with exposure to formaldehyde among other occupations.

A survey, along with a NJDHSS educational bulletin, was mailed to all 1,848 licensed funeral directors in New Jersey, as well as all members of the New Jersey State Funeral Directors Association, to collect information on demographics, embalming history, numbers of embalmings performed, work practices, embalming room ventilation, training, use of respiratory protection, past diagnoses of asthma, health symptoms, spills, and smoking. The survey also asked whether the embalmer ever had their exposure to formaldehyde measured and asked for monitoring results, if available.

On-site industrial hygiene evaluations were conducted during embalming to assess formaldehyde exposures, observe work practices, and evaluate effectiveness of ventilation systems. NJDHSS identified several sources of formaldehyde exposure that were potentially controllable with ventilation engineering controls, and specific recommendations were made to the evaluated workplaces. Responding to a need recognized during this project, NJDHSS developed a fact sheet describing a method for determining the ventilation rate in embalming rooms, and provided the sheet to the NJSFDA for distribution to their members. NJDHSS also developed a project to design and evaluate an affordable easy-to-fabricate local exhaust ventilation system.

Educational Materials Developed:

- *Occupational Health and Funeral Homes*
- *Ventilation of Funeral Home Preparation Rooms – Guidelines and Calculations* (included in *Appendix*).

Publications

Schill DP, *Predictors of Formaldehyde Exposure Monitoring in New Jersey Funeral Homes*, presented at Tulane University, School of Public Health and Tropical Medicine, 1999 (included in *Appendix*).

Polyurethane Bed Liners

Businesses potentially involved in the application of after-market polyurethane bed liners for trucks were identified using D&B iMarket data and the alerts were mailed to identified businesses, along with a survey requesting information on how bed liners are applied and what safety and exposure control methods are in place to protect workers.

Educational Materials Developed:

- *ALERT – Diisocyanates: Important Information for Applicators of Sprayed-on Polyurethane Bed Liners* (included in *Appendix*).
- *What Workers and Employers Need to Know About Diisocyanates (draft,* included in *Appendix*).

Physician and Nurse Outreach

An extremely important factor for case identification for all sources of data is physician recognition of potential WRA cases. An analysis of SENSOR WRA data shows that there is a much higher likelihood of an ascertained case being confirmed if the ascertainment source is a physician report. Seventy-four percent of potential cases reported to NJDHSS by physicians are eventually confirmed in accordance with NIOSH/SENSOR Case Confirmation Criteria, while only 23 % are confirmed for potential cases identified through hospital discharge data. The result of these efforts have increased recognition and reporting of occupational diseases, including WRA.

The OHS Program convened the NJDHSS Physician and Nurse Outreach Advisory Board (PNOAB). Members of PNOAB include representatives of the Allergy & Immunology Society, the American College of Emergency Physicians, the New Jersey Hospital Association, the Health Insurance Group, the Association of Occupational Health Nurses, the

State Nurses Association, the New Jersey Thoracic Society, the Occupational & Environmental Medicine Association, the Pediatric/Adult Asthma Coalition of New Jersey, the Association of Local Health Officers, the University of Medicine and Dentistry of New Jersey, and primary health care providers. Invited the New Jersey State Society of Physician Assistants (PA) to join PNOAB and assigned tasks for the representative.

The goal of PNOAB was to develop, conduct, and evaluate outreach to increase occupational disease recognition, reporting, and medical surveillance by physicians, advanced practice nurses, and physician assistants with regards to WRA and silicosis. The objectives were to (1) identify, implement, and evaluate effective methods of physician outreach and education on diagnosing, reporting, and conducting appropriate medical surveillance on occupational diseases, and (2) explore mechanisms for establishing a network of New Jersey occupational health care providers to diagnose, report, and conduct medical surveillance for occupational diseases.

The UMDNJ medical school curriculum for second year medical students was modified to include a session on WRA, with a focus on a case study of a fatal case of WRA provided to UMDNJ by NJDHSS. The fatal WRA case had been recognized by several NJ physicians prior to the patient's death, but never reported to NJDHSS.

An MS PowerPoint presentation was developed for grand rounds and meetings of professional associations and societies. The presentation includes three parts: 1) NJDHSS Reporting Guidelines (presented by the NJDHSS PNOAB Project Coordinator), 2) WRA Recognition and Diagnosis (presented by clinicians who are faculty members from UMDNJ/EOHSI), and 3) Industrial Hygiene Intervention (presented by an OHS Program Certified Industrial Hygienist, and it is followed with a question and discussion period. Arrangements were made with chairmen of associations, societies, and directors of educational departments in hospitals for CME credits to be given after the NJDHSS presentations.

Educational Materials Developed:

- *New Jersey Law Requires Physicians and Advanced Practice Nurses to Report Individuals Diagnosed with WRA*
- *Guidelines – WRA Recognition, Diagnosis, and Reporting*
- *HIPAA and the Provision of Protected Health Information to the NJDHSS*
- *Reporting WRA - Important Information*
- *Do You Have WRA?*
- *Every Breath Counts! – Important Information for Adults with Asthma*
- *Industries and Asthmagens Associated With Work-Related Asthma*

New Jersey State Society of Physician Assistants

The New Jersey State Society of Physician Assistants was invited to join the PNOAB to promote recognition and voluntary reporting of WRA. A letter of cooperation was obtained from the Society stating they would promote the voluntary reporting of WRA, as well other reportable occupational diseases, among their members. Outreach efforts to promote recognition and reporting by over 1,200 licensed physician assistants in New Jersey are important for developing an effective core physician/advanced practice nurse/physician assistant reporting base in the surveillance system.

Examples of Interventions for Silicosis

New Jersey Silica Partnership/Silica Outreach and Research (SOAR) Alliance

The New Jersey Silica Partnership (renamed in 2004 to the Silica Outreach and Research [SOAR] Alliance) was comprised of a group of stakeholders, including OSHA, NIOSH, NJDHSS, laborers' unions, contractors' associations, NJDOT, and NJTA. The goals of this project, renamed in 2004 to the Silica Outreach and Research (SOAR) Alliance, were to collect air samples to quantify silica exposures on silica dust-producing tasks during road construction and repair work; evaluate effectiveness of existing engineering controls and identify new controls; incorporate protective contract language into NJ highway repair contracts, and raise industry awareness of silica hazards and preventive measures. NJDHSS partnered with federal OSHA, other state agencies, the Laborers' union, ten highway repair contractors and their trade association, and other stakeholders, to accomplish the partnership goals.

The project demonstrated that a variety of groups including employers and government agencies, along with industry and labor organizations, could work together to successfully implement occupational health initiatives. Data were obtained that confirmed dangerous silica exposures in highway construction. As a result of the findings, the New Jersey Department of Transportation incorporated language into their contracts for highway work that requires bidding contractors to take measures to protect their workers from silica. Laborer union locals in New Jersey began a program of training members in the hazards of silica, and medically qualifying and fit testing them for respirators. NJDHSS provided data to the OSHA Office of Regulatory Analysis for use in the development of a comprehensive standard for silica.

Committees were formed among partner representatives to identify, evaluate, and define gaps in available technologies for controlling the release of dust during tool operation. Three existing and custom-designed engineering

controls for jackhammers were evaluated for dust exposure reduction and feasibility of use. NJDHSS coordinated the air-sampling portion of the test and participated in the drafting of a report of findings. The document, *How to Assemble Your Own Jackhammer Water Spray Control*, was developed by a partner and is being widely disseminated in New Jersey and other states by the OHS Program.

Highway Repair: A New Silicosis Threat

The goal of this project was to more broadly examine the effect of highway repair methods on silica exposures to construction workers. Both disease surveillance data and air sampling data show that silica exposure in highway construction is a major problem. Universally accepted mechanisms for disease prevention are not currently in place. A large worker population is at risk for developing silicosis and other health effects from exposure to crystalline silica. Prevention activity such as medical screening, innovative control methods, preventive health standards, and safety-related contract language is necessary to prevent future occupational disease problems in this population.

Educational Materials Developed:

- *Elements of an Effective Silicosis Prevention Program* - Microsoft® PowerPoint presentation made available to the Laborers' union locals and contractors' trade association for use by their members.

Publications:

- Valiante DJ, Schill DP, Rosenman KD, and Socie E. *Highway Repair: A New Silicosis Threat.* May 2004, Vol 94, No. 5 American Journal of Public Health, 876-880

New Jersey-NIOSH Silica Industry Intervention Projects

NJDHSS coordinated this project with the NIOSH Division of Applied Research and Technology (formerly the Engineering Control Technology Branch) to study the three predominant silica industries in New Jersey: pottery and related products (SIC 326), foundries (SIC 332 & 336), and sand mines (SIC 1442 & 1446). The NJDHSS silicosis surveillance system identified 98, 68, and 21 confirmed cases, respectively, in these industries. Forty-seven percent of the confirmed cases in the NJDHSS Silicosis Register worked in these industries.

Representative workplaces in each of the three categories were selected and targeted for extensive industrial hygiene evaluation. NJDHSS staff, in conjunction with a team of industrial hygienists and engineers from the NIOSH ECTB, conducted in-depth industrial hygiene evaluations of each facility. Reports of findings and recommendations were disseminated to each respective company. Articles were published in peer reviewed journals or as NIOSH reports.

Educational Materials Developed:

- *To My Doctor – What Physicians Should Know About Silicosis in Surface Mining and Milling Workers*

Publications:

- NJDHSS co-authored or contributed to the following four publications that resulted from the foundry interventions; complete citations are provided in *References*: Cooper, 1993; O'Brien, 1990; Cooper, 1989; O'Brien, 1989.

Abrasive Blasting Project

Abrasive blasting companies were identified from several sources, including: Business-to-Business Yellow Pages, equipment rental companies, NJ Department of Labor listings of industrial painting contractors (SIC 1721), and New Jersey water tower owners. A survey was developed and sent to 485 businesses identified from these sources to collect information regarding the use of silica sand as an abrasive agent. Industrial hygiene evaluations were conducted at three locations, and an overexposure was measured at one location. NJDHSS developed an educational fact sheet on substitutes for silica sand in abrasive blasting and disseminated it to all SENSOR Silicosis states and all identified companies involved in abrasive blasting.

Educational Materials Developed:

- *Stop Silicosis in Sandblasters – Use Silica Substitutes*

Foundry Research and Intervention Group

The NJDHSS Foundry Research and Intervention Group was formed to identify brass and bronze foundries where there is a hazard of exposure to silica and/or lead, and to conduct on-site industrial hygiene evaluations at these facilities. Target foundries were identified on the basis of reports of elevated blood lead levels received by the Occupational Health Surveillance Program. The hypothesis of the project was that foundries identified through the lead surveillance project as workplaces where lead exposure is occurring are also exposing workers to silica dust.

Industrial hygiene evaluations were conducted at identified foundries. Both silica and lead exposures, and respective control measures, were evaluated. Reports with recommendations for controlling worker exposures to silica and lead were issued to each facility.

Center to Protect Workers' Rights Work Control Group

NJDHSS is a member of this group partnering with the International Union of Bricklayers and Allied Craftworkers to identify and evaluate silica exposures and engineering controls for masonry work. The International Union of Bricklayers and Allied Craftworkers has translated the NJDHSS educational booklet, *To My Doctor: What Physicians Need to Know About Silicosis in Construction, Demolition, and Renovation Workers*, into French, Italian, Polish, Portuguese, Russian, and Spanish languages; published it in their trade magazine, *Bricklayer News*, and made the booklet available to all members of the union. This partnership is ongoing.

Silica in Dental Laboratories

Two cases of silicosis in dental laboratory technicians were identified by NJDHSS from hospital discharge data. Other states conducting surveillance for silicosis were contacted, and it was found that they had also identified multiple cases of silicosis among dental technicians. This prompted NJDHSS to develop a hazard surveillance project designed to collect information on silica use in dental laboratories, provide employers and workers with educational materials, and raise industry awareness of silica and other health hazards in dental labs. An educational brochure on silica hazards in dental labs, *What Dental Technicians Need to Know About Silicosis* was developed and posted on the NJDHSS web site. The OHS Program developed and mailed the *Survey of Silica Use in New Jersey Dental Laboratories* to 538 dental laboratories identified in New Jersey to collect information on silica use and exposure control measures. Forty-one exposure measurements for silica were collected at 16 different dental labs. Sampling results indicate that dental lab technicians may be exposed to silica and that engineering controls should be used at these facilities to prevent exposure.

Educational Materials Developed:

- *What Dental Technicians Need to Know about Silicosis* (included in Appendix)

Publications

- CDC (reported by: DP Schill, NJDHSS), Silicosis in Dental Laboratory Technicians – Five States, 1994-2000. MMWR 2004;53(9):195-1979

Silica and Monument Builders

The NJDHSS silicosis surveillance system identified seven cases of silicosis in individuals who worked as monument builders, carving cemetery markers and other figures from granite. NJDHSS conducted site visits at selected monument building firms to observe methods of granite carving, machinery used, exposure control methods, and employee work practices. Engineering controls for this type of work were extensively researched. Information was used to develop an educational bulletin and exposure control checklist, which were disseminated through the Monument Builders of North America Association.

Educational Materials Developed:

- *To My Doctor – What Physicians Should Know About Silicosis in Cemetery Monument Builders*
- *Checklist – Controlling Silica Exposure during Memorial Building*

Publications:

- Senn E, *Silicosis: Incurable but Preventable*, in MB News, the official publication of the Monument Builders of North America Association, 56:7, July 1999.

Miscellaneous

New Jersey Interdepartmental Asthma Committee

This committee was formed in 2001 among Divisions in the NJDHSS, the NJ Department of Environmental Protection, the NJ Department of Education, the NJ Department of Human Services, and the US Department of Health and Human Services. The mission of the committee is "To improve the health of people living and/or working in New Jersey by effective prevention, identification and management of asthma, through a coordinated partnership among public and private organizations." Most members of the committee are involved in pediatric asthma, and had not demonstrated an interest in adult-onset work-related asthma. The NJDHSS work-related asthma Project staff was instrumental in ensuring that committee members became aware of the magnitude and significance of work-related asthma. As a result, the original mission statement was modified to include people working in New Jersey, and thirteen objectives related to work-related asthma were proposed and accepted for introduction into the committee's strategic

plan. The committee released the "Interdepartmental Report and Strategic Plan for Asthma" in June 2003, and participated in the publication of an annual report, *Asthma in New Jersey, Annual Update,* for years 2005 and 2006.

Outreach to Disparate Populations

The proportion of asthma estimated to be attributable to work is statistically significantly higher among Hispanic adults (17.3%) than white non-Hispanic adults (9.2%). The OHS Program has collaborated with the NJDHSS Office of Minority Health and the Immigration and American Citizenship Organization. The Occupational Health Surveillance Program published two articles (included in Appendix) in *La Guia del Inmigrante* (The Immigrant's Guide). This magazine is published in Spanish, and is distributed to over 10,000 Latino households in New Jersey. The first article, "Protect Yourself on the Job, It's Your Right!" was published in the January-February 2005 (Vol. V, No.1) edition, and provided resources and information about OSHA and NIOSH, presented several case studies, and listed job titles that are considered hazardous. The second article, "Is Your Asthma Related to Your Job?", was published in the May-June 2006 (Vol. VI, No. 3) edition, and focused on work-related asthma, presented four case studies, provided recommendations, and listed resources.

World Trade Center Scientific Advisory Committee

the purpose of the World Trade Center (WTC) Scientific Advisory Committee is to advise ATSDR and the New York Department of Health on the design and development of a registry of workers and community members who were exposed to pollutants generated by the collapse and burning of the WTC. The registry will be used for a longitudinal study of the health status of registry members, including the development of occupational/environmental asthma. Cases of WTC dust- or chemical-related diseases, identified through the NJDHSS occupational disease surveillance projects will be referred to the registry.

New Jersey Behavioral Risk Factor Surveillance System (BRFSS) Survey

NJDHSS submitted two standardized questions on WRA, which were validated by other WRA surveillance states, for inclusion in the NJBRFSS survey. The data obtained from the survey is used to generate state-specific estimates for work-related new-onset and work-aggravated asthma in New Jersey. These estimates are utilized to refine, expand, or redirect surveillance and intervention activities. Data is used to generate estimates for disparate populations to improve targeting of proposed activities to mitigate or prevent WRA in these populations. These data and related findings are shared with NIOSH, the New Jersey Interdepartmental Asthma Committee, as well as other partners and stakeholders.

Occupational Health Surveillance (OHS) Update

NJDHSS published topical articles of interest in the Surveillance Program newsletter, *OHS Update.* The *OHS Update* is disseminated to a population of physicians, advanced practice nurses, and physician assistants identified through the PNOAB activities, including other occupational health organizations and individuals on the OHS mailing list. *OHS Updates* are also posted on the NJDHSS Web site.

NJDHSS Web site

The NJDHSS surveillance program has a Web page (www.state.nj.us/health/eoh/survweb) that includes a description of surveillance, intervention, and outreach activities, as well as "html" and "PDF" versions of most of the related educational materials. New sections for this Web page were designed to highlight surveillance data and information for health care providers, aimed at enhancing WRA recognition and reporting. The data sections of the Web page are updated biannually.

Work-related Asthma Web Site

The new WRA Web site (www.nj.gov/health/eoh/ survweb/wra) was launched in March 2006. The Web site features resources for employers, employees, and the New Jersey medical community. A handout and post card card, developed to advertise the Web site, was disseminated along with other WRA educational materials during case follow-up and at PNOAB outreach venues.

Silica Exposure Data

The OHS Program contributed air sampling results collected during industrial hygiene intervention activities related to silica in construction to the NIOSH Electronic Library of Construction Safety and Health (eLCOSH), OSHA for use in the rulemaking docket for the Silica in Construction Standard. Data were compiled by researchers and published in a peer-reviewed article: Flanagan ME, Seixas N, Becker P, Takacs B, Camp J.: Silica exposure on construction sites: results of an exposure monitoring data compilation project. J Occup Environ Hyg. 2006 Mar; 3(3):144-52.

TRANSLATION OF FINDINGS

Under the NIOSH-funded SENSOR grants, the Occupational Health Surveillance (OHS) Program of the New Jersey Department of Health and Senior Services (NJDHSS) accomplished the following:

- Created the resource capacity to develop and conduct surveillance activities for silicosis
- Pilot tested the surveillance system under a NIOSH-funded SENSOR experimental grant
- Adapted the silicosis surveillance system to the surveillance of work-related asthma and other work-related diseases
- Used a "Lessons Learned " approach to improve and refine the methods and protocols for conducting occupational disease surveillance activities
- Identified and obtained vital occupational disease surveillance data from new data sources necessary to identify potential occupational diseases for which intervention actions can be efficiently implemented
- Collaborated with department, state, federal, labor, and private entities to achieve the goal of eliminating work-related health hazards
- Employed a staff of board-certified industrial hygienists who are experts in the recognition, evaluation, and control of work-related health hazards
- Conducted on-site industrial hygiene evaluations of workplaces that were identified through surveillance data.

These were accomplished using data management systems and a diverse staff with experience and expertise in conducting occupational disease surveillance activities.

The surveillance tools developed by NJDHSS are transferable to other entities. Educational materials, database structures, data dictionaries, data collection instruments, and standard operating procedures and protocols developed by NJDHSS are made available to other states for use in developing or refining their occupational disease surveillance systems. Workplace interventions can be accomplished by using in-house industrial hygiene expertise or, if unavailable, by establishing a formal referral system with the federal Occupational Safety and Health Administration (OSHA).

As a result of industrial hygiene capacity developed under the NIOSH-funded SENSOR grants, industrial hygiene resources are available to other branches of NJDHSS, as well as OSHA and other states. The NJDHSS Office of Emergency Response utilized OHS Program industrial hygienists during the response, contamination characterization, and remediation work for the anthrax attack that affected New Jersey postal facilities. The NJDHSS Infectious and Zoonotic Disease Service uses industrial hygienists from the OHS Program to conduct environmental investigations of facilities where outbreaks of Legionnaires' disease have occurred. The NJDHSS Environmental Health Service avails themselves of the expertise the OHS Program possesses in industrial hygiene instrumentation and exposure measurement. The New York City Department of Health and federal OSHA called upon OHS Program industrial hygienists to assist in the response and recovery phases of the World Trade Center disaster.

NIOSH funding also fostered the development of capacity in the area of health education. A member of the OHS Program staff, working with staff industrial hygienists, is responsible for the design and development of educational materials, as well as layout and content of the OHS Program Web site. This expertise is shared with other programs in NJDHSS. All educational materials are posted on the NJDHSS Web site, and made available to state and federal partners to enhance their outreach efforts.

IMPACT, RELEVANCE, AND OUTCOMES

NJ Legislation passed with NJDHSS support
Dry cutting Law: Staff of the OHS program commented on the proposed bill and participated with the NJ dept of labor and workforce development in the drafting of the regulation. Since the legislation was enacted, OHS industrial hygienist have made referrals of contractors found to be violating the law to DLWD.

NJDHSS actively promoted the banning of smoking in NJ workplaces which resulting the inclusion of the occupational component in the April 2006 NJ legislation which bans smoking in NJ all public facilities and private workplaces. Indoor air pollutants including tobacco smoke are the most commonly identified cause of work related asthma identified by SENSOR surveillance data.

New Jersey Silica Partnership Leads to Development of Dust Control for Jackhammer
The New Jersey Silica Partnership comprised of a group of stakeholders, including OSHA, NIOSH, NJDHSS, laborers' unions, contractors' associations, NJDOT, and NJTA was formed for the purpose of identifying and evaluating new and existing engineering controls for silica dust-generating tasks associated with roadway repair work. Air monitoring data were analyzed and the water-spray method was determined to be the most effective and feasible engineering control for jackhammer operation.

- A video exposure monitoring tape of the jackhammer evaluation trials was created using data logged by a direct-reading aerosol monitor. The OHS program distributed the exposure monitoring videotapes to partnership members and other stakeholders for education and training.
- A packet, *How To Assemble Your Own Jackhammer Water Spray Control*, was developed by a member of the SOAR alliance. OHS staff disseminated the packet to NJ Department of Public Works and provided consultation for implementing the engineering controls.
- As a result of SOAR, New Jersey Department of Transportation incorporated language into their contracts for highway work that requires bidding contractors to take measures to protect their workers from silica.
- Laborer union locals in New Jersey began a program of training members in the hazards of silica, and medically qualifying and fit testing them for respirators.
- NJDHSS provided data to the OSHA Office of Regulatory Analysis for use in the development of a comprehensive standard for silica.

Increase Physician Reporting
In 2003, a revision to the reporting regulation required that advanced practice nurses also report occupational diseases. In 2005, NJDHSS entered into a formal agreement with the NJ Society of Physician Assistants to promote voluntary reporting of WRA and other occupational diseases.

As part of the NJDHSS Physician and Nurse Outreach Advisory Board (PNOAB) outreach, educational materials were developed, disseminated, and presented to appropriate groups. NJDHSS coordinated with the NJ Board of Medical Examiners for distribution of the NJDHSS WRA orientation packet to 1,800 newly licensed MDs.

The following educational materials were developed and disseminated to 10,000 member of medical groups in NJ:

- *New Jersey Law Requires Physicians and Advanced Practice Nurses to Report Individuals Diagnosed with WRA*
- *Guidelines – WRA Recognition, Diagnosis, and Reporting*
- *HIPAA and the Provision of Protected Health Information to the NJDHSS*
- *Reporting WRA - Important Information*
- *Do You Have WRA?*
- *Every Breath Counts! – Important Information for Adults with Asthma*
- *Industries and Asthmagens Associated With Work-Related Asthma*

UMDNJ Medical School Curriculum
The UMDNJ medical school curriculum for second year medical students was modified to include a session on WRA, with a focus on a case study of a fatal case of WRA provided to UMDNJ by NJDHSS. Educational packages were distributed at Public Health Symposium, NJ Nursing Convention, and Public Health Nurses meeting. Two special issues of the *NJDHSS Occupational Health Surveillance Update* newsletters were developed, and a WRA Web page was created for target audiences.

CME Credits
Procedures for applying/obtaining CME credits for WRA presentations were developed by NJDHSS in collaboration with the CME-issuing agencies. Arrangements were made with chairmen of associations, societies, and directors of educational departments in hospitals for CME credits to be given after the NJDHSS presentations. Upon request from associations/societies/hospitals NJDHSS developed lecture questionnaires, learning objectives, filled in faculty disclosure forms, and submitted with presenters' CVs to the Accreditation Council for Continuing Medical Education. To date, CMEs have been awarded to 128 MDs, 20 physician assistants, and 25 nurses.

Collaboration with New Jersey State Society of Physician Assistants
The New Jersey State Society of Physician Assistants (Pas) was invited to join the PNOAB to promote recognition and voluntary reporting of WRA. NJDHSS collaborated with the PA Licensing Board to distribute the orientation packet to newly licensed PAs, as well as to those renewing their licenses.

