



REPORT
of **ACTIVITIES**
for **FISCAL**
YEAR 1997

prepared by the

NATIONAL INSTITUTE *for*
OCCUPATIONAL SAFETY
***and* HEALTH**



U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
Public Health Service
Centers for Disease Control and Prevention
National Institute for Occupational Safety and Health





REPORT
of **ACTIVITIES**
for **FISCAL**
YEAR 1997

prepared by the

NATIONAL INSTITUTE *for*
OCCUPATIONAL SAFETY
***and* HEALTH**



U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
Public Health Service
Centers for Disease Control and Prevention
National Institute for Occupational Safety and Health



March 1999

TABLE *of* CONTENTS

EXECUTIVE SUMMARY 1

INTRODUCTION 3

STRATEGIC GOAL 1 5

The National Occupational Research Agenda 5

1997 Research Activities 5

Laboratory Research 5

Field Research 6

New Technologies 7

Extramural Research Grants and Cooperative Agreements 8

Agriculture 8

Construction 9

Mining 10

Small Business 11

STRATEGIC GOAL 2 13

Surveillance 13

STRATEGIC GOAL 3 17

Health Hazard Evaluations 17

Control Technologies 17

Recommendations 18

STRATEGIC GOAL 4 19

Information 19

Training 20

Capacity Building 22

CONCLUSION 23

EXECUTIVE SUMMARY

The National Institute for Occupational Safety and Health (NIOSH) is part of the Centers for Disease Control and Prevention (CDC) within the Department of Health and Human Services (DHHS). NIOSH, the federal agency responsible for research and prevention of workplace hazards, is headquartered in Washington, D.C., and has facilities in Anchorage, Alaska; Atlanta, Georgia; Cincinnati, Ohio; Morgantown, West Virginia; Pittsburgh, Pennsylvania; and Spokane, Washington.

Currently, there are 127 million individuals, 16 years of age or older, in the United States workforce. The workforce is aging, becoming more ethnically and racially diverse, and includes more women. Safety and health hazards experienced by workers have implications for their personal lives, their productivity, and the productivity of the nation as a whole. According to a NIOSH-funded study published in 1997, work-related injuries cost the nation more than \$145 billion and work-related diseases cost an additional \$26 billion, making the total financial burden a staggering \$171 billion (1992). While occupational health research has improved worker protection against many hazards and diseases, much remains to be done. Workers are still at risk for noise induced hearing loss and exposed to lead and silica, two long-recognized occupational hazards that cause chronic lung disease. As the workplace and workforce change, new hazards emerge. Violence is now a threat in the workplace, latex allergies are increasing among health care workers, new chemicals and processes place workers in danger, and the long-term effects of many exposures remain unknown.

NIOSH continues to reduce work-related injuries and illnesses by conducting research, publishing recommendations for preventing work-related injuries and illnesses, and training professionals in occupational safety and health.

NIOSH significant accomplishments for FY 1997 include:

Institute Infrastructure

- Completed assimilation of the former Bureau of Mines creating a dynamic mining research component within the Institute.

Scientific Findings

- Identified the molecular events responsible for occupational cancers caused by metals such as arsenic and cadmium, the early gene environmental reactions responsible for particle induced inflammatory lung disease, and a molecular biomarker for chronic arsenic exposure.
- Developed a home test for determining the level of certain pesticides in urine.
- Derived a lifting equation to identify both jobs with increased risk of lower back pain and changes in lifting practices that will help prevent future injuries.

New Technology

- Developed, tested, and deployed engineering controls for highway-class asphalt paving equipment in cooperation with equipment manufacturers. As a result of this collaboration, the Occupational Safety and Health Administration (OSHA) and the paving equipment manufacturers signed a voluntary agreement to incorporate engineering controls on all highway-class paving equipment manufactured after July 1, 1997.
- Increased performance capabilities and cut by one-half the size and weight of a gas chromatograph/mass spectrometer (GC/MS). The instrument has been granted two U.S. patents. The GC/MS is the only portable analytical instrument capable of providing an immediate, positive identification of a hazardous gas or vapor at the work site.

- Developed the technology to classify hazardous fibers, such as asbestos and fiberglass, according to their length. Laboratory studies involving fibers classified using this new technology confirm the role of fiber length on cellular damage in the lungs.

Policy and Recommendations

- Published the NIOSH Latex Alert highlighting the potential for serious allergic reactions to latex in health care workers which provided recommendations for minimizing latex exposure.
- Published two documents to further the science and understanding of the relationship between work and musculoskeletal disorders. One document establishes the scientific basis for the association between known risk factors in the workplace and musculoskeletal disorders, the second gives practical solutions for preventing or reducing musculoskeletal disorders.
- Collaborated with the Department of Energy, the Centers for Disease Control and Prevention's National Center for Environmental Health (NCEH), and the Agency for Toxic Substances and Disease Registry (ATSDR) to develop a coordinated Public Health Plan for Department of Energy (DOE)-site workers and communities.

Partnering

- Increased NIOSH resources in support of the National Occupational Research Agenda (NORA). NIOSH's FY1997 NORA investment of \$28.1 million was nearly double that of FY1996.
- Established 20 teams, one each to address research priorities established within NORA. These implementation teams are made up of experts from government, industry, labor, professional societies, and academia.
- Completed the first ever survey of Federal partners to determine funding levels and research interests in occupational safety and health.

Education and Outreach

- Awarded 222 grants and cooperative agreements for \$45.1 million in 35 states.
- Added a new Education and Research Center

(ERC) at the University of South Florida at Tampa to serve the Southeast region of the country. ERCs provide occupational safety and health training and other resources for professionals in industry, labor, government, and academia. This brings the total number of ERCs to 15 in 14 states.

- Worked closely with state health departments, the regional Federal Emergency Management Agency, and the American Red Cross to help flood victims along the Ohio River and ensure the safety of workers involved with the rescue, clean-up, and reconstruction operations.
- Established the National Center for the Prevention of Childhood Agricultural Injuries in Marshfield, Wisconsin, to serve as a national resource for raising awareness of childhood agriculture injuries and coordinating prevention efforts.

Services

- Conducted 335 Health Hazard Evaluations at the request of employers, employees, and federal, state, and local agencies, to examine potential hazards in the workplace.

Awards

- NIOSH's Pittsburgh Research Laboratory (PRL) was awarded the prestigious *R&D Magazine* annual award for one of the top 100 innovative technological advancements of the year. PRL received the award for the design of a portable device for measuring methane in rock samples. This device has the potential to reduce the risk of mine explosions and improve the safety of underground mine workers.
- Albert Munson, Ph.D., Division Director of the Health Effects Research Laboratory, received the 1997 Education Award from the Society of Toxicology. This award is given annually to an individual whose contributions to the teaching and training of toxicologists have significantly advanced the field of toxicology.
- Two NIOSH scientists from the Division of Physical Sciences and Engineering (DPSE), Kevin Ashley, Ph.D. and Paul Schlecht, were included in "Who's Who in the Lead Hazard Control Industry."

INTRODUCTION

An unhealthy working environment affects workers' health and productivity, and may even render them unable to work. The consequences of occupational safety and health hazards are reflected in the following statistics:

- In 1996 on a typical day in the United States, 16 workers died from injuries.
- Each day, an average of 137 workers died from work-related diseases.
- According to the National Safety Council, the costs for occupationally-related injuries exceeded \$121 billion in 1996.

The National Institute for Occupational Safety and Health (NIOSH) is committed to making the workplace a safer environment for all people. NIOSH is constantly faced with new challenges as the workforce grows older and changes in demographic composition, as individuals work longer hours, and as issues facing workers evolve.

NIOSH has been conducting health research and making recommendations for preventing occupational illness and injury since its inception in 1970. The Occupational Safety and Health Act created both NIOSH and the Occupational Safety and Health Administration (OSHA), giving each unique responsibilities and placing them in different governmental departments. Charged with conducting research and implementing prevention activities, NIOSH is located in the Centers for Disease Control and Prevention (CDC) within the

Department of Health and Human Services (DHHS). OSHA is required to promulgate regulations and enforce health and safety standards in the workplace and is part of the Department of Labor. FY 1997 marked completion of the transfer of the health and safety research programs from the former U.S. Bureau of Mines to NIOSH. In FY 1997, NIOSH's total operating budget was \$173 million and NIOSH staff numbered 1,364.

