REPORT ON
OCCUPATIONAL SAFETY AND HEALTH
FOR FISCAL YEAR 1995

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16. Abstract (Limit: 200 words) The work accomplished by NIOSH in the year 1995 in efforts to promote occupational safety and health was summarized in this report. These included the publication of the criteria for a new recommended standard to protect workers against black lung disease; increased emphasis in four critical occupational safety and health research areas of surveillance, intervention, health services, and work organization; work with industry, labor and the public to revise outdated national standards for respirators used to protect workers from hazardous environments; added a seventh Agricultural Safety and Health Research Center to a national network of centers to reduce illnesses and injuries among farm workers; funded a Connecticut program that reduced overall blood lead (7439921) levels among road construction workers by 50%; published a study which indicated that gold miners had an increased risk of silicosis; collaborated with industry and labor to reduce exposures to asphalt and metalworking fluids, and reduce hearing loss, job stress, and back injuries in the workplace; and funded 14 educational resource centers at universities in 13 states.

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EXECUTIVE SUMMARY

Over the next ten years, the United States workforce is expected to grow from 125 million people to 145 million, become older, more racially diverse, and include a higher percentage (48 percent) of women. In fiscal year (FY)1995, to address the needs of this changing workforce, the National Institute for Occupational Safety and Health (NIOSH), a research institution of the Centers for Disease Control and Prevention (CDC), Department of Health and Human Services, began development of the National Occupational Research Agenda (NORA) to guide the Nation's research investments over the next decade. This national strategy was completed in FY 1996 and will be reported in the next annual report to Congress.

In general, workers in 1995 could expect a safer and more healthful working experience than their predecessors did. Rates for fatal injuries dropped from 9.4 per 100,000 workers in 1975 to 5.0 in 1994. The number of coal workers who died from pneumoconiosis (black lung disease) decreased by 1,000 between 1979 and 1992. Advances in public health research have improved worker protection against lung disease from cotton dust, cancer from vinyl chloride, and reproductive disorders from glycol ethers.

However, other problems persist. The rate for nonfatal injuries has risen slightly since 1987, from 7.7 to 8.4 cases per 100 workers in 1994. Workers continue to be at risk for noise-induced hearing loss and little progress has been made since the mid-1980s. Reducing exposures to lead and silica--two long-recognized occupational hazards--remains a significant challenge.

At the same time, new hazards continue to emerge. The public has become aware of the threat of violence in the workplace. Deaths from homicide are now the second leading cause of fatal injury on the job. Another widely-reported problem is repetitive strain injuries, which have tripled since the mid-1980s.

These occupational illnesses and injuries place an enormous burden on workers, their families, and the economy. The National Safety Council estimated that work injuries cost $121 billion in medical costs and lost wages in 1994. Another recent study estimated total costs of work injuries and illnesses in 1992 to be $174 billion (3% of the GDP).

NIOSH has contributed research findings and recommendations for some of the nation's most effective and health standards. NIOSH's recommendations are widely used by industries to voluntarily achieve safe and healthy workplaces. NIOSH continues to reduce work-related injuries and illnesses by conducting research, publishing recommendations, and training professionals in occupational safety and health. During FY 1995, NIOSH accomplished the following:

- Published criteria for a new recommended standard to protect workers against black lung disease. The Criteria Document, "Occupational Exposure to Respirable Coal Mine

disease. The Criteria Document, "Occupational Exposure to Respirable Coal Mine Dust," recommends lowering the standard for exposure to respirable coal mine dust to 1 mg/m^3 because research studies concluded that lung diseases were occurring among miners exposed at the current Mine Safety and Health Administration (MSHA) standard of 2 mg/m^3, and because it is technologically feasible to achieve this reduced exposure level.

- Increased emphasis in four critical occupational safety and health research areas: surveillance, intervention, health services, and work organization. After publishing a request for applications on these topics, NIOSH funded research grants, that included $1.65 million to develop models for hazard and medical surveillance among workers in energy-related industries; $1.8 million to study information on costs, outcomes, accessibility, and other factors associated with health services; and $.5 million to study interventions for preventing youth injuries.

- Worked with industry, labor, and the public to revise outdated national standards for respirators used to protect millions of workers from hazardous environments. The new standards increased competition among manufacturers and resulted in less expensive and more effective respirators. In the health care industry, the cost of respirators used to protect workers from TB dropped from $10 to as little as 60 cents. Based on an assessment of costs at acute care facilities, NIOSH estimated that the Department of Veterans Affairs would save $16 million annually and the health care industry will save hundreds of millions each year.

- Added a seventh Agricultural Safety and Health Research Center to a national network of centers to reduce illnesses and injuries among farm workers. The new center in Texas will conduct research and training programs to prevent farm injuries among children, TB in migrant farm workers, and illnesses and injuries in the logging, nursery growing, cotton farming, and cattle raising industries.

- Funded a Connecticut program that reduced overall blood lead levels among road construction workers by 50 percent and lowered the State's workers' compensation costs. Efforts are underway to implement these prevention strategies in other States.

- Published a study which found that gold miners, with a lifetime exposure to silica at levels permitted by the Occupational Safety and Health Administration (OSHA), had an increased risk of silicosis. A mortality study among these miners revealed a two-fold excess of autoimmune diseases such as arthritis.

- Collaborated with industry and labor to reduce exposures to asphalt and metalworking fluids, and reduce hearing loss, job stress, and back injuries in the workplace. Research in these areas will enable NIOSH to develop effective and practical recommendations to protect workers.

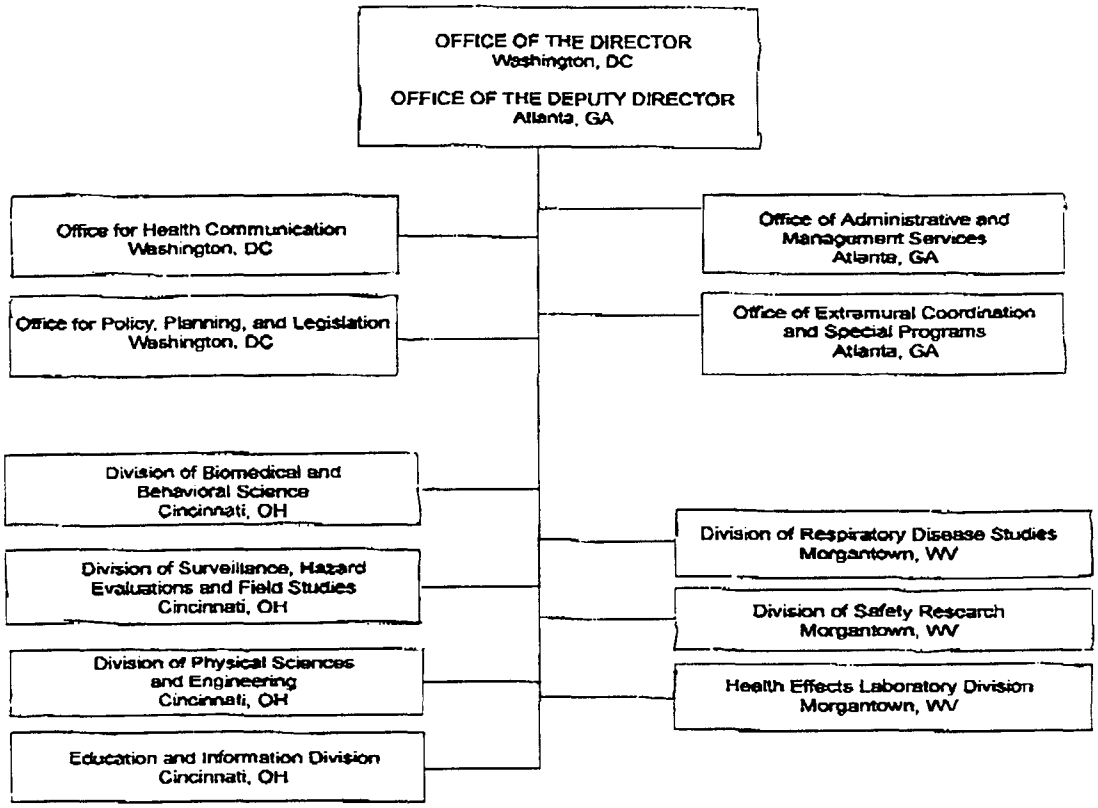
- Funded 14 educational resource centers at universities in 13 States. The programs provide multidisciplinary graduate and continuing education programs in occupational medicine, occupational health nursing, industrial hygiene, safety engineering, and research. In addition, 39 single discipline project training grants received NIOSH support.