Latex Allergy Task Force
The Latex Allergy Task Force developed and disseminated the following educational materials:

- Latex Allergy - A Guide to Prevention (included in Appendix)
- *Guidelines: Management of Natural Rubber Latex Allergy* (included in Appendix)
- *Selecting the Right Glove for the Right Task in Health Care Facilities* (included in Appendix)

Glutaraldehyde in Health Care Facilities
A NJDHSS educational booklet was developed by NJDHSS that addressed health effects of glutaraldehyde; exposure limits; exposure control; storage, use and disposal; air monitoring; medical surveillance; and recordkeeping. The booklet was sent to all New Jersey health care facilities, and was posted on the NJDHSS Web site.

Educational Materials Developed:

- *Glutaraldehyde: Guidelines for Safe Use and Handling in Health Care Facilities* (included in *Appendix*)

A *Glutaraldehyde Worker Survey* was developed and distributed to 173 potentially exposed workers in 12 different health care facilities where on-site evaluations had been conducted. Findings of the survey and project were introduced by the OSHA Office of Regulatory Analysis into the docket for the promulgation of a new legal permissible exposure limit for glutaraldehyde.

Publications:
Schill, D, Valiante D, Coyne M; *Glutaraldehyde in New Jersey Health Care Facilities.* NJDHSS Occupational Health Surveillance Newsletter, February 2001 (included in *Appendix*).

Formaldehyde and Embalmers
OHS work-related asthma surveillance identified embalmers (funeral directors) as a high-risk group for exposure to formaldehyde, a recognized cause of asthma. The New Jersey State Funeral Directors Association (NJSFDA) partnered with NJDHSS for this project and demonstrated support of this study by publicizing it in their monthly magazine and by faxing a notice to the association's 920 members.

On-site industrial hygiene evaluations were conducted during embalming to assess formaldehyde exposures, observe work practices, and evaluate effectiveness of ventilation systems. NJDHSS identified several sources of formaldehyde exposure that were potentially controllable with ventilation engineering controls, and specific recommendations were made to the evaluated workplaces.

Responding to a need recognized during this project, NJDHSS developed a fact sheet describing a method for determining the ventilation rate in embalming rooms, and provided the sheet to the NJSFDA for distribution to their members. NJDHSS also developed a project to design and evaluate an affordable easy-to-fabricate local exhaust ventilation system.

Educational Materials Developed:

- *Occupational Health and Funeral Homes*
- *Ventilation of Funeral Home Preparation Rooms – Guidelines and Calculations* (included in Appendix).

Publications
Schill DP, *Predictors of Formaldehyde Exposure Monitoring in New Jersey Funeral Homes*, presented at Tulane University, School of Public Health and Tropical Medicine, 1999 (included in *Appendix*).

Polyurethane Bed Liners
Businesses potentially involved in the application of after-market polyurethane bed liners for trucks were mailed alerts along with a survey requesting information on how bed liners are applied and what safety and exposure control methods are in place to protect workers.

Educational Materials Developed:
- *ALERT – Diisocyanates: Important Information for Applicators of Sprayed-on Polyurethane Bed Liners* (included in *Appendix*).
- *What Workers and Employers Need to Know About Diisocyanates (draft,* included in *Appendix*).

Highway Repair: A New Silicosis Threat
Educational Materials Developed:
- *Elements of an Effective Silicosis Prevention Program* - Microsoft® PowerPoint presentation made available to the Laborers' union locals and contractors' trade association for use by their members.

Publications:
- Valiante DJ, Schill DP, Rosenman KD, and Socie E. *Highway Repair: A New Silicosis Threat.* May 2004, Vol 94, No. 5 American Journal of Public Health, 876-880

New Jersey-NIOSH Silica Industry Intervention Project
NJDHSS coordinated this project with the NIOSH Division of Applied Research and Technology (formerly the Engineering Control Technology Branch) to study the three predominant silica industries in New Jersey: pottery and related products (SIC 326), foundries (SIC 332 & 336), and sand mines (SIC 1442 & 1446). Representative workplaces in each of the three categories were selected and targeted for extensive industrial hygiene evaluation. NJDHSS staff, in conjunction with a team of industrial hygienists and engineers from the NIOSH ECTB, conducted in-depth industrial hygiene evaluations of each facility. Reports of findings and recommendations were disseminated to each respective company.

Educational Materials Developed:
- *To My Doctor – What Physicians Should Know About Silicosis in Surface Mining and Milling Workers*

Publications:
- NJDHSS co-authored or contributed to the following four publications that resulted from the foundry interventions; complete citations are provided in *References*: Cooper, 1993; O'Brien, 1990; Cooper, 1989; O'Brien, 1989.

Abrasive Blasting Project
NJDHSS developed an educational fact sheet on substitutes for silica sand in abrasive blasting and disseminated it to all SENSOR Silicosis states and all identified companies involved in abrasive blasting.

Educational Materials Developed:
- *Stop Silicosis in Sandblasters – Use Silica Substitutes*

Foundry Research and Intervention Group
Industrial hygiene evaluations were conducted at identified foundries and both silica and lead exposures, and respective control measures, were evaluated. Reports with recommendations for controlling worker exposures to silica and lead were issued to each facility.

Outreach to Disparate Populations
NJDHSS partnered with the International Union of Bricklayers and Allied Craftworkers to identify and evaluate silica exposures and engineering controls for masonry work. The International Union of Bricklayers and Allied Craftworkers has translated the NJDHSS educational booklet, *To My Doctor: What Physicians Need to Know About Silicosis in Construction, Demolition, and Renovation Workers*, into French, Italian, Polish, Portuguese, Russian, and Spanish languages; published it in their trade magazine, *Bricklayer News*, and made the booklet available to all members of the union.

The proportion of asthma estimated to be attributable to work is statistically significantly higher among Hispanic adults (17.3%) than white non-Hispanic adults (9.2%). The OHS Program collaborated with the NJDHSS Office of Minority Health and the Immigration and American Citizenship Organization. The Occupational Health Surveillance Program published two articles (included in Appendix) in *La Guia del Inmigrante* (The Immigrant's Guide). This magazine is published in Spanish, and is distributed to over 10,000 Latino households in New Jersey. The two articles:

- "Protect Yourself on the Job, It's Your Right!" was published in the January-February 2005 (Vol. V, No.1) edition, and provided resources and information about OSHA and NIOSH, presented several case studies, and listed job titles that are considered hazardous.
- "Is Your Asthma Related to Your Job?", was published in the May-June 2006 (Vol. VI, No. 3) edition, and focused on work-related asthma, presented four case studies, provided recommendations, and listed resources.

Silica in Dental Laboratories

NJDHSS developed a hazard surveillance project designed to collect information on silica use in dental laboratories, provide employers and workers with educational materials, and raise industry awareness of silica and other health hazards in dental labs. A *Survey of Silica Use in New Jersey Dental Laboratories* was designed to collect information from identified dental labs on silica use, safety and health practices, engineering controls, and air monitoring data.

Surveillance staff mailed the survey along with the educational brochure, *What Dental Technicians Need to Know About Silicosis*, to 538 dental laboratories identified in New Jersey to collect information on silica use and exposure control measures. Additional copies of brochures were mailed in response to requests from dental labs that had completed and returned the survey, as well as those that found it on the OHS Web site or learned about it from other sources.

The education brochure was also distributed by NIOSH to approximately 15,000 dental labs in the United States.

Educational Materials Developed:

- *What Dental Technicians Need to Know about Silicosis* (included in Appendix)

Publications

- CDC (reported by: DP Schill, NJDHSS), Silicosis in Dental Laboratory Technicians – Five States, 1994-2000. MMWR 2004;53(9):195-1979

Silica and Monument Builders

Information was used to develop an educational bulletin and exposure control checklist, which were disseminated through the Monument Builders of North America Association.

Educational Materials Developed:

- *To My Doctor – What Physicians Should Know About Silicosis in Cemetery Monument Builders*
- *Checklist – Controlling Silica Exposure during Memorial Building*

Publications:

- Senn E, *Silicosis: Incurable but Preventable*, in MB News, the official publication of the Monument Builders of North America Association, 56:7, July 1999.

OHS Program Silica Exposure Data

Contributed air sampling results collected during industrial hygiene intervention activities related to silica in construction. Data were compiled by researchers and published in a peer-reviewed article:

Flanagan ME, Seixas N, Becker P, Takacs B, Camp J.: Silica exposure on construction sites: results of an exposure monitoring data compilation project. J Occup Environ Hyg. 2006 Mar; 3(3):144-52.

Fatal Case of Work-related Asthma

NJDHSS identified a fatal case of work-related asthma through surveillance of New Jersey death certificate data. The victim worked as a material handler/laborer in a materials milling facility where he was exposed to shark cartilage dust, a heretofore unrecognized cause of asthma. OHS Program industrial hygienists conducted an on-site evaluation of exposures and control methods at the facility. Based on the unusual nature of the exposure, and the fact that the exposure resulted in a fatality, NIOSH was requested to perform a formal Health Hazard Evaluation at the facility. A NIOSH researcher used the case as a basis for publishing a peer-reviewed paper, on which the OHS Program investigating industrial hygienist was listed as a co-author:

Publication

Ortega HG, Kreiss K, Schill DP, Weissman DN. Fatal asthma from powdering shark cartilage and review of fatal occupational asthma literature. *Am J Ind Med.* 2002; 42:50-54.

SCIENTIFIC REPORT

BACKGROUND

Public health surveillance is the ongoing systematic collection, analysis, and interpretation of health data essential to the planning, implementation, and evaluation of public health practices, closely integrated with the timely dissemination of these data to those who need to know (NIOSH, 2001b). Surveillance is vital to the prevention of occupational injury and illness. An occupational health surveillance system provides information crucial to monitoring workplace safety and health, identifying occupational hazards, directing workplace intervention, and evaluating the effectiveness of these actions. There is no comprehensive nationwide system of surveillance for occupational diseases, injuries, and hazards. The Strategic Surveillance Plan of the National Institute for Occupational Safety and Health (NIOSH) recognizes that States have a vital role to play, and that state-based surveillance activities provide a vital foundation for national surveillance systems (NIOSH, 2001b). States should have the capacity to conduct focused, in-depth surveillance, follow-up investigations, and interventions for selected targeted conditions. Work-related asthma (WRA) and silicosis are among the 13 priority health conditions identified for surveillance by the NIOSH-States Surveillance Planning Work Group (NIOSH, 2001b). Selection by the work group was based on the criteria of magnitude, severity, intervention potential, effectiveness/preventability, emergent conditions, public concern, economic impact, and feasibility of surveillance.

Since 1985, the staff of the Occupational Health Surveillance (OHS) Program in the New Jersey Department of Health and Senior Services (NJDHSS) has conducted surveillance projects for silicosis and work-related asthma. Experienced staff members included an epidemiologist, medical adviser, data management specialists, data analysis specialists, public health representatives, and board-certified industrial hygienists. OHS Program staff also included an expert at desktop publishing and Web site management who has broad experience in the development, publication, and dissemination of educational materials to meet the needs of NJDHSS intervention initiatives. The New Jersey State Epidemiologist, who has published extensively in the field of occupational health, provides in-kind support. The staff has worked together as a team on surveillance projects for adult lead poisoning; cadmium, mercury, and arsenic toxicity; tuberculosis; and fatal work-related injuries: as well as silicosis and work-related asthma. These surveillance projects were successful in systematically collecting surveillance data from a number of different sources, analyzing data, and interpreting the results to enable the planning, implementation, and evaluation of specific intervention activities. Findings and outcomes of surveillance projects were prepared for timely dissemination to appropriate individuals and stakeholders. During the course of conducting occupational health surveillance projects, NJDHSS investigators:

1) Identified, evaluated, and utilized various available sources of data on occupational diseases. Selected and developed data sources appropriate to the condition under surveillance.

2) Designed timely, simple, and acceptable surveillance systems for accurately collecting occupational health data. Staff created registries and database systems for tracking reports of elevated levels of heavy metals (lead, cadmium, mercury, arsenic), work-related fatalities, and occupational cases of silicosis, asthma, and tuberculosis. Databases were also developed for managing information from case-based interventions, as well as industry-wide hazard surveillance studies.

3) Conducted analysis of data to estimate the burden of occupational disease in New Jersey and describe the epidemiology of specific diseases, implemented strategies for intervention, and targeted specific industries for educational outreach and exposure characterization.

4) Developed and carried out industry-wide hazard surveillance studies for silicosis in foundries, potteries, sand mines, highway construction, dental laboratories, and monument builders; and for work-related asthma in health care facilities, funeral homes, and dialysis centers. Conducted on-site industrial hygiene evaluations of specific workplaces identified through surveillance and issued reports with recommendations for controlling exposure to the causal agent of the targeted condition. Obtained voluntary participation and cooperation from employers and employees to help achieve surveillance project goals.

5) Issued alerts and educational bulletins to specific industries as a result of surveillance project findings. Published surveillance findings in annual newsletters, special reports, and articles in the peer-reviewed literature. Developed educational materials for employers, employees, and their physicians. A complete list of educational materials on occupational health developed by the NJDHSS is included in the Appendix. Developed and gave presentations on general surveillance activities, specific occupational health conditions, specific workplace evaluations, and industry-wide studies at national public health, industrial hygiene, and epidemiology meetings. A list of publications and presentations is included in the Appendix.

6) Evaluated the effectiveness of surveillance and intervention activities by comparing completeness of data sources used to identify cases, and by performing follow-up industrial hygiene evaluations at previously inspected workplaces to assess compliance with original recommendations

The OHS Program currently maintains registries for silicosis; work-related asthma; adult blood-lead elevation; and work-related fatalities identified in New Jersey.

Under the NIOSH-funded Sentinel Event Notification Systems for Occupational Risks (SENSOR) grants, NJDHSS succeeded in conducting surveillance for work-related asthma and silicosis, increased the number of identified work-related asthma and silicosis cases; and conducted intervention and information dissemination activities to prevent these occupational diseases.

WORK-RELATED ASTHMA: IMPORTANCE, SCOPE, AND NATURE

Work-related Asthma

Asthma is a disease characterized by increased responsiveness of the trachea and bronchi to various stimuli. Work-related asthma (WRA) is caused by a workplace exposure to such a stimulus. The number of agents that cause WRA is large and constantly growing. Approximately 400 substances have been associated with WRA, and the classes of substances implicated include certain microbial agents, specific animal proteins, several plant products, and numerous industrial chemicals (Bernstein, 1999).

Magnitude of the Asthma Problem

According to data collected from the 2000 National Behavioral Risk Factor Surveillance System (BRFSS) survey, an estimated 14.6 million U.S. adults had asthma; an overall prevalence of asthma of 7.2% (Reese, 2001). Between 1980 and 1996, the self-reported prevalence of asthma increased by 73.9%. During this period, asthma-related lost workdays for adults increased more than 50% from 6.2 to 14.5 million, reflecting the increase in prevalence. Approximately 14.5% of adults reported activity limitation due to asthma. During 1980-1999, the number of hospital visits, including hospital outpatient department visits, for asthma as the primary diagnosis increased from 5.9 million to 10.8 million. During 1992-1999, the number of Emergency Department visits for asthma increased 36% (Mannino, 2002). The steady rise in the prevalence of asthma constitutes an epidemic, which by all indications is continuing. Even if rates were to stabilize, asthma would continue to be a profound public health problem (USDHSS, 2000).

In 1998, the National Heart, Lung and Blood Institute (NHLBI) estimated that the annual costs of asthma were $11.3 billion per year, which includes $7.5 billion in direct medical expenses and $3.8 billion in indirect expenses, such as lost workdays for adults with asthma and lifetime earnings lost due to mortality from asthma (NIH, 1999). In New Jersey, 2000 BRFSS survey data estimated that up to 449,202 adults with asthma. There were 14,654 hospitalizations for asthma among New Jersey residents in 1999, 8,451(58%) among adults 20 years-of-age and above. There were 80 deaths in 1999 (all ages) with asthma certified as the underlying cause. The Asthma and Allergy Foundation of America estimated that asthma costs New Jersey more than $323 million each year (Asthma & Allergy Foundation of America Website, 2000).

Magnitude of the Work-related Asthma Problem

WRA is asthma caused by workplace exposure to any of a large variety of stimuli. It can be a debilitating lung disease with symptoms of chest tightness, cough, shortness of breath, and/or wheezing in reaction to exposures to chemicals or other substances at work. Asthma, in the form of work-aggravated asthma and new-onset asthma due to conditions at the workplace, has become the most common occupational lung disease (NIOSH, 2000). New Jersey's State Health Officials have recognized the need to address WRA by sponsoring its inclusion in the New Jersey Asthma Interdepartmental Strategic Plan (NJDHSS, 2001b). Nationally, an estimated 15% of adult asthma is attributable to occupational factors (ATS, 2003). Using the estimate that 15% of adults with asthma have acquired asthma from a work exposure, and applying this estimate to New Jersey BRFSS data (450,000 adults with asthma) suggests that there are approximately 67,500 adults in New Jersey who may have asthma caused or aggravated by their job (NJDHSS 2003). Individuals with WRA are more likely to be hospitalized than other workers (Liss, 2000) and more likely to suffer loss of earnings than those with asthma unrelated to work (Cannon, 1995). Direct and indirect costs attributable to WRA in the U.S. have been estimated at $1.6 billion annually (Leigh, 2002). WRA is a serious public health concern in New Jersey with its extensive industrial base, growing service industry, large minority workforce, and concentrated populations.

The New Jersey Behavioral Risk Factor Survey (NJBRFSS) is a telephone survey that is a component of the National BRFSS. The BRFSS monitors major behavioral risk factors and chronic conditions associated with disability and death among adults, aged 18 and over, who live at home. The questionnaire used in the NJBRFSS is customized on an annual basis by supplementing required and optional modules from the BRFSS questionnaire with a set of state-

designed questions approved by CDC. Respondents to the NJBRFSS are asked if they have ever been told by a doctor, nurse, or other health professional that they had asthma. Two standardized questions on WRA were added to the NJBRFS in 2003 and 2004. These questions were asked of respondents who reported having ever had asthma. The questions are: *Have you ever been told by a doctor or other medical person that your asthma was related to any job you ever had?* and *Did you ever tell a doctor or other medical person that your asthma was related to any job you ever had?* These data provide state-specific information on WRA prevalence not otherwise available. These data can also be used to assess the burden of WRA to plan and target intervention activities at the state level.

According to the estimates derived from both 2003 and 2004 NJBRFS survey data, among adults with current asthma in New Jersey, 49,458 (10.7%) of these asthma cases may be work-related (See Table 1). The proportion of asthma estimated to be attributable to work is statistically significantly higher among Hispanic adults (17.3%) than white non-Hispanic adults (9.2%). The estimated prevalence of work-related asthma cases is higher among females (31,365) than males (18,092).

Table 1

Estimated Prevalence of Work-Related Asthma* Among NJ Adults With Asthma by Gender and Race NJBRFS 2003-2004

	Asian	Black	White	Other	Hispanic	All Races
Male						
No. of Asthmatics	6,288	16,367	99,089	5,217	18,990	147,501
Number Work-related*	0	2,071	9,477	613	5,221	18,092
Percent Work-related*	0	11.4	9.6	11	24.9	12.6
95 % CI		(5.6, 21.8)	(6.8, 13.5)	(1.4, 55.1)	(14.3, 39.6)	(9.5, 16.5)
Female						
No. of Asthmatics	8,982	47,309	199,168	8,818	47,686	314,926
Number Work-related*	291	6,157	18,178	974	4,964	31,365
Percent Work-related*	4.6	13.0	9.3	12.8	10.7	9.8
95 % CI	(0.6, 26.7)	(8.2, 20.0)	(7.3, 11.9)	(4.6, 31.1)	(6.0, 18.4)	(8.1, 11.8)
NJ Total						
No. of Asthmatics	15,270	63,676	298,258	14,036	66,676	462,427
Number Work-related*	291	8,228	27,655	1,587	10,185	49,458
Percent Work-related*	2.5	13.5	9.2	13.6	17.3	10.7
Estimated 95 % CI	(0.3, 15.6)	(9.4, 19.2)	(7.5, 11.2)	(5.5, 29.8)	(11.4, 25.5)	(9.1, 12.6)

* Adult asthma related to work (responded affirmatively to either or both of the two NJBRFS questions: *Have you ever been told by a doctor or other medical person that your asthma was related to any job you ever had?* and *Did you ever tell a doctor or other medical person that your asthma was related to any job you ever had?*

Note: - Age adjusted to the 2000 U.S. Standard Population
- Prevalence estimates by racial/ethnic category are based on small samples and should be interpreted cautiously.

Source: New Jersey Behavioral Risk Factor Survey, New Jersey Department of Health and Senior Services, Center for Health Statistics

Work-related asthma surveillance programs have been implemented with NIOSH funding in four states - New Jersey, California, Massachusetts, and Michigan. From 1993 through 1999, these programs identified a total of 2,526 cases of WRA (NIOSH, 2003). Within these states, most cases occurred in manufacturing (42%) and services (34%) among operators, fabricators, and laborers (33%) and managerial and professional specialty (20%). The categories of agents most frequently associated with WRA cases were miscellaneous chemicals (20%), cleaning materials (12%), and mineral and inorganic dust (11%). Since workers are exposed to a wide range of possible causative agents, the occupational setting offers a significant opportunity for research on asthma causes and triggers. Characterization of the conditions under which WRA develops, including assessment of exposure-response relationships, enables development of effective prevention strategies. Identifying interventions to prevent asthma is the most promising approach to ending the epidemic of asthma (NIH, 2000).

Relevance to Healthy People 2010
The NJDHSS is committed to achieving the health promotion and disease prevention objectives of *Healthy People 2010* (USDHHS, 2000b), a comprehensive, nationwide health promotion and disease prevention agenda. The *Healthy People 2010* objectives addressed by our proposal include: **Objective 23-6**, *Increase the proportion of Healthy People 2010 objectives that are tracked regularly at the national level*; **Objective 23-7**, *Increase the proportion of Healthy People 2010 objectives for which national data are released within one year of the end of data collection*; **Objective 24-5**, *Reduce the number of school or work days missed by persons with asthma because of their asthma*; and **Objective 24-8**, *Establish in more than 25 states a surveillance system for tracking asthma deaths, illnesses, disabilities, impact of occupational and environmental factors on asthma, access to medical care, and asthma management*. The critical nature of asthma is recognized by its inclusion as a separate chapter in *Healthy New Jersey 2010*, published by NJDHSS. The objectives reflect the need to reduce the death rate, hospital and emergency room admissions, and problems of ethnic minority populations who suffer disproportionately from the disease (NJDHSS, 2001a).

SILICOSIS: IMPORTANCE, SCOPE, AND NATURE

Silicosis
Silicosis is a chronic inflammatory condition of the lung caused by the inhalation of crystalline silica dust, which occurs almost exclusively in occupational settings. Inhalation of silica particles promotes the formation of scar tissue that can lead to disability or death. Symptoms of silicosis usually do not appear until more than 20 years after the initial exposure. However, exposure to high airborne concentrations of silica dust can cause acute silicosis within a few years, and may result in death within months of intense occupational exposure. Occupational exposure to respirable silica has also been shown to cause many other adverse health effects, including lung cancer, pulmonary tuberculosis (TB), chronic renal disease, autoimmune disease, and airways diseases (NIOSH, 2002; American Thoracic Society, 1997). Respirable crystalline silica is classified as a known human carcinogen by the International Agency for Research on Cancer (IARC, 1997), NIOSH (NIOSH, 2002), and the U.S. Department of Health and Human Services (NTP, 2000). In 2005, the American Conference of Governmental Industrial Hygienists (ACGIH) reduced the Threshold Limit Value (TLV) for exposure to respirable crystalline silica dust by 50%, from 50 $\mu g/M^3$ to 25 $\mu g/M^3$, as a time-weighted average (ACGIH, 2005).

Magnitude of Silicosis Problem
Nationally, a total of 16,131 silicosis-associated deaths were recorded during 1968-2001 (CDC, 2003). Statistics show that more than 250 workers die each year from silicosis in the U.S. (Mahoney, 1999). However, due to underreporting and underrecognition, these numbers may actually be higher. A 1995 study found that the potential average years of life lost associated with silicosis was 22.1 years and the potential cumulative years of work lost due to silicosis was 983,185 years (Zhong, 1995). Among the individuals identified with silicosis, 8% had been exposed to silica for less than 10 years and 27% had been exposed for thirty or more years (NIOSH, 2002a). In addition, an unknown number of deaths occur each year from other silica-related diseases such as tuberculosis, lung cancer, renal disease, and scleroderma (NIOSH, 2002).