As required by the Government Performance and Results Act (GPRA), NIOSH developed four Institute-wide strategic goals in FY 1997. The complete version of the NIOSH Strategic Plan is available on the NIOSH Home Page at <http://www.cdc.gov/niosh>. These goals complement the goals set out by both DHHS and CDC.

The four NIOSH goals--targeting of research, surveillance, prevention, and information dissemination and training-- represent the broad spectrum of NIOSH's work. It is the interplay of these goals that has and will make the vision of this Institute--safer and healthier workplaces--a reality.

To best describe NIOSH's accomplishments during FY 1997, this Report of Activities has been organized around the Institute's four strategic goals. This Report highlights the work of the Institute during FY 1997 and it is not an exhaustive account of Institute-wide activity.

STRATEGIC GOAL 1

Conduct a targeted program of research to reduce morbidity, injuries, and mortality among workers in high priority areas and high-risk sectors.

THE NATIONAL OCCUPATIONAL RESEARCH AGENDA

In April 1996, NIOSH released the National Occupational Research Agenda (NORA), a national framework to guide occupational safety and health research activities into the 21st century. NORA was developed with extensive input from more than 500 organizations and individuals outside of NIOSH. These included members of the occupational safety and health community, other government organizations, universities, industry, labor and professional societies, who worked together to identify research gaps and target future research resources.

NORA includes 21 research priorities that drive coordinated national research aimed at protecting the health and safety of workers, as well as helping to reduce the heavy economic costs imposed on the United States by job-related injuries and illnesses. Examples of these priority areas include traumatic injuries, work-related allergies, special worker populations at risk, musculoskeletal disorders, reproductive abnormalities, infectious diseases, and emerging workplace technologies. Twenty teams were formed, one to address NORA implementation in each of the research priority areas (two priority areas involving musculoskeletal disorders were combined).

NIOSH held its first national conference with NORA partner organizations on July 1, 1997 at the National Academy of Sciences. The purpose of this conference was to review progress and discuss further opportunities for implementing NORA. At the event were representatives from more than 200 business, labor, government, health, and science organizations that have partnered with NIOSH to develop and implement the agenda over the past year. During the conference NIOSH issued a report describing first-year successes

under NORA which included: increasing NIOSH's investments in NORA priority areas; creating systems for assessing the effectiveness of NORA in the long term; establishing new research partnerships; and using NORA working teams to stimulate projects on preventing job-related latex allergy. For a complete report of FY 1997 NORA activities, visit the NIOSH Home Page at: <http://www.cdc.gov/niosh>.

1997 RESEARCH ACTIVITIES

Laboratory Research

New Laboratory Opened

In October 1996, NIOSH dedicated its new laboratory facility that houses the Health Effects Laboratory Division, located in Morgantown, West Virginia. The new laboratory provides state-of-the-art facilities for conducting advanced research in key health disciplines and developing new methods to communicate health and safety information meaningfully to workers and employers. Disciplines represented at the laboratory include immunotoxicology, microbiology, and biochemistry.

History provides evidence that medical progress has not occurred without the sustained pursuit of basic science. Occupational health issues are no exception. Thus, priority was given to the hiring of talented, experienced researchers at the new laboratory who will produce information, methodologies, and tools for identifying early signs of job-related diseases, understanding the complex effects of exposures on the body's fundamental systems (including the reproductive and central nervous systems, vital organs, and skin), designing better diagnostic and warning devices, and spurring other advancements to keep pace with rapid changes in today's workplaces and working populations.

Significant Toxicological and Molecular Biological Findings

NIOSH laboratory research has identified (1) the molecular events responsible for occupational cancers caused by such metals as cadmium and arsenic; (2) the early gene environmental reactions responsible for particle induced inflammatory lung disease; and (3) a molecular biomarker for chronic arsenic exposure. These findings are being used in risk assessment and can lead to improved prevention strategies.

Time-Saving Breakthrough

Histoplasmosis is an infectious disease that affects the lungs and is caused by the inhalation of *Histoplasma capsulatum* spores from soil contaminated by avian or bat excreta. NIOSH researchers developed a polymerase chain reaction (PCR) method that reduces the time needed to detect soil contamination from two months to two days. This method is a potential breakthrough for both the agricultural and construction industries, where workers often risk exposure to *Histoplasma capsulatum*.

Home Tests for Pesticide Exposures

NIOSH developed a direct-reading kit for determining the level of agricultural chemicals in urine. The kit does not require instrumentation and is simple enough to be used by persons without laboratory training. It is the first kit which permits workers to determine their own pesticide level. In the future, the use of this testing procedure may be combined with other interventions, such as the use of protective clothing, to determine the effectiveness of the intervention.

Assessing Workers' Risks

During FY 1997, NIOSH conducted risk assessments that supported work within NIOSH as well as other agencies, such as the Occupational Safety and Health Administration (OSHA), the Mine Safety and Health Administration (MSHA), and the Environmental Protection Agency (EPA). Risk assessment projects were conducted in the following areas: 1,3-butadiene, chrysotile asbestos, diesel exhaust, electromagnetic frequencies, noise, safety hazards, and silica.

The purpose of these projects is to measure the relationship between exposure levels and disease development. Results of the diesel exhaust risk

assessment described the risk of lung cancer associated with varying levels of diesel exposures. The risk assessment of asbestosis provides evidence of a significant risk for lung cancer and nonmalignant respiratory disease at the previous OSHA standard (1 fiber/cc) and supports OSHA's recent lowering of the standard (0.1 fibers/cc) for all forms of asbestos. The results of these projects have been published in the scientific literature.

Field Research

Protecting Workers in Marion, Indiana

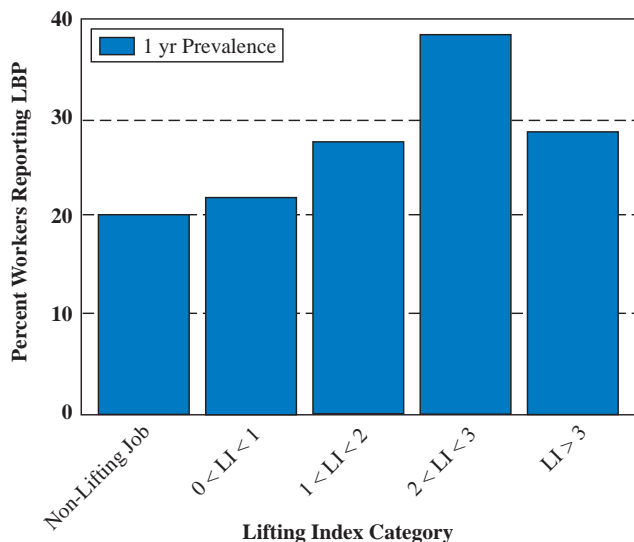
At the request of workers, NIOSH evaluated potential exposures to nitrosamines at an automotive rubber sealant plant in Marion, Indiana. A suspected human carcinogen, nitrosamines bind or attach to DNA, leading to the formation of DNA adducts, which, if left unrepaired, may result in a genetic mutation. NIOSH measured DNA adducts in workers' blood and urine. Results revealed that workers exposed to nitrosamines were more likely to have a specific DNA adduct in their blood than those with no nitrosamine exposure. This data will help the company evaluate the need for changes in the ventilation of the plant to reduce nitrosamine air levels and will help prevent similar exposures in other plants using nitrosamines.

NIOSH Improves Transportable Equipment

NIOSH scientists redesigned a piece of laboratory equipment, the gas chromatograph/mass spectrometer (GC/MS), for use in field industrial hygiene studies. The GC/MS units presently available are fairly large and heavy, weighing approximately 210 pounds, and are best described as "transportable" rather than "portable." Both the weight and volume of the redesigned GC/MS were reduced by 50%, resulting in a weight of approximately 100 pounds for the new instrument. The size reduction was accompanied by increased performance capabilities compared to other portable units. This instrument was used to help reduce exposures to printing solvents at a vinyl printing company in Ohio. The NIOSH instrument has been granted two patents, and two articles describing its utility have been published in the scientific literature.