INTRODUCTION

The workplace environment profoundly affects workers' health. Each day 137 individuals die from work-related diseases and 16 workers die from injuries on the job. Every five seconds a worker is injured. Every 10 seconds a worker is temporarily or permanently disabled. In 1994, occupational injuries cost $121 billion in lost wages, productivity, and health care costs. The same year, employers reported 6.3 million work injuries and 515,000 cases of occupational illness.

Congress enacted the Occupational Safety and Health Act "to assure so far as possible every working man and woman in the Nation safe and healthful working conditions and to preserve our human resources." This Act established NIOSH to conduct health research and make recommendations for preventing occupational illness and injury. It also requires the Occupational Safety and Health Administration (OSHA) to promulgate regulations and enforce health and safety standards in the workplace. Whereas NIOSH is located organizationally within the Centers for Disease Control and Prevention (CDC), Department of Health and Human Services (HHS), OSHA is part of the Department of Labor. In FY 1995, NIOSH's budget was $132 million and NIOSH staff numbered 958.

NIOSH Organizational Chart FY 95



MAJOR ACCOMPLISHMENTS IN FISCAL YEAR 1995

Identifying Problems in the Workplace

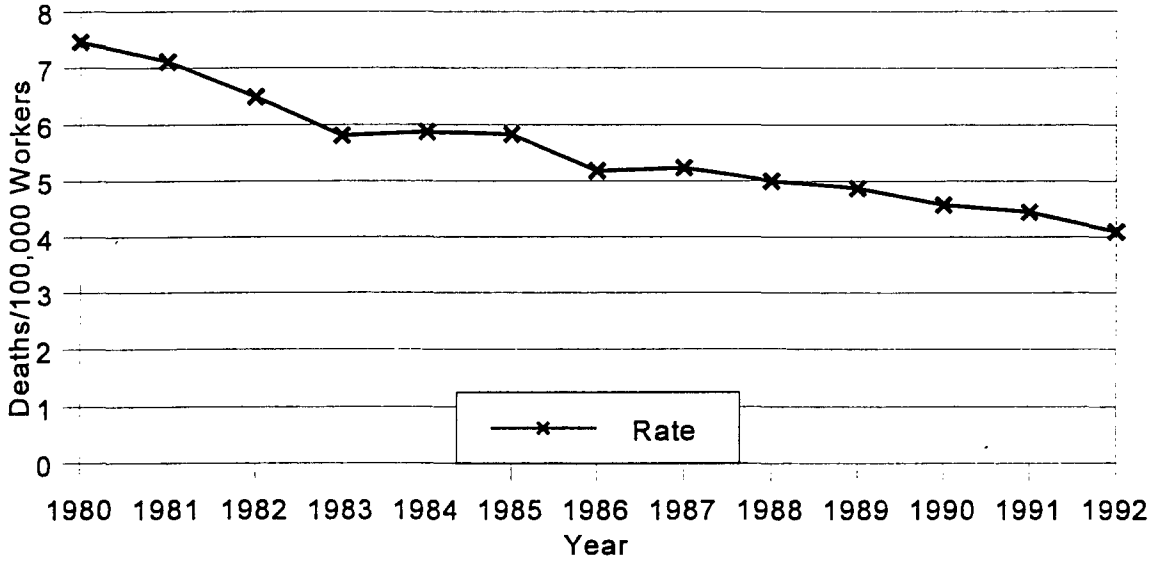
Fatal Work Injuries NIOSH investigates work-related fatalities to understand factors that contribute to or cause deaths. For example, NIOSH investigates deaths from falls, electrocutions, deaths in confined spaces, and machine-related deaths. Recommendations developed from these evaluations are published nationally and internationally to inform employers, workers, safety and health professionals, and other government agencies of ways to prevent deaths in similar circumstances. In FY 1995, NIOSH investigators conducted 20 work-related fatality investigations in six States. In addition, NIOSH funded 136 extramural workplace fatality investigations in 14 States. Findings from these investigations were published to prevent deaths in crane operations, logging, and firefighting.

The National Traumatic Occupational Fatalities (NTOF) surveillance system was developed by NIOSH to fill information gaps regarding work-related injuries. The NTOF surveillance system is based on death certificate information. NTOF data have shown that the number and rate of fatal occupational injuries have been decreasing since the 1980s. The rates decreased in nearly every demographic and employment sector, with greater declines among men, African Americans, and younger workers.

NIOSH uses NTOF data to guide research and to prioritize national prevention activities. By identifying the leading cause of work-related injury deaths, scientists know where to target efforts to save lives. This year, NIOSH began efforts to address the high rate of work-related motor vehicle crashes.

National Traumatic Occupational Fatalities, 1980-1992

Death Rates by Year for Civilian Workers

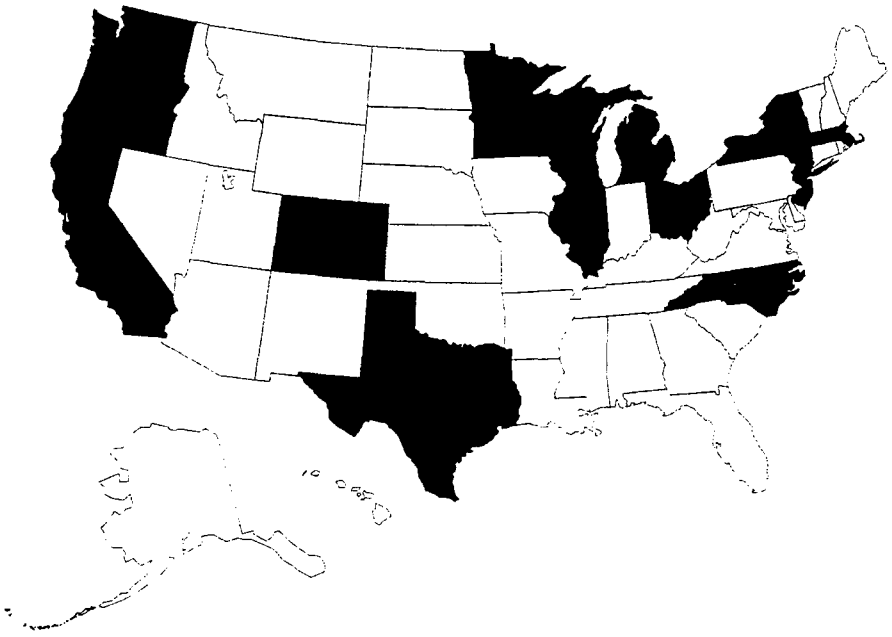


Non-Fatal Injuries NIOSH studies non-fatal injuries--those resulting in medical treatment, lost time from work, or restricted work activity--through a cooperative agreement with the Consumer Product Safety Commission. In 1993 there were 7.9 work-related injuries per 100 full-time workers. The rate of non-fatal injuries appears to have risen slightly since 1985. By studying non-fatal injuries, NIOSH has found that more than 64,000 youths per year receive treatment in emergency rooms for work-related injuries. NIOSH provided this information to the Department of Labor, which is evaluating child labor laws. NIOSH found that during a one-month period, 30,000 construction workers had on-the-job injuries. NIOSH is studying the risk factors for falls and eye injuries, since these injuries were responsible for the construction-related injuries. Work-related injuries to farmers were tracked by NIOSH and the U.S. Department of Agriculture. About 200,000 injuries occurred on farms in 1993, with an injury rate of 6.5 per 100 full-time farmworkers. Tractor rollovers are an important source of farm injuries; in fact, they are the leading cause of fatal injury among agricultural workers. NIOSH used surveillance data to identify the most common makes and models of farm tractors that lack rollover protection devices.