A study of silica exposure data found that, nationally, the highest exposures to silica occurred in construction work, iron and steel foundries, and metal services, in particular for employees in fields such as masonry, stonework, and painting (Linch, 1998). Among a total of 6,194 OSHA air samples collected from 1987-1996 to measure worker exposures to silica, about 19% exceeded the OSHA Permissible Exposure Limit (PEL) for silica (NIOSH, 2002a). A NIOSH team's review of 728 OSHA inspection samples from 310 construction sites showed that 35% exceeded the OSHA PEL. Overexposures ranged from 39% in masonry and stone work to 52% in painting work which involved sandblasting (The Center to Protect Workers' Rights, 1998). Studies suggest that 100,000 workers in the U.S. are exposed to silica through sandblasting, rock drilling, and mining operations alone and that more than 1.5 million American workers are exposed to silica, a number that is expected to increase (Mahoney, 1999). In addition, the production and use of building materials that may contain silica, such as concrete and masonry, has been escalating dramatically over the last century. U.S. production of construction sand and gravel was approximately 1.3 billion tons during 2003 and imports of these materials totaled more than 4 billion tons during the same time period (USGS, 2004). Recognizing the changing work patterns and the associated severity of silica exposure in the construction industry, NIOSH issued alerts to prevent silicosis in this industry (NIOSH, 1996), in addition to targeting the specific tasks of rock drilling (NIOSH, 1992a) and sandblasting (NIOSH, 1992b). OSHA initiated their National Special Emphasis Program for Silica in 1996 to conduct outreach and workplace inspections. In 1997, OSHA committed itself to developing a comprehensive silica standard to reduce exposure to silica and prevent silicosis. OSHA released a draft standard for Control of Silica Exposure in Construction in 2003 to small businesses for review and feedback. The outcome of this effort is pending.

Occupational exposure to respirable crystalline silica is a serious but preventable health hazard. The number of current cases of silicosis and silica-related disease in the United States is unknown (NIOSH, 2002). During 1988-1999, NIOSH-

funded surveillance programs in New Jersey, Michigan, and Ohio identified 1,370 confirmed cases of silicosis, mostly through hospital discharge data (1024, 75%), physician reports (170, 12%), workers' compensation data (89, 6%), and death certificates (60, 4%). A majority of the cases (1,012, 75%) occurred in the primary metals and stone/clay/glass manufacturing industries. Construction and mining accounted for 85 (6%) and 69 (5%) of the cases, respectively (Reilly, 2004). The numbers of facilities and respective employees for these industries in New Jersey are presented in Table 4.

Relevance to Healthy People 2010

The NJDHSS is committed to achieving the health promotion and disease prevention objectives of *Healthy People 2010*, a comprehensive nationwide health promotion and disease prevention agenda (USDHHS, 2000b). The *Healthy People 2010* objectives addressed by our proposal include: **Objective 20-4**, *Reduce pneumoconiosis deaths*; **Objective 23-6**, *Increase the proportion of Healthy People 2010 objectives that are tracked regularly at the national level*; **Objective 23-7**, *Increase the proportion of Healthy People 2010 objectives for which national data are released within one year of the end of data collection.*

PROGRESS ACHIEVED UNDER SPECIFIC AIMS

The overall goal of the work conducted by the NJDHSS Occupational Health Surveillance Program under the SENSOR grant was to identify potential cases of work-related asthma and silicosis; classify cases in accordance with established SENSOR case confirmation criteria; evaluate exposures associated with the cases; identify new industries, occupations, and causes associated with the diseases; and implement interventions to prevent these occupational diseases in New Jersey. The occupational disease surveillance system in New Jersey follows the SENSOR model comprised of four principal components: a selected target condition, health data sources for case identification and reporting, a surveillance center to collect and evaluate case data, and targeted intervention activities using case data.

Specific Aim 1:
Utilize New Jersey's hospital discharge electronic reporting system, emergency department electronic data system, death certificate registry, workers' compensation electronic data system, physician/advanced practice nurse reporting system, and other sources to identify potential cases of work-related asthma and silicosis.

Hospital Discharge Data

HDD have been used for a variety of occupational health surveillance programs under the SENSOR model (Baker, 1989). HDD are a national data system with standardized variables, formats, and coding. In New Jersey, hospital discharge data have been computerized since 1981. A regulation (N.J.A.C. 8:31B-Subchapter 2) requiring hospitals to report discharge data electronically has been promulgated effective August, 2000. Under electronic reporting procedures initiated in August of 2000 and completed in December 2001, hospitals report data on discharges monthly through a data intermediary to the NJDHSS Office of Facility Information Systems. Consequently, data on discharges needed for surveillance activities can be obtained within one to three months of the hospitalization. NJDHSS has used case-based surveillance for WRA using HDD to identify potential cases of WRA. For this purpose, the record selection process used two specific discharge diagnosis codes: ICD-9 493 (asthma) as primary diagnosis and ICD-9 506 (inhalation of gas fumes or vapor) as any discharge diagnosis (MMWR 1997). These data, being restricted to hospitalized individuals, would enable the identification of severe cases of WRA.

The OHS Program obtained monthly datasets of hospital discharge data (HDD) from NJDHSS Hospital Financial Reporting Support Division, created subsets of NJ hospital discharge by ICD-9, and identified the following.

- 490 cases of possible work-related asthma from HDD diagnosis of ICD-9 506 (respiratory condition caused by inhalation of fumes or vapors), ICD-9 493 with Workers' Compensation as a primary payer.
- 1,180 cases of possible occupational silicosis from HDD diagnosis of ICD-9 502 (silicosis) and ICD- 9 505 (pneumoconiosis, unspecified). See Tables 2 and 3.

OHS Program data analysts electronically merged data sets of newly identified cases and hospital name and addresses with letter requesting medial records and radiographs to obtain necessary information on patients with possible cases of work-related asthma or silicosis and reviewed medical records in order to classify cases.

Letters of consent were mailed to cases identified for follow-up, requesting permission to obtain a telephone interview.

The database of New Jersey Acute Care Hospitals is regularly updated in order to maintain a current network of contacts to expedite requests of medical records of patients with possible or confirmed cases of work-related asthma or silicosis.

The OHS Program followed up on cases of silicosis and work-related asthma identified from hospital discharge data in accordance with respective SENSOR case confirmation and classification procedures.

Emergency Department Data

Emergency Departments (EDs) in the United States treat almost 100 million patients annually. The importance of public health surveillance and the potential of Emergency Department Data (EDD) surveillance have been well documented (Thacker, 1996; Garrison, 1994). However, there are currently few systems that collect information on ED visits for the purpose of developing public health interventions. As a result of the case mix and volume of patients they treat, the 5,200 EDs in the U.S. are well positioned to provide useful data for public health surveillance of injury and illness. ED surveillance systems have the potential to identify problems of public health concern locally, regionally, and nationally. By systematically collecting data on all visits, targeted interventions can be developed to prevent or lessen the morbidity and mortality from many acute diseases and injuries (Hirshohn, 1999).

EDD available from the NJDHSS Facility Information Systems are utilized to identify cases of occupational injuries, poisonings, and illnesses, including WRA. NJDHSS recently completed a preliminary analysis of data from two New Jersey hospital emergency departments. There were a total of 16,383 ED visits in one year, of which 12,811 were among the working-age population (aged 16 and over). An analysis of the dataset using ICD-9 and disease codes as search criteria resulted in 120 work-related cases with an ICD-9 code between 800-999 (injuries, illnesses, and poisonings). Of these, 32 (27%) were sprains and strains, 32 (27%) were open wounds, and 26 (22%) were superficial injuries. A similar analysis by ICD code for reportable occupational and environmental diseases, injuries, and poisonings found 21 injuries and 109 poisonings. There were no WRA cases identified by asthma diagnosis and workers' compensation as primary payer, however, there were approximately 140 cases of potential asthma that would require review of medical records in order to determine work-relatedness. Although this analysis showed that 1% of ED visits are work-related, these preliminary data may grossly underestimate the burden of occupational injury, illness and disease in New Jersey due to (1) lack of recognition and physician underreporting and (2) reporting regulations in place during 2003, which excluded ED patients who were not admitted to the hospital. As of January 1, 2004, an amendment to the Hospital Reporting of Uniform Bill Data expanded hospital reporting requirements to include all patients treated in EDs as outpatients. As a result, NJDHSS now captures all ED visits. As there are approximately 3 million ED visits each year in New Jersey, if 1% of all visits were work-related, that would result in approximately 30,000 cases.

The OHS Program obtained a set of EDD from NJDHSS Hospital Financial Reporting Support Division for period January 2004 – September 2006 and uploaded the data into an MSAccess2000 data table.
The data set was analyzed data set in order to identify cases of work-related asthma and silicosis for SENSOR follow-up procedures. See Tables 2 and 3.

- Identified 100 cases with ICD-9 493 (asthma) and Workers' Compensation as a primary payer.
- Identified 182 cases with ICD-9 506 (respiratory condition caused by inhalation of fumes or vapors) and Workers' Compensation as a primary payer.
- Identified 20 cases with ICD-9 786.2 (cough) and Workers' Compensation as a primary payer.
- Identified 35 cases with ICD-9 786.09 (dyspnea) and Workers' Compensation as a primary payer.
- Identified 8 case with ICD-9 502 (silicosis) and Workers' Compensation as a primary payer.
- Identified 1 case with ICD-9 505 (pneumoconiosis, NOS) and Workers' Compensation as a primary payer.

Selection criteria for identifying all potentially work-related ED visits were selected. A data analysis plan for ED data was written and data analysis was initiated. Preliminary analysis show that of the 2,371,830 emergency visits, 66,800 had either worker's compensation as a payer or had an injury code indicating the injury happened at work. Utilizing a SAS macro written to search multiple variables for different ICD codes, all records were searched for asthma (ICD codes 493, 493.01, 493.02, 493.10, 493.20, 493.21, 493.22, 493.81, 493.82, 493.90, 493.91, 493.92) as one of the diagnoses. This search obtained 769 (1.2%) records, with an ED visit due to asthma, of the 66,800 potentially occupational-related records.

Cases of work-related asthma identified through ED data were followed up in accordance with the SENSOR case processing procedures. The data set of newly identified cases and hospital name and addresses was electronically merged with letter requesting medial records and radiographs to obtain information on patients with possible cases of work-related asthma or silicosis. Medical records were reviewed by the OHS Program Medical Adviser in order to ascertain if cases were possibly work related in order to classify cases. Letters of consent were mailed to cases identified for follow-up, requesting permission to obtain a telephone interview.

An updated set of EDD, including records of patients treated in EDs as outpatients (per the amended Hospital Reporting of Uniform Bill Data in New Jersey effective January 1, 2004) was obtained. This data set consists of approximately 2,3771,830 records for ED visits from January through December, 2004.

Death Certificate Registry Data
Vital records are an easily accessible and inexpensive source of information on disease mortality. The data are governed by national standards for the collection, processing and coding of causes of death and other information, ensuring that data are generally of high quality. DCRD is an essential data source for the surveillance system for chronic diseases such as WRA and silicosis. The NJDHSS Vital Records Unit maintains a computerized database of all death certificates. From 1999, the underlying cause of death is coded using ICD-10 coding system. In addition, this unit maintains multiple causes of death data received from the National Center for Health Statistics (NCHS). NJDHSS Vital Records data are available monthly, whereas, NCHS' data are available annually. Routine search of vital records for WRA and silicosis will capture critical but rare event of death due to these diseases, leading to rapid case identification and associated interventions, as appropriate.

The OHS Program obtains monthly updates of death certificate (DC) "underlying cause of death" data for work-related asthma and silicosis from the NJDHSS Vital Records Unit. Annual updates of NJ death certificates for "underlying cause of death" and "contributory cause of death" for work-related asthma and silicosis are obtained from the National Center for Health Statistics (See Tables 2 and 3).

Confirmed cases of work-related asthma and silicosis identified from DC data following respective SENSOR case processing and confirmation criteria.

Workers' Compensation Data
The workers' compensation data (WCD) system captures data on reported job injuries and illnesses, medical care, disability, and payments. It is one of the few sources that collect cost data. Because the insurance coverage is for the lifetime of the claim, cases are followed over time. Automation of claims handling by WC insurers is rapidly becoming commonplace, as is automation of medical billing and, at a slightly lesser pace, computerization of medical records (Maizlish, 2000). WCD is an important source for identification of occupational diseases, including work-related asthma. The New Jersey Department of Labor and Workforce Development (NJDOLWD) promulgated a regulation effective July 1, 2002 that requires Workers' Compensation Insurance providers to file First Report of Illness or Injury electronically (FROI). This law was fully implemented in January 2003. The advent of electronic reporting enables rapid access to data on work-related illness. NJDHSS has an excellent working relationship with (NJDOLWD); Division of Workers' Compensation (DWC) and the DWC Division Director/Chief Judge is a member of the NJDHSS Occupational Health Surveillance Advisory Board. NJDHSS proposes to continue to work with the DWC to utilize WCD to identify cases of work-related asthma.

The OHS Program analyzed and compared the NJ registry data with workers' compensation data in order to develop a strategy for evaluating search criteria for identifying potential cases of work-related asthma and silicosis.

A formal Memorandum of Agreement was entered into with the NJ Department of Labor and Workforce Development to access Workers' Compensation data. NJDLWD Division of Workers' Compensation is currently obtaining computer servers needed for the new electronic data management system.

Physician/Advanced Practice Nurse Reporting
Physicians have been required by NJ regulation to report occupational and environmental injuries, poisonings, and diseases, including WRA and silicosis, since 1985. In 2003, a revision to the reporting regulation required that advanced practice nurses also report occupational diseases.

Other Sources

NJ Poison Information and Education: Evaluated the usefulness of the NJ Poison Information and Education (NJPIES) data system for identification of cases of work-related asthma. Collaboration with NJPIES is ongoing.

Physician Assistant Reporting System: NJDHSS entered into a collaborative agreement with the NJ Physician Assistants Society to promote voluntary reporting of occupational diseases by physician assistants.

TABLE 2
Summary Statistics for Work-Related Asthma

Reporting Period	*Reporting Source*	*n*	*Cases Interviewed*	*Cases Closed*	*Cases Confirmed*	*Not Work-related Asthma*	*Insufficient Data*
Beginning 1988-9/92	Physician	194	9	6	4	1	1
	Hospital Discharge	25					
	Other	4					
10/92 – 9/94	Physician	88	90	99	68	23	8
	Hospital Discharge	46					
	Other	0					
10/94 –9/96	Physician	61	48	108	74	9	25
	Hospital Discharge	32					
	Other	0					
10/96 – 9/98	Physician	57	42	90	50	29	11
	Hospital Discharge	55					
	Other	2					
10/98 – 9/00	Physician	10	4	26	14	1	11
	Hospital Discharge	6					
	Other	0					
10/00 –9/02	Physician	10	5	9	7	1	1
	Hospital Discharge	0					
	Other	1					
10/02-9/04	Physician	14	33	47	41	4	2
	Hospital Discharge	20					
	Workers' Comp	*					
	Emergency Dept	64					
	Other	4					
10/04 –9/06	Physician	24	32	450	202	233	15
	Hospital Discharge	306					
	Workers' Comp	*					
	Emergency Dept	271					
	Other	1					
TOTAL	**ALL**	**1,295**	**263**	**835**	**459**	**301**	**74**

**Awaiting NJDLWD Division of Workers' Compensation to obtain computer servers needed for new electronic data management system.*

TABLE 3
Summary Statistics for Silicosis

Reporting Period	*Reporting Source*	*N*	*Cases Interviewed*	*Cases Closed*	*Cases Confirmed*	*Other*	*N*
Beginning 1979-9/92	Physician	23	94	797	290	Coal worker's pneumoconiosis	132
	Hospital Discharge	690				Asbestosis	26
	Death Certificates	43				Not silicosis	96
	Other	41				Insufficient data	252
						Other	1
10/92 – 9/94	Physician	1	109	125	59	Coal worker's pneumoconiosis	16
	Hospital Discharge	125				Asbestosis	12
	Death Certificates	9				Not silicosis	24
	Other	0				Insufficient data	12
						Other	2
10/94 – 9/96	Physician	1	53	88	32	Coal worker's pneumoconiosis	8
	Hospital Discharge	69				Asbestosis	4
	Death Certificates	13				Not silicosis	20
	Other	4				Insufficient data	19
						Other	5
10/96 – 9/98	Physician	1	43	48	18	Coal worker's pneumoconiosis	7
	Hospital Discharge	87				Asbestosis	1
	Death Certificates	2				Not silicosis	16
	Other	2				Insufficient data	5
						Other	1
10/98 – 9/00	Physician	2	31	64	25	Coal worker's pneumoconiosis	1
	Hospital Discharge	57				Asbestosis	2
	Death Certificates	0				Not silicosis	18
	Other	0				Insufficient data	17
						Other	1
10/00 – 9/02	Physician	0	25	34	10	Coal worker's pneumoconiosis	2
	Hospital Discharge	36				Asbestosis	2
	Death Certificates	18				Not silicosis	5
	Other	0				Insufficient data	15
						Other	0

Reporting Period	*Reporting Source*	*N*	*Cases Interviewed*	*Cases Closed*	*Cases Confirmed*	*Other*	*N*
10/02 – 9/04	Physician	0	57	108	43	Coal worker's pneumoconiosis	9
	Hospital Discharge	56				Asbestosis	1
						Not silicosis	12
	Emergency Dept	3				Insufficient data	42
	Death Certificate	2					
	Workers' Comp	*					
	Other	0				Other	1
10/04 – 9/06	Physician	0	36	43	21	Coal worker's pneumoconiosis	0
	Hospital Discharge	60				Asbestosis	0
	Emergency Dept	7				Not silicosis	13
	Death Certificate	0					
	Workers' Comp	*				Insufficient data	9
	Other	0				Other	0
TOTAL	**ALL**	**1,352**	**448**	**1,307**	**498**	**ALL**	**809**

**Awaiting NJDLWD Division of Workers' Compensation to obtain computer servers needed for new electronic data management system.*

Specific Aim 2:
Process potential cases of work-related asthma by means of patient and physician interviews, medical record review, and workplace identification/evaluation.

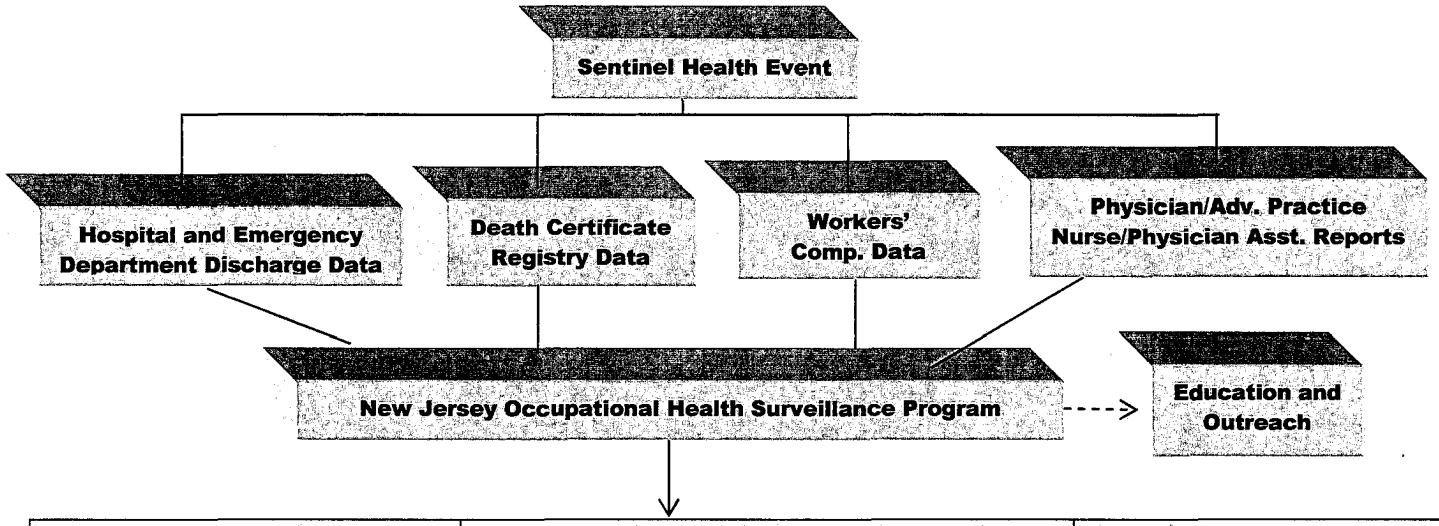
Identification of New Cases: Names of potential cases of WRA and silicosis are identified using source data as described under **Specific Aim 1**. In order to collect the data necessary to accomplish the goals of the project, the following steps were followed for cases that were identified from source data.

Preparation of New Cases: The standard operating procedures for processing of potential WRA and silicosis cases, *Procedures for Identifying and Processing Cases – Work-Related Asthma Registry* and *Procedures for Identifying and Processing Cases – Silicosis Registry*, are included in the Appendix. Medical records (including pulmonary function test results, patient peak expiratory flow data, radiology and other imaging reports, etc) are requested from the treating physician or hospital. Consultations with treating physicians are conducted when appropriate. We are not required to receive consent from the patient in order to obtain medical records and other information needed to process the case, as interpreted in N.J.A.C. 8:57-3.2. However, if an individual specifically denies access to their medical records, no attempt will be made to obtain the records. If it is determined from the medical record that the patient has died, then the death certificate is obtained from the NJDHSS Vital Records Unit. Project staff review and discuss records and those cases appropriate for follow-up are identified.

Patient Follow-up: Attempts are made to contact the identified patient to conduct a telephone interview. If the patient is known to be deceased, the next-of-kin is contacted for a telephone interview. A minimum of six attempts are made to contact the individual or next-of-kin. The individual reported with a case of WRA is interviewed using a standard 60-question telephone questionnaire. Following the successful completion of an interview, a thank-you letter with educational materials, as appropriate, is sent to the patient or next-of-kin.

Schematics of New Jersey's surveillance systems for work-related asthma and silicosis using this model are shown below in **Figures 1** and **2,** respectively (see pages 11 and 12).