A Formula for Low Back Pain Prevention

The NIOSH lifting equation is a scientifically-derived mathematical equation designed to identify lifting jobs that could place workers at risk for low back pain (LBP). The formula takes into account a variety of conditions for a lifting event as it provides the “lifting index” for a specific task. The formula has been revised and a 50-job study was conducted to evaluate its utility. Analysis of the data revealed that as the lifting index increased, so did the amount of LBP experienced by the workers. The study concluded that the NIOSH lifting equation is effective in identifying jobs with increased risk of LBP and for identifying changes in lifting practices that will help prevent future injuries.



New Technologies

A Medical Diagnostic Tool

NIOSH researchers at the Health Effects Laboratory Division (HELD) developed a system to accurately record the sound pressure waves created when an individual coughs. Coughs are associated with over 100 different pulmonary diseases, and the NIOSH technique for cough analysis has the potential to become a useful non-invasive tool for screening large populations of workers to obtain information concerning their pulmonary function. In a preliminary study, results showed agreement between the cough sound index and the clinical pulmonary diagnosis.

NIOSH Develops Long Sought-After Method to Measure Fibers

Asbestos fibers have demonstrated potential for causing asbestosis, lung cancer, and mesothelioma, with the dimensions of these fibers serving as a major determining factor in causing these diseases. Before the Fiber Length Classifier was developed by NIOSH, there had been no useful way of separating commercial fibers according to their length. Laboratory studies involving length-classified fibers using this new technology confirm the role of fiber length on cellular damage in the lungs and may have implications for future standards on fibers.

NIOSH Develops a Life-Saving Carbon Monoxide Sensor

NIOSH researchers developed a new application for a chemical sensor to monitor worker exposures to toxic gases and vapors, specifically, carbon monoxide. The sensor is designed to be used with small gasoline-powered engines. The sensor mechanism is linked to the engine, and when the sensor “sees” a predetermined quantity of carbon monoxide it causes the engine to shut down. A patent application has been submitted for this instrument and it has been described in the scientific literature.

Helping Health Care Facilities Detect TB Bacteria Early

NIOSH researchers have developed a technique that incorporates a sensitive DNA analysis with indoor air monitoring. The resulting technology will have the ability to quickly detect a small number of tuberculosis bacteria in the air and will enable health care facilities to monitor and control the spread of tuberculosis from infected patients. In addition, the efficacy of environmental control measures, such as increased ventilation and negative pressure rooms, could be monitored with this technology.

EXTRAMURAL RESEARCH GRANTS *and* COOPERATIVE AGREEMENTS

NIOSH sponsors innovative extramural research that complements and supplements its intramural research program. Through a competitive process, proposals judged to be scientifically sound and related to program priorities are supported through a network of research grants and cooperative agreements.

In FY 1997, NIOSH supported an extramural grants program of approximately \$17.5 million. With these funds, NIOSH supported 94 grants in laboratory and field studies. NIOSH receives research grant applications through the Division of Research Grants in the National Institutes of Health. Major categories of research grants include investigator-initiated (R01 grants), Small Business Innovative Research, and targeted requests for proposals in health services research, construction, agriculture, and child agriculture.

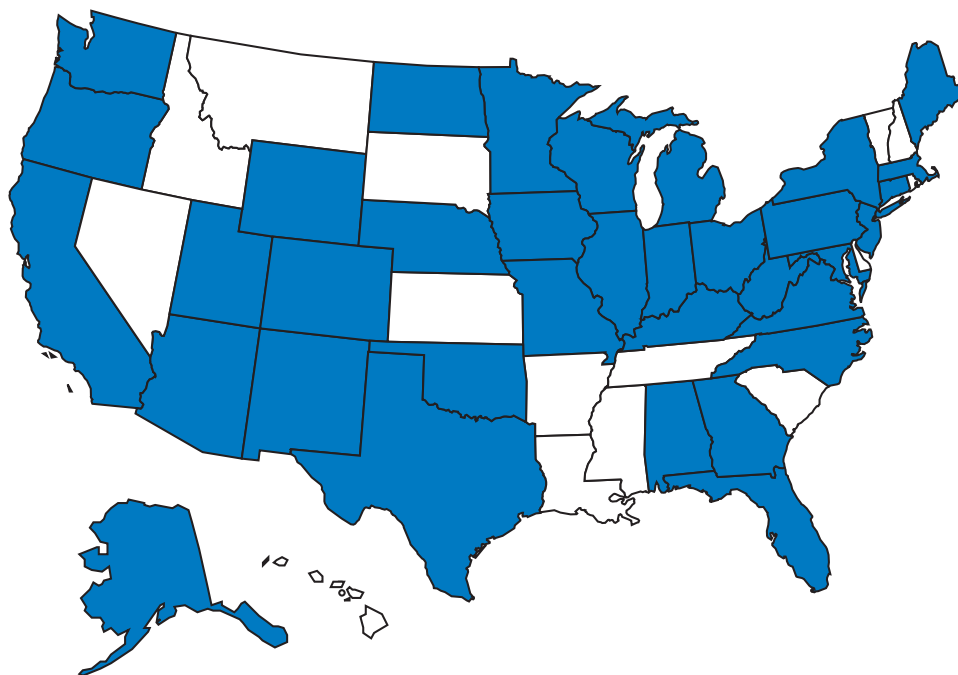
Cooperative agreements permit NIOSH to arrange collaborative surveillance and research opportunities with state health departments, universities, labor unions, and nonprofit organizations. In FY 1997, NIOSH

awarded \$27.6 million for 128 cooperative agreements in 35 states and four international organizations. These funds supported research efforts primarily in agriculture, construction, fatal and nonfatal occupational injury, and surveillance of adult blood lead levels. In the area of agricultural research, NIOSH awarded \$9.2 million to 34 cooperative agreements in 15 states and, in construction, NIOSH awarded \$5 million in cooperative agreements. In occupational radiation and energy-related health research, NIOSH awarded \$1.6 million to six cooperative agreements.

AGRICULTURE

The agriculture industry in the United States employs approximately 3.5 million workers; when including part-time help, about 8 million individuals work in agriculture. According to data from the National Traumatic Occupational Fatalities (NTOF) surveillance system, the agriculture industry has the second highest rate of occupational fatalities in the country. Farmers are at high risk for fatal and nonfatal injuries, work-related lung diseases, noise-induced hearing loss, skin diseases, and certain cancers associated with chemical use and prolonged sun

STATES *with* NIOSH COOPERATIVE AGREEMENTS FY 97



NIOSH has 128 Cooperative Agreements with 36 States and 4 international organizations for \$27,604,163

exposure. Farmers also experience chronic diseases such as cardiovascular disease, hypertension, hearing loss, and asthma.

In addition to the safety and health of adults working on farms, NIOSH is also concerned with occupational safety and health issues surrounding child farmworkers. Farming is one of the few industries in which the families (who often share the work and live on the premises) are also at risk for injuries, illness, and death. Every year approximately 100 children are killed in farmwork-related incidents, and another 100,000 are injured. More than 900,000 children under the age of 15 years and 346,000 children 15-19 years of age lived on U.S. farms and ranches in 1991. Another 800,000 are children of farmworkers, including migrants and hired laborers, and may be exposed to hazards that are carried home or may themselves work in a farm setting.

Agricultural Research and Prevention Centers

The eight Centers, funded by NIOSH at \$5.1 million in FY 1997, provide a multi-disciplinary approach to agricultural safety and health through a network of regional centers throughout the United States. Agricultural Research and Training Centers are located in California, Colorado, Iowa, Kentucky, New York, Texas, Washington, and Wisconsin.

Agricultural Child Research Grants

NIOSH distributes an additional \$2.7 million to independent researchers to study the prevention of agricultural injuries in children. Research grants were funded in California, Illinois, Indiana, Iowa, Kentucky, Minnesota, Mississippi, Missouri, Ohio, Oregon, Washington, and Wisconsin.