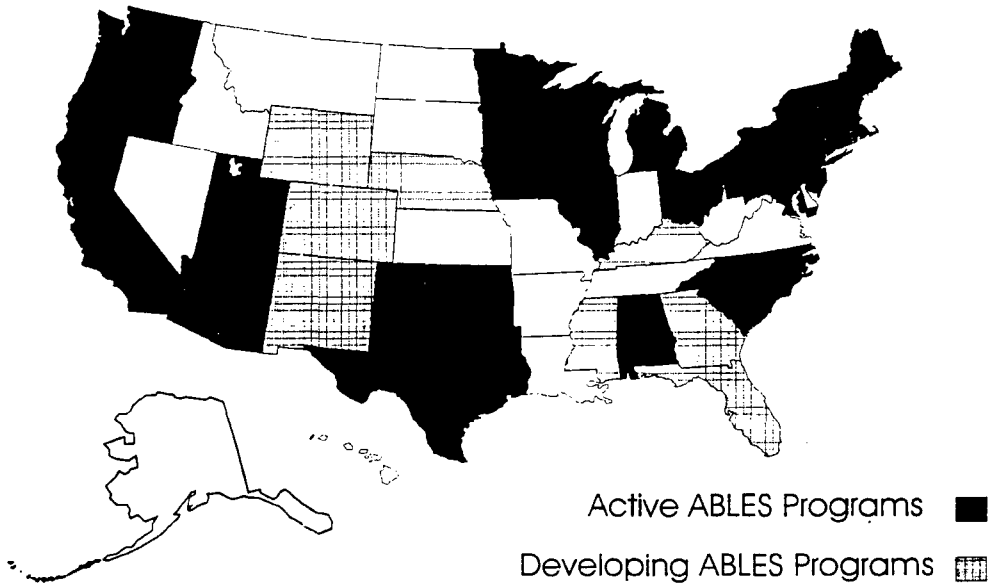
State-Based Surveillance of Work-Related Injuries and Illnesses NIOSH supports surveillance activities in 14 States addressing 12 occupational conditions, diseases, and injuries including the following: amputations, asthma, burns, cadmium overexposure, carbon monoxide poisoning, carpal tunnel syndrome, dermatitis, injuries in children, noise-induced hearing loss, pesticide health effects, silicosis, and tuberculosis. State health department staff conduct in-depth investigations of injuries and illness problems. Health department staff identified farm augers as a significant source of amputation injury, and published information to notify users of how to prevent harm. This year progress was made to identify and address problems related to carbon monoxide poisoning from gasoline powered engines (concrete cutters and power washers).

Surveillance of Lead Exposures Lead exposure has been recognized as an occupational problem since ancient times. Today it continues to be a significant problem for workers. NIOSH operates a surveillance program in 25 States to identify cases of elevated blood lead levels (above 25 ug/dL), which can cause anemia, nervous system, gastrointestinal, and reproductive disorders. During FY 1995, nearly 17,000 adults with blood lead levels equal to or greater 25 μg/dL were reported. More than five percent had blood lead levels above 50 μg/dL, the level at which OSHA requires medical removal until the worker's blood lead level is reduced. Based on State data, NIOSH estimates that nationally, more than 26,000 adults have blood lead levels equal to or greater than the 25 μg/dL. Surveillance activities enable States to target outreach efforts to workplaces in need of control technology and educational interventions.

SENSOR (Sentinel Event Notification for Occupational Risks)
Cooperative Agreements FY 95



States Participating in Adult Blood Lead Epidemiology and Surveillance (ABLES) Program, FY 95



Identifying Populations at Risk NIOSH published its findings from analyses of the National Health Interview Survey, Occupational Health Supplement. These findings provide useful information for policy makers and planners to target strategies to prevent occupational carpal tunnel syndrome and back pain. Auto mechanics, heavy machinery mechanics, miners, equipment operators and construction workers have the highest prevalence of back pain from repeated activities. Mail service, health care, and construction are occupations with the highest prevalence of carpal tunnel syndrome.

Worksite Safety and Health Research

NIOSH conducts research among workers to understand the causes and factors associated with illnesses and injuries. Research is conducted in partnership with workers, employers, academia, and other government agencies. Because workers are exposed to higher hazardous levels of substances for longer periods of time, what is learned in occupational health research can be invaluable for understanding broader environmental health problems.

Studying Health Problems Among Granite Workers NIOSH studied more than 3,000 workers at 20 crushed stone operations. While researchers found deaths from pneumoconiosis and other non-malignant lung diseases had increased significantly among all groups, granite workers suffered the most.

Reducing Pesticide Exposures in Commercial Greenhouses Since 1991, NIOSH has worked with the management of a large commercial greenhouse to reduce worker exposure to pesticides. By adopting NIOSH's recommendation that workers wear gloves when handling pesticide-treated plants, a commercial greenhouse experienced a significant decrease in workers' compensation claims.

Reducing Exposures to Blood-Borne Pathogens Compliance with safe work practices is an important issue for the more than six million U.S. health care workers potentially exposed to blood-borne pathogens. NIOSH evaluated compliance with universal precautions at hospitals in Maryland, Texas, and Minnesota. Results showed that the combination of engineering controls, management commitment to safety, and employee involvement were most effective in achieving compliance. In addition, NIOSH designed a needlestick prevention strategy for a Maryland hospital. By adopting NIOSH's recommendations, needlestick injuries were reduced by 38 percent.

Allaying Infertility Concerns Among Soldiers The Department of the Army sought help from NIOSH to study reproductive effects associated with lead exposures for soldiers firing the 155 Howitzer and for its radio operators exposed to microwave radiation. NIOSH concluded that there were no male reproductive effects associated with lead exposure or microwave radiation for either group.

Reducing Fatigue Among Shift Workers More than 20 million workers experience excessive or chronic fatigue from stressful shift work schedules requiring night work, mandatory overtime, or 10-hour or 12-hour shifts. In cooperation with the Veterans Administration Medical Center in Dayton, Ohio, and the Finnish Institute of Occupational Health, NIOSH conducted a series of studies regarding this problem. NIOSH developed guidelines to reduce excessive fatigue from demanding or stressful work schedules.

Reducing Exposures in Household Battery Recycling Excessive exposure to mercury damages the nervous system and kidneys. NIOSH conducted a health hazard evaluation at a household battery recycling facility in Texas to assess mercury exposures. Household battery recycling is a new and emerging technology driven by societal demands to reduce the hazardous substances in landfills. Results of the investigation revealed that workers in certain buildings and jobs were overexposed to mercury. The NIOSH investigation prompted plant owners and managers to request guidance and assistance in implementing safety and health recommendations to reduce the hazard.

Controlling Exposure to Water Additive Used to Control Dust in Mines NIOSH conducted a hazard evaluation of a water additive commonly used to suppress dust in mines. NIOSH's assistance was requested after a worker developed reactive airway dysfunction syndrome (an asthma-like condition). NIOSH surveyed workers at the coal mine and found that the majority of coal miners reported adverse health effects including irritation of the skin, eyes, nose and throat, headaches, and various pulmonary symptoms. Based on this evaluation and the toxicity reports, NIOSH recommended that the mine operator temporarily suspend use of the additive. NIOSH plans to conduct an industry-wide study to evaluate the additive's health effects.

Reducing Silicosis in Surface Miners NIOSH and the Mine Safety and Health Administration (MSHA) coordinated a national "special emphasis program" on surface coal mine health. NIOSH research found a widespread silica hazard, more than what had been previously noted. NIOSH conducted numerous training seminars in Pennsylvania targeting surface miners, surface mine operators, state mine inspectors, and state health department personnel. NIOSH began discussions with MSHA and the Pennsylvania Department of Health to provide free chest x-ray screening and follow-up medical care to Pennsylvania surface miners through the State's chronic respiratory disease program. These activities are helping to improve the health of the surface mining community. Many operators have instituted controls, work practices have changed, silicosis awareness has increased, and surveillance/screening programs are being developed.

Laboratory Research

NIOSH conducts laboratory research to evaluate hazards under controlled conditions, develops technology and information for worksite research, and develops and evaluates protective measures. Much of what is known about the causes and mechanisms of work-related disease has

been learned through laboratory research. By examining the effects of toxins and hazards on cellular, biological, physical, and mental functions in the laboratory, researchers are able to design appropriate health studies and prevention measures.

Effects of Combined Exposure Noise and Chemicals on Hearing More than nine million workers are exposed to a combination of hazardous noise and chemicals in the printing, petrochemical, electrical, manufacturing, and agricultural industries. A NIOSH animal study confirmed earlier reports that exposure to toluene, a solvent, can cause hearing losses similar in severity to those caused by exposure to hazardous levels and types of noise. Recent worksite studies identified solvent exposure and hearing loss as an emerging occupational health problem. NIOSH is working to identify an animal model to understand the mechanism of this type of hearing loss.

Effects of Freshly Fractured Silica on Lung Tissue NIOSH designed an inhalation system that permitted laboratory exposures to both freshly fractured and aged silica dust. Test results showed that animals exposed to freshly milled silica showed more cell changes and inflammation than those exposed to aged dust. Exposure to freshly milled silica may account for the increased risk of silicosis in workers such as sand blasters, rock drillers, and silica flour millers.

New Technology

NIOSH conducts work site and laboratory research to develop procedures and equipment for controlling and measuring occupational safety and health hazards. NIOSH assists employers and small businesses in designing workplaces to reduce exposure to hazards. NIOSH develops, identifies, and evaluates effective engineering controls and work practices used in a variety of processes and industries. In addition, NIOSH laboratory researchers develop and improve methods to analyze airborne toxic substances found in the workplace.