FIGURE 1
New Jersey Department of Health & Senior Services
Silicosis Surveillance System Flowchart



Case Confirmation

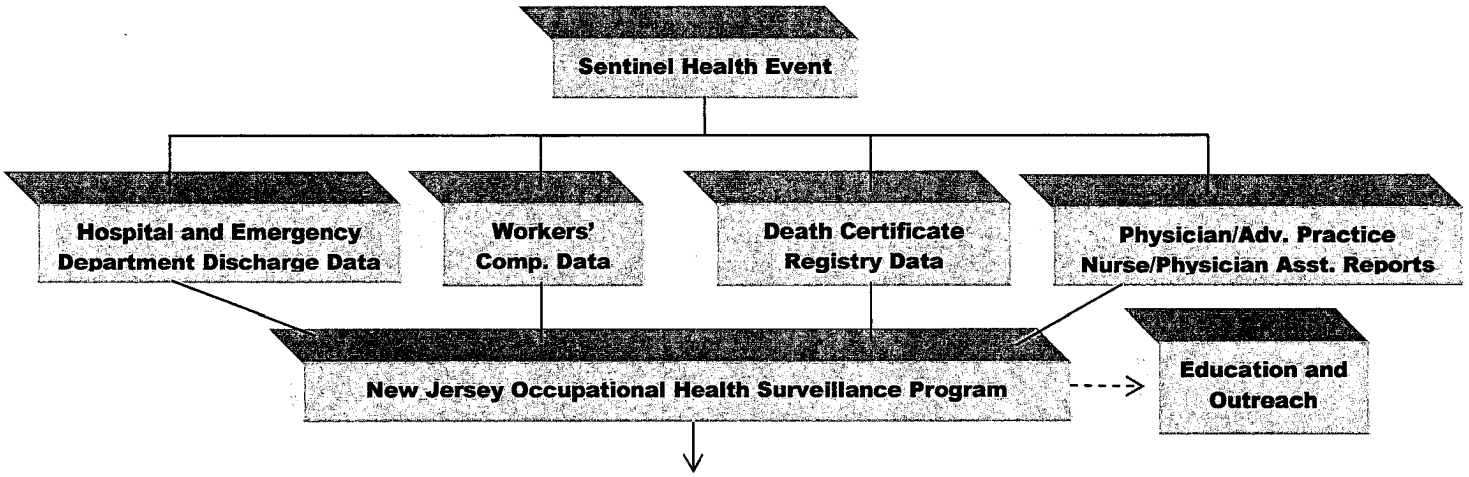
Reported Individuals	Hospitals, Emergency Departments, Center for Health Statistics, NJDOL Div. of Workers' Compensation (WC)	Reporting Physicians and Advanced Practice Nurses, and Physician Assistants
• Interview to: ➢ obtain occupation, employer, other core variables ➢ determine work-relatedness of data or report ➢	• Obtain medical and radiology records and WC data to: ➢ collect occupation, employer, other core variables ➢ determine work-relatedness of data or report • Obtain X-rays for review by B-reader for confirmation of diagnosis	• Provide: ➢ educational materials ➢ thank you letter ➢ reporting forms ➢ outcome of reported workplace evaluation

Interventions

Individuals	Employers	Health Care Providers
REPORTED INDIVIDUALS • Provide educational materials on: ➢ health effects ➢ medical care ➢ workplace controls ➢ legal rights and remedies ***OTHER INDIVIDUALS AT RISK*** • Provide educational materials on: ➢ health effects ➢ medical care ➢ workplace controls ➢ legal rights and remedies • Encourage medical screening with their own physician	***REPORTED WORKPLACES*** • Provide educational materials on: ➢ health effects ➢ workplace controls • Conduct telephone interview to: ➢ determine exposures and control measures ➢ determine other workers at risk • Conduct on-site evaluation to: ➢ gather information on exposures and control measures ➢ make recommendations for controls • Conduct follow-up to on-site evaluation: ➢ check compliance with recommendations ➢ make referrals to OSHA ***OTHER WORKPLACES AT RISK*** • Provide educational materials on: ➢ health effects ➢ workplace controls • Conduct mailed survey to: ➢ determine exposures and control measures ➢ determine other workers at risk • Encourage medical screening of high-risk employees	• Implement education on: ➢ recognition of silicosis ➢ reporting requirements ➢ medical surveillance recommendations

FIGURE 2
New Jersey Department of Health & Senior Services
Work-Related Asthma Surveillance System Flowchart

Case Identification



Case Confirmation

Reported Individuals	Hospitals, Emergency Departments (ED), NJDHSS Vital Records Unit, NJDOLWD-Division of Workers' Compensation (WC)	Reporting Physicians, Advanced Practice Nurses, and Physician Assistants
• Interview to: ➢ obtain occupation, employer, other core variables ➢ determine work-relatedness of data or report ➢ identify asthmagen	• Obtain medical records, ED, death certificate, and WC data to: ➢ collect occupation, employer, other core variables ➢ determine work-relatedness of data or report	• Provide: ➢ educational materials ➢ thank you letter ➢ reporting forms ➢ outcome of reported workplace evaluation

Intervention

Individuals	Employers	Health Care Providers
REPORTED INDIVIDUALS • Provide educational materials on: ➢ health effects ➢ medical care ➢ workplace controls ➢ legal rights and remedies ***OTHER INDIVIDUALS AT RISK*** • Provide educational materials on: ➢ health effects ➢ medical care ➢ workplace controls ➢ legal rights and remedies • Encourage medical screening with their own physician	***REPORTED WORKPLACES*** • Provide educational materials on: ➢ health effects ➢ workplace controls • Conduct telephone interview to: ➢ determine exposures and control measures ➢ determine other workers at risk • Conduct on-site evaluation to: ➢ gather information on exposures and control measures ➢ make recommendations for controls • Conduct follow-up to on-site evaluation: ➢ check compliance with recommendations ➢ make referrals to OSHA ***OTHER WORKPLACES AT RISK*** • Provide educational materials on: ➢ health effects ➢ workplace controls • Conduct mailed survey to: ➢ determine exposures and control measures ➢ determine other workers at risk • Encourage medical screening of high-risk employees	• Implement education on: ➢ recognition of work-related asthma ➢ reporting requirements ➢ medical surveillance recommendations

Specific Aim 3:
Analyze collected data to confirm and classify cases of work-related asthma and silicosis.

A critical component of the surveillance system is the review of the medical, demographic, and employment information collected for each case to determine if it meets the respective *NIOSH/SENSOR Case Confirmation Criteria* for WRA and silicosis (See Appendix).

Review of Work Histories: After the patient follow-up process is completed, the SENSOR Work-Related Asthma or Silicosis Coordinator and Industrial Hygienist review the case file. If the questionnaire is missing the patient's work history, a review of the medical records and/or death certificate, and any other available records, is conducted in an attempt to identify the patient's occupation, place of work, employer name, or specific exposure information. If still unavailable, a series of telephone calls are made to the patient to obtain a work history. Finally, an attempt to obtain the work history is made by mailing a Work History Survey. If confirmation of a suspect workplace or exposure to a specific causal agent cannot be obtained, the case will be closed with no further follow-up.

WRA Case Confirmation: Reported cases of suspected work-related asthma are classified according to the *NIOSH/SENSOR Case Confirmation Criteria.* Reporting physicians are sometimes requested to participate in the confirmation/classification of WRA cases.

1. The patient tracking/core variables form is updated with information from the interview and coded using the AOEC system. SENSOR-Asthma Industrial Hygienist requests the AOEC to assign the agent a code if none exists. The AOEC list designates whether the agent is considered to be an asthmagen. At this time, SENSOR-Asthma Industrial Hygienist also codes occupation and industry and determines type of employer follow-up.
2. SENSOR- Asthma staff reviews the case file to determine if sufficient information is available to apply the Surveillance Case Definition Decision Logic. The three items to be considered are: a) is there a physician diagnosis of asthma, b) is there evidence of a relationship between symptoms and work exposure, and c) is the exposure known to be associated with occupational asthma. Evidence for these items are found in various parts of the interview questionnaire, reporting form, and/or medical record.
3. If the case is confirmed, then medical records are reviewed further to obtain results of spirometry and other asthma-related tests.

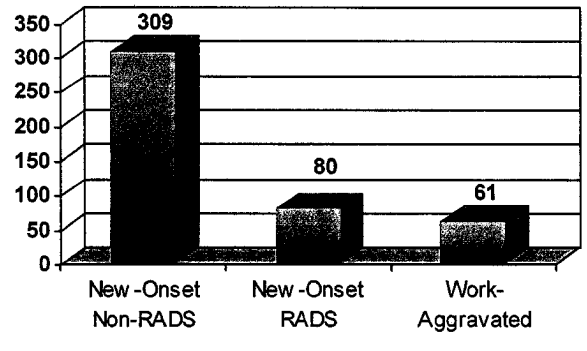
Summary Data: Work-Related Asthma
Between 1988 and 2005, a total of 1,245 possible cases were reported to the NJDHSS WRA Registry. Sources of reports were as follows:

• Physician Reports	456 (37%)
• Hospital Discharge	484 (39%)
• Emergency Department*	294 (23%)
• Other	11 (1%)

**available beginning in 2004.*

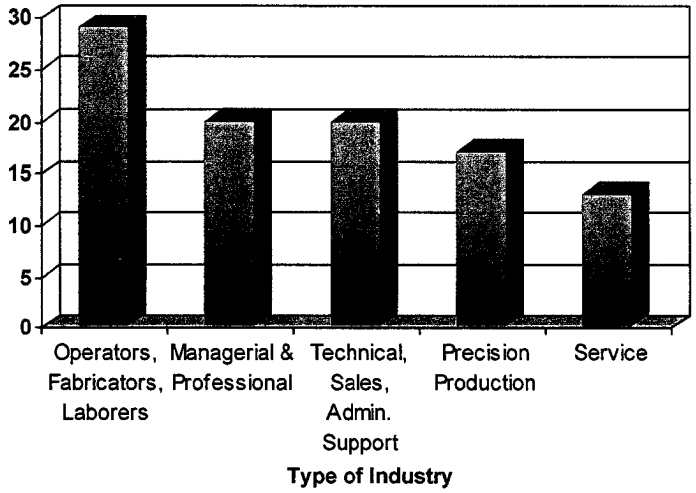
Among these reported cases, 461were confirmed as WRA; 309 (69%) were classified as "new-onset asthma," 82 (18%) as "reactive airways dysfunction syndrome (RADS)," and 65 (14%) as "work-aggravated asthma" (See Figure 3).

FIGURE 3
Number of Confirmed Work-Related Asthma Cases
New Jersey, 1988-2005
N=450



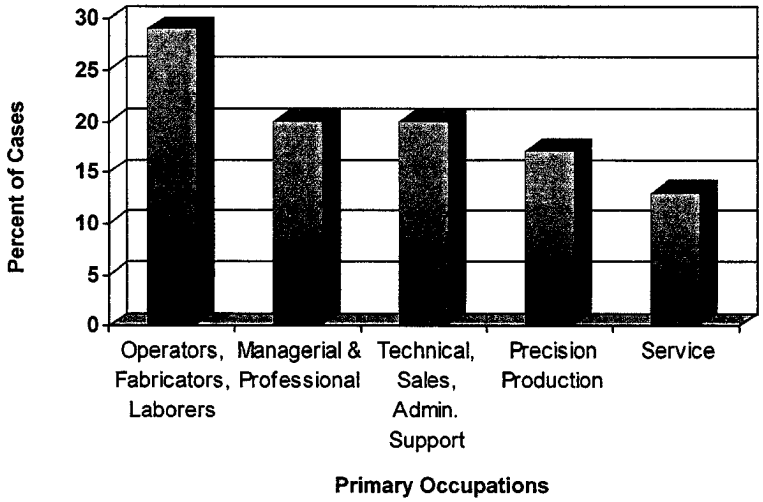
Cases of WRA were identified in all industry types. Figure 4 shows the types of industries in which more than 15 cases were identified. In New Jersey, manufacturing accounted for 185 (41%) cases, and services accounted for 142 (32%) cases. Within the service sector, there were 70 (16%) cases in health services, with the highest number of cases, 45 (10%), reported from general medical and surgical hospitals. The next highest number of cases, 17 (4%), was reported from elementary and secondary schools, while 15 (3%) cases were reported from pharmaceutical manufacturers. The most frequently reported asthma- causing agents were chemicals (not otherwise specified), indoor air pollutants, solvents, and diesel exhaust.

FIGURE 4
Work-Related Asthma Cases by Selected Industry Type
New Jersey, 1988-2005
N=461



The occupational categories most frequently identified for cases of WRA are shown in Figure 5.

FIGURE 5
Work-Related Asthma Cases by Selected Occupational Categories
New Jersey, 1988-2005
N=450



Between 1985 and 2005, a total of 1245 cases were reported to the NJDHSS WRA Registry, 456 (37%) reported by physicians, 484 (39%) identified from HDD, 294 (23%) identified from Emergency Department and 11 (1%) identified by other sources. Among these reported cases, 461(37%) were confirmed as "work-related asthma;" 237 (19%) were classified as "not asthma;" 91 (7%) were "not work-related;" and 63 (11%) could not be classified due to "insufficient or incomplete data." Among the confirmed cases of WRA, 314 (68%) were classified as "new-onset asthma, 65 (14%) were classified as "work-aggravated asthma" and 82 (14%) as "Reactive Airways Dysfunction Syndrome (RADS)." Among the 314 cases with new-onset asthma, 114 (36%) cases had been exposed to an agent that was known to

cause WRA via an immunologically mediated mechanism. The remaining 200 (64%) cases were exposed to substances that have not been classified by the Association of Occupational and Environmental Clinics as asthma-causing agents. In New Jersey, manufacturing accounted for 184 (40%) cases, and services accounted for 148 (32%) cases. Within the service sector there were 74 (16%) cases in health services, with the highest number of cases, 48 (10%) reported from general medical and surgical hospitals. The next highest number of cases, 18 (4%) was reported from elementary and secondary schools, while 12 (3%) cases were reported from pharmaceutical preparations. The most frequently reported putative causes of WRA were indoor air pollutants, diesel exhaust, formaldehyde, and chemicals (not otherwise specified).

Table 4 is a list of 43 industry groups where three or more cases of WRA were identified. The table provides the number and percent of cases, along with number of New Jersey facilities and employees in the respective industry. As shown in Table 4, hospitals, schools, pharmaceutical manufacturers, and inorganic chemical manufacturers were the most predominant industries where confirmed cases of WRA were identified. There are a total of 46,164 facilities and approximately 1,137,000 employees for this subgroup of industries demonstrating the magnitude of potential exposure to asthmagens in the workplace. The service industries, education and health care, together account for-26,221 facilities and over 639,000 employees. According to the New Jersey Department of Labor and Workforce Development's Industry & Occupational Employment Projections, service sector industries are expected to grow by 26.7% between 1998 and 2008, adding nearly 326,000 jobs. A health service is one of the state's two largest industries (NJ Department of Labor, 2002). Strengthening surveillance, prevention, and intervention efforts for WRA in the services, educational, and health industries, in particular, will be highly beneficial. By occupation group, machine operators and tenders (except precision group) ranked first with 75 (16%) cases, followed by professional specialty occupations with 53 (11%) cases, and service occupations with 45 (10%) cases. The healthcare-related occupations with four or more cases were registered nurses with 24; nursing aides, with five; and, health technologists and technicians, and licensed practical nurses, with four each.

TABLE 4
Primary Industrial Exposures with Three or More Confirmed Occupational Asthma Cases in New Jersey 1985 to 2006 with Number of Employees and Facilities with Potential Exposure

SIC[1] Code	Industry	Number of Cases	Percent	Number of Employees[2]	Number of Facilities[2]
8062	General medical and surgical hospitals	48	10.4	132,703	300
8211	Elementary and secondary schools	18	3.9	227,452	4,431
2834	Pharmaceutical preparations	12	2.6	70,424	429
2819	Industrial inorganic chemicals, nec	11	2.4	8,951	120
3341	Secondary nonferrous metals	10	2.2	944	25
8221	Colleges and universities	9	2.0	48,924	329
3089	Plastics products, nec	9	2.0	21,399	500
9199	General government, nec	9	2.0	7,009	202
8011	Offices and clinics of medical doctors	8	1.8	100,977	14,871
5411	Grocery stores	7	1.5	96,301	6,253
3732	Boatbuilding and repairing	6	1.3	2,439	80
1731	Electric work	6	1.3	36,055	4,348
2621	Paper mills	6	1.3	3,022	84
2034	Dried/dehydrated fruits/vegetables/soup mixes	6	1.3	2,567	16
9711	National security	5	1.1	23,895	283
2911	Petroleum refining	5	1.1	4,071	43
3069	Fabricated rubber products, nec	5	1.1	4,310	128
2851	Paints and allied products	5	1.1	4,536	132
2844	Toilet preparations	5	1.1	22,179	297
9221	Police protection	5	1.1	24,995	474
9223	Correctional institution	4	0.9	8,601	76
2879	Agricultural chemicals, nec	4	0.9	166	18
9411	Administration of educational programs	4	0.9	9,232	154
9224	Fire protection	4	0.9	19,072	778
2095	Roasted Coffee	4	0.9	786	24
8059	Nursing and personal care, nec	4	0.9	6,807	186
4213	Trucking except local	3	0.6	19,820	1,060
3663	Radio and TV. communications equipment	3	0.6	10,906	192
2821	Plastic materials & resins	3	0.6	10,706	119

2082	Malt beverages	3	0.6	1,200	22
8071	Medical laboratories services	3	0.6	8,478	585
2899	Chemical preparations, nec	3	0.6	7,445	204
7011	Hotel & motel services	3	0.6	73,193	1,436
2051	Bread, cake, and related bakery products	3	0.8	22,262	866
2752	Commercial printing, lithographic	3	0.6	21,740	1,459
2759	Commercial printing, misc	3	0.6	6,730	794
3674	Semiconductors and related devices	3	0.6	7,674	125
8322	Individual and family services	3	0.6	40,706	4,081
5093	Scrap and waste materials	3	0.6	3,203	341
3339	Primary nonferrous metals, nec	3	0.6	634	21
3711	Motor vehicles & car bodies	3	0.6	4,085	55
9431	Administration of public health programs	3	0.6	10,870	223
	Total for Industries with 3 or more Cases	273	59.0	----------	----------
	Industries with <3 cases	190	41.0	---------	----------
Total		**463**	**100.0**	**1,137,469**	**46,164**

1) *Office of Management and Budget, Standard Industrial Classification, 1987 Manual, Washington D.C., U.S. Government Printing Office, 1989.*

2) *MarketPlace [CD-ROM Database], Dun & Bradstreet, April 2004.*

Silicosis Case Confirmation: Reported cases of suspected silicosis are classified according to the *NIOSH/SENSOR Case Confirmation Criteria* (See Appendix). Reporting physicians are sometimes requested to participate in the confirmation/classification of WRA cases.

4. The patient tracking/core variables form is updated with information from the interview and coded using the AOEC system. SENSOR Silicosis Industrial Hygienist reviews the work history to determine if there existed a potential for exposure to silicosis. At this time, the SENSOR Silicosis Industrial Hygienist also codes occupation and industry and determines type of employer follow-up.
5. SENSOR- Asthma staff reviews the case file to determine if sufficient information is available to apply the Surveillance Case Definition Decision Logic. The three items to be considered are: a) is there a physician diagnosis of silicosis, b) is there evidence of a workplace exposure to silica, and c) is there pathology, radiology, or other medical imaging technique that is consistent with a diagnosis of silicosis. Evidence for these items are found in various parts of the interview questionnaire, reporting form, and/or medical record.
6. A chest radiograph is obtained, if possible, and classified by a NIOSH-certified B reader to classify the radiograph for the presence of pneumoconiosis, specifically silicosis.

Summary Data: Silicosis

Among 133 OSHA air samples collected in New Jersey during 1987-1996, 20% exceeded the PEL, with an average severity of 2.5 times the PEL (NIOSH, 2002). Since OSHA inspects only a small percentage of worksites, these data may not be representative of actual exposure levels. NJDHSS workplace industrial hygiene evaluations documented exposure to silica dust in excess of the OSHA or MSHA PEL in 26% of the companies. The exposure levels exceeded the NIOSH Recommended Exposure Limit (REL) for 38% of the companies with exposure data (NJDHSS, 1998).In New Jersey there were 38,484 companies identified by the National Occupational Exposure Survey (NOES) with potential silica exposure (Valiante, 1992b). A NJDHSS study examining silica exposure of highway/road repair work demonstrated that workers were exposed to concentrations up to 12 times the OSHA PEL. The results of 36 (88%) of 41 full-shift exposure measurements collected for five roadway repair tasks were in excess of the OSHA PEL (NJDHSS, 2001; Valiante, 2001). Table 5 displays number and percent of cases, number of employees, and number of facilities with potential silica exposure for 36 industry categories with three or more confirmed cases of silicosis. This table indicates that in 2002, there are 8,676 facilities and over 75,000 employees with potential exposure to silica in New Jersey. The manufacturing sector has the highest number (288) of confirmed cases. However, construction has the highest number of facilities (7,703), and employees (37,859), with potential exposure. As mentioned earlier, 19 silicosis cases were identified among construction laborers. Focusing surveillance and intervention activities on the construction industry will be of great significance in the primary prevention of silicosis.

Table 5
Primary Industries with Three or More Confirmed Silicosis Cases in New Jersey with Numbers of Employees and Facilities with Potential Exposure - 1979 to 2006

SIC code[1]	Industry	# of cases	%	# of employees[2]	# of facilities[2]
3261	Porcelain plumbing fixtures	56	11.3	757	7
3325	Steel foundries, nec	34	6.8	107	7
3321	Gray and ductile iron foundries	31	6.2	1,029	14
3253	Ceramic wall and floor tile	26	5.6	105	16
1446	Industrial sand	26	5.2	196	11
3269	Pottery products, nec	23	4.6	202	23
1011	Iron Ore Mining	20	4.0	0	0
3264	Porcelain electrical supplies	17	3.4	410	14
3281	Cut stone and stone products	16	3.2	451	49
1622	Bridge, tunnel, elevated highway const.	15	3.0	716	40
3312	Blast furnaces and steel mills	15	3.0	791	56
3262	Porcelain china table and kitchenware	9	1.8	877	4
3295	Minerals, ground or treated	7	1.4	195	11
1741	Masonry and other stonework	7	1.4	5,763	1,173
1442	Construction sand and gravel	6	1.2	370	33
3731	Shipbuilding and repairing	6	1.2	5,378	23
1721	Painting and paper hanging	5	1.0	8,272	2,539
3251	Brick and structural clay tile	5	1.0	47	4
1799	Special trade contractors, nec	5	1.0	14,625	2,743
3069	Fabricated rubber products, nec	5	1.0	2,629	98
3297	Non clay refractories	5	1.0	107	5
1411	Dimension stone	4	0.8	198	15
1611	Highway & street construction	4	0.8	6,730	681
3221	Glass containers	3	0.6	2,001	15
3052	Rubber & plastic hose and belting	3	0.6	221	14
3229	Pressed and blown glass, nec	3	0.6	2,105	66
3231	Products of purchased glass	3	0.6	3,525	82
3711	Motor vehicles and car bodies	3	0.6	1,483	44
3479	Metal coating and allied services	3	0.6	1,364	110
3339	Primary nonferrous metals, nec	3	0.6	409	15
1743	Terrazzo and ceramic tile & installation	3	0.6	1,753	527
3255	Clay refractories	3	0.6	200	4
1429	Sand, gravel and crushed stone	3	0.6	186	11
3263	Semi-vitreous table and kitchenware	3	0.6	8	2
3292	Asbestos products	3	0.6	18	3
2844	Perfumes, cosmetics & toilet products	3	0.6	12,203	217
	Total for Industries with 3 or more cases	387	77.9	---------	---------
	All other Industries with < 3 cases	96	19.3	---------	---------
9999	Non classifiable establishment	14	2.8	----------	----------
Total		**497**	**100.0**	**75,431**	**8,676**

1) *Office of Management and Budget, Standard Industrial Classification, 1987 Manual, Washington D.C., U.S. Government Printing Office, 1989.*
2) *Dun & Bradstreet, April 2004.*

Specific Aim 4:
Conduct on-site industrial hygiene evaluations of workplaces where cases of work-related asthma or silicosis have been identified.

NJDHSS conducts on-site industrial hygiene inspections at companies and worksites identified by surveillance data. . The reporting or treating physician/nurse is typically invited to accompany NJDHSS staff during site visits. These workplace inspections or evaluations are performed to provide the employer with detailed information and recommendations for protecting workers from exposure to the hazardous substance(s) causing silicosis or WRA. In addition, the information derived from these individual workplace evaluations is used in the development of educational materials, and in publications and reports that are disseminated or shared in the occupational health community. Initial contact of all identified workplaces is by a mailed packet of educational materials, tailored to the specific agent or process associated with the disease. Those workplaces where an on-site industrial hygiene evaluation is determined

to be appropriate according to established protocol (See Appendix) are contacted by telephone to schedule a date for the evaluation. collect information on the circumstances surrounding the exposure to the causative agent for the adverse health condition. An on-site industrial hygiene evaluation is scheduled. The protocols for conducting the workplace evaluation at worksites where a case(s) of work-related asthma or silicosis, *Industrial Hygiene Investigation Protocol: Work-related Asthma* and *Industrial Hygiene Investigation Protocol: Silicosis* (included in Appendix). The workplace evaluation is designed to collect and interpret information about workplace processes, hazardous substances, effectiveness of exposure control methods, respiratory protection, training and medical surveillance programs, and other employee protection methods in place for preventing hazardous exposures. The on-site evaluation includes: employer interview to collect information on business operations, number of employees, employee job titles and duties, employee health and safety programs, past environmental sampling, and past employee medical tests and exams; review of hazardous materials handled, including inventory records, Material Safety Data Sheets, and container labels; walk-through of facility to observe work activities, processes, machinery, equipment, tools and materials used by employees, personal protective equipment, hygiene facilities and practices, engineering controls (enclosure of process/employee, local exhaust/dilution ventilation), and HEPA vacuums. Interviews with co-workers with exposures similar to the reported individual are conducted when possible, covering health problems and concerns with workplace conditions. Air sampling for specific substances is conducted depending on observations during the walk-through and available employer data. A closing conference is held with company management to provide feedback on the preliminary findings. Verbal recommendations are made at this time to correct any deficiencies observed during the walkthrough, especially those that are recognized as immediately dangerous to life or health.

Within thirty days following the on-site evaluation, the industrial hygienist issues a report of findings and recommendations for reducing exposure to the identified causative agent. Workplace-specific recommendations may include substitution with less toxic substances, feasible engineering controls, personal protective equipment, housekeeping, hygiene facilities and practices, employee training and education, and environmental sampling. Attachments to the report will include appropriate selections from the library of OHS Program educational materials, many of which are included in the Appendix.

A letter accompanying the report requests the company to provide NJDHSS with a detailed, written response on the actions taken regarding each recommendation made in the final report. The company is asked to respond within 90 days of receiving the NJDHSS workplace evaluation report. At least one year after the date of the initial workplace evaluation, a follow-up evaluation is conducted to determine employer compliance with the NJDHSS recommendations and the current status of workplace conditions. This allows NJDHSS to collect information that will be used to evaluate the surveillance system.