Community Partners for Healthy Farming

NIOSH funded \$1.9 million in FY 1997 for community-based programs that include both action-oriented surveillance and intervention research projects. This set of projects is built on the strengths of the former Occupational Health Nurses in Agricultural Communities. Community Partners projects include migrant and seasonal workers in their study populations, and involve collaboration between researchers and stakeholders in the communities. Community Partners funded surveillance projects and intervention research projects in nine and six states, respectively.

Farm Family Health and Hazard Surveys

Farm Family Health and Hazard Surveys assessed the health status and hazards faced by farmers and farm families in California, Colorado, Iowa, Kentucky, New York, and Ohio. Field surveys are completed, and the data collected are being analyzed by state survey teams for state and local uses. Using the data, several publications were completed in FY 1997 on topics including prevalence of respiratory symptoms in Colorado, analyses of depression and stress-related injuries in Iowa, and prevalence of tractor and machinery hazards in New York.

The National Center for the Prevention of Childhood Agricultural Injuries

In FY 1997, NIOSH implemented recommendations for the prevention of childhood agriculture injury which included the establishment of a national center dedicated to the prevention of childhood agricultural injuries. NIOSH awarded a cooperative agreement to the National Farm Medicine Center in Marshfield, Wisconsin, to establish this Center which will serve as a national resource for raising awareness of childhood agricultural injuries and coordinating prevention efforts. Activities will include health communications campaigns, outreach to stakeholders and partners, and training of health and safety professionals.

CONSTRUCTION

There are almost eight million construction workers in the U.S., of whom 1.5 million are self-employed. Ninety percent of the 636,000 construction companies employ less than 50 workers, and few construction companies have formal health and safety programs. According to data from the National Traumatic Occupational Fatalities (NTOF) surveillance system for the years 1980-1993, the construction industry had the highest number of fatalities in the country. In 1995, 1,000 workers were killed on the job, more than in any other industry. Construction injuries are responsible for 15% of all workers' compensation costs. NIOSH is collaborating with the construction industry and unions to develop new strategies to reduce worker injuries and illnesses. In FY 1997, NIOSH funded \$1.2 million in research grants for the study of construction safety and health.

Collaborations With Labor

Scientists from NIOSH have worked extensively with several labor unions to study the health hazards faced by construction workers. NIOSH collaborated with unions representing carpenters, electrical workers, sheet metal workers, and bricklayers. Results of these projects have been presented to workers and scientists at national conferences and have been published for scientific, technical, and lay audiences. These findings will further be used to develop educational materials and to conduct focus groups for intervention/prevention programs.

Increased Mortality Among Construction Workers

NIOSH conducted a national study to investigate the mortality among 13,301 members of the International Association of Bridge, Structural and Ornamental Ironworkers. The study found that union members who had died between 1984 and 1991 experienced a higher number of deaths from falls and other injuries when compared to the U.S. population. In addition, this group of workers had higher mortality from lung cancer, mesothelioma, pneumoconiosis, and other respiratory diseases. The results are applicable to all workers in similar jobs. Additional studies need to be conducted to learn which potential exposures, such as ionizing radiation, diesel exhaust, asphalt and welding fumes, are associated with these disease risks.

Reducing Exposures to Welding Fumes

Welding operations pose safety and health risks to over 500,000 workers in a variety of industries. Metal fume fever and lung cancer are two examples of health hazards associated with exposures to welding fumes and gases. NIOSH evaluated welding operations using both walk-through surveys and in-depth field studies in California, Indiana, Iowa, Kentucky, Minnesota, Ohio, and Pennsylvania. This study provides an independent evaluation of welding control technologies, enabling employers and welders to choose the most appropriate control option for their operations.

MINING

Reorganization and Programmatic Transitions

FY 1997 witnessed the transfer of health and safety research programs from the former U.S. Bureau of Mines (Department of the Interior) to NIOSH. With the transfer, NIOSH became the new home of the Pittsburgh and Spokane Research Laboratories (PRL and SRL). The two laboratories deal with mining issues unique to their regions, with the PRL focusing on Eastern mining, particularly underground coal mining, and the SRL focusing on the Western mining industry, particularly those safety hazards found in metal/nonmetal mining and surface mining.

The reorganization of the Pittsburgh and Spokane research laboratories resulted in the establishment of four branches and two activities for research at PRL and two branches and two activities for research at SRL. SRL has an administrative support unit, while PRL has a substantial administrative and management services branch.

Associate Director of Mining Named

In October 1997, Robert L. Grayson, Ph.D., was named the first permanent Associate Director of Mining. Dr. Grayson has responsibility for activities at NIOSH's mining research laboratories in Pittsburgh and Spokane and for the coordination of mining research throughout the Institute. Prior to his appointment to NIOSH, Dr. Grayson was professor of mining engineering at the School of Mines and Metallurgy, University of Missouri at Rolla. He has also served as a professor of mining engineering at the College of Engineering and Mineral Resources, as Dean of the College of Mineral and Energy Sources, West Virginia University, and as chair of the West Virginia Mine Inspectors' Examining Board.

Protecting Miners' Hearing

NIOSH researchers, in collaboration with the Mine Safety and Health Administration (MSHA), conducted analyses of over 42,000 hearing tests obtained from 9,000 miners. The study showed that by age 50, 49% of the male miners had hearing impairment that affected daily communication, as compared to 9% of the males in the control group. This information is being used to alert miners, mine safety professionals, and the mining industry of the severe consequences of noise exposure for metal/nonmetal miners, and of the need for more diligent efforts to minimize exposures.

SMALL BUSINESS

Metal-Working Fluids in Small Businesses

Metal-working fluids (MWFs) is a generic term which applies to fluids used for cooling, flushing, and lubricating metal parts and tools during metal machining. An estimated 1.2 million workers in the United States are potentially exposed to MWFs. Exposure to MWFs has been strongly associated with dermatitis and nonmalignant respiratory health effects including asthma, hypersensitivity pneumonitis, airways irritation, and chronic bronchitis.

NIOSH and OSHA signed an interagency agreement beginning in FY 1997 to characterize MWF exposures in small businesses. Field investigations were completed in California, Illinois, Indiana, Ohio, Oregon, and Washington. The collected data will be used by OSHA to help determine the need to regulate occupational exposures to MWFs and to help determine industry-wide needs for future evaluation and control of MWFs. NIOSH is also investigating the microbial component of MWFs, the selection of air cleaners to control MWF mist exposures, and a procedure to separate MWFs from other components that may be present.

Reducing Hazards in the Dry-Cleaning Industry

There are between 30,000 and 40,000 dry-cleaning establishments and 250,000 workers employed in dry-cleaning in the United States. Seventy percent of the shops have ten or fewer employees. Perchloroethylene, used by approximately 90% of U.S. shops, is a known animal carcinogen and a suspected human carcinogen. NIOSH investigators evaluated available technology to control worker exposure to this substance. In addition to evaluating state-of-the-art machines, NIOSH investigators evaluated the effectiveness of retrofitting controls on older equipment. These studies are important because there is a tremendous impact on the community via exposures to perchloroethylene occupationally, environmentally, and even in the home. Each year in the U.S. there are about 1,500 perchloroethylene dry-cleaning machines sold, and 80% of those machines are equipped with older technology that causes extremely high worker exposures. NIOSH's control technology/intervention research has shown that state-of-the-art dry-cleaning machines can substantially reduce these high exposures. NIOSH has produced seven Hazard Control documents to provide dry-cleaning shop owners with information concerning effective, low-cost control options to reduce worker exposures.

STRATEGIC GOAL 2

Develop a system of surveillance for major occupational illnesses, injuries, and health hazards.