Spot Test Kit to Measure Lead Levels More than a million U.S. workers are exposed to lead. NIOSH is evaluating a chemical spot test technique that instantly measures changes in lead levels in the workplace, so that the effectiveness of controls can easily be evaluated.

Method to Measure Airborne Diesel Dust Particulate Diesel exhaust is classified as a probable human carcinogen by the International Agency for Research on Cancer. An estimated 1.35 million workers in the U.S. are exposed to exhaust from diesel engines. Diesel exhaust is a chemically complex mixture containing thousands of compounds. Previous methods for monitoring exposures to particulate diesel exhaust lacked adequate sensitivity and selectivity. NIOSH developed an innovative thermal-optical technique to identify elemental carbon in diesel particulate matter. NIOSH will conduct epidemiological studies among workers exposed to diesel exhaust to define the relationship between exposure and cancer risk.

Methods to Conduct Indoor Air Quality Investigations The public is greatly concerned

about indoor air quality (IAQ). Over the past six years, roughly 40 percent of the requests to NIOSH for health hazard evaluations were to investigate possible IAQ problems. Measuring levels of potential hazards in indoor air is complicated by the difficulty of obtaining accurate measurements of extremely low levels of potential toxic substances. Adding to the complexity is the possible existence of hundreds of hazards in the indoor environment. NIOSH is developing methods that will enable investigators to identify exposures to two of the leading groups of indoor pollutants: volatile organic compounds, which can cause health effects such as kidney damage and cancer, and biological agents, including allergens and microbes.

Intervention and Control Technology Research

NIOSH conducts research to evaluate the effectiveness of existing approaches to reduce or eliminate hazards that cause injury or illness to workers. These prevention measures may involve a technological solution, such as finding a safe substitute for a more hazardous substance, or changing the workplace process or design. A special program was established to assist small businesses, which often lack in-house safety and health professionals.

Control of Air Contaminants During Autobody Repair Forty thousand workers employed in the autobody repair industry perform spray-painting. Excessive exposure to paint during autobody refinishing can cause asthma, other respiratory problems, and eye and skin irritation. NIOSH provided control technology information to the industry and published an article on this subject in the American Industrial Hygiene Association Journal. In addition, NIOSH is promoting these findings to employers through presentations at industry meetings and an article appearing in a trade journal serving the autobody repair industry.

Prevention and Control of TB Responding to a request from hospital management, NIOSH evaluated ventilation systems in TB isolation rooms. While the hospital was undergoing renovations, NIOSH recommended changes to the ventilation system. With NIOSH's assistance, the new isolation rooms meet or exceed CDC's TB guidelines. In addition, NIOSH is developing a technique to measure the amount of airborne TB to better assess the efficacy of ventilation controls in removing TB organisms from the air, or containing them in isolation rooms.

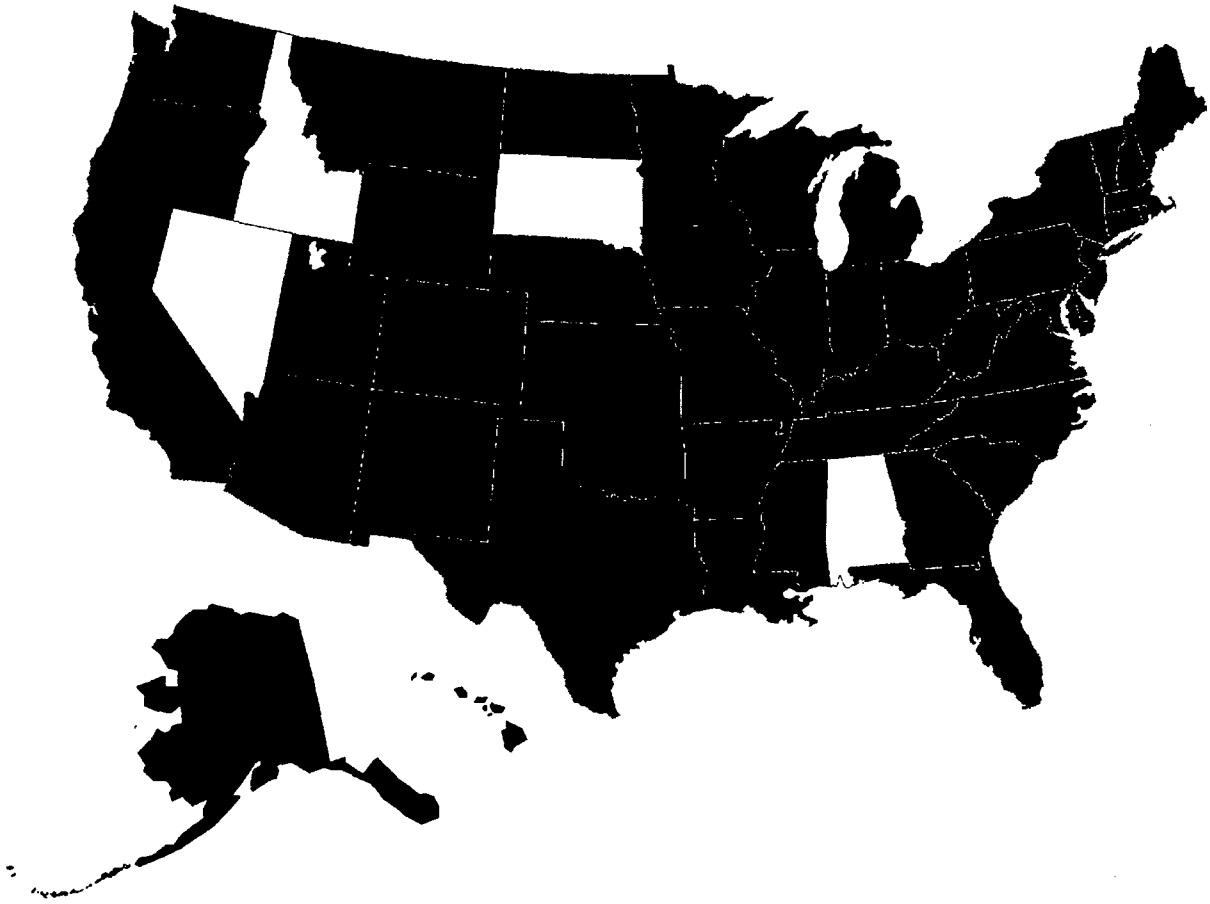
Prevention of Musculoskeletal Problems at the IRS The Internal Revenue Service (IRS) requested technical assistance from NIOSH to reduce musculoskeletal problems among its 40,000 data entry operators. NIOSH studies have demonstrated that short, hourly rest breaks significantly reduce musculoskeletal discomfort with no loss of productivity. The IRS has implemented the frequent break schedule at its Austin Service Center and may adopt frequent rest breaks at all its offices.

Extramural Research Grants and Cooperative Agreements

NIOSH sponsors innovative extramural research that complements its intramural research program. NIOSH makes grant awards that are judged to be scientifically sound, related to program priorities, and that will ultimately be of practical value in solving workplace problems.

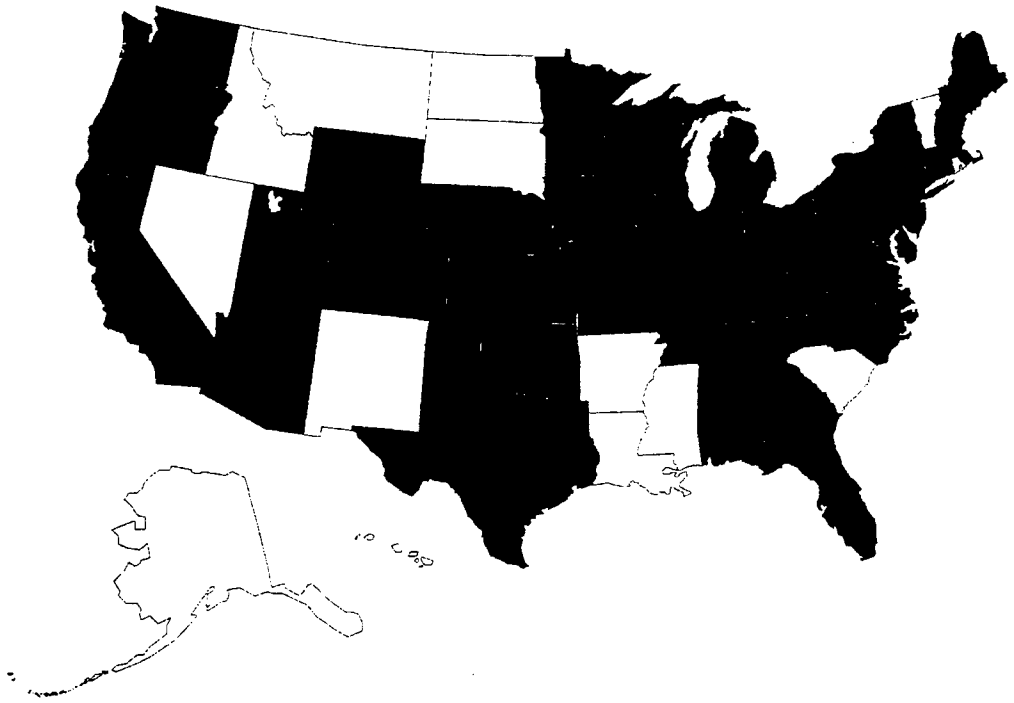
Research Grants In FY 1995, NIOSH supported an extramural grants program of approximately $13 million. With these funds, NIOSH supported 87 grants, which involved laboratory and field studies. NIOSH participates in the National Institutes of Health system for solicitation and review of investigator-initiated grants.