Industrial Hygiene Evaluations for WRA

One hundred and thirty-four initial on-site industrial hygiene evaluations were conducted at New Jersey workplaces in response to sentinel cases of WRA identified through NJDHSS surveillance activities. Twenty-nine follow-up evaluations were conducted in order to determine if recommendations made by NJDHSS industrial hygienists after the initial visit were followed (See Evaluation Section).Industrial hygiene evaluations are conducted in accordance with the *Industrial Hygiene Investigation Protocol: Work-related Asthma*. Determinations of industrial hygiene follow-up actions for a subset of the registry data are shown in Table 6.

Table 6 Follow-Up Actions for Identified Cases of Potential Work-Related Asthma

Action	Total # Cases
Worksite visit done	110
Worksite visit not done, no patient consent	90
Worksite visit not done, letter with educational materials only	60
Worksite visit not done, one time event	50
Worksite visit not done, process/agent/worksite no longer in operation	45
Worksite visit not done, not asthma	38
Worksite visit not done, patient no longer employer there, patient deceased	25
Worksite visit not done, IH done by another or referred to another	23
Worksite visit not done, IAQ	23
PEOSH referral	23
Worksite visit not done, worksite out of state	21
Worksite visit not done, other	19
Worksite visit not done, lost contact with patient	14
Worksite visit not done, not occupational asthma	13
Pending	12
Worksite visit not done, no co-workers	8
Worksite visit not done, employer refusal	6

Worksite visit not done, worksite unknown	5
Worksite visit not done, worksite in patient's home/worksite in patient's car	3

Fatal Case of Work-related Asthma

NJDHSS identified a fatal case of work-related asthma through surveillance of New Jersey death certificate data. The victim worked as a material handler/laborer in a materials milling facility where he was exposed to shark cartilage dust, a heretofore unrecognized cause of asthma. OHS Program industrial hygienists conducted an on-site evaluation of exposures and control methods at the facility. Based on the unusual nature of the exposure, and the fact that the exposure resulted in a fatality, NIOSH was requested to perform a formal Health Hazard Evaluation at the facility. A NIOSH researcher used the case as a basis for publishing a peer-reviewed paper, on which the OHS Program investigating industrial hygienist was listed as a co-author: Ortega HG, Kreiss K, Schill DP, Weissman DN. Fatal asthma from powdering shark cartilage and review of fatal occupational asthma literature. *Am J Ind Med.* 2002; 42:50-54.

Industrial Hygiene Evaluations for Silicosis

Eighty-three initial on-site industrial hygiene evaluations were conducted at New Jersey workplaces in response to sentinel cases of silicosis identified through NJDHSS surveillance activities. Forty-one follow-up evaluations were conducted in order to determine if recommendations made by NJDHSS industrial hygienists after the initial visit were followed. Industrial hygiene evaluations are conducted in accordance with the *Industrial Hygiene Investigation Protocol: Silicosis.*

Silicosis worksite variables: During Annual SENSOR Silicosis Workshops held from 1995 through 1998, funded states and NIOSH industrial hygienists worked to develop a system of standardized variables for summarizing information across states that is obtained during telephone interviews of employers or during on-site industrial hygiene evaluations of work sites. These variables can be used for follow-ups that were either prompted by cases identified through sentinel-event surveillance or for those that follow the hazard surveillance model. In 2000, a NIOSH industrial hygienist pilot tested the variables during an on-site evaluation conducted at a New Jersey foundry.

NJDHSS created MS Access data tables and data entry forms for a selected subset of the variables, consisting mainly of the core variables that were designated as such during their development. NJDHSS is conducting further pilot testing with the subset of core variables at workplaces identified through the sentinel-event surveillance project and industry-wide intervention activities.

Specific Aim 5:
Conduct interventions for work-related asthma and silicosis in affected industries and populations in New Jersey.

The NJDHSS collaborated with partners and stakeholders to conduct industry-wide intervention projects involving silicosis and WRA in specific industries, users of a particular asthmagen, or especially affected populations. The selected projects are based on analysis of past silicosis and WRA surveillance data from New Jersey and other states conducting surveillance for this condition. The decision to conduct a specific project relies on factors unique to New Jersey. Issues such as the magnitude of the problem, severity, number of individuals affected, feasibility, political/economic climate, and industry and labor support are all factors that are evaluated in determining the value of the project. The anticipated multiplier effect, sustainability of the proposed activity, resources required, and availability and interest of potential stakeholder representatives are also considered.

WRA INDUSTRY-WIDE INTERVENTIONS

Prevention of Latex Allergy in New Jersey Health Care Facilities

The use of latex gloves has proven effective in preventing transmission of many infectious diseases. Unfortunately, the increased use of latex gloves in this preventive effort has contributed to documented sensitization to latex allergens of 1-6% of the general population, and 7-17% of health care workers (Phyllips, 1999; Griefe, 1995). Sensitization to latex among this population has led to the development of WRA. Extrapolating from New Jersey's census data, these estimates suggest that as many as 11,000 nurses, 4,000 doctors, and 1,000 dentists may be latex sensitive. Studies have shown that exposure to the aerosol released from powdered latex gloves is associated with the development or exacerbation of asthma (Tarlo, 1994). In response to a proposal from the NJDHSS Occupational Health Surveillance Advisory Group, the NJDHSS convened the Latex Allergy Task Force comprised of stakeholders and representatives from medical schools, professional associations, ELASTIC (latex allergy victims advocacy group), occupational medicine physicians, and the glove manufacturing industry.

***Data Collection, Findings, and Interventions*:** Interventions were conducted in three phases: 1) in March 1998, an educational mailing consisting of a newly-issued *NIOSH Alert on Latex Allergy in the Workplace* was sent to over 2,400 health care facilities; 2) in April 2000, educational materials, including guidelines on management of latex allergy, were developed and distributed to the 2,400 health care facilities, as well as posted on the NJDHSS Web site, and 3) in October 2000, a *Survey of Latex Allergy Management in New Jersey Hospitals* was developed and distributed to 122 New Jersey health care facilities. The survey asked for information on policies regarding patient care, employee health, selection of gloves, changes in institutional practices made based on NJDHSS guidelines, and number of employees with latex-related illness. Survey results show that 37 (90%) of the respondents reported that they had policies regarding patient care, 31 (76%) had policies regarding employee health, 17 (41%) had policies on glove selection. The survey also found that 18 (44%) of the hospitals made changes in their institutional practices based on the NJDHSS guidelines. Additionally, respondents reported having identified at least 87 employees with some type of latex allergy. Between 1998 and 2000, NJDHSS conducted educational lectures on latex allergy prevention for various audiences, and a set of slides was developed and made available to health care facilities for use in employee training.

A follow-up survey to determine changes in behavior as a result of the NJDHSS Latex Allergy outreach efforts is sent to all New Jersey health care facilities who received the outreach materials and completed a baseline survey (See Evaluation section).

***Educational Materials Developed*:**

- *Latex Allergy - A Guide to Prevention.*
- *Guidelines: Management of Natural Rubber Latex Allergy & Selecting the Right Glove for the Right Task in Health Care Facilities* (included in Appendix)

Glutaraldehyde in Health Care Facilities

Analysis of data in the Work-related Asthma Registry revealed that eleven cases of WRA were associated with exposure to glutaraldehyde in health care workers. Glutaraldehyde is widely used, is a known sensitizer, and has an ACGIH Threshold Limit Value (TLV) that had recently been significantly reduced. Based on this information, a hazard surveillance project was initiated. This project was designed to characterize the exposure potential to this chemical in New Jersey health care facilities, and to educate employers and employees about health hazards and exposure control measures.

Data Collection: The *Glutaraldehyde User Survey*, along with a NJDHSS educational bulletin, was mailed to 415 licensed hospitals, ambulatory care facilities, and renal dialysis centers in New Jersey. Two hundred and sixty-three (57%) surveys were returned, 122 (46%) of which reported use of glutaraldehyde. A total of 27,363 gallons of glutaraldehyde per year were reportedly used by the facilities, with 2,432 workers being potentially exposed. Results show that 108 (89%) employers implemented employee training, 101 (83%) used engineering controls, and 113 (93%) used personal protective equipment to control exposure to glutaraldehyde. The survey also showed that health care facilities had made the least progress in implementing respiratory protection [76 (62%)] and exposure assessment [61 (50%)]. A *Glutaraldehyde Worker Survey* (included in *Appendix)* was also developed and distributed to 173 potentially exposed workers in 12 different health care facilities where on-site evaluations had been conducted. The survey asked for information on demographics, frequencies and methods of glutaraldehyde use, exposure control methods, training, and work-related symptoms. Of 53 (31%) returned surveys, 39 (74%) of the respondents reported that they could detect the odor of glutaraldehyde, and 15 (29%) reported eye irritation while using the chemical.

Interventions: NJDHSS conducted 12 on-site evaluations that included air monitoring for glutaraldehyde vapor during various tasks. Air monitoring results indicated that exposures in some hospital endoscopy units and renal dialysis centers exceeded the new TLV for glutaraldehyde. Findings of the NJDHSS project were introduced by the OSHA Office of Regulatory Analysis into the docket for the promulgation of a new legal permissible exposure limit for glutaraldehyde. A NJDHSS educational booklet was developed by NJDHSS that addressed health effects of glutaraldehyde; exposure limits; exposure control; storage, use and disposal; air monitoring; medical surveillance; and recordkeeping. The booklet was sent to all New Jersey health care facilities, and was posted on the NJDHSS Web site.

***Educational Materials Developed*:**

- *Glutaraldehyde: Guidelines for Safe Use and Handling in Health Care Facilities* (included in *Appendix*)

Publications
Schill, D, Valiante D, Coyne M; *Glutaraldehyde in New Jersey Health Care Facilities.* NJDHSS Occupational Health Surveillance Newsletter, February 2001 (included in *Appendix*).

Formaldehyde and Embalmers
WRA surveillance identified embalmers (funeral directors) as a high-risk group for exposure to formaldehyde, a recognized cause of asthma. Four cases of WRA in embalmers were identified in the NJDHSS WRA registry. Additionally, 13 other cases of confirmed WRA were associated with exposure to formaldehyde among other occupations. Studies have shown that embalmers are at risk of significant exposure to formaldehyde during the embalming process (Korczynski, 1994).

Data Collection: A survey, along with a NJDHSS educational bulletin, was mailed to all 1,848 licensed funeral directors in New Jersey, as well as all members of the New Jersey State Funeral Directors Association, to collect information on demographics, embalming history, numbers of embalmings performed, work practices, embalming room ventilation, training, use of respiratory protection, past diagnoses of asthma, health symptoms, spills, and smoking. The survey also asked whether the embalmer ever had their exposure to formaldehyde measured and asked for monitoring results, if available. Six hundred and three (33%) were returned of which 298 (49%) reported current embalming practice. Of those, 284 (96%) reported receiving training, 267 (90%) stated that the embalming room has special ventilation (usually a wall fan), and 224 (77%) reported that their workplace had been monitored for formaldehyde levels. Additionally, 201 (69%) stated that they could detect the odor of formaldehyde while embalming, while only 42 (14%) reported that they used a respirator. The New Jersey State Funeral Directors Association (NJSFDA) partnered with NJDHSS for this project; they reviewed the draft survey and recommended changes and clarifications of survey questions. Prior to sending out the survey, the NJSFDA also demonstrated support of this study by publicizing it in their monthly magazine and by faxing a notice to the association's 920 members.

Interventions: On-site industrial hygiene evaluations were conducted during embalming to assess formaldehyde exposures, observe work practices, and evaluate effectiveness of ventilation systems. NJDHSS identified several sources of formaldehyde exposure that were potentially controllable with ventilation engineering controls, and specific recommendations were made to the evaluated workplaces. Responding to a need recognized during this project, NJDHSS developed a fact sheet describing a method for determining the ventilation rate in embalming rooms, and provided the sheet to the NJSFDA for distribution to their members. NJDHSS also developed a project to design and evaluate an affordable easy-to-fabricate local exhaust ventilation system.

Educational Materials Developed:
- *Occupational Health and Funeral Homes*
- *Ventilation of Funeral Home Preparation Rooms – Guidelines and Calculations* (included in *Appendix*).

Publications
Schill DP, *Predictors of Formaldehyde Exposure Monitoring in New Jersey Funeral Homes*, presented at Tulane University, School of Public Health and Tropical Medicine, 1999 (included in *Appendix*).

Polyurethane Bed Liners
As a result of a fatal case of WRA identified by the Michigan SENSOR project, an intervention is currently being conducted in New Jersey. An applicator of after-market sprayed-on polyurethane bed liners suffered an asthma attack while spraying a van floor with the diisocyanate-containing chemical mixture. A hazard alert suitable for posting at the workplace has been drafted, describing the hazard of exposure to diisocyanates and the precautions that should be taken to prevent exposure. Businesses potentially involved in the application of after-market polyurethane bed liners for trucks have been identified using D&B iMarket data. The alerts were mailed to identified businesses, along with a survey requesting information on how bed liners are applied and what safety and exposure control methods are in place to protect workers. Recipients of the alert will also be asked how the alert will be used, as well as how useful they found the information. A comprehensive information bulletin on diisocyanates is also being drafted for use in educational interventions at workplaces where diisocyanates are used.

Educational Materials Developed:
- *ALERT – Diisocyanates: Important Information for Applicators of Sprayed-on Polyurethane Bed Liners* (included in *Appendix*).
- *What Workers and Employers Need to Know About Diisocyanates (draft,* included in *Appendix*).

Tungsten Carbide

A hazard surveillance project for tungsten carbide (TC) was implemented based on five cases of WRA identified through the Work-Related Asthma Surveillance Project. A literature and Internet search for toxicity and hazard control information on tungsten carbide was conducted, and an educational brochure, *What Workers Need to Know about Tungsten Carbide and Work-Related Asthma*, was drafted for TC workers and employers, and a *Tungsten Carbide User Survey* was developed to collect information on how tungsten is used and the exposure prevention procedures are in place. One-thousand-two-hundred-thirty-six (1,236) New Jersey companies in eight SIC codes where exposure to TC may occur were identified. A cover letter, the educational brochure, the survey, and a self-addressed postage-paid envelope will be mailed to all users of TC identified using D&B iMarket data. Survey responses will be data-entered and analyzed to select companies for on-site industrial hygiene evaluations and air sampling for TC dust and cobalt. A report of findings and recommendations for each company where exposure evaluation and air sampling was conducted will be issued. A report on the methods and outcomes of the Tungsten Carbide Hazard Surveillance Project will be issued and submitted for publication in the *Occupational Health Surveillance Update* newsletter and/or a peer-reviewed journal.

Educational Materials Developed:
What Workers Need to Know about Tungsten Carbide and Work-Related Asthma (draft, included in *Appendix*).

SILICOSIS INDUSTRY-WIDE INTERVENTIONS

New Jersey Silica Partnership
Silica Outreach and Research (SOAR) Alliance

The New Jersey Silica Partnership (renamed in 2004 to the Silica Outreach and Research [SOAR] Alliance) comprised of a group of stakeholders, including OSHA, NIOSH, NJDHSS, laborers' unions, contractors' associations, NJDOT, and NJTA was formed to address issues associated with silica exposure among New Jersey highway construction and repair workers. The goals of the NJ SOAR Alliance are to:

- Raise industry awareness of silica hazards and exposure control measures,
- Quantify silica exposures caused by silica-producing tasks during road construction and repair work,
- Identify existing and develop new engineering controls to reduce silica exposure, and
- Improve compliance with OSHA and NJ PEOSH standards for silica exposure, respiratory protection, and hazard communication.

The goals of this project, renamed in 2004 to the Silica Outreach and Research (SOAR) Alliance, were to collect air samples to quantify silica exposures on silica dust-producing tasks during road construction and repair work; evaluate effectiveness of existing engineering controls and identify new controls; incorporate protective contract language into NJ highway repair contracts, and raise industry awareness of silica hazards and preventive measures. NJDHSS partnered with federal OSHA, other state agencies, the Laborers' union, ten highway repair contractors and their trade association, and other stakeholders, to accomplish the partnership goals.

Phase 1: Eleven sets of samples were collected at nine different worksites involving seven partner highway repair contractors. A total of 53 samples were collected for seven different work tasks. Prior to carrying out the air sampling portion of the project, contractors, trade associations, and union officials were provided with training on the OSHA Special Emphasis Program on Silica, health hazards of silica exposure, elements of a silicosis prevention program, and an overview of the protocol to be followed during the air sampling component of the project.

Phase 1 Findings: Sample results indicated that there is significant risk of overexposure to silica for workers performing all road repair tasks that involve concrete, as well as asphalt milling. Engineering controls were not used on any of the sampled tasks, except for asphalt milling. Studies revealed that exposure levels can be significantly influenced by various environmental and physical factors. Until feasible engineering controls can be developed and/or used effectively, highway repair workers must rely on appropriate respiratory protection to control their exposures to silica dust.

The NJ SOAR Alliance has conducted outreach to major contractors involved in highway construction in New Jersey. This outreach included formal training, presentations, and distribution of educational materials on the control of silica dust hazards. Strategies to encourage smaller companies to utilize a pool of prequalified union workers were developed. Through the two NJ Locals of the International Laborer's Union, their laborers are offered training in silica hazards, and are fit-tested and medically qualified to wear a respirator for tasks which may result in elevated silica exposure. NJ SOAR Alliance partners also plan to continue the development and identification of effective engineering controls for other tasks and equipment that are associated with silica overexposures.

Significance of Findings: The project demonstrated that a variety of groups including employers and government agencies, along with industry and labor organizations, could work together to successfully implement occupational health initiatives. Data were obtained that confirmed dangerous silica exposures in highway construction. As a result of the findings, the New Jersey Department of Transportation incorporated language into their contracts for highway work that requires bidding contractors to take measures to protect their workers from silica. Laborer union locals in New Jersey began a program of training members in the hazards of silica, and medically qualifying and fit testing them for respirators. NJDHSS provided data to the OSHA Office of Regulatory Analysis for use in the development of a comprehensive standard for silica.

Publications:

- *Schill DP, Valiante DJ.* New Jersey Silica Partnership. *Occupational Health Surveillance Newsletter, February 2001, pages 1-4.* (Included in Appendix)

Phase 2: The partnership initiated a project focusing on engineering controls for tools and machinery used in highway construction and repair. Partners included those from Phase I, as well as road repair equipment manufacturers and distributors. Committees were formed among partner representatives to identify, evaluate, and define gaps in available technologies for controlling the release of dust during tool operation. Three existing and custom-designed engineering controls for jackhammers were evaluated for dust exposure reduction and feasibility of use. NJDHSS coordinated the air-sampling portion of the test and participated in the drafting of a report of findings. Additionally, approximately 1,600 highway repair contractors have been formally notified that NJDHSS is available to provide consultation and technical assistance regarding work involving silica dust.

Members selected jackhammer operation as the first task to be addressed for evaluation of engineering controls. Identified existing engineering controls and selected the following for evaluation: rock drill shroud with dust collector, custom-made jackhammer shroud with dust collector, and a water-spray control designed and constructed by a partner contractor. Coordinated and participated in a project to conduct air monitoring for silica during a series of short-term test trials for the three types of engineering controls used during jackhammer operations. Air monitoring data was analyzed and the water spray method was determined to be the most effective and feasible engineering control for jackhammer operation. A video exposure monitoring tape of the jackhammer evaluation trials was created with using data logged by a direct-reading aerosol monitor. Distributed videotapes to partnership members and other stakeholders. Surveillance staff worked with partner contractor representatives and a scientist from the NIOSH Division of Applied Research and Technology to develop a project to sample "real world" full-shift exposures of jackhammer operators using newly developed water-spray engineering controls.

NJDHSS coordinated and participated in a second two-day multi-partner air-sampling project to evaluate effectiveness of new jackhammer engineering control for dust. Staff downloaded data from direct-reading air-monitoring instrument, reviewed data, and provided to NIOSH for analysis and development of a video exposure monitoring tape.

Phase 2 Findings: The first engineering controls to be evaluated were three different dust control and suppression devices fitted to jackhammers. All of the devices reduced operator dust exposures by at least 50%, and one of the controls, a water spray dust suppressor, reduced respirable dust levels by as much as 90%. During all jackhammer trials, workers were videotaped. The sampling results were then synchronized with, and overlaid upon the video footage. This video exposure monitoring creates a link between exposure and specific activity, and serves as a useful training tool for workers, who are able to see how work practices and other factors within their control influence their exposure to dust. The Partnership then began evaluating the water spray control on actual job sites. A two-day on-site sampling project was conducted. Results from this study indicate that the water spray was an effective control, and reduced the respirable dust from 71% to 90%. An educational manual, *How to Make Your Very Own Jackhammer Spray Dust Control*, was developed by a certified industrial hygienist with the NJ Laborers Health and Safety Fund, a NJ SOAR Alliance partner. The manual describes the steps in assembling and attaching the water-spray control, and includes a list of parts and materials, their sources, and their costs.

Significance of Findings: When proper practices are not followed or exposure control measures are not maintained, respirable crystalline silica exposures can exceed the NIOSH Recommended Exposure Limit (REL), the OSHA Permissible Exposure Limit (PEL), or the American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Value (TLV). NIOSH recommends an exposure limit of 0.05 mg/m^3 to reduce the risk of developing silicosis, lung cancer, and other adverse health effects. The ACGIH TLV is also 0.05 mg/m^3 will be reduced in 2005 to 0.025 mg/m^3), and the OSHA PEL varies with % crystalline silica in the dust (but is essentially 0.1 mg/m^3. The results of the evaluation of several different dust control devices demonstrated that the water spray device was very effective in reducing respirable dust concentrations. Since the water spray control is constructed of readily available materials, is relatively unobtrusive to the jackhammer operator, and is easily retrofitted to almost any jackhammer, this control

method is expected to find favor among roadway repair contractors. This device is now being tested on actual job sites to determine if the exposure to respirable dust while employing the water spray would exceed the NIOSH REL, ACGIH TLV, and the OSHA PEL over an eight-hour shift. The SOAR Alliance is also planning additional studies to investigate the effectiveness of new and existing engineering controls for other dust-producing tasks identified during Phase I. In preparation for the next phase of engineering control evaluation, staff have researched available dust control equipment for drilling, cleanup, sawcutting, milling, and chipping operations.

Publications

Echt A, Sieber K, Jones E, Schill DP, Lefkowitz D, Sugar J, Hoffner K. 2003. Controls of respirable dust and crystalline silica from breaking concrete with a jackhammer. *J. Applied Occupational and Environ. Health.* 18: 491-495

Echt A, Sieber K, Jones E, Schill DP, Lefkowitz D, Sugar J, Hoffner K, NJ silica partnership. 2003. In-depth survey report of control of respirable dust and crystalline silica from breaking concrete with a jackhammer at Bishop Sanzari Companies, North Bergen, NJ. Cincinnati, OH: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Institute for Occupational Safety and Health, Report No. EPHB 282-11a.

Echt A, Sieber K, Williams, D, Cantrell, A, Schill DP, Lefkowitz D, Sugar J, Hoffner K, NJ silica partnership. 2004. In-depth survey report of a water spray device for suppressing respirable and crystalline silica dust from jackhammers at E.E. Cruz Company, South Plainfield, NJ. Cincinnati, OH: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Institute for Occupational Safety and Health, Report No. EPHB 282-11c.

Highway Repair: A New Silicosis Threat

The goal of this project was to more broadly examine the effect of highway repair methods on silica exposures to construction workers. Both disease surveillance data and air sampling data show that silica exposure in highway construction is a major problem. Universally accepted mechanisms for disease prevention are not currently in place.

Significance of Findings: A large worker population is at risk for developing silicosis and other health effects from exposure to crystalline silica. Prevention activity such as medical screening, innovative control methods, preventive health standards, and safety related contract language is necessary to prevent future occupational disease problems in this population.

Educational Materials Developed:

- *Elements of an Effective Silicosis Prevention Program* - Microsoft® PowerPoint presentation made available to the Laborers' union locals and contractors' trade association for use by their members.

Publications:

- Valiante DJ, Schill DP, Rosenman KD, and Socie E. *Highway Repair: A New Silicosis Threat.* May 2004, Vol 94, No. 5 American Journal of Public Health, 876-880

New Jersey-NIOSH Silica Industry Intervention Projects

NJDHSS coordinated this project with the NIOSH Division of Applied Research and Technology (formerly the Engineering Control Technology Branch) to study the three predominant silica industries in New Jersey: pottery and related products (SIC 326), foundries (SIC 332 & 336), and sand mines (SIC 1442 & 1446). The NJDHSS silicosis surveillance system identified 98, 68, and 21 confirmed cases, respectively, in these industries. Forty-seven percent of the confirmed cases in the NJDHSS Silicosis Register worked in these industries.

Interventions: Representative workplaces in each of the three categories were selected and targeted for extensive industrial hygiene evaluation. NJDHSS staff, in conjunction with a team of industrial hygienists and engineers from the NIOSH ECTB, conducted in-depth industrial hygiene evaluations of each facility. Reports of findings and recommendations were disseminated to each respective company. Articles were published in peer reviewed journals or as NIOSH reports.