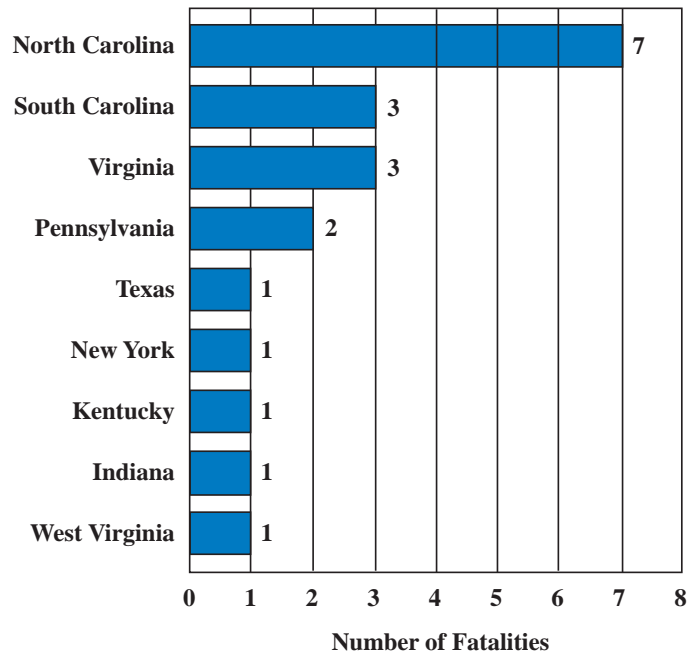
SURVEILLANCE

Monitoring Fatal Injuries

NIOSH conducts Fatality Assessment and Control Evaluation (FACE) investigations to understand factors that contribute to or cause deaths from work injuries. During FY 1997, the FACE program conducted field investigations of work-related fatalities in three primary targeted areas: falls from elevations, machine-related injuries, and logging injuries. The goal of the NIOSH FACE program is to prevent fatal work injuries by identifying work situations at high risk for fatal injury and to formulate prevention strategies. During FY 1997, NIOSH conducted 20 FACE investigations in nine states (Indiana, Kentucky, North Carolina, New York, Pennsylvania, South Carolina, Texas, Virginia, West Virginia). Through scientific research and analyses, recommendations are developed based on FACE investigations to alert employers, workers, safety and health professionals, and other government agencies to potentially hazardous situations that could lead to fatal injury.

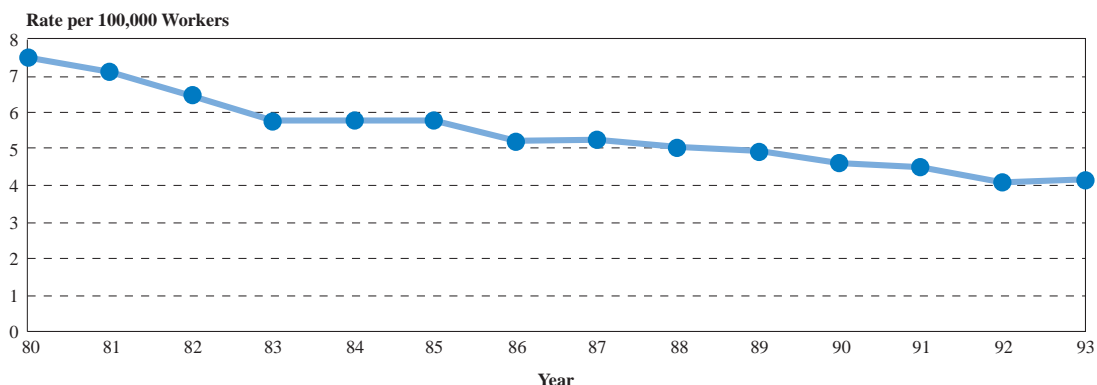
A second surveillance system, the National Traumatic Occupational Fatalities (NTOF) surveillance system, allows NIOSH to determine the causes and nature of workplace deaths occurring from traumatic injury. NTOF data analyzed in FY 1997 indicate that

FACE INVESTIGATIONS by STATE of OCCURRENCE 1997



during the 14-year period from 1980 to 1993, 82,696 workers died as a result of injuries sustained at work, a reduction, over this time period, of 45% in the annual rate of work-related deaths.

RATE of TRAUMATIC OCCUPATIONAL FATALITIES by YEAR, 1980-1993



NTOF data further indicate that for the most recent ten years of data, 1984-1993, the states with the greatest number (rather than rate) of fatal occupational injuries were California, Texas, Florida, Illinois, and Pennsylvania respectively. The states with the highest rates include: Alaska, Idaho, Montana, Mississippi, West Virginia, and Wyoming.

Workers Still at High Risk for Lead Exposures

Lead exposure has been recognized as an occupational problem since ancient times. Although there have been indications of a decreasing trend among adults since 1993, elevated blood lead levels (BLLs) continued to be a significant problem for workers in 1997. Elevated BLLs can cause anemia, nervous system, gastrointestinal, and reproductive disorders, and may also affect children and spouses if lead is carried home on clothing or other articles from the workplace. NIOSH directs the Adult Blood Lead Epidemiology and Surveillance (ABLES) Program as a means of identifying and preventing cases of elevated BLLs (those above 25 µg/dL).

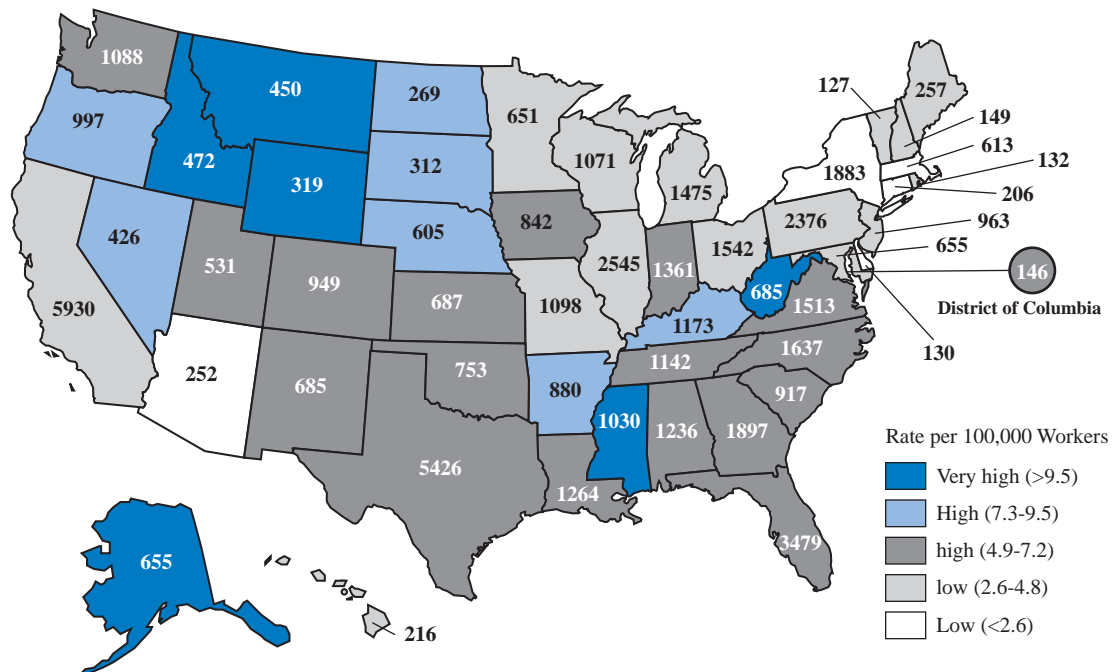
In FY 1997, ABLES programs were operating in 27 States and an additional 10 States not involved with the ABLES program either had adult lead surveillance capability or were in the process of developing that

capability. During 1996, 25 States reported 12,672 adults with blood lead levels equal to or greater than 25 µg/dL through this surveillance system. Of these individuals, 751 (5.9%) had BLLs above 50 µg/dL, the level at which OSHA requires medical removal from the workplace. Surveillance activities enable States to target intervention efforts to workplaces in need of control technology, education, or other intervention activities, including the prevention of take-home lead exposures to children and spouses.