States Receiving NIOSH Funding in FY 95



Cooperative Agreements Cooperative agreements permit NIOSH to arrange collaborative surveillance and research opportunities with state health departments, universities, labor unions, and nonprofit organizations. In FY 1995, NIOSH awarded $28 million to 117 cooperative agreements in 32 States. These funds supported research efforts primarily in agriculture, construction, fatal and nonfatal occupational injury, and occupationally-related tuberculosis.

States with NIOSH Cooperative Agreements FY 95



Agriculture

More than 3.5 million full-time workers are employed in agriculture. If unpaid farm workers and family members 14 and older are included, nearly eight million people work in agriculture. Agriculture ranks among the most hazardous industries. 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 exposure. Farmers also experience chronic diseases such as cardiovascular disease, hypertension, hearing loss, and asthma. Every day, approximately 500 agricultural workers suffer disabling injuries, about half resulting in permanent impairment. 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. Each year nearly 300 children are killed in agriculture-related activities and approximately 23,000 children and adolescents are injured. To address these problems NIOSH funds research, training, and outreach programs in agricultural communities in 20 States.

Establishing a Nationwide Network of Agricultural Research and Training Centers NIOSH established the seventh agricultural research and training center in Tyler, Texas. The Centers provide a multi-disciplinary approach to agricultural safety and health through a network of regional centers throughout the United States. The Texas Center's top priority is to prevent fatal injuries among women and children, especially children under the age of ten. The Center plans to open a chapter of "Farm Safety '4' Just Kids," to teach safety around machinery and animals. In addition, the Center plans to work with other border States to prevent tuberculosis in migrant farm workers, develop safety programs for logging and large animal handling, and promote occupational safety and health as a productivity issue among trade associations.

National Agricultural Safety Information In June 1995, the National Agricultural Safety Disc (NASD) was released to provide information about agricultural health, safety, and injury prevention. Users can access more than 2,000 farm safety and health publications, OSHA and EPA standards, more than 500 NIOSH agricultural safety and health publications, and 1,000 training videos, slide presentations, posters, sample news releases, and public service announcements. NASD includes a directory of agricultural safety and health professionals around the country.

Safe Grain and Silage Handling Grain and silage handling machinery is responsible for many deaths and disfiguring injuries and amputations. From 1985-1989, the top four causes of grain and silage-handling deaths were suffocation, entanglement in augers, falls from machinery, bins, and buildings, and electrocutions from machinery contacting overhead power lines. NIOSH published a booklet recommending procedures to prevent injuries during each step of grain production, including harvesting, transporting, storing, conveying, and processing grain. The booklet also recommends safety measures to prevent rollovers and crashes with automobiles, two common causes of injury.

Pesticide Finding from the Farm Family Health and Hazard Survey NIOSH estimates that each year three to six million farmers are exposed to pesticides. Working with Ohio State University, NIOSH identified significant correlations between pesticide usage and certain nervous system problems such as memory loss. This is the first finding indicating an effect of pesticide use on neurological dysfunction among family farmers. NIOSH is analyzing these data further to find out whether the symptoms are associated with specific pesticides and to see whether the neurologic abnormalities increase risk for injuries and other conditions.

Construction

There are more than seven million construction workers in the U.S., of whom 1.5 million are self-employed. About 90 percent of the 636,000 construction companies employ fewer than 50 workers. One thousand construction workers are killed on the job every year--more than in any other industry. Construction injuries are responsible for 15 percent of all workers' compensation

costs. Few construction companies have formal health and safety programs. Construction workers are also at risk for exposure to hazards such as lead, asbestos, and silica. NIOSH and the construction industry are collaborating to develop new strategies to reduce worker injuries and illnesses.

Controlling Exposures During Construction NIOSH and the construction industry are collaborating on a study to evaluate the adequacy of available engineering controls to reduce exposures to lead and drywall dust, which can result in acute and chronic effects such as reduced lung function and silicosis. This information will be used to develop cost-effective control technologies to reduce workers' exposures.

Reducing "Take-Home" Lead Exposure Among Construction Workers NIOSH conducted a comprehensive study of exposures affecting the families of lead-exposed construction workers. Construction workers' children were six times more likely than neighborhood children to have blood lead levels at or exceeding the CDC action level of 10 ug/dL. NIOSH recommended that workers change clothes and shower at work to prevent home and automobile contamination.

Studying Mortality Among Construction Carpenters NIOSH, in cooperation with the Carpenters' Health and Safety Fund, completed a major proportionate mortality study of construction workers who died between 1987 and 1990. NIOSH found that construction carpenters are at increased risk of dying from work-related injury, asbestosis, and cancers of the lung, pleura, stomach, bone, and breast. The study confirmed that construction carpentry is extremely hazardous and underscores the need for more work to prevent work-related injury, cancers, and respiratory disease.

Controlling Exposures to Lead-Based Paint and Drywall Dust NIOSH and the construction industry are collaborating on a study to evaluate the adequacy of available engineering controls to reduce workers' exposures. NIOSH identified effective controls to reduce worker exposure to lead during the removal of lead-based paint and to dust exposure during the sanding of drywall. Drywall dust exposure can result in acute and chronic effects such as reduced lung function and silicosis. NIOSH provides information to employers regarding the cost-effectiveness of control technology to encourage them to take immediate steps to reduce workers' exposures.

Controlling Exposures During Asphalt Paving Over a half million workers are exposed to asphalt fumes, a petroleum product used extensively in road paving, roofing, roofing shingles, and waterproofing. When applied, molten asphalt generates fumes that can cause skin diseases and eye and respiratory tract irritation. Laboratory studies have found that chemical extracts of asphalt fumes have cancer-causing and mutagenic properties, although these findings have not been confirmed in the field.

Through an interagency agreement with the Department of Transportation, NIOSH is evaluating control technology to reduce workers' exposure to asphalt fumes in road paving. NIOSH's involvement was requested by the National Asphalt Pavement Association (NAPA). NIOSH's

laboratory analyses of the industry-developed control technology have demonstrated the ability to capture up to 100 percent of the fumes where the highest amount is generated. In the first worksite evaluation, NIOSH recorded a 90 percent capture efficiency of fumes. NIOSH is conducting further evaluations of control technology in partnership with industry and other federal agencies.

Preventing Hearing Loss in Carpenters The U.S. Department of Commerce estimates that there were 1.3 million carpenters in 1994. At the request of the United Brotherhood of Carpenters and Joiners International Union, NIOSH measured the hearing ability of union members. Nearly 70 percent of the carpenters tested showed evidence of hearing loss. NIOSH then tested the hearing of apprentices and carpenters who were just beginning their careers. Initial analysis indicates greater hearing losses among older carpenters, with a majority of the younger carpenters having normal hearing as they begin their trade. NIOSH will conduct further evaluation of noise levels and hearing protection use in this industry to recommend hearing loss prevention measures.

Small Business

Small businesses, those with fewer than 50 employees, frequently lack access to occupational safety and health information. Small businesses often lack the financial and technical resources to develop prevention programs. Since 1986, NIOSH has conducted engineering studies to assist small businesses. To reach owners and workers in these businesses, NIOSH and its partners conduct worksite and intervention research.