Educational Materials Developed:

- *To My Doctor – What Physicians Should Know About Silicosis in Surface Mining and Milling Workers*

Publications:

- NJDHSS co-authored or contributed to the following four publications that resulted from the foundry interventions; complete citations are provided in *References*: Cooper, 1993; O'Brien, 1990; Cooper, 1989; O'Brien, 1989.

Abrasive Blasting Project

Abrasive blasting companies were identified from several sources, including: Business-to-Business Yellow Pages, equipment rental companies, NJ Department of Labor listings of industrial painting contractors (SIC 1721), and New Jersey water tower owners. A survey was developed and sent to 485 businesses identified from these sources to collect information regarding the use of silica sand as an abrasive agent. Three hundred and thirty-three (69%) businesses responded. Of these, 83 (25%) stated that they did abrasive blasting; and, of these, 36 (43%) claimed that they used silica sand as the abrasive. A lead exposure survey, with questions about abrasive blasting and silica sand use, was sent to 624 municipal water companies and other agencies and companies with water towers. Two hundred and sixty-four responders confirmed work on water towers. Thirty-nine (15%) claimed that they had conducted abrasive blasting in the previous five years, and of those, 27 (69%) used silica sand. Industrial hygiene evaluations were conducted at three locations, and an overexposure was measured at one location. NJDHSS developed an educational fact sheet on substitutes for silica sand in abrasive blasting and disseminated it to all SENSOR Silicosis states and all identified companies involved in abrasive blasting.

Educational Materials Developed:

- *Stop Silicosis in Sandblasters – Use Silica Substitutes*

Foundry Research and Intervention Group

The NJDHSS Foundry Research and Intervention Group was formed to identify brass and bronze foundries where there is a hazard of exposure to silica and/or lead, and to conduct on-site industrial hygiene evaluations at these facilities. Target foundries were identified on the basis of reports of elevated blood lead levels received by the Occupational Health Surveillance Program. The hypothesis of the project was that foundries identified through the lead surveillance project as workplaces where lead exposure is occurring are also exposing workers to silica dust.

Interventions: Industrial hygiene evaluations were conducted at identified foundries and both silica and lead exposures, and respective control measures, were evaluated. Reports with recommendations for controlling worker exposures to silica and lead were issued to each facility.

Center to Protect Workers' Rights Work Control Group

NJDHSS is a member of this group partnering with the International Union of Bricklayers and Allied Craftworkers to identify and evaluate silica exposures and engineering controls for masonry work. The International Union of Bricklayers and Allied Craftworkers has translated the NJDHSS educational booklet, *To My Doctor: What Physicians Need to Know About Silicosis in Construction, Demolition, and Renovation Workers*, into French, Italian, Polish, Portuguese, Russian, and Spanish languages; published it in their trade magazine, *Bricklayer News*, and made the booklet available to all members of the union. This partnership is ongoing.

Silica in Dental Laboratories

Two cases of silicosis in dental laboratory technicians were identified by NJDHSS from hospital discharge data. Other states conducting surveillance for silicosis were contacted, and it was found that they had also identified multiple cases of silicosis among dental technicians. This prompted NJDHSS to develop a hazard surveillance project designed to collect information on silica use in dental laboratories, provide employers and workers with educational materials, and raise industry awareness of silica and other health hazards in dental labs. A database of 538 dental labs in New Jersey was created using data from the Dun & Bradstreet iMarket database, cross-referenced against the New Jersey telephone Yellow Pages. A *Survey of Silica Use in New Jersey Dental Laboratories* was designed to collect information from identified dental labs on silica use, safety and health practices, engineering controls, and air monitoring data. An educational brochure on silica hazards in dental labs, *What Dental Technicians Need to Know About Silicosis*, was developed and posted on the NJDHSS web site. The brochure was also disseminated by NIOSH to approximately 15,000 dental laboratories in the U.S under their letterhead.

Surveillance staff mailed the *Survey of Silica Use in New Jersey Dental Laboratories* to 538 dental laboratories identified in New Jersey to collect information on silica use and exposure control measures. Along with the survey, a cover letter, the educational brochure, *What Dental Technicians Need to Know About Silicosis*, and a self-addressed postage-paid return envelope were sent. Staff mailed additional copies of brochures in response to requests from dental labs that had completed and returned the survey, as well as those that found it on the OHS Web site or learned about it from other sources.

Staff entered and analyzed data in MS Access, and identified users of significant amounts of silica. The OHS Program SENSOR Silicosis industrial hygienist selected a set of dental laboratories for on-site industrial hygiene evaluations and for airborne crystalline silica air sampling. NJDHSS established a contract with an AIHA-accredited industrial hygiene analytical laboratory for analysis of samples collected at dental labs, and sampling pumps and collection media for silica sampling were procured.

Forty-one exposure measurements for silica were collected at 16 different dental labs. Sampling results indicate that dental lab technicians may be exposed to silica and that engineering controls should be used at these facilities to prevent exposure.

Educational Materials Developed:

- *What Dental Technicians Need to Know about Silicosis* (included in Appendix)

Publications

- CDC (reported by: DP Schill, NJDHSS), Silicosis in Dental Laboratory Technicians – Five States, 1994-2000. MMWR 2004;53(9):195-1979

Silica and Monument Builders

The NJDHSS silicosis surveillance system identified seven cases of silicosis in individuals who worked as monument builders, carving cemetery markers and other figures from granite. NJDHSS conducted site visits at selected monument building firms to observe methods of granite carving, machinery used, exposure control methods, and employee work practices. Engineering controls for this type of work were extensively researched. Information was used to develop an educational bulletin and exposure control checklist, which were disseminated through the Monument Builders of North America Association.

Educational Materials Developed:

- *To My Doctor – What Physicians Should Know About Silicosis in Cemetery Monument Builders*
- *Checklist – Controlling Silica Exposure during Memorial Building*

Publications:

- Senn E, *Silicosis: Incurable but Preventable*, in MB News, the official publication of the Monument Builders of North America Association, 56:7, July 1999.

Silica Exposure from Dry Cutting and Dry Grinding

An educational intervention project was initiated that targets workers who cut or grind concrete, brick, or stone, including granite countertops. OHS Program industrial hygienists commented on a bill, and participated in the drafting of regulation language addressing silica exposure during dry cutting and grinding work. The law, N.J.S.A. 34:5-182, prohibits dry cutting and dry grinding of masonry materials. Using SIC codes, targeted businesses were identified in the *Dun and Bradstreet MarketPlace* database to generate mailing addresses and contact information.

An educational fact sheet, entitled (included in Appendix), and an evaluation survey were finalized and will be mailed to approximately 2,400 companies. The fact sheet details the hazards of dry cutting and grinding and its relation to silica dust exposure, and presents several recommendations regarding exposure prevention. The evaluation survey is designed both as an impact evaluation tool of the fact sheet, and as a surveillance tool which will obtain information about the frequency of dry cutting activities, the availability of training, the use of personal protective equipment and the use of engineering controls, such as water, to control dust.

Educational Materials Developed:

- *Dry Cutting and Grinding is Risky Business*

Specific Aim 6:
Coordinate activities under the *Physician and Nurse Outreach Advisory Board* to conduct outreach and education aimed at increasing work-related asthma recognition, reporting, and medical surveillance by physicians and advanced practice nurses.

An extremely important factor for case identification for all sources of data is physician recognition of potential WRA cases. An analysis of SENSOR WRA data shows that there is a much higher likelihood of an ascertained case being confirmed if the ascertainment source is a physician report. Seventy-four percent of potential cases reported to NJDHSS by physicians are eventually confirmed in accordance with NIOSH/SENSOR Case Confirmation Criteria, while only 23 % are confirmed for potential cases identified through hospital discharge data (See Figure 6). Diagnosing a work-related illness is difficult for most physicians with little or no training in occupational health (Mailzlish, 2000). The New Jersey study of medical management of lead-exposed workers indicated that physician knowledge needed to be increased to prevent lead poisoning (Roche, 1995). A solution to the problem of work-related disease underrecognition is to increase the knowledge base and the availability of high-quality occupational medical services for the prevention of occupational injury and illness (Rudolph, 2000). Unless an occupational history is taken on every patient, the etiologic diagnosis might be missed, treatment may be inappropriate, and exposure can continue.

Clinicians should develop skills in taking occupational histories (Lax et al, 1998). Also, the proportion of exposed individuals who receive appropriate medical screening for early disease detection and the proportion of cases in which appropriate work restrictions or modifications are prescribed should be increased. The result of these efforts have increased recognition and reporting of occupational diseases, including WRA.

In New Jersey, physicians and advanced practice nurses are required by law (N.J.A.C. 8:57-3.2) to report occupational and environmental diseases, poisonings, and injuries, including cases of WRA. Reporting parties are required to use the NJDHSS "Occupational Disease and Injury Report for Physicians and Advanced Practice Nurses" (Form OCC-31) which is also posted on the NJDHSS Web site in both PDF format and in an electronic Microsoft Word template.

Underrecognition and underreporting of occupational diseases by physicians is a well-documented problem in occupational disease surveillance (Freund et al, 1990; Milton et al, 1998). Outreach efforts to increase recognition and reporting by treating physicians are essential for developing an effective core physician/advance practice nurse-reporting base in the surveillance system.

Advisory Group

The OHS Program convened the NJDHSS Physician and Nurse Outreach Advisory Board (PNOAB). Members of PNOAB include representatives of the Allergy & Immunology Society, the American College of Emergency Physicians, the New Jersey Hospital Association, the Health Insurance Group, the Association of Occupational Health Nurses, the State Nurses Association, the New Jersey Thoracic Society, the Occupational & Environmental Medicine Association, the Pediatric/Adult Asthma Coalition of New Jersey, the Association of Local Health Officers, the University of Medicine and Dentistry of New Jersey, and primary health care providers. Invited the New Jersey State Society of Physician Assistants (PA) to join PNOAB and assigned tasks for the representative.

The goal of PNOAB was to develop, conduct, and evaluate outreach to increase occupational disease recognition, reporting, and medical surveillance by physicians, advanced practice nurses, and physician assistants with regards to WRA and silicosis. The objectives were to (1) identify, implement, and evaluate effective methods of physician outreach and education on diagnosing, reporting, and conducting appropriate medical surveillance on occupational diseases, and (2) explore mechanisms for establishing a network of New Jersey occupational health care providers to diagnose, report, and conduct medical surveillance for occupational diseases.

The first PNOAB meeting was held in September of 2003. The PNOAB members and NJDHSS staff reviewed NIOSH-funded physician outreach and education activities conducted by Massachusetts, New York, Michigan, and California. The PNOAB action plan and a proposal for formulation of work groups were formulated. Routine communication was established between PNOAB members and NJDHSS staff. Work group chairpersons conducted in-person and/or teleconference meetings with members of the work groups and NJDHSS representatives.

The following five work groups were convened and tasks and timelines for each were established:

1. Guidelines/Educational Material/Reporting Requirements
   - Develop comprehensive guidelines on how to recognize, diagnose, and report WRA and silicosis.
   - Develop educational materials (pamphlets, posters, pharmacy inserts, case studies for CME, etc.) with information on how to recognize, diagnose, and report; and on the importance of taking a work history, conducting medical surveillance, and appreciating the value of physician reporting for effective occupational disease surveillance.
   - Establish new case definition for WRA that differentiates possible, probable, and confirmed cases.
   - Conduct grand rounds at hospitals, and presentations at professional meetings and conferences.

2. Web Page
   - Develop new NJDHSS occupational health Web page for physicians and nurses. Develop feedback for reporting physicians and nurses.

3. Clinics Network
   - Select clinics, physician offices, managed care groups, and health insurance organizations for piloting active surveillance.
   - Contact office managers and offer outreach, education (CME, etc.), medical, clinical and/or IH consultations.
   - Request reporting of WRA and silicosis cases. Search for possible WRA cases.

4. Active Surveillance

- Investigate workers' compensation (WC), emergency department (ED), and New Jersey Poison Information and Education System (NJPIES) data to increase case recognition and reporting. Develop recommendations regarding improvement in WRA case recognition and reporting.
- Contact physicians to request that they report cases of WRA.

5. Industrial Hygiene Consultations
   - Provide consultations to physicians and nurses regarding worksite processes, asthmagenic agents, and exposure control measures.
   - Conduct IH evaluations at workplaces of cases reported by physicians/nurses/physician assistants.
   - Disseminate findings and recommendations from IH evaluations to reporting health care providers, employer, affected employee, and local health department.
   - Analyze information obtained from IH evaluations to aid in the design and implementation of industry-wide IH interventions.

Effective Outreach Methods
Leaders of professional associations and societies were consulted to discuss effective educational outreach strategies for their members and obtained information on total number of members and distribution means that are available from the associations and societies:

- New Jersey Allergy, Asthma & Immunology Society
- American College of Occupational and Environmental Medicine (ACOEM)
- New Jersey Thoracic Society
- American Academy of Family Physicians (NJ Chapter)
- Medical Society of NJ
- New Jersey State Association of Occupational Health Nurses
- NJ Chapter of American College of Emergency Physicians
- NJ State Society of Physician Assistants.
- NJ Division of Consumer Affairs concerning Advanced Practice Nurses
- NJ Board of Medical Examiners concerning newly licensed physicians

Developed a plan for the outreach activities to physicians, advanced practice nurses and physician assistants, including who is the audience and how the outreach activities will be delivered (mailing, e-mail, presentation, newsletter, web site, etc.)

Educational Materials
Obtained approval from NJDHSS Senior Staff, finalized educational materials; requested and obtained printing costs, and printed the following educational materials (included in Appendix):

Table 7

Document Name	Number
1. New Jersey Law Requires Physicians and Advanced Practice Nurses to Report Individuals Diagnosed with WRA	10,000
2. Guidelines – WRA Recognition, Diagnosis, and Reporting	10,000
3. HIPAA and the Provision of Protected Health Information to the NJDHSS	10,000
4. Reporting WRA - Important Information	10,000
5. Do You Have WRA?	10,000
6. Every Breath Counts! – Important Information for Adults with Asthma	300
7. Industries and Asthmagens Associated With Work-Related Asthma	200

NJDHSS coordinated with the NJ Board of Medical Examiners for distribution of the NJDHSS WRA orientation packet to 1,800 newly licensed MDs.

NJDHSS obtained hard copy and/or electronic mailing lists, and/or labels from licensing boards, associations/societies, and hospitals to facilitate the distribution of educational materials. Tailored letters were developed to capture a variety

of audiences to be sent the educational materials. Arrangements were made to accomplish the distribution of educational materials to target audiences according to the following plan:

Table 8
WRA Educational Materials Distribution

Group Name	Members Total #	Mailing	Meetings	Total Educational Materials
Newly licensed MDs	1,800	1,800	N/A	1,800
APN (licensed) & Occupational Health Nurses	3,600	3,600	300	3,900
PAs (licensed) (NJ Soc of PA 1,000)	1,200	1,200	300	1,500
Allergists (Members of AAAI)	140	140	100	240
PNOAB, NJDHSS consultant list, MDs reporting other than WRA cases	150	150	N/A	150
Am. College of Occupational & Environ. Med.	200	200	100	300
NJ Thoracic Society	170	170	100	270
NJ Chapter of Am. College of Emergency Phys.	600	0	100	100
NJ Academy of Family Practice	900	900	200	1,100
Medical Society of NJ (targeted specialties)	500	0	100	100
Total	**9,260**	**8,160**	**1,300**	**9,460**

Web page
Agreements with the New Jersey Local Information Network and Communications System (LINCS) and other Web portals were established for advertising to MDs/Nurses/PAs. The new WRA Web page for health care providers was posted on the NJDHSS Web site. The WRA Web page for health care providers on the NJDHSS Web site was updated with new materials, as they became available.

Presentations
An MS PowerPoint presentation was developed for grand rounds and meetings of professional associations and societies. The presentation includes three parts: 1) NJDHSS Reporting Guidelines (presented by the NJDHSS PNOAB Project Coordinator), 2) WRA Recognition and Diagnosis (presented by clinicians who are faculty members from UMDNJ/EOHSI), and 3) Industrial Hygiene Intervention (presented by an OHS Program Certified Industrial Hygienist, and it is followed with a question and discussion period. The presentation is tailored to each unique audience, as necessary. CME credits are offered to those who attend the presentation

The initial presentation on WRA and industrial hygiene workplace evaluation was conducted at the request of the Chairman of the American College of Occupational & Environmental Medicine (ACOEM) for presentation. The presentation at the ACOEM quarterly members meeting included CME credits and distribution of educational materials/orientation packet. Following that presentation, six additional presentations were conducted for 129 physicians, 29 MD residents, 20 physician assistants, two physician assistant students, and 25 nurses. The joint NJDHSS/EOHSI presentation has been conducted as shown in Table 9.

Table 9
PNOAB Outreach Presentations

Audience	Association/Society/Hospital
Physicians	American College of Occupational & Environmental Medicine
Physicians	Meridian Health System, hospital
Physicians	NJ Allergy, Asthma, & Immunology Society
Physicians	Atlantic Health System, hospital
Physician Assistants	NJ Society of Physician Assistants
Physicians	Meridian Health System, hospital
Nurses	NJ State Association of Occupational Health Nurses

UMDNJ Medical School Curriculum
The UMDNJ medical school curriculum for second year medical students was modified to include a session on WRA, with a focus on a case study of a fatal case of WRA provided to UMDNJ by NJDHSS. The fatal WRA case had been recognized by several NJ physicians prior to the patient's death, but never reported to NJDHSS. Educational packages were distributed at Public Health Symposium, NJ Nursing Convention, and Public Health Nurses meeting. Two special issues of the *NJDHSS Occupational Health Surveillance Update* newsletters were developed, and a WRA Web page was created for target audiences.

CME Credits
Procedures for applying/obtaining CME credits for WRA presentations were developed by NJDHSS in collaboration with the CME-issuing agencies. Arrangements were made with chairmen of associations, societies, and directors of educational departments in hospitals for CME credits to be given after the NJDHSS presentations. Upon request from associations/societies/hospitals NJDHSS developed lecture questionnaires, learning objectives, filled in faculty disclosure forms, and submitted with presenters' CVs to the Accreditation Council for Continuing Medical Education. To date, CMEs have been awarded to 128 MDs, 20 physician assistants, and 25 nurses.

Occupational Health Provider Network
The list of board-certified occupational medicine physicians is regularly updated and posted on the OHS Program Web site. Arrangements were made with the UMDNJ, EOHSI Occupational Health Clinic to offer clinical consultation to health care providers regarding cases with diagnostic dilemmas, as well as cases that require exposure determination, employment decision, and/or medical removal. Throughout presentations, educational mailings, and NJDHSS Web page, NJDHSS conveys the message about the following NJDHSS assistance available to health care providers:

- WRA case classification;
- list of specialists to assist with the diagnosis of WRA;
- industrial hygiene consultations regarding conditions and exposures at patient's workplace that may be associated with WRA.

NJDHSS also conducted focused outreach to request reporting of WRA cases from physicians who reported WRA cases in the past, and from physicians who reported other occupational diseases to NJDHSS.

NJDHSS provided assistance to EOHSI Occupational Health Department to search for possible/probable WRA cases caused by exposures from World Trade Center.

Partnership with New Jersey's medical school-based Environmental and Occupational Health Sciences Institute
The OHS Program finalized a Memorandum of Agreement (MOA) between the University of Medicine and Dentistry of New Jersey, Environmental and Occupational Health Sciences Institute (EOHSI), and the New Jersey Department of Health and Senior Services (NJDHSS). The purpose of the MOA was to develop, conduct, and evaluate outreach and education in order to increase occupational disease recognition, reporting, and medical surveillance by New Jersey physicians, as well as to obtain the services of a physician resident to assist in ascertainment and confirmation of cases of WRA and silicosis.

The Director of the Occupational Health Service, OHS Program Managers, and Occupational Health Surveillance Program staff provided an overview of goals, objectives, WRA recognition and reporting, and resident's assignments. The director of EOHSI's Occupational Health Department provided an overview of the resident's duties and expectations from the Practicum rotation at the NJDHSS. The curriculum for the Practicum was reviewed by the NJDHSS staff and approved by the UMDNJ Residency Directors. NJDHSS staff conducted orientation training for the resident. EOHSI assigned medical residents to review medical records, interview patients, and participate in final case classification.

Collaboration with New Jersey State Society of Physician Assistants
The New Jersey State Society of Physician Assistants (Pas) was invited to join the PNOAB to promote recognition and voluntary reporting of WRA. A letter of cooperation was obtained from the Society stating they would promote the voluntary reporting of WRA, as well other reportable occupational diseases, among their members. Outreach efforts to promote recognition and reporting by over 1,200 licensed physician assistants in New Jersey are important for developing an effective core physician/advanced practice nurse/physician assistant reporting base in the surveillance system. A disease-reporting orientation packet was developed. NJDHSS collaborated with the PA Licensing Board to distribute the orientation packet to newly licensed PAs, as well as to those renewing their licenses. We will also explore the possibility of obtaining CME credits for PAs. Procedures will be developed for PAs who report cases to NJDHSS to provide feedback on the outcome of NJDHSS follow-up with the reported individual's workplace. The possibility of a revision in Curriculum for PA students will be explored to include information on surveillance for WRA and other work-related diseases. The efforts of our collaboration will be evaluated as described in Specific Aim 9 and revised as necessary.

Specific Aim 7:
Collaborate with partners and stakeholders to contribute to statewide and national prevention efforts for silicosis and WRA.

The importance of active stakeholder participation has been demonstrated to be a key element of successful interventions (Israel, 1992; CDHS, 1998). The NJDHSS maintains an Occupational Health Surveillance Advisory Board comprised of over 30 occupational health experts from academia, industry, labor, and government. The Advisory Board meets annually with NJDHSS surveillance staff to review current activities, provide guidance and input, and plan future directions. The model of establishing a cooperative partnership between equipment manufacturers, users, operators, and government was first attempted in New Jersey during a silicosis surveillance intervention at a large steel foundry where hand-held grinding machines were targeted for engineering controls (O'Brien, 1990). A successful partnership with equipment manufacturers was accomplished in NIOSH's asphalt paving control technology project (Moran, 1997). NJDHSS has been successful in the following partnerships: a) the New Jersey Silica Partnership to address growing concerns about silica exposure to road and highway construction workers, first identified through the NJDHSS SENSOR silicosis surveillance project, b) with the New Jersey Department of Transportation for prevention of silica and lead exposure by incorporating protective silica and lead safety language in contracts for road repair and bridge painting projects, respectively, c) the Center to Protect Worker's Rights Silica Work Controls Group, d) the NJDHSS Latex Allergy Task Force for Prevention of Latex Allergy in Health Care Facilities, e) the World Trade Center Health Registry Scientific Advisory Committee, and f) the New Jersey Public Employees Occupational Safety and Health Program. Interventions required the recruitment of stakeholders and partners from past endeavors, and gaining cooperation from new ones.

One of the objectives of the NIOSH Surveillance Strategic Plan is to enhance surveillance of occupational illnesses, injuries, and hazards in construction (NIOSH, 2001). NJDHSS continues to contribute to statewide and national efforts to control occupational exposure to silica and causes of work-related asthma. NJDHSS, as a partner in the New Jersey Silica Partnership, was instrumental in collecting data that demonstrated excessive silica dust exposure in highway construction and repair workers. New Jersey silica exposure data have been incorporated into various databases used by researchers and policy makers, such as the NIOSH Electronic Library of Construction Occupational Safety and Health (eLCOSH), and OSHA has also used New Jersey silica exposure data in their docket for the development and promulgation of a comprehensive standard for crystalline silica (NJDHSS 2001), and a peer-reviewed publication (included in the Appendix).

Another objective of the NIOSH Surveillance Strategic Plan was to expand dissemination of surveillance information and access to data for public health action (NIOSH, 2001). In 2001, surveillance staff from New Jersey, California, and Wisconsin authored a Council of State and Territorial Epidemiologists Position Statement calling for OSHA to revise their standards for lead in general industry and construction based partially on recent data from state adult blood lead surveillance. Surveillance data, findings of case investigations, and intervention results are analyzed and disseminated to various groups and decision makers in need of data on occupational diseases and their prevention. Specific Aims 8 and 9 are proposed to continue and improve analysis, evaluation, and dissemination of surveillance results. NJDHSS previously summarized the OSHA Cadmium Standard in a booklet (included in the Appendix) and disseminated it soon after the standard was promulgated in 1992. When promulgated, the requirements of the OSHA standard for Control of Silica Exposure in Construction will be summarized by NJDHSS, and presented in a similar format that is easily understood by employers and employees.