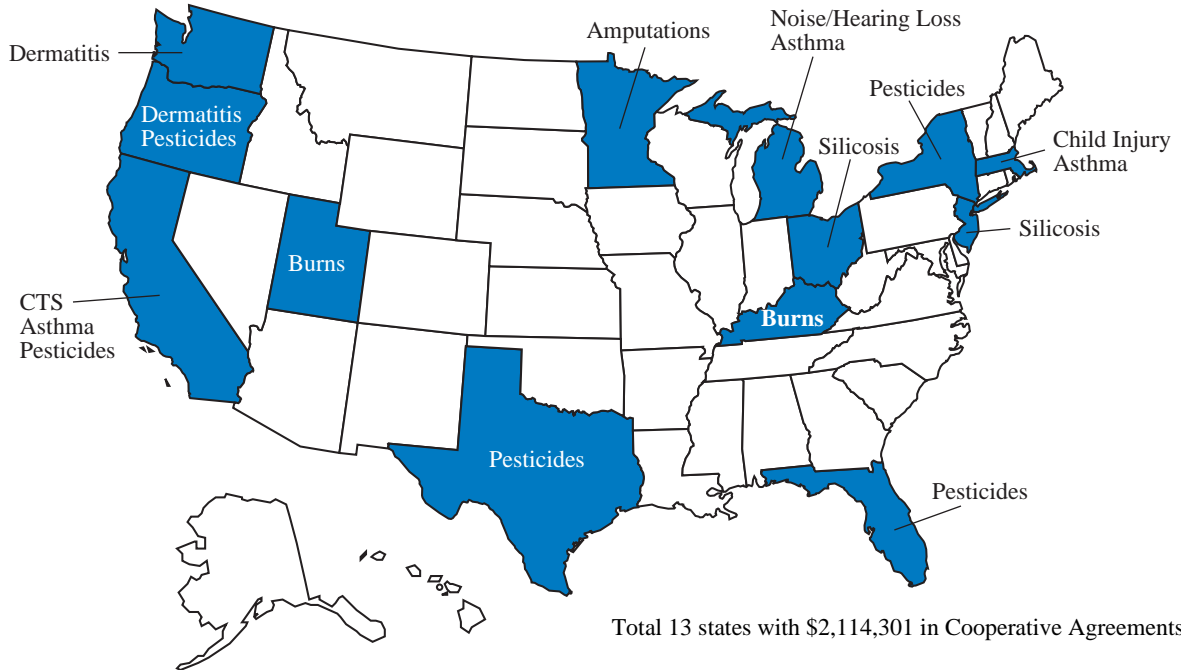
Monitoring States for Worker Health and Safety

NIOSH supports a network of surveillance systems (referred to as SENSOR--Sentinel Event Notification for Occupational Risks) that are operated by thirteen state agencies across the country. Through cooperative agreements with NIOSH, these state agencies conduct surveillance of targeted occupational safety and health conditions and provide follow-up investigations, technical assistance, or intervention demonstrations at work sites where problems are identified. During FY 1997, NIOSH awarded \$2.1 million to 13 States for surveillance of the following nine conditions: amputations, asthma, burns, carpal tunnel syndrome, dermatitis, injuries in children, noise-induced hearing loss, the health effects of pesticide exposure, and silicosis.

NUMBER and AVERAGE ANNUAL RATE of TRAUMATIC OCCUPATIONAL FATALITIES by STATE, 1984-1993



**SENSOR (SENTINEL EVENT NOTIFICATION for OCCUPATIONAL RISKS)
COOPERATIVE AGREEMENTS FY 97**



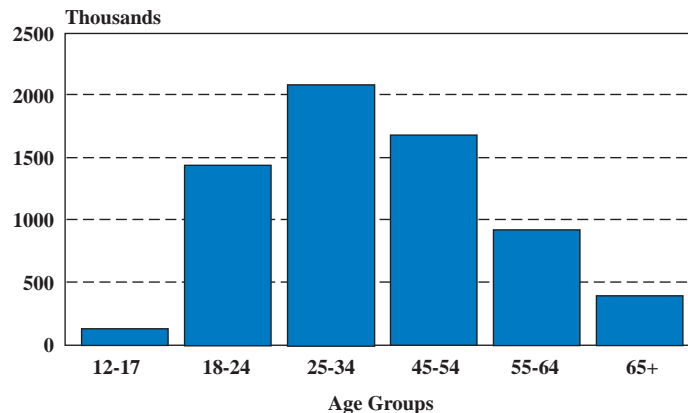
In FY 1997 SENSOR data on carbon monoxide (CO) poisonings resulted in the publication of a NIOSH CO Alert. The Alert, addressing CO poisonings from small gasoline-powered engines, was a collaborative effort of NIOSH, OSHA, USEPA, and the Consumer Product Safety Commission (CPSC).

Tracking Nonfatal Injuries in Hospital Emergency Rooms

Using the National Electronic Injury Surveillance System (NEISS), NIOSH collaborates with the Consumer Product Safety Commission to conduct national surveillance of nonfatal occupational injuries.

This surveillance system provides national data for all nonfatal occupational injuries for workers treated in hospital emergency departments. NIOSH estimated that during the 2-year period, from October 1995 through September 1997, 6.7 million workers came to hospital emergency departments for medical care due to an occupational injury. According to a separate database, the National Hospital Ambulatory Medical Care Survey (NHAMCS) of 1996, it was estimated that 12% of all injury visits to hospital emergency departments were work-related. This is considered to be a conservative estimate, however, because the occupational status of more than one-quarter of the cases was unknown.

**NONFATAL
OCCUPATIONAL INJURIES**
Treated in U.S. Hospital Emergency Departments
6.7 Million Injuries: October 1995 - September 1997



STRATEGIC GOAL 3

Increase occupational disease and injury prevention activities through workplace evaluations, interventions, and recommendations.

NIOSH is in a unique position to improve the lives of American workers through prevention policy, research, and the translation of scientific findings. There are four main avenues by which NIOSH engages in prevention activities--health hazard evaluations, intervention studies, control technology studies, and recommendations to external partners to promote healthy and safe workplaces.

HEALTH HAZARD EVALUATIONS

During FY 1997, NIOSH conducted 335 health hazard evaluations, at the request of employers, employees, and federal, state, and local agencies, to examine potential hazards in the workplace. To fully investigate these situations, NIOSH assembles multi-disciplinary teams that include physicians, industrial hygienists, engineers, and other safety and health professionals to conduct the evaluations. Once the evaluations are complete, the findings and recommendations, which are non-regulatory, are provided to management, labor, and other interested parties. These on-site visits encompass every conceivable industry--from school rooms to auto factories, and from hospitals to chemical manufacturers.

Topics investigated by the health hazard evaluation program in FY 1997 included studies of exposures to a suspected human carcinogen among automotive workers in Marion, Indiana; lead exposures among workers at a lead-acid battery manufacturing plant in San Antonio, Texas; reports of headaches, discomfort, and irritability among operating room personnel wearing surgical isolation suits at a Cincinnati, Ohio orthopaedic center; and occurrences of respiratory distress among employees at a cement company in Union Bridge, Maryland.

CONTROL TECHNOLOGIES

Reengineering Ink Formulas and Improving Air Flow for Printers at Risk

At a vinyl printing shop in Cincinnati, Ohio, NIOSH scientists used innovative techniques to reduce solvent exposures. At the shop, which specializes in printing shower curtains, the existing controls were both expensive and ineffective at protecting workers from breathing in solvents. The first control suggested by NIOSH was a system for enclosing the silk screen process, thus containing the solvent vapors without interfering with completion of the task. The second control put in place was a new set of inks developed by NIOSH. When using the reformulated ink with increased ventilation rates, workplace concentrations dropped to approximately 10% of those normally experienced. The techniques employed by NIOSH eliminated the use of hazardous chemicals, reduced employee exposures by 90%, and reduced exhaust of hazardous chemicals to the surrounding community.

Developing Engineering Controls to Reduce Occupational Exposure to Asphalt Fumes

NIOSH worked with equipment manufacturers to develop, test, and deploy engineering controls for highway-class asphalt paving equipment. The engineering controls are designed to reduce occupational exposure to asphalt fumes during the paving process. This collaboration resulted in the signing of a voluntary agreement between OSHA and the paving equipment manufacturers to incorporate engineering controls on all highway-class paving equipment manufactured after July 1, 1997.

