

12.

Governmental Activities Concerning Worker Health and Safety

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Governmental Activities Concerning Worker Health and Safety

This chapter has three major sections. The first describes the framework of U.S. Government activities created by the Occupational Safety and Health (OSH) Act, while the second discusses the main activities of the Occupational Safety and Health Administration (OSHA): setting standards, inspecting and enforcing regulations, pro-

viding public education and services, and monitoring the performance of State programs. The third section describes the activities of the National Institute for Occupational Safety and Health (NIOSH) in hazard identification, research on controls, and information dissemination.

CURRENT FEDERAL/STATE FRAMEWORK

In the Occupational Safety and Health Act of 1970, Congress authorized the creation of three agencies to set and enforce mandatory health and safety standards; to conduct research on occupational hazards and their control; and to review contested enforcement actions. The three agencies are OSHA, NIOSH, and the Occupational Safety and Health Review Commission (OSHRC).

One other Federal agency, the Mine Safety and Health Administration (MSHA) of the U.S. Department of Labor, specializes in worker health and safety. It is responsible for the health and safety of workers in coal mines, as well as in other metal and nonmetal mines. It was created as a result of the Metal and Non-Metallic Mine Safety Act of 1966, the Coal Mine Health and Safety Act of 1969, and the Mine Safety and Health Act of 1977 (333). Its activities are not described in detail in this assessment.

OSHA is a regulatory agency that sets and enforces regulations concerning the control of health and safety hazards. It began its operations on April 28, 1971. Part of the Department of Labor, it is headed by a Presidentially appointed Assistant Secretary of Labor for Occupational Safety and Health, to whom the Secretary of Labor has delegated authority to administer the OSH Act. OSHA sets mandatory health and safety standards, inspects workplaces to ensure compliance,

and proposes penalties and prescribes abatement plans for employers found violating the standards. In addition, OSHA provides for public, worker, and employer education and consultation, mostly through grant activities. Finally, OSHA partially finances the operations of State agencies operating "State plans" and monitors their performance.

NIOSH is a research agency that is part of the Centers for Disease Control (CDC) of the U.S. Public Health Service, which is part of the Department of Health and Human Services (HHS). NIOSH is headed by a Director appointed by the Secretary of HHS for a term of six years. It was created from what had been the Bureau of Occupational Safety and Health and started operations as NIOSH on June 30, 1971. Congress mandated that it conduct research and related activities on developing criteria or recommendations to be used by OSHA in setting standards, on identifying and evaluating workplace hazards, and on measurement techniques and control technologies, as well as provide professional education and disseminate health and safety information.

The OSHRC has three members appointed by the President, with the advice and consent of the Senate, for staggered terms of six years. Its duties are limited to reviewing and resolving disputes concerning OSHA citations and penalties. In doing so, the Review Commission interprets the

meaning of OSHA standards and thus determines the nature and scope of many employer obligations concerning employee health and safety.

In addition, the act created a temporary commission to examine the workers' compensation system—the National Commission on State Workmen's Compensation Laws. It also created a permanent advisory body for OSHA, known as the National Advisory Committee on Occupational Safety and Health.

Both OSHA and NIOSH have been criticized since their creation in 1971. OSHA has been called to task by employers and their representatives for issuing standards that are excessively expensive, overly stringent, not based on scientific evidence, or unrelated to employee health and safety. Labor unions, on the other hand, have criticized OSHA for failing to devote adequate resources to enforcement, for delaying or failing to set new regulations, and for considering employers' costs as a basis for health and safety decisions.

NIOSH, too, has been accused of having failed to fulfill its mission. OSHA has complained about the inadequacy of NIOSH's criteria documents for OSHA standard-setting. NIOSH has been criticized by the General Accounting Office for the quality of its criteria document and Health Hazard Evaluation programs. Labor groups have criticized NIOSH for being unresponsive to worker requests. Management representatives have claimed that Health Hazard Evaluations were too aggressively pursued and that NIOSH research was of poor scientific quality.

Separation of Research and Regulation

The OSH Act separated occupational health and safety research activities from standard-setting and enforcement by placing these responsibilities into two different departments of the Federal Government. This may, in part, simply be the result of the history of Federal activities, which prior to the OSH Act had been found in both the Department of Labor and the Public Health Service of HHS and their predecessor agencies. During congressional consideration of the OSH Act (see ch. 11), labor unions strongly supported designation of the Labor Department as the lead reg-

ulatory agency. The congressional