Designate New Asthmagens: Collaboration with the Association of Occupational and Environmental Clinics
NJDHSS requests and obtains assignment of AOEC agent codes for newly-identified substances associated with potential cases of WRA. NJDHSS participates in the established mechanism to enable new agents to be included with an "Asthmagen" designation on the Association of Occupational and Environmental Clinics (AOEC) database of agents and exposure codes, as follows: NJDHSS proposes and submits newly-identified agents that meet the consensus criteria established by SENSOR states to AOEC for assignment of asthmagen designation, as necessary. NJDHSS submits the name of the agent, relevant case information, and supporting documentation to the COSS, NIOSH, other SENSOR states, and nationally recognized medical experts on WRA. NJDHSS participates in any teleconferences and sessions at the Annual WRA Workshop with the aforementioned parties to discuss the relative merits of including each agent under consideration on the list. Cases of WTC dust- or chemical-related diseases, identified through the NJDHSS occupational disease surveillance projects are referred to the registry.

New Jersey Interdepartmental Asthma Committee
This committee was formed in 2001 among Divisions in the NJDHSS, the NJ Department of Environmental Protection, the NJ Department of Education, the NJ Department of Human Services, and the US Department of Health and Human Services. The mission of the committee is "To improve the health of people living and/or working in New

Jersey by effective prevention, identification and management of asthma, through a coordinated partnership among public and private organizations." Most members of the committee are involved in pediatric asthma, and had not demonstrated an interest in adult-onset work-related asthma. The NJDHSS work-related asthma Project staff was instrumental in ensuring that committee members became aware of the magnitude and significance of work-related asthma. As a result, the original mission statement was modified to include people working in New Jersey, and thirteen objectives related to work-related asthma were proposed and accepted for introduction into the committee's strategic plan. The committee released the "Interdepartmental Report and Strategic Plan for Asthma" in June 2003. This document was endorsed by the commissioners of NJDHSS, NJ Department of Environmental Protection, NJ Department of Human Services and the NJ Department of Education. The strategic plan has been reviewed and updated to indicate tasks completed and include new initiatives. Asthma in New Jersey, published February 2003, an inaugural comprehensive report describing the effects of asthma on the health of New Jersey residents, includes work-related asthma surveillance data. An annual report for years 2004 and 2005, *Asthma in New Jersey, Annual Update*, coordinated by the NJDHSS Division of Family Health Services, Have been published with updated charts, tables, and executive summary describing the OHS Program activities for work-related asthma surveillance.

Outreach to Disparate Populations: Collaboration with Immigration and American Citizenship Organization

The proportion of asthma estimated to be attributable to work is statistically significantly higher among Hispanic adults (17.3%) than white non-Hispanic adults (9.2%). The OHS Program has collaborated with the NJDHSS Office of Minority Health and the Immigration and American Citizenship Organization. The Occupational Health Surveillance Program published two articles (included in Appendix) in *La Guia del Inmigrante* (The Immigrant's Guide). This magazine is published in Spanish, and is distributed to over 10,000 Latino households in New Jersey. The first article, "Protect Yourself on the Job, It's Your Right!" was published in the January-February 2005 (Vol. V, No.1) edition, and provided resources and information about OSHA and NIOSH, presented several case studies, and listed job titles that are considered hazardous. The second article, "Is Your Asthma Related to Your Job?", was published in the May-June 2006 (Vol. VI, No. 3) edition, and focused on work-related asthma, presented four case studies, provided recommendations, and listed resources.

The World Trade Center Health Registry (WTCHR), Scientific Advisory Committee

The WTCHR was initiated on September 5, 2003, to track the health of residents, school children, workers and others who were directly exposed during and after the collapse of the World Trade. Those who enrolled answered a 30-minute telephone survey about where they were on 9/11/01, and reported the status of their health. The survey aims to track the physical and mental health of people exposed to the events related to September 11, 2001 for up to twenty years. Of the 71,609 total enrollees, 7,305 were from NJ, by far the second largest represented state next to New York (56,783). These enrollees either worked there on September 11, once lived there, or acted in a response capacity following the attack. Occupational Health Surveillance staff participate in the WTCHR Scientific Advisory Committee, a group that meets quarterly to provide technical assistance to the Registry staff, and to provide updates of related projects by the members.

NJDHSS Public Employees Occupational Safety and Health (PEOSH) Program

In an effort to effectively distribute the *How to Make Your Very Own Jackhammer Spray Dust Control* manual and other outreach materials to jackhammer operators in New Jersey, the Silicosis Surveillance Project is collaborating with the NJ PEOSH Program to reach Departments of Public Works (DPWs) across the state. PEOSH inspectors and consultants have hand-delivered the manual and other educational materials to DPWs they have visited that use jackhammers. One DPW has already retrofitted six of their jackhammers with the water-spray kit as a result of a PEOSH consultation.

In addition, a mailing packet, which includes a cover letter, the water-spray kit manual, educational brochures on silicosis, and a survey will be mailed to all New Jersey DPWs. The survey was developed to function both as an evaluation tool of the mailing, and as a surveillance tool by asking questions regarding jackhammer use, use of personal protective equipment, and training. The survey also allows the recipient to provide contact information if assistance is needed in installing a water-spray kit.

New Jersey Department of Transportation (NJDOT)

The NJDOT, a NJ SOAR Alliance partner, incorporated protective language for work involving silica exposure into their contracts for road repair and construction. The Surveillance Program has begun a project to assess the effectiveness of the current contract language and determine if the language should be broadened. Program industrial hygienists are conducting site visits to work areas to assess compliance with the components of the contract language, and will provide recommendations to NJDOT regarding modifications that should be made to the contract language. The following health and safety components will be evaluated on site: engineering controls, work practice controls,

respiratory protection, whether a competent person is supervising the work, area controls, the health and safety plan, and worker training.

Also, the NJDOT has adopted the use of the water-spray dust control for jackhammers, and made modifications that allow several jackhammers to be connected to a single water tank.

Collaboration with other stakeholders

NJDHSS seeks out opportunities to collaborate with New Jersey State agencies and other stakeholders to control occupational exposure to asthmagens and silica. NJDHSS meets with each agency to explore possibilities for collaboration, and then selects and designs a collaboration. The following collaborations are now in place:

- Consortium of Occupational State-based Surveillance (COSS): participate in biannual COSS meetings to share and learn from experiences within the group, work through issues of common interest, and work to refine state occupational safety and health surveillance activities to maximize impact on worker safety and health.
- Council of State and Territorial Epidemiologists (CSTE): collaborated with NIOSH and CSTE to revise the CSTE Asthma Case Definition to include WRA, similar to the CSTE Silicosis Case Definition.
- NJ State Society of Physician Assistants (PA) and PA Licensing Board: collaborate to promote recognition and voluntary reporting of WRA. NJ Department of Environmental Protection (NJDEP): require the use of low sulfur diesel fuel to reduce the exposure of truck, bus, and heavy equipment operators to diesel exhaust, a work-related asthmagen.
- NJDEP: limit the time period that diesel-fueled vehicles are permitted to idle. This type of control has been put into effect in some other states and shown to reduce occupational exposure to diesel exhaust. A state regulation was passed banning the idling of school buses while on school properties.
- NJDEP-Air Toxics Steering Committee: serve as an advocate for occupational health-related issues, including WRA.
- NJDEP-Interagency Risk Assessment Committee: as a member and co-chair, serve as an advocate for occupational health-related issues, including WRA.
- NJ Public Employees Occupational Safety and Health Program (PEOSH): collaborate on projects involving public employees. Continue to participate in joint on-site industrial hygiene evaluations with PEOSH at public sector workplaces where cases of WRA or silicosis have been identified.
- World Trade Center (WTC) Scientific Advisory Committee membership: the purpose of the Committee is to advise ATSDR and the New York Department of Health on the design and development of a registry of workers and community members who were exposed to pollutants generated by the collapse and burning of the WTC. The registry will be used for a longitudinal study of the health status of registry members, including the development of occupational/environmental asthma. Cases of WTC dust- or chemical-related diseases, identified through the NJDHSS occupational disease surveillance projects will be referred to the registry.
- NJ Clean Air Council: serve as an advocate for occupational health-related issues, including WRA. Staff members will participate with other state agencies, certain public and private institutions, and community representatives in meetings and development of recommendations to improve quality of air in New Jersey.
- Northeast States Coordinated Air Use Management (NESCAUM) Committee: serve as an advocate for occupational health-related issues, including WRA.

Specific Aim 8:
Generate and disseminate reports of work-related asthma and silicosis surveillance findings.

Comply with data and information standards

The NJDHSS promotes efficient, integrated, and interoperable surveillance systems by working towards compatibility of our WRA and silicosis database with data and information standards for New Jersey's Web-based Communicable Disease Reporting System (CDRS), which is compliant with standards for CDC's National Electronic Disease Surveillance System (NEDSS). NEDSS electronically integrates and links together a wide variety of surveillance activities and will facilitate more accurate and timely reporting of disease information to CDC and state and local health departments. Consistent with recommendations proffered in the 1995 report, Integrating Public Health Information and Surveillance Systems, NEDSS includes data standards, an Internet-based communications infrastructure built on industry standards, and policy-level agreements on data access, sharing, burden reduction, and protection of confidentiality. A document, *Provision of Medical Records and X-ray Films to the NJDHSS* document

(included in Appendix), that describes the department's right of access to such records, reporting requirements, how data are used, and how confidentiality is protected is issued with requests for medical records and X-rays. The OHS Program ensures compliance with NJDHSS policies governing the collection, management, and security of personal health information, as stipulated under HIPAA and the NJ Institutional Review Board.

Annual Report
NJDHSS prepares an annual report of accomplishments and impact of WRA and silicosis surveillance project that is appropriate for public release. The annual report is incorporated into the Occupational Health Service Annual Report (2006 report is included in the Appendix), which is posted on the NJDHSS Web site.

Submit WRA and silicosis data to the Data Coordination Center of the Consortium of State-based Surveillance
NJDHSS submits aggregate data on WRA and silicosis annually, or upon request, to the Data Coordination Center (DCC) of the Consortium of State-based Surveillance (COSS) using the core variables that have been established under the SENSOR project, or in a format to be determined later by the DCC. State aggregate data is provided to NIOSH for analysis and publication in CDC's MMWR and/or in NIOSH publications such as the Worker Health Chart book and Work-Related Lung Disease (WoRLD) Report, or for use by independent researchers at NIOSH. The revised NIOSH Respiratory Disease Surveillance System (RDSS) Local Collection Module software is used for submitting WRA and silicosis data to NIOSH.

Analyze WRA and silicosis data quarterly and monthly
New variables were created and incorporated into the surveillance databases to enable tracking of the status of cases during the case processing phase. NJDHSS performs quarterly analysis of data from our WRA and silicosis surveillance systems for numbers of cases, reporting sources, case category, primary exposure agent, primary industrial exposures, occupational group, outcomes of industrial hygiene evaluations, etc. Summary statistics and charts for all confirmed WRA cases reported since 1986 are updated and disseminated to partners and stakeholders, as deemed appropriate by NIOSH/SENSOR state advisers.

Collect New Jersey Behavioral Risk Factor Surveillance System (BRFSS) Survey data on WRA
NJDHSS submitted two standardized questions on WRA, which were validated by other WRA surveillance states, for inclusion in the NJBRFSS survey. The data obtained from the survey is used to generate state-specific estimates for work-related new-onset and work-aggravated asthma in New Jersey. These estimates are utilized to refine, expand, or redirect surveillance and intervention activities. Data is used to generate estimates for disparate populations to improve targeting of proposed activities to mitigate or prevent WRA in these populations. These data and related findings are shared with NIOSH, the New Jersey Interdepartmental Asthma Committee, the DCC, as well as other partners and stakeholders.

Working meetings, groups, LISTSERVs
NJDHSS will attend meetings, will participate in workgroups, and will be joining Listservs, including the following:

- COSS annual meeting and twice a year Coordination Committee (CC) meetings;
- NIOSH annual meetings and workshops with states;
- Northeast states (CT, MA, ME, NH, NJ, NY, RI) annual May meeting in Connecticut;
- LISTSERV with the Northeast states;
- SENSOR LISTSERV if it is re-activated;
- NJDHSS PNOAB and Occupational Health Surveillance Advisory Board biannual meetings;
- National Asthma Conference;
- Northeast Regional Occupational Health meeting;
- CSTE annual meeting.

Publications and presentations
The NJDHSS disseminates WRA and silicosis findings through various state and national groups, organizations, and publications, including the American Public Health Association, Journal of Occupational and Environmental Medicine, Journal of Industrial Medicine, Journal of Applied Occupational and Environmental Hygiene, and American Industrial Hygiene Association Journal. Presentations on findings are made at the annual CSTE meeting, the annual WRA and silicosis workshops, as well as other appropriate meetings and conferences.

Occupational Health Surveillance (OHS) Update
NJDHSS published topical articles of interest in the Surveillance Program newsletter, *OHS Update*. The *OHS Update* is disseminated to a population of physicians, advanced practice nurses, and physician assistants identified through the PNOAB activities, including other occupational health organizations and individuals on the OHS mailing list. *OHS Updates* are also posted on the NJDHSS Web site.

NJDHSS Web site
The NJDHSS surveillance program has a Web page (www.state.nj.us/health/eoh/survweb) that includes a description of surveillance, intervention, and outreach activities, as well as "html" and "PDF" versions of most of the related educational materials. New sections for this Web page were designed to highlight surveillance data and information for health care providers, aimed at enhancing WRA recognition and reporting. The data sections of the Web page are updated biannually.

Work-related Asthma Web Site
The new WRA Web site (www.nj.gov/health/eoh/ survweb/wra) was launched in March 2006. The Web site features resources for employers, employees, and the New Jersey medical community. A handout and post card, developed to advertise the Web site, was disseminated along with other WRA educational materials during case follow-up and at PNOAB outreach venues.

NIOSH's Electronic Library of Construction Safety and Health (eLCOSH) Web page
The NJDHSS will continue to share construction-related publications and exposure data with NIOSH for posting on their eLCOSH Web page, including publications on WRA and silicosis.

NIOSH Surveillance Clearinghouse Web page
The NJDHSS continues to cooperate with NIOSH on a needs-assessment to determine what materials should be included on a Surveillance Clearinghouse Web page and will continue to work on the Web page, as needed

Collaboration on NIOSH publications
The NJDHSS collaborates on various NIOSH publications dealing with WRA and silicosis as determined jointly by NIOSH and other WRA/silicosis surveillance States (See *Bibliography*).

OHS Program Silica Exposure Data
Contributed air sampling results collected during industrial hygiene intervention activities related to silica in construction. Data were compiled by researchers and published in a peer-reviewed article:

> Flanagan ME, Seixas N, Becker P, Takacs B, Camp J.: Silica exposure on construction sites: results of an exposure monitoring data compilation project. J Occup Environ Hyg. 2006 Mar; 3(3):144-52.

Collaboration with NIOSH Health Education Branch
Photographs taken by OHS Program industrial hygienists during intervention activities at silica-related construction sites were provided to NIOSH for incorporation into their latest informational booklet on silicosis: *SILICOSIS: Learn the Facts.*

Collaboration with OSHA Office of Standards Development
NJDHSS has provided exposure data and findings from intervention projects for incorporation into the rulemaking dockets for a glutaraldehyde Permissible Exposure Limit and the Silica in Construction standard.

Specific Aim 9:
Evaluate the silicosis and work-related asthma surveillance systems.

Process Evaluation by Logic Model
A logic model was developed for the NJDHSS occupational disease surveillance process (included in Appendix). The logic model was used evaluate the timeliness of process flow, leading to the development of a new set of variables for the WRA and silicosis surveillance databases that enable the determination of the status of individual case processing, as well as all cases currently in the processing phase.

Evaluation Using CDC Guidelines
In evaluating the WRA and silicosis surveillance systems, the NJDHSS followed the *CDC Updated Guidelines for Evaluating Public Health Surveillance Systems* (CDC, 2000). This evaluation endeavored to assure that the surveillance systems operate efficiently, serving a useful public health function, and meet their objectives.

- ***Simplicity:*** *Ability to structure and operate the surveillance system with ease.*

The ease of data entry was improved by creating MS Access data entry forms with pull down menus and range restrictions to replace the practice of entering data directly into the database table. Following pilot testing, the data

entry forms were modified and drop down menus were added to eliminate data entry errors. The protocol was rewritten detailing steps with a time frame for each phase of case processing and a procedure to expedite the closing of cases.

- ***Flexibility:*** *Ability to adapt the system for different diseases.*

The system is flexible; it was originally developed for silicosis and easily adapted for WRA. It will serve as the basis for developing surveillance systems for pesticide and chemical poisoning, as well as other future surveillance systems.

- ***Data quality:*** *Completeness and validity of the data in the system.*

Prior to submissions of data sets from the WRA and silicosis registries, the data set is run the NIOSH Respiratory Disease Surveillance System Local Collection Module's Validation Program. Error logs were reviewed and case files pulled to ensure data were accurate and complete. NIOSH receives the data and runs further checks of data accuracy and completeness. Any errors found by NIOSH are brought to the attention of NJDHSS, and further review of case files is conducted in order to resolve the errors.

- ***Acceptability:*** *Willingness of physicians and advance practice nurses to report cases of WRA and silicosis. Willingness of hospitals to provide medical information of individuals with WRA and silicosis. Willingness of reported individuals to provide information about the location and circumstances of their WRA and silicosis. Willingness of employers to provide information in mail questionnaires, telephone interviews, on-site visits, and implementing recommendations for prevention of further cases of WRA and silicosis.*

Physicians and advanced practice nurses have not demonstrated willingness to report cases to NJDHSS, in spite of a state regulation that requires them to do so. This issue has been addressed through the Physicians and Nurses Outreach Project (See PNOAB). Hospitals willingly honor requests from NJDHSS for medical records and chest radiographs. Sometimes, when there is change in personnel in the medical records or radiology department, NJDHSS will be denied records without a signed authorization from the patient. NJDHSS then contacts the new decision maker at the hospital and educates them on the rights of NJDHSS to obtain the records under HIPAA.

- ***Data quality:*** *Completeness and validity of the data in the system.*

Completeness

The databases were modified to incorporate variables which were being collected but not data entered. Additionally, new variables were added to both the questionnaires and their associated databases to enable the tracking of case status within each project. This will enable the system to generate reports detailing the status of case processing and work site investigations, as well as to alert the project industrial hygienist when a work site follow-up evaluation is necessary. A result of creating this tracking system was the discovery of lag times in certain steps of case processing (further discussed in evaluating timeliness).

Capture-Recapture Analysis

In a collaborative effort with Michigan, a capture-recapture analysis was carried out on the silicosis registry database to estimate underreporting and undercounting of silicosis cases. This effort also served as an evaluative tool of the system which revealed that all sources of data from which a case was identified had not consistently been entered into the database. The protocol of data entry was revised and now each new source of a case will be updated in the registry.

Validity

Due to overcoding of workers' compensation as primary payer, cases were being processed in the surveillance system which were not work-related. This was discovered during an evaluation of the WRA system which resulted in the conclusion that many potential cases of WRA which were culled using both an ICD code and worker's compensation as primary payer were not, in fact, work-related.

As a result of this evaluation, outreach was conducted to educate coders on our use of the HD and ED data. Specifically, an article was published in the Discharge Data Collection User's newsletter explaining NJDHSS use of hospital discharge data and the need for accurate coding of worker's compensation as primary payer to successfully conduct surveillance activities. Since this filter is used to obtain all potentially work-related asthma cases from the ED and HD datasets and are currently using resources to identify cases that may not be work-related.

- ***Sensitivity:*** *Ability to identify the workplaces for a high proportion of cases of WRA. Ability to identify cases that are work-related, and identify the workplaces where they occurred.*

Ninety-four percent of confirmed WRA cases (n=493) had the workplace identified. In silicosis, 82% of cases had their workplace identified. Although it is recognized that our surveillance system is not capturing all workplaces where cases occur, our system is using sentinel cases to develop industry-wide intervention.

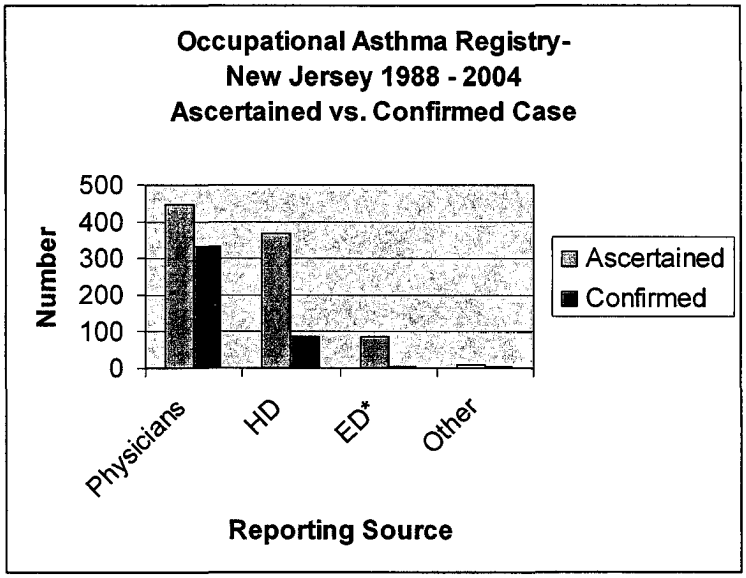
Physicians remain the most reliable source for ascertaining cases of WRA, underscoring the importance of physician reporting in the prevention of the disease. Review of the medical records for individuals coded with ICD-9 493 showed that the ED data set was a better source for potential cases of WRA than the HD data set. Because a substantial number of asthma cases are reported without being classified as work-related, workers' compensation as a primary payer is added as a proxy for work-relatedness when filtering for cases coded with 493. Few potential cases of WRA were ascertained through review of medical records of hospitalized patients discharged with ICD-9 506 diagnosis (respiratory condition resulting from inhalation of chemical fumes and vapors). Specifically, as shown in the table below, five cases were identified in the HD data set and none of the identified cases were considered asthma in the ED data set. In summary, searches for hospital discharges coded 493 (ED) and 506 (HD) will routinely be undertaken to identify potential cases of WRA.

Table 10

Source	ICD-9 Code	Disease	Total Identified	Potential WRA Cases
Physician	---	Confirmed or suspected WRA	9	9
HDD	506	Respiratory conditions due to inhalation of gases, fumes, and vapors	109	5
ED	506	Respiratory conditions due to inhalation of gases, fumes, and vapors	122	0
HDD	493	Asthma as primary diagnosis and Workers' Compensation as primary payer	10	0
ED	493	Asthma as primary diagnosis and Workers' Compensation as primary payer	34	17
ED	786.9	Dyspnea	25	1
ED	786.2	Cough	15	3
TOTAL			324	35

Seventy-four percent of cases identified through physician reports end up being confirmed, whereas only 23% of those identified from HD data are confirmed (See Figure 6).

Figure 6
Occupational Asthma Registry-New Jersey 1988 - 2004
Ascertained vs. Confirmed Case



- ***Representativeness:*** *Ability to accurately describe the occurrence of cases of WRA by demographics of affected individuals, period of time, geographical distribution, and type of workplace.*

The proportion of cases with gender, race, ethnicity and geographic residence are shown in Table 11. The types of workplaces where cases of work-related asthma or silicosis were identified are shown in Tables 4 and 5.

Table 11
Demographic Characteristics of Confirmed Cases

Demographic	WRA	Silicosis
Gender	100%	100%
Race	98%	94%
Ethnicity	63%	41%
Address case	99%	*

*Unable to calculate proportion of silicosis cases with known address because case address was not data entered into the database until 2006

- ***Timeliness:*** *Ability to perform the steps in the surveillance system without delay between steps. Ability to identify workplaces in time to intervene and prevent additional cases of WRA.*

An evaluation of the timeliness of both WRA and silciosis case processing was carried out and it was determined there was a time lag in certain steps within case processing. As a result, a protocol was developed detailing time frames for each step. An evaluative analysis of the flow of cases revealed a bottleneck in the case interviews. All of the steps in processing case from initiation to closure were evaluated and it was concluded that the completion of case interviews was a significant barrier to timely case processing. NJDHSS initiated an effort to evaluate the yield of cases based on their reporting source and ICD code and will prioritize case follow-up process based on the findings.

Evaluation Using Occupational Health Surveillance Indicators

The indicators for silicosis are shown in Table 12. A trend analysis will be conducted to determine if there are changes over time. This will serve as an ongoing evaluative component of educational outreach projects in silicosis. No indicators have been set for WRA; if any become available, they will be pilot tested.