Partnering of Manufacturers to Make Washing Machines Ergonomically Friendly

NIOSH researchers collaborated with process engineers at an appliance manufacturing facility in Webster City, Iowa to design a new washing machine manufacturing line that falls within ergonomic guidelines. The purpose is to reduce/eliminate musculoskeletal injuries occurring to workers during the manufacturing process. The engineering control findings will be transmitted to the rest of the industry through the Association of Home Appliance Manufacturers and two industry trade journals, enabling plant engineers to implement the controls in other facilities. A parallel effort at this facility involved a longitudinal musculoskeletal epidemiology study to examine associations between workplace ergonomic and psychosocial stressors and disorders of the musculoskeletal system.

RECOMMENDATIONS

NIOSH Alert: Preventing Allergic Reactions to Natural Rubber Latex in the Workplace

The health care industry employs 7.7 million workers. The prevalence of latex allergy among this group has been estimated to be between 8 and 12%. The NIOSH Latex Alert highlighted the potential for serious allergic reactions to latex and provided recommendations for minimizing latex-related health problems. In FY 1997, NIOSH distributed more than 100,000 copies of this document to hospitals, health care clinics, nursing homes, and dental offices. Informed employers and workers will be taking steps to prevent unnecessary exposure to natural rubber latex products.

NIOSH Technical Document: Engineering Control Guidelines for Hot Mix Asphalt Pavers

The production of this document was the result of an ongoing partnership between NIOSH and other federal agencies, various paver manufacturers, and national asphalt groups. The asphalt document presents guidelines for implementing engineering controls that reduce highway asphalt fumes at the source. Using these guidelines, OSHA signed a Voluntary Agreement with the paving equipment manufacturers to incorporate engineering controls on all highway-class paving

equipment manufactured after July 1, 1997. More than 14,000 copies of this document were disseminated in FY 1997. Approximately 300,000 U.S. workers are potentially exposed to asphalt fumes during highway, road, street, and sidewalk construction. Use of recommendations in this document will make the workplace safer for these workers.

Pocket Guide to Chemical Hazards

In June of 1997, NIOSH published a new edition of the NIOSH Pocket Guide to Chemical Hazards, one of the most popular documents published by the Government Printing Office (GPO). The NIOSH Pocket Guide is widely used by industry, labor and government as a favorite source of reliable information on chemical hazards and appropriate safeguards. The initial distribution plan calls for NIOSH to distribute 41,000 copies, and the National Technical Information Service (NTIS) and GPO, combined, to distribute 100,000. NIOSH copies are already in short supply.

NIOSH Technical Document: Control of Health and Safety Hazards in Commercial Drycleaners

This essential reference on safety and health in the drycleaning industry represents the efforts of NIOSH researchers in collaboration with industry, labor, and other government organizations. The document presents research findings and hazard control measures to regulatory agencies and owners of drycleaning shops. The document helps provide a safe and healthful working environment for workers in the drycleaning industry by describing the most effective control technologies and procedures for reducing occupational exposures to perchloroethylene (PERC) and for controlling exposures to spotting chemicals, to fire, and to ergonomic hazards.

STRATEGIC GOAL 4

Provide workers, employers, the public, and the occupational safety and health community with information, training, and capacity to prevent occupational diseases and injuries.

INFORMATION

Health Communication Offices

Occupational safety and health information translation and dissemination occurs primarily through the Office of Health Communication, located in Washington, DC, and the Education and Information Division in Cincinnati, Ohio. A third branch, focusing on health communication research, is part of the Health Effects Laboratory Division in Morgantown, West Virginia, which opened in October 1996. Health communication activities at NIOSH ensure optimal translation of science and dissemination to prevention partners.

Publications

During FY 1997, NIOSH was involved in numerous activities relating to the dissemination of occupational safety and health information. These activities included the publication of four technical documents, 11 Hazard Controls, one Hazard Identification document, and three Alerts. In addition to these NIOSH documents, NIOSH scientists published nearly 300 journal articles and 125 book chapters and proceedings in the scientific literature. For a complete listing of NIOSH publications, please refer to the NIOSH home page (<http://www.cdc.gov/niosh>).

CDC Morbidity and Mortality Weekly Reports (MMWR)

CDC publishes new and emerging public health findings weekly in the MMWR which is distributed to the general public health community, particularly those in state and local health departments. During FY 1997, NIOSH published the following in MMWR: 13 articles on topics including lung diseases and agriculture-related injuries; four quarterly reports of adult blood lead levels; a reprint of an article on occupational liver cancer; a

surveillance summary on silicosis; and an announcement of available surveillance information from the NIOSH *Report on Work-Related Lung Diseases*.

Heavy Demand for Documents Addressing Musculoskeletal Disorders

NIOSH developed two documents in FY 1997 to further the science and understanding of the relationship between work and musculoskeletal disorders.

Musculoskeletal Disorders and the Workplace: A Critical Review of Epidemiological Evidence for Work-Related Musculoskeletal Disorders of the Neck, Upper Extremity, and Low Back establishes the scientific basis for the association between known risk factors in the workplace and musculoskeletal disorders. The second document, *Elements of Ergonomic Programs: A Primer Based on Workplace Evaluations of Musculoskeletal Disorders* gives practical solutions for controlling musculoskeletal disorders in the workplace. Approximately 20,000 copies of this document were requested by occupational safety and health professionals and the labor and business communities.

Worker-Friendly NIOSH Educational Documents

NIOSH scientists and health communication specialists collaborated to produce several non-technical, easy-to-read pamphlets for distribution to workers. The educational document, *Plain Language About Shiftwork*, was developed to provide general information on safety and health problems associated with shiftwork and demanding work schedules. Written in plain language, the document defines shiftwork and describes occupations that use shift schedules. A second document, *Alternative Keyboards*, assists people interested in purchasing keyboards of differing design. It provides information about common alternative keyboard designs and their effect on work posture. Finally, *Reduce Contamination at Home*, is a document

designed to address the potential problem of workers unknowingly carrying hazardous substances into the home from work on their clothes, bodies, tools, and other items.

Increased Use of NIOSH 800-Number Service

The NIOSH toll-free 800-number is a service that provides technical assistance to workers, employers, and safety and health professionals. No comparable service exists in the U.S. The 800-number served more than 97,000 callers during FY 1997 (approximately 266 calls per day), a 16% increase over FY 1996. In addition, more than 21,000 fax documents were transmitted to callers by the automated fax-on-demand function of the 800-number, a 50% increase over FY 1996. The states with the greatest number of calls included: California, Ohio, New York, Pennsylvania, Texas, Illinois, and Florida respectively. These states accounted for more than 40% of all calls. The most frequently requested information was related to: chemicals and solvents, ergonomics, respirators and respiratory effects, sampling and analytical methods, and NIOSH databases.

Call: 1-800-35-NIOSH (64674)

NIOSH 800-Number Saves Lives

In January 1997, a safety manager at a liquid bulk storage terminal in South Carolina called the NIOSH 800-number to confirm that organic vapor respirators were adequate to protect his workers from exposures to hydrogen sulfide. A NIOSH expert warned the safety manager that these types of respirators were not sufficient and that exposures could be lethal. Checking with the safety manager the following day, NIOSH staff found that in place of workers, a remote-operated video was used to complete the task. Had NIOSH not been consulted, workers might have died.

NIOSH Home Page

The NIOSH Home Page provides public access to NIOSH research and documents and provides links to other occupational safety and health home pages. The Home Page contains the full text of NIOSH Alerts, criteria documents, current intelligence bulletins, hazard controls, updates, and other NIOSH publications. Also included is information regarding the National Occupational Research Agenda, upcoming NIOSH meetings and events, NIOSH grants activities, training opportunities, the NIOSH state profiles, and the NIOSH

Strategic Plan. Presently, more than 7,000 pages of information are available on the NIOSH Home Page (<http://www.cdc.gov/niosh>).

NIOSH Documents Available on CD-ROM

NIOSH generated three major CD-ROM products during FY 1997. The *NIOSH Criteria Documents Plus CD-ROM* contains the full text of all NIOSH criteria documents, Alerts, and current intelligence bulletins in a searchable format. The second CD-ROM product, *Health Hazard Evaluation (HHE) CD-ROM*, contains the full text of 505 HHE formal final reports completed between 1990-1996. The third CD-ROM product, the *1997 Edition of the National Ag Safety Disc (NASD)*, contains a collection of more than 2,300 agricultural health and safety publications, video abstracts, slides, safety training modules, posters, and regulatory information from state, federal, and national organizations.

TRAINING

Training Activities

The Occupational Safety and Health Act requires NIOSH to assure that an adequate supply of qualified personnel are available to carry out the mandates of the Act. Since 1971, NIOSH training programs have provided support for the majority of occupational safety and health professionals trained in the U.S. Much of the training that NIOSH provides takes place in universities throughout the country and is administered via 15 Education and Research Centers and 40 Training Project Grants. This program, modest compared to other health professional training programs, is invaluable because it enables universities to provide occupational safety and health training to health professionals.

Education and Research Centers (ERCs)

Currently NIOSH provides partial funding for university programs at 15 ERCs in 14 states with a total budget of \$9.2 million. These centers provide training and other resources for professionals in industry, labor, government, and academia. The number of graduate students enrolled in ERCs during the 1995-96 school year (the latest year for which data are available) was 1,099 and the number of academic graduates was 376 for the same school year. In FY 1997, NIOSH added a new

Center at the College of Public Health, University of South Florida at Tampa, to serve the Southeast region of the country. Like other ERCs it will also provide research training and continuing education. In addition to outreach in their regions, the ERCs trained 37,000 students in continuing education programs. The Office of the Inspector General reviewed the NIOSH ERC program and found that 82% of the individuals trained went on to pursue careers in occupational safety and health.

Training Project Grants (TPGs)

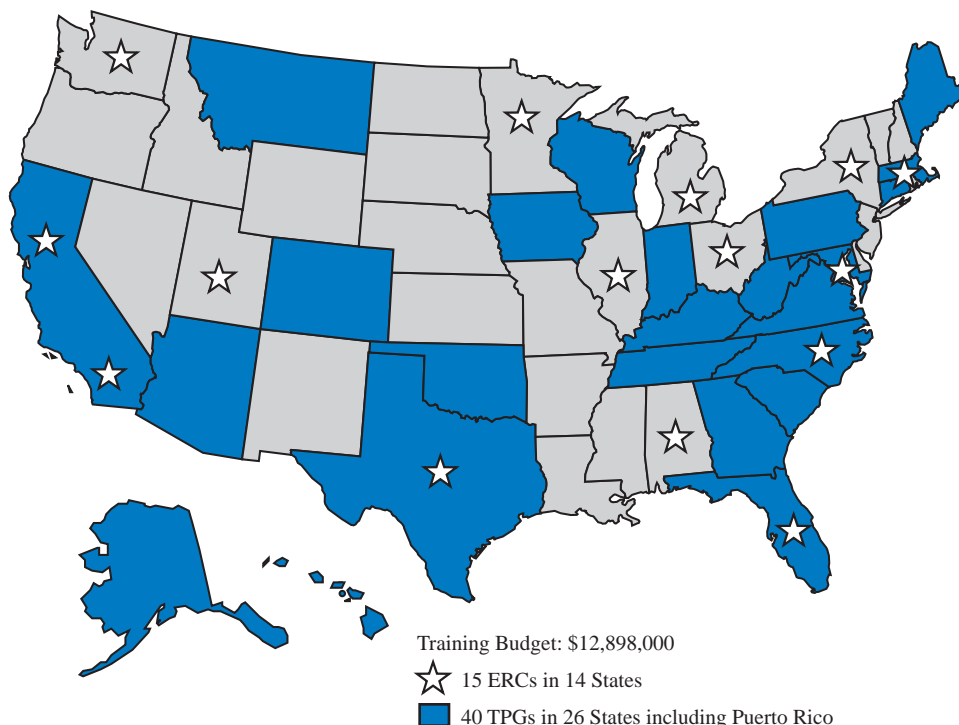
NIOSH training project grants (TPGs) are grants awarded to universities in 26 states to fund projects and project activities in the area of occupational safety and health. In FY 1997, NIOSH spent \$2.8 million on 38 single-discipline TPGs that provide training in occupational medicine and nursing, safety engineering, industrial hygiene, marine safety, construction safety, physician assistance, health promotion, and ergonomics, and two lead based paint abatement projects. In the academic year 1995-96, NIOSH-supported programs graduated 360 occupational safety and health professionals and provided training for 1,512 students.

Vocational Education Safety and Health Training Curricula

In FY 1997, NIOSH hosted two meetings of national vocational educators and occupational safety and health professionals to solicit input for NIOSH's vocational education safety and health initiative. This initiative is a large-scale effort to incorporate occupational safety and health information into the nation's vocational education system. As part of the initiative, training modules pertinent to occupational safety and health practices for vocational education are being developed. These modules are being completed through agreements with universities and vocational educational associations.

NIOSH sponsored two \$1,000 awards for high schools participating in an Occupational Safety and Health Skills Competition at the 1997 Annual Skill U.S.A. Championships of the Vocational Industrial Clubs of America. The awards were presented to the top two schools submitting projects in the area of occupational safety and health.

TRAINING PROJECT GRANTS *and* EDUCATIONAL RESOURCE CENTERS FY97



CAPACITY BUILDING

Helping Flood Victims

The flooding of the Ohio River in March 1997 caused extensive damage and loss in Ohio and northern Kentucky. Researchers from NIOSH were dispatched to Lexington, Kentucky, to work with Kentucky State health officials and ensure the safety of workers involved with the rescue, clean-up, and reconstruction operations. As part of this effort, NIOSH staff worked closely with state health departments and the regional Federal Emergency Management Agency (FEMA). In addition, approximately 20,000 copies of the NIOSH Flood Update were distributed to sheriff's offices, fire departments, health departments, and local and county government offices in areas affected by the flooding. By creating a front page spotlight item (icon above) for the hazards associated with flood clean-up work, the NIOSH Home Page significantly increased its national visibility. The NIOSH Home Page became a hotlink to several other emergency information websites, including FEMA, the American Red Cross, and OSHA.

Preventing Take-Home-Toxins

The Health Effects Laboratory Division led a creative health information outreach project at a machining plant in Alabama designed to protect employees and their families from exposure to beryllium

dust. Workers can unknowingly transfer occupational toxins to their homes and family members if practical safeguards are not followed. Using customized presentations and materials designed in a user-friendly format, the importance of safeguards in preventing the unintentional contamination of workers' cars and homes with beryllium dust was emphasized.

Occupational Safety and Health in Mining Communities

Both the Pittsburgh Research Laboratory (PRL) and the Spokane Research Laboratory (SRL) participated in educational and community functions to teach members of the community about mine safety and health issues in FY 1997. The Silver Kid Mine at SRL is a mock-up demonstration mine used to educate children about the importance of mining, the dangers associated with mining and milling processes and the dangers associated with entering abandoned mines. While touring the Silver Kid, children are given the opportunity to wear and handle mine safety equipment, such as safety glasses, hard hats, self-rescuers, mine lamps, and steel-toed boots. Each year the PRL holds an open house for individuals interested in mine safety and health. Typically, 1000 to 2000 people attend. Additionally, the experimental mines at PRL are popular sites for school field trips.

CONCLUSION

The National Institute for Occupational Safety and Health (NIOSH) continues to be committed to reducing work-related disease, injury, and death. In FY 1997, the Institute's research programs resulted in significant research findings, development of new technology, and the issuance of recommendations to increase the prevention of occupational disease and injury. Through the National Occupational Research Agenda (NORA), NIOSH continues to foster partnerships with the occupational safety and health broader research community, public and private. The partnerships augment resources available for funding research in relevant NORA priority areas.

Detailed information about all of NIOSH's research programs and projects is available through the Institute's toll free number: 1-800-35NIOSH (1-800-356-4674) or by visiting the NIOSH web site at <http://www.cdc.gov/niosh>.

Contact NIOSH at:
1-800-35-NIOSH (1-800-356-4674)

or visit the NIOSH Homepage at:
<http://www.cdc.gov/niosh>



Delivering on the Nation's promise:

*Safety and Health at work
for all people through research
and prevention*