Perchloroethylene Exposures in the Dry-Cleaning Industry The dry-cleaning industry has more than 30,000 establishments in the United States, mostly small businesses. About 90 percent of U.S. dry-cleaning establishments use perchloroethylene as their primary cleaning solvent. Perchloroethylene, classified by the International Agency for Research on Cancer (IARC) as an animal carcinogen, is also associated with elevated rates for cancers of the urinary tract, bladder, esophagus, pancreas, and colon among dry-cleaning workers. NIOSH is evaluating the efficacy of various technologies to control exposures. This information will be distributed to owners, managers, and workers in the industry. In addition, NIOSH initiated a pilot program to determine the best method to communicate risk to the dry-cleaning industry, decrease solvent exposure, and address other health and safety issues. Results from the pilot study show that owners and operators are more aware of environmental standards for perchloroethylene than of the potential health risks to workers. NIOSH will use this information to develop communication materials aimed at reducing exposures.

Preventing Homicide in Convenience Stores Approximately 23,000 robberies and 100 homicides occur annually in convenience stores. Approximately two-thirds of homicides occur in a robbery situation. The number of non-fatal injuries to convenience store workers during a

robbery is unknown. NIOSH is conducting several studies that will enable researchers to better understand risk factors and prevention measures for injuries associated with robbery. These include examining crime statistics from the FBI and other agencies and evaluating the effectiveness of alternative environmental designs (such as store lay out) in reducing robberies.

Preventing Youth Injuries from Paper Balers Paper balers are used to bundle cardboard boxes for recycling. Department of Labor (DOL) child labor laws have prohibited 16- and 17-year-old employees from loading, operating, and maintaining these machines because of the danger for severe injury or death. At the request of DOL, NIOSH safety engineers evaluated paper baler safeguards at work sites. The engineers compared equipment performance with requirements of the American National Standards Institute (ANSI) consensus safety standard and found that the devices did not perform adequately. In addition, many older paper balers that are still in use lack safeguards, and are not distinguishable from the new paper balers. Because of the continuing risk for injury from paper balers, NIOSH recommended that DOL prohibit operation of this equipment by minors. In 1995, Congress proposed to modify the Fair Labor Standards Act of 1938 to allow youth to load balers as long as they are turned off and have safeguards against turning on during loading. This provision became law on August 6, 1996 (P.L. 104-174).

Mining

Approximately 400,000 miners are employed in more than 11,000 surface and underground mines in the U.S. Each year, an estimated 2,000 miners die from lung diseases caused by exposure to coal mine dust. The Federal Black Lung Program paid more than $18 billion to beneficiaries in the 1980s. Miners are at risk for fatal and nonfatal injuries, and have the highest rate of fatal injuries of all U.S. industries.

Lung Disease in Coal Miners NIOSH conducted laboratory studies of workers who had developed severe lung impairment while working in dusty mines. A group of coal miners were identified with significant declines in lung function that were associated with mining region and job tenure. This suggests that regional differences in mine dusts may account for miners' lung damage. In addition, increased airway responsiveness was associated with reduced lung function, and may be a biomarker of ongoing lung damage. Findings from this research will be helpful in designing medical monitoring programs for coal miners and workers exposed to dust, and for further investigations of why certain individuals develop clinical disease from dust exposure.

Health Effects Study of Uranium Millers Uranium millers are potentially exposed to uranium ore dust, silica, radon daughters, and acid mists and fumes. While there is only one operating uranium mill in the U.S., issues remain about the potential health effects of uranium milling. The Department of Defense Appropriations Act of 1994 (Public Law 103-139) required the Army Environmental Health Agency to study the health effects of uranium milling. That agency

requested NIOSH assistance in conducting this study. NIOSH is evaluating data to update information from previous, limited studies of uranium millers. Findings will be used to evaluate health effects of uranium dust exposure among workers employed in various components of uranium fuel production.

Health Effects of Diesel Exhaust NIOSH submitted to MSHA a study evaluating the risk of lung cancer that results from occupational exposure to diesel exhaust. Analyses of epidemiologic and animal studies suggest that the risk to miners under current standards may be greater than the 1 case per 1,000 generally used for setting occupational standards for carcinogens in the United States.

Silicosis in Gold Miners NIOSH completed a study of more than 3,000 gold miners exposed to high levels of silica. The study indicates that workers with lifetime exposures to silica permissible under the OSHA standard have a substantially increased risk of silicosis. A mortality study among these miners also revealed a twofold excess of auto-immune diseases such as arthritis.

Energy-Related Health Research

In FY 1995, NIOSH received approximately $5 million to conduct research among workers employed in energy-producing industries. Under a Memorandum of Understanding (MOU) with the Department of Energy, NIOSH oversees contract studies that are evaluating health risks to energy workers. In addition to these studies, NIOSH also funds cooperative agreements and grants that are examining the relationship between agents used in energy production (beryllium, plutonium, asbestos, chemical exposures, electric and magnetic fields, heat) and health outcomes, including cancers and respiratory disease.

In FY 1995, researchers found that workers at the Savanna River Plant in South Carolina who were exposed to ionizing radiation had an increased risk of dying from leukemia. NIOSH held a public meeting to notify workers, management, and the Department of Energy of this finding. NIOSH is conducting several other evaluations that will further scientific understanding of the association between ionizing radiation and leukemia.

New Partnerships

Surveillance of Pesticide Exposures NIOSH is collaborating with the Council of State and Territorial Epidemiologists, the EPA, the National Center for Environmental Health, and six states with pesticide surveillance programs to develop methods for identifying victims of poisonings. The goal is to produce an electronic database and a manual to facilitate the initiation of pesticide surveillance programs in States and to encourage multi-state data sharing.

UAW-GM-NIOSH Memorandum of Understanding In April 1995, General Motors (GM), the United Autoworkers (UAW), and NIOSH signed a Memorandum of Understanding (MOU) to conduct joint research on work-related injuries and illness. This is the broadest private sector alliance in NIOSH's history. Goals of the MOU include development of new technology to reduce worker exposures to metal-working fluids (which cause asthma) and evaluate the usefulness of NIOSH's lifting guidelines in reducing low back disorders.

Ford Motor Co. NIOSH has entered into a Cooperative Research and Development Agreement (CRADA) with the UAW-Ford Motor Company National Joint Committee on Health and Safety, the UAW, the Hawkwa Group (an occupational health computer software publisher), and James Anderson & Associates (an acoustical engineering firm) to develop, manage, and analyze occupational health data. The initial focus of the CRADA will be on hearing conservation.

Evaluation of the Efficacy of Back Belts in Material-Handling Workers NIOSH is collaborating with Wal-Mart Stores, Inc., to study whether back belts reduce injury among employees who perform heavy lifting tasks. Currently NIOSH does not recommend the use of back belts to reduce injuries in uninjured workers, but many employers believe that back belts reduce back injury and that using back belts will reduce their workers' compensation rates. This study will analyze health data for 8,000 Wal-Mart employees in 160 stores and will serve as the basis for future NIOSH recommendations regarding back belt use.

Electric and Magnetic Fields Research A three-year interagency agreement was initiated with the National Institute of Environmental Health Sciences for NIOSH to conduct laboratory research and operate a regional electric and magnetic field (EMF) study facility. This program is expected to better understand the health risks associated with EMF exposure.

Ergonomic Interventions for the Household Appliance Industry According to the Bureau of Labor Statistics, the incidence of musculoskeletal trauma in the Household appliance industry doubled between 1988 and 1991. Engineering controls can be used to reduce the incidence of musculoskeletal disorders among household appliance workers. NIOSH researchers initiated a study to compare the effectiveness and costs of interventions in appliance plants. NIOSH is collaborating on this study with the Association of Home Appliance Manufacturers.

International Health Projects

Training Physicians in Occupational Respiratory Disease NIOSH worked with the International Labour Office (ILO) to develop an international program for training physicians in the developing world on the prevention and recognition of dust-induced occupational lung diseases. This program, which emphasizes primary prevention, medical screening, and surveillance, was conducted in the Czech Republic, Mexico, Brazil, Russia, Ukraine, Turkey, Africa, Vietnam, Peru, Venezuela, Thailand, and Chile.

Surveillance of DOE Workers NIOSH awarded $1.65 million in research grants to develop models for conducting hazard and medical surveillance among workers exposed to radiation and other hazardous agents at nuclear facilities and other energy-related industries. These models will provide state-of-the-art approaches to hazard and medical surveillance for occupational safety and health. Grants were awarded to the University of Washington, the University of Cincinnati, the University of Colorado, Oak Ridge Associated Universities, and the University of California.

Health Services Research NIOSH initiated a major new extramural research program in health services research. Health services research provides information on costs, outcomes, accessibility, and other factors associated with health services. This information helps policy makers to identify and utilize effective health services and prevention programs. For example, NIOSH is funding a grant in Connecticut to evaluate the impact of recent State changes in the laws that govern how care is provided to individuals under workers compensation for upper-extremity disorders caused by repetitive strain injuries. NIOSH health services research projects will look at how best to integrate work place prevention, acute care, and return-to-work programs. In 1995, eight institutions were awarded a total of approximately $1.8 million. Grants were awarded to the following institutions: Boston University, Duke University, Michigan State University, the National Public Services Research Institute, the State of California, the University of Maryland, the University of Connecticut Health Center, and the University of Rochester.

Prevention of Injuries Among Working Youths NIOSH awarded $500,000 to three institutions to develop safety and health education strategies to prevent injuries among working youths. NIOSH research has found that workers 18 years of age and younger are at higher risk than adult workers for severe injury. Each year, about 70 youths are killed at work and 64,000 are injured or develop a work-related illness. Grants were awarded to the University of California, Berkeley, the Massachusetts Health Research Institute, Inc., and the University of California at Los Angeles.

SERVICES AND RECOMMENDATIONS

Health Hazard Evaluations During FY 1995, NIOSH responded to 403 requests from employers, employees, and federal, state, and local agencies to examine potential hazards in the workplace. Because each worksite is unique, NIOSH assembles multidisciplinary teams that include physicians, industrial hygienists, engineers, and other safety and health professionals to conduct the evaluations. Findings and recommendations, which are non-regulatory in nature, are provided to management, labor, and other interested parties (such as state or local health and

safety agencies). Health hazard evaluations enable NIOSH to offer recommendations to prevent exposures to newly-discovered hazards for which regulations may not yet exist. Findings are also used to establish research priorities and to examine trends in potential hazards.

Special focuses of the health hazard evaluation program in FY 1995 included studies of pesticide exposures, tuberculosis transmission in hospitals, cardiovascular effects among automobile airbag manufacturers, pneumoconiosis in graphite mills, and exposures to potential hazards among Navy personnel.

NIOSH 1-800 Number In FY 1995, NIOSH responded to more than 88,000 calls on its toll-free information number. States with the greatest number of callers included the following: California, New York, Ohio, Texas, Pennsylvania, Florida, and Illinois. The most frequently requested information was related to chemicals and solvents, safety and injuries, lifting and ergonomics, respirators and respiratory effects, and OSHA, MSHA, EPA regulations.

Publications NIOSH authors published 199 peer-reviewed journal articles. NIOSH also published 70 health hazard evaluation reports and 26 technical reports. Publications by NIOSH-supported extramural authors totaled 75. Nearly 400,000 occupational safety and health publications were distributed. The most popular publication was the NIOSH Pocket Guide to Chemical Hazards.

Databases NIOSH maintains several databases on occupational safety and health research, including a literature database (NIOSHTIC) and the Registry of Toxic Effects of Chemical Substances (RTECS) database. NIOSH Alerts and State Profiles are available on the World Wide Web. NIOSH publications are available on the Internet (pubstaft@niosdt1.em.cdc.gov).

Revised Respirator Regulation Working with industry, labor, and the public, NIOSH updated national standards for respirators used to protect millions of workers from potentially hazardous environments. The new standards (42 CFR Part 84) enabled respirator manufacturers to produce more effective protection at substantially reduced prices, lowering cost and improving worker protection. For example, TB respirators cost $10 before NIOSH issued the new standards, but dropped to as low as 60 cents afterwards. Based on an assessment of costs at acute care facilities, NIOSH estimates that the Department of Veteran Affairs will save $16 million annually. The health care industry is expected to save hundreds of millions annually.

Electronic Processing Respirator Approvals NIOSH began using an electronic system to manage the respirator certification process. This system enables manufacturers to submit applications electronically, reduces the number of records and drawings required for certification, and provides NIOSH with quick access to approval information when responding to public information requests or worksite problems.

New Criteria for the Prevention of Coal Workers' Pneumoconiosis Research has demonstrated that miners with working lifetime exposures to respirable coal mine dust at the

current MSHA standard of 2 mg/m^3 have an elevated risk of developing occupational respiratory diseases (including simple coal workers' pneumoconiosis, progressive massive fibrosis, and chronic obstructive pulmonary disease). NIOSH published a criteria document for coal mine dust with recommendations to reduce occupational health risks of underground and surface coal miners. The document includes a recommended exposure limit for respirable coal mine dust, methods for monitoring worker exposures, use of personal protective equipment, and procedures for miners' medical screening and surveillance. In response to this document, MSHA has announced the appointment of a Pneumoconiosis Advisory Committee to address the issues raised in the criteria document.

Reducing Disease from Cotton Dust Exposure Two decades ago, NIOSH played a major role in the establishment of a comprehensive federal occupational health standard to reduce workers' exposure to cotton dust. After this regulation went into effect, the incidence of byssinosis, or "brown lung disease" resulting from cotton dust exposure was vastly reduced. To further reduce the risk of occupational respiratory disease among cotton textile workers and to enhance the flexibility of the current OSHA cotton dust standard, NIOSH published Current Intelligence Bulletin (CIB) #56, *"Washed Cotton: A Review and Recommendations Regarding Batch Kier Washed Cotton."* The research findings demonstrated the effectiveness of a system for mildly washing cotton that significantly lowers the potential respiratory toxicity of cotton prior to the textile mill processing. NIOSH recommends that OSHA include this process as an acceptable method to wash cotton under the existing Cotton Dust Standard. NIOSH also recommended that cotton processors substitute mildly washed cotton for unwashed cotton.

Preventing Deaths and Injuries of Adolescent Workers In 1993, 68 adolescents under age 18 died of work-related injuries and an estimated 64,000 required treatment in hospital emergency rooms. Adolescents are at high risk for work-related injury compared to adults. NIOSH issued an Alert that summarized information about work-related injuries among adolescents, identified hazardous work, and recommended prevention measures. More than 27,000 copies of the Alert were disseminated during FY 1995. Every high school principal in the United States received an Alert summary sheet.

Preventing Electrocutions of Crane Operators and Crew Members Working Near Overhead Power Lines NIOSH fatality investigations indicate that employers, supervisors, and workers may not be aware of the hazards associated with working near overhead power lines. This Alert described six fatalities that resulted from operating machinery near power lines and recommended ways to prevent electrocutions. The Alert was sent to the Crane Institute, labor unions, carriers and riggers, and the National Homebuilders Association. In addition, the Alert was distributed to the American Society of Mechanical Engineers Committee, the Committee responsible for developing the ANSI standard for crane safety.

Preventing Injuries and Deaths of Loggers NIOSH described the deaths of six loggers in an Alert and made recommendations on how to prevent injuries and deaths in logging operations. NIOSH fatality investigations revealed that workers and employers in the logging industry are

often unaware of the risks associated with work in this industry, such as electrocution and machine-related incidents. NIOSH distributed the Alert to the American Pulpwood Association, University Colleges of Agriculture and Forestry, forestry management professionals, and 1,500 logging companies.

Participatory Ergonomic Interventions in Meatpacking Plants NIOSH issued a report supporting management and employee participation to solve musculoskeletal problems. The research focused on hazards in meatpacking plants, but the recommendations apply to other industries, such as machine paced work and work involving powered hand tools.

MSHA Regulatory Action on NIOSH Alert In 1992, NIOSH published an Alert, "Preventing Silicosis and Deaths in Rock Drillers." In FY 1995, MSHA took action to ensure that the prevention measures recommended in the Alert were implemented at mine sites. MSHA promulgated a surface mine drilling regulation which focused on control technology to reduce dust levels.

Guidelines for Chemical Hazards The *Occupational Safety and Health Guidelines for Chemical Hazards* provide summary information about chemical substances found in the workplace. For every entry, the guidelines list the NIOSH recommended exposure limit, OSHA permissible exposure limit, data on chemical names and synonyms, and symptoms of overexposure. The guidelines also contain recommendations for environmental and medical monitoring procedures, information about the selection and use of respiratory and personal protective equipment, control measures, and procedures for emergency treatment.

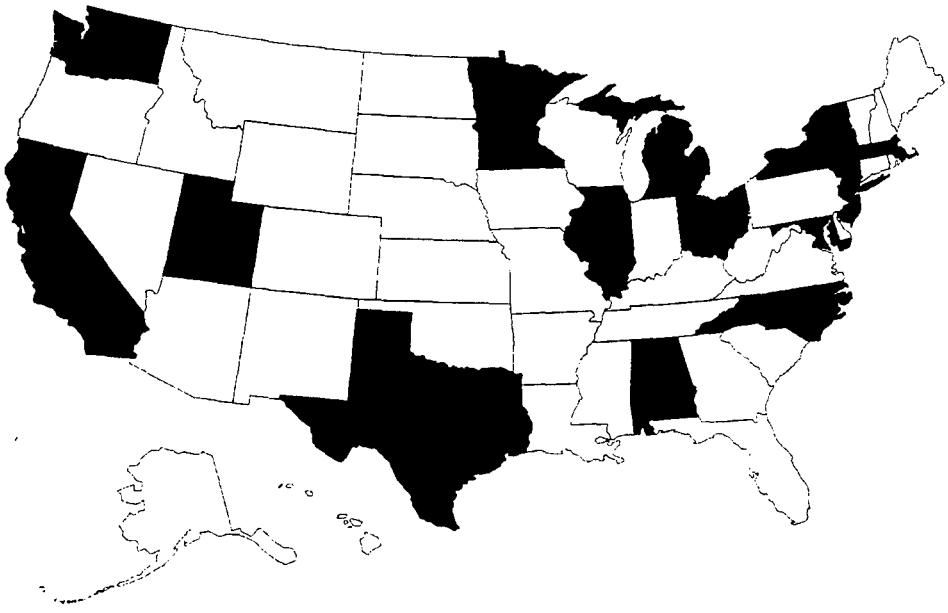
Maximizing Protection from Hearing Protection Devices NIOSH estimates that about 30 million workers are exposed to levels of noise that could damage hearing. Because so many workers who use hearing protection still lose their hearing, NIOSH researchers investigated ways to improve hearing protective devices. Researchers identified problems related to the fit of the device and inaccuracies in the system used by manufacturers and EPA to rate effectiveness of the devices. NIOSH informed EPA and the manufacturers about the problems with this system, and developed training courses to teach workers how to maximize protection from the hearing devices they use. NIOSH published a compendium on hearing protective equipment for health and safety professionals, manufacturers, and OSHA.

Comments and Testimony NIOSH provides comments to federal agencies on proposed regulations based on its research findings. During FY 1995, NIOSH provided comments to the Department of Labor (e.g. operator training for powered industrial trucks, respiratory protection, confined spaces, indoor air quality, longshoring and marine terminals, and preventing injuries to young workers), the Nuclear Regulatory Commission (respiratory protective equipment), and the Environmental Protection Agency (protecting workers during lead-based paint abatement).

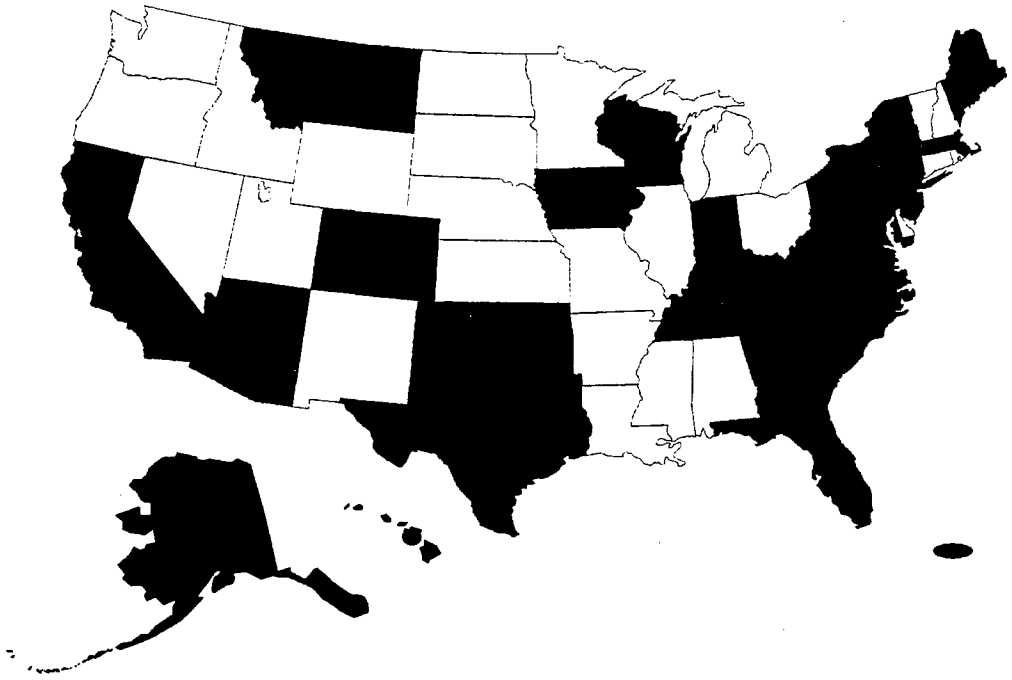
The Occupational Safety and Health Act requires NIOSH to assure that an adequate supply of well-trained professionals are available to carry out the purposes of the Act. Since 1971, NIOSH training programs have provided support for the majority of occupational safety and health professionals trained.

Educational Resource Centers (ERCs) ERCs meet national and regional needs for trained occupational safety and health professionals. These centers serve as regional resources for professionals in industry, labor, government, and academia. In FY 1995, NIOSH awarded $7,854,000 to 14 universities that provide multidisciplinary graduate and continuing education programs in occupational medicine, occupational health nursing, occupational health and safety, and industrial hygiene. In addition, NIOSH provided $2,501,000 to 39 single-discipline project training grants that provide training in these fields, as well as in marine safety, construction safety, physician assistance, health promotion, and ergonomics. In FY 1995, NIOSH-supported programs which graduated 726 occupational safety and health professionals.

Educational Resource Centers FY95



NIOSH Project Training Grants FY 95



Educating Physicians in Occupational Health and the Environment (EPOCH-Envi) The goal of this program is to promote and integrate occupational medicine into medical education. NIOSH funded six workshops for primary care training faculties. Fifty-one physicians with responsibility for training residents attended the workshops.

Project Minerva Through Project Minerva, NIOSH works with business schools and companies to educate future owners and managers about the importance of occupational safety and health. Educational materials are available through Minerva's home page on the Internet (http://www.minerva.org).

Safety and Health Awareness for Preventive Engineering Project (Project SHAPE) Project SHAPE is a collaboration among NIOSH, engineering professional societies, and schools to enhance the education of engineers in occupational safety and health. A study conducted last year by the Accreditation Board for Engineering and Technology found that engineering disciplines have gained ground in incorporating safety and health information into their engineering curricula. NIOSH is evaluating instructional modules to further improve progress in this area.

Vocational Schools NIOSH developed new training modules aimed at high school and vocational school students. Through cooperative agreements with the University of California at Berkeley, UCLA, and the Massachusetts Department of Public Health, three pilot community projects involving local high schools, parents, teachers, students, and employers have been initiated to promote community awareness of safety and health issues relevant to young workers. In collaboration with the American Vocation Association, NIOSH is developing a series of safety and health modules to introduce hazard recognition and control strategies in vocational instruction programs.

Small Businesses Through a $75,000 cooperative agreement with the Minority Health Professions Foundation of Morehouse Medical College, NIOSH is designing a series of occupational safety and health courses for small business managers to be offered at historically black colleges. NIOSH and the Minority Health Professions Foundation held a workshop to promote occupational safety and health seminars for small business operators.

International Association of Firefighters (IAFF) NIOSH provided $1.8 million to support training for 2,911 firefighters and emergency responders through a cooperative agreement with the International Association of Firefighters (IAFF). The training program teaches firefighters and emergency responders procedures to handle emergencies involving hazardous materials, such as chemical spills.

Hazardous Waste Clean-up Workers A major concern of the U.S. government during the next decade will be remediation and clean-up of hazardous waste disposal sites, including nuclear power and weapons plants. NIOSH funded $173,000 in cooperative agreements to the National Environmental Education and Training Center affiliated with Indiana University of Pennsylvania and West Virginia University to train clean-up workers.

Surface Mine Workers NIOSH investigators found that silica exposure is more widespread than previously thought. To raise awareness of the hazard of silica exposure, NIOSH and MSHA developed a training video and conducted seminars in Pennsylvania for surface miners and operators, mine inspectors, and state health department personnel.

American Psychological Association The American Psychological Association (APA) and NIOSH expanded a postdoctoral training program in occupational health psychology. This program trains organizational and clinical psychologists to design healthy work environments and provide counseling on occupational stress. NIOSH and APA hosted an international conference that addressed stress and workplace violence.

Lead Paint Abatement Title X of the Housing and Community Development Act (P.L. 102-550) requires that all lead-based paint activities be carried out by individuals who meet minimum training requirements and are certified through an EPA-approved program. NIOSH provided grants totaling $500,000, which were used to train 650 workers and supervisors in safe procedures for lead paint abatement.