Table 12

Indicator	*2000*	*2001*	*2002*
Annual number of silicosis hospital discharges	47	49	45
Annual rate of silicosis hospital discharges	6.8	7.36	6.6
Annual, age-standardized, rate of silicosis hospital discharges	6.8	7.1	6.3
Annual number of silicosis deaths	2	2	5
Annual silicosis death rate per million residents	.301	0.301	0.73
Annual, age-standardized silicosis death rate	.43	0.29	0.69

An evaluation will be developed and implemented to determine the effect of our two industry-wide interventions. A survey will be used to collect information on changes made by companies within the industry as a result of our intervention and related educational materials.

Evaluation of Industrial Hygiene Interventions

Initial industrial hygiene evaluations are conducted at workplaces where a case of WRA had been identified. At least one year later, a follow-up industrial hygiene evaluation was conducted to determine employer compliance with initial recommendations. Table 13 shows the results of an evaluation of compliance with NJDHSS recommendations for each component of the workplace's occupational health program for 20 workplaces where a follow-up industrial hygiene evaluation had been conducted.

Table 13
Industrial Hygiene Evaluation Findings
Initial vs. Follow-up

Occupational Health Program Component	No. of Workplaces with Recommendation to Improve	No. of Workplaces that Complied with Recommendation
Personal Protective Equipment	6	4 (67%)
Housekeeping	12	8 (67%)
Hygiene	7	5 (71%)
Training	16	11 (69%)
Safety Meetings	17	5 (29%)
Air Monitoring	16	7 (44%)
Medical Surveillance	16	9 (56%)
Engineering Controls	19	10 (53%)
Respiratory Protection	15	10 (67%)

Physician and Nurse Outreach Evaluation

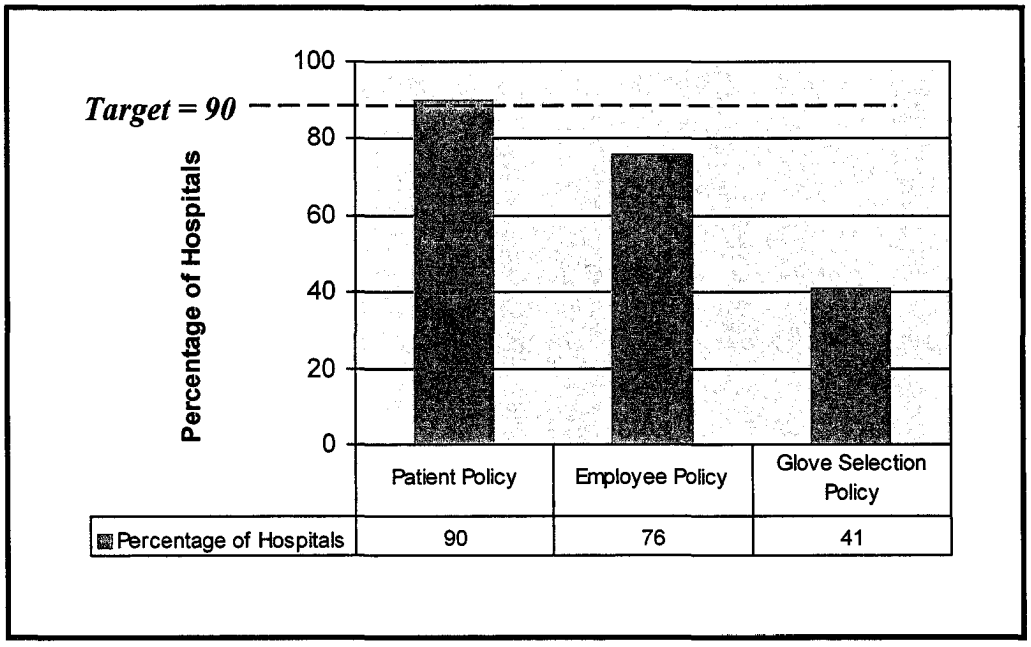
Assembled collection of examples of post-presentation evaluation questions and drafted evaluation survey for use following presentations and mailings on WRA recognition, diagnosis, and reporting to physician associations, societies, and grand rounds. Three evaluation surveys were developed, approved by PNOAB members and finalized. First one was design to determine if participant knowledge on WRA improved after the presentation. The Evaluation Survey is distributed and collected after presentation. The second one was designed for the Accreditation Council for Continuing Medical Education and is distributed at presentations. NJDHSS receives copies of those forms from Associations, societies, and hospitals. The third one was designed to determine if reader knowledge on WRA improved after reading NJDHSS educational materials. That form is distributed with WRA educational packages. The Evaluation Surveys (after presentation) were analyzed for 66 survey participants; results are presented in Table 14.

Table 14
NJDHSS Evaluation Survey Results
66 Survey Participants after Presentation

Survey Question	Answer	
Prior to today's presentation, were you aware that:	Yes %	No %
WRA accounts for an estimated 15% of all adult asthma cases?	41	59
WRA includes these three distinct types: new-onset asthma, work-aggravated asthma, and reactive airways dysfunction syndrome (RADS)?	52	48
NJ Law requires that you report occupational asthma to DHSS?	38	61
You have an option of reporting to DHSS possible, probable, and/or confirmed cases of WRA?	33	67
HIPPA permits the disclosure of protected health information to DHSS?	59	41
DHSS provides assistance with case classification for possible, probable, confirmed WRA cases?	39	61
DHSS has a list of specialists to assist you with diagnosis or other clinical questions?	41	59
DHSS conducts consultations regarding exposures at your patient's workplace that may be associated with WRA?	42	58
DHSS conducts education and training to employers recommending elimination or substitution of materials, isolation of the process or operation, engineering controls (ventilation), and personal protection (respirators, personal hygiene)?	45	55

After collection of evaluation surveys, NJDHSS will analyze survey and CME form responses, evaluate physicians, nurses, and physician assistants WRA awareness; physician and nurses reporting; methods of outreach and education; and will develop report to appropriate parties to enhance WRA recognition, reporting and medical surveillance in NJ.

Figure 7
Percentage of Hospitals* that Developed a Policy Regarding Latex-sensitization Prevention
New Jersey, 2000



In 2000, the New Jersey Department of Health and Senior Services (NJDHSS) Occupational Health Surveillance Program convened a Latex Allergy Task Force to provide guidance and advice to NJDHSS regarding the prevention and management of natural rubber latex (NRL) sensitization and allergy. The Task Force developed guidelines entitled " Management of Natural Rubber Latex Allergy" and "Selecting the Right Glove for the Right Task in Health Care Facilities." The guidelines were distributed to health care facilities to assist them in management of latex sensitization.The guidelines are available on the NJDHSS Occupational Health Surveillance Program Web site and included in the *Appendix*.

Interventions were conducted in three phases: 1) in March 1998, an educational mailing consisting of a newly-issued NIOSH Alert on Latex Allergy in the Workplace was sent to over 2,400 health care facilities; 2) in April 2000, educational materials, including guidelines on management of latex allergy, were developed and distributed to the 2,400 health care facilities, as well as posted on the NJDHSS Web site, and 3) in October 2000, a *Survey of Latex Allergy Management in New Jersey Hospitals* was developed and distributed to 122 New Jersey health care facilities. The survey asked for information on policies regarding patient care, employee health, selection of gloves, changes in institutional practices made based on NJDHSS guidelines, and number of employees with latex-related illness. Baseline data was collected through a survey of a sample of 122 New Jersey general, specialty, and AIDS hospitals. A follow-up mailing was sent to non-responders of the first mailing. Hospitals were asked to provide the requested information on a voluntary basis. Overall 34 percent of surveyed hospitals completed the questionnaire. Survey results show that 37 (90%) of the respondents reported that they had policies regarding patient care, 31 (76%) had policies regarding employee health, 17 (41%) had policies on glove selection. The survey also found that 18 (44%) of the hospitals made changes in their institutional practices based on the NJDHSS guidelines. Additionally, respondents reported having identified at least 87 employees with some type of latex allergy. Between 1998 and 2000, NJDHSS conducted educational lectures on latex allergy prevention for various audiences, and a set of slides was developed and made available to health care facilities for use in employee training.

Among the hospitals completing the 2000 baseline questionnaire, the percentage having a policy regarding prevention of latex allergy was as follows:

Patient policy	90% (95% confidence interval [81%, 99%])
Employee policy	76% (95% confidence interval [63%, 89%])
Selection of glove policy	41% (95% confidence interval [26%, 56%])

In 2007, the Occupational Health Surveillance (OHS) Program will reassess New Jersey hospital facilities' adherence to the guidelines: *Management of Natural Rubber Latex Allergy* and *Selecting the Right Glove for the Right Task in Health Care Facilities*. The Program will send a survey which will address patient and employee policy regarding the prevention and management of NRL sensitization and allergy, and hospitals policy regarding selection of the right glove or the right task. The Program will mail the survey to all New Jersey hospitals. Educational materials on prevention and management of NRL sensitization and allergy will be included in this mailing. Results of the survey will be evaluated and disseminated to hospitals.

LIST OF PUBLICATIONS/PRESENTATIONS – WORK-RELATED ASTHMA

Educational Materials

Title	Format	Audience
Asthma and Cleaning Products -What Workers Need to Know	brochure	employees
New Jersey Law Requires Physicians and Advanced Practice Nurses (APNs) to Report Individuals Diagnosed with Work-Related Asthma	office poster	physicians and APNs
Guidelines – Work-Related Asthma Recognition, Diagnosis, and Reporting	booklet	physicians and APNs
HIPAA and the Provision of Protected Health Information to the NJDHSS	fact sheet	physicians and APNs
Reporting Work-Related Asthma - Important Information	fact sheet	physicians and APNs
Do You Have Work-Related Asthma?	brochure	employees
Every Breath Counts! – Important Information for Adults with Asthma	brochure	employees
Industries and Asthmagens Associated With Work-Related Asthma	fact sheet	physicians and APNs
Work-Related Asthma Resources	brochure	general
Important Information for Applicators of Polyurethane Spray-on Bed Liners	health alert	employees
Ventilation of Funeral Home Preparation Rooms - Guidelines and Calculations	fact sheet	employers
Guidelines: "Management of Natural Rubber Latex Allergy" and "Selecting the Right Glove for the Right Task in Health Care Facilities"	booklet	employers
Latex Allergy: A Guide to Prevention	brochure	employers and employees
Glutaraldehyde: Guidelines for Safe Use and Handling in Health Care Facilities	fact sheet	employers and employees
Occupational Health and Funeral Homes	fact sheet	fact sheet

Peer-Reviewed Publications

Pechter E, Davis L, Tumpowsky C, Flattery J, Harrison R, Reinisch F, Reilly MJ, Rosenman KD, Schill DP, Valiante DJ, Filios M. Work-related asthma among health care workers: Surveillance data from California, Massachusetts, Michigan, and New Jersey, 1993-1997. Am J Ind Med 2005; 47:265-275.
Goe SK, Henneberger PK, Reilly MJ, Rosenman KD, Schill DP, Valiante D, Flattery J, Harrison R, Davis L, Tumpowsky C, Filios MS. A descriptive study of work-aggravated asthma. Occup Env Med 2004;61:512-517.
Rosenman KD, Reilly MJ, Schill D, Valiante D, Flattery J, Harrison R, Pecher E, Davis L, Tumpowsky L, Filios M. Cleaning agents and work-related asthma. J Occup Environ Med 2003;45:556-563.
Henneberger PK, Derk S, Davis L, Tumpowsky C, Reilly, MJ, Rosenman KD, Schill DP, Valiante D, Flattery J, Harrison R, Reinisch F, Filios MS. Work-related reactive airways dysfunction syndrome cases from surveillance in selected US states. J Occup Environ Med 2003;45:360-368.
Goodwin SS, Stanbury MJ, Wang ML, Silbergeld E, Parker JE. Previously undetected pneumoconiosis in New Jersey decedents. Am J of Indust Med 2003;44:304-311.
Ortega HG, Kreiss K, Schill DP, Weissman DN. Fatal asthma from powdering shark cartilage and review of fatal asthma literature. Am J Ind Med 2002; 42(1)50-4.
Jajosky RA, Harrison R, Reinisch F, Flattery J, Chan J, Tumpowski C, Davis L, Reilly MJ, Rosenman KD, Kalinowsky D, Stanbury M, Schill D, Wood J. 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 1999;48/No. SS-3; 1-20.
Stanbury MJ, Gatti E, Sokolowski JW. RADS in a nurse exposed to pentamidine. (Letter) J Occup Environ Med 1996; 38:330-331.
Reilly MJ, Rosenman KD, Watt F, Schill D, Stanbury MJ, Trimbath LS, Jajosky RA, Musgrave K, Castellan R, Bang KM, Ordin D. Surveillance for occupational asthma. Michigan and New Jersey,1988-1992. MMWR 1994;43/No SS-1: 9-17.

Other Publications

¿Esta su Asma Relacionada con su Profesión? (Is Your Asthma Related to Your Job?) Immigration & American Citizenship Organization's La Guía del Inmigrante (The Immigrant's Guide newsletter). Vol VI No. 3 - 2006. This newsletter is published in Spanish and distributed to over 10,000 Latino households in New Jersey.
Asthma in New Jersey, Update 2006 (comprehensive NJDHSS annual report describing the effects of asthma on the health of New Jersey residents; includes section on work-related asthma).
A 24-page Special Issue on Work-Related Asthma. NJDHSS "Occupational Health Surveillance Update" newsletter, May 2006.
Asthma in New Jersey, Update 2005 (comprehensive NJDHSS annual report describing the effects of asthma on the health of New Jersey residents; includes section on work-related asthma).
Preventing Occupational Disease and Injury in New Jersey - The Role of the Clinician "Occupational Health Surveillance Update" newsletter. December 2003.

Glutaraldehyde in New Jersey Health Care Facilities - NJDHSS "Occupational Health Surveillance Update" newsletter, February 2001.
Department Establishes Latex Allergy Task Force - NJDHSS "Occupational Health Surveillance Update" newsletter, December 1999.
Occupational Latex Asthma - NJDHSS "Occupational Health Surveillance Update" newsletter, January 1998.
Occupational Asthma: Interesting Case Reports - NJDHSS "Occupational Health Surveillance Update" newsletter, January 1996.
Hospitalizations with Occupational Lung Diseases Rising in New Jersey. NJDHSS "Occupational Health Surveillance Update" newsletter, December 1993.

Presentations at National Meetings

Author/Title	Meeting
Mazurek JM, Filios MS, Willis R, Schill DP, Rosenman KD, Davis LK, Pechter E, McGreevy K, Flattery J, Reilly MJ. Work-related asthma in the educational services industry-California, Massachusetts, Michigan, and New Jersey, 1993-2000.	American Public Health Association (APHA) Annual Meeting, Philadelphia, PA, December 2005.
Schill D. Collaborative outreach project to improve the diagnosis and reporting of work-related asthma in New Jersey.	National Council of State and Territorial Epidemiologists Annual Meeting. Albuquerque, NM, June 2005.
Valiante D. Using hospital emergency department data to track occupational asthma in minority occupations.	Third Maine Occupational Safety & Health Research Symposium. Augusta, ME, May 2005.
Gerwel B. Expansion of the work-related asthma case definition: New Jersey.	National Council of State and Territorial Epidemiologists Annual Meeting. Boise, ID, June 2004.
Goe SK, Henneberger PK, Reilly MJ, Rosenman KD, Schill DP, Valiante D, Flattery J, Harrison R, Davis L, Tumpowsky C, Filios MS. A descriptive study of work-aggravated asthma. (poster presentation).	American Thoracic Society Annual Meeting, 2002.
Hossain T, Schill D, Ramaprasad R. Workers' compensation in work-related asthma in New Jersey. (poster presentation).	American Occupational Health Conference, San Francisco, CA, April 2001.

Schill D. SENSOR work-related asthma workshop. Update of state activities.	National Council of State and Territorial Epidemiologists Annual Meeting. New Orleans, LA, June 2000.
Valiante D. Alternative methods for data collection in occupational asthma.	
Schill D, Reilly, MJ, Rosenman K, Tumpowsky C, Flattery J. Work-related asthma in health care settings.	
Schill D, Valiante D. Glutaraldehyde in New Jersey health care facilities.	OSHA national meeting, Washington, DC, January 2000.
Gerwel B. Natural rubber latex allergy - NJDHSS preventive measures.	Annual Meeting of the American Public Health Association, November 1999.
Schill D. Predictors of formaldehyde exposure monitoring in New Jersey embalmers.	Tulane University, School of Public Health and Tropical Medicine. August 1999.
Valiante D. Soluaga L. Under-reporting issues.	Council of State and Territorial Epidemiologists Annual Meeting. Madison, WI, June 1999.
Mohr SN, Kipen HM, Stanbury M, Scardella A. The New Jersey database on acute inhalation injuries.	American Lung Association/American Thoracic Society Conference. San Francisco, CA, May 1997.
Maxfield R, Celan A, Reilly MJ, Rosenman K, Kalinowski D, Stanbury M, *et al.* State-based silicosis surveillance.	Annual Meeting of the Society for Occupational and Environmental Health, December 1995.

Educational Materials

Title	Format	Audience
Dry Cutting and Grinding is Risky Business	fact sheet	employers and employees
Reduce Silica Exposure During Jackhammer Work -Use A Simple Water-Spray Dust Control	info packet	employees
What Dental Technicians Need To Know About Silicosis	brochure	employees
Stop Silicosis in Sandblasters, Use Silica Substitutes	fact sheet	employers
What Physicians Need to Know About Occupational Silicosis and Silica Exposure Sources	fact sheet	physicians
Silicosis Resources	pocket card	general
To My Doctor: What Physicians Need to Know About Silicosis in Construction, Demolition, and Renovation Workers	fact sheet	physicians and employees
What Physicians Need to Know About Occupational Silicosis and Silica Exposure Sources	fact sheet	physicians
List of NIOSH Certified B-readers in New Jersey	info sheet	general

Peer-Reviewed Publications

Valiante DJ, Schill D, Rosenman KD, Socie E. Highway repair: A new silicosis threat. Am J Public Health 2004;94:876.
Rosenman KD, Petcher E, Schill DP, Valiante DJ, Bresnitz EA, Cummings KR, Socie E, Filios MS. Silicosis in dental laboratory technicians – Five States, 1994-2000. MMWR 2004;53/No-9:195-197.
Echt A, Sieber K, Jones E, Schill D, Lefkowitz D, Sugar J, and Hoffner K. Control of respirable dust and crystalline silica from breaking concrete with a jackhammer. Appl Occup Environ Hyg 18:491-495, 2003.
Rosenman KD, Stanbury MJ, Reilly MJ. Mortality among persons with silicosis reported to two State based disease surveillance systems. Scan J Work Environ Health 1995; 21 suppl 2:73-6.
Stanbury M, Joyce P, Kipen H. Silicosis and workers' compensation in New Jersey. J Occup Environ Med 1995; 37:1342-1347.
Cooper TC, Gressel MG, Froehlich PA, Caplan PE, Mickelsen RL, Valiante D, Bost P. Successful reduction of silica exposures at a sanitary ware pottery. Am Ind Hyg Assoc. J 1993; 54:600-606.

Reilly MJ, Rosenman KD, Watt F, Stanbury M, Valiante DJ, Helmus LE, Migliozzi NA, Anderson H, Hanrahan L, Jajosky RA, Musgrave KJ, Castellan R, Ordin D. Silicosis surveillance - Michigan, New Jersey, Ohio, Wisconsin. MMWR 1993;42/No. SS-5:23-28.
Valiante D, Bost P, Stanbury M, Szenics J, NIOSH. Silicosis among pottery workers - New Jersey MMWR 1992;42:405-411.
Valiante DJ, Richards T, Kinsley KB. Silicosis surveillance in New Jersey: Targeting workplaces using occupational disease and exposure surveillance data. Am J Ind Med 1992; 21:517-526.
Brien D, Froehlich PA, Gressel MG, Hall RM, Clark NJ, Bost P, Fischbach T. Silica exposure in hand grinding steel castings. Am Ind Hyg Assoc. J 1992; 53:42-48.

Other Publications

New Jersey Silica Partnership. NJDHSS "Occupational Health Surveillance Update" newsletter, February 2001.
A 12-page Special Issue on Silicosis. NJDHSS "Occupational Health Surveillance Update" newsletter, December 1998.
Silicosis in a graphite milling plant. NJDHSS "Occupational Health Surveillance Update," January 1996.

Presentations at National Meetings

Author/Title	Meeting
Schill D. Dental laboratory technicians and silica – a state-wide intervention project (poster presentation).	National Council of State and Territorial Epidemiologists Annual Meeting. Anaheim, CA, June 2006.
Valiante D. Silicosis and highway construction workers.	American Public Health Association (APHA) Annual Meeting. Philadelphia, PA, December 2005.
Schill D. Silica exposure and silicosis in dental laboratory technicians, an unregulated worker population.	Third Maine Occupational Safety & Health Research Symposium. Augusta, ME, May 2005.
Schill D. Dental laboratory technicians and silica – a hazard surveillance project.	National Council of State and Territorial Epidemiologists Annual Meeting. Boise, ID, June 2004.
Schill D. Silica exposure in New Jersey highway workers.	National Council of State and Territorial Epidemiologists Annual Meeting. Portland, OR, June 2001.
Leiker R, Whittaker S, Valiante D. Construction projects crossing state lines.	National Council of State and Territorial Epidemiologists Annual Meeting. New Orleans, LA, June 2000.

Schill D. Silica exposure among highway construction workers.	
Schill D, Valiante D. Silica exposure in New Jersey highway workers (poster presentation).	Public Health Care Summit I, October 1999.
Schill D. Silicosis in New Jersey highway workers.	Construction Industry Advancement Program/Oxford Environment Silicosis Symposium, December 1999.
Senn E. Employers for targeted prevention activities.	Council of State and Territorial Epidemiologists Annual Meeting. Madison, WI, June 1999.

HUMAN SUBJECTS RESEARCH

This human subjects research meets the definition of "Clinical Research."

Protection of Human Subjects

The NJFACE program has received IRB approval through November 18, 2005 (Federal Wide Assurance Identifier FWA00004020, protocol #1120040026). Approval is reviewed annually.

Risks to the Subjects

Human Subjects Involvement and Characteristics: The human subjects in this study are defined as the victims, employers, co-workers, and witnesses to a work-related fatal injury. All fatality victims will be included, regardless of age, sex, race, or other characteristic. NJFACE investigations will be initiated as per the protocols outlined in the research section.

NJFACE gathers data on 100 to 140 work-related fatalities per year. We anticipate conducting 12 on-site FACE investigations, and usually interview one to three employers, witnesses, and co-workers per investigation.

Sources of Materials: Demographic and incident data will be gathered for each fatality victim and entered into the NJFACE first report database. Further detailed data will be collected during NJFACE investigations, including witness statements, photographs, measurements, and available documentation on the incident. Confidential records will only be available to NJFACE staff with IRB clearance to review data. Database records will be linked and identified through a unique number, no direct identifiers will be included.

Potential Risks: The primary risk is the loss of confidentiality if an interview statement is revealed. Such a loss may have negative repercussions, such as an employer retaliating against an employee, or potential ramifications due to lawsuits or other legal actions.

Adequacy of Protection Against Risks

Recruitment and Informed Consent: Victims of work-related fatal injuries are entered into the study immediately after identification by the NJFACE surveillance system. If the incident is in-scope for investigation, a NJFACE investigator will contact the employer for permission to investigate. The consent form, introductory letter, and NJFACE brochure is faxed or mailed before the investigation. During the visit, the investigator again explains the program to confirm consent. The investigator will similarly explain the program and obtain consent before interviewing any witnesses and co-workers. All parties are informed that they may discontinue the investigation at any time without penalty.

Protection Against Risk: NJFACE has obtained an NIH Certificate of Confidentiality (see Appendix A-3) to prevent the forced release of identifying information, such as from legal actions. This mitigates much of the loss of confidentiality risk outlined above. No personal identifiers are included in any databases. All databases are password protected. Paper records are kept in locked file cabinets, and confidential records are purged from the paper files on the completion of a NJFACE investigation.

Potential Benefits of the Proposed Research to the Subjects and Others

Participating employers will directly benefit from the study by receiving a detailed investigation report with recommendations for preventing future incidents. Other employers, employees, safety professionals, and interested parties will benefit by using the NJFACE reports and other publications to make their workplaces safer, thus reducing the incidence of employee injuries and fatalities. The small risk of loss of confidentiality is reasonable in relation to reducing the risk of fatal or serious workplace injuries.

Importance of the Knowledge to be Gained

The knowledge gained from the study will be used to produce educational materials aimed at reducing the incidence of work-related injuries and fatalities.

Inclusion of Women and Minorities
Women and minorities will be included in all aspects of this study.

Inclusion of Children
All work-related fatal injury victims aged 21 years and younger will be included in this study. Due to the psychological trauma of witnessing a fatality, children under 18 years of age will not be interviewed as witnesses or co-workers during a NJFACE investigation. Children aged 18 to 21 may be interviewed with the informed consent of the subject.

VERTEBRATE ANIMALS

None will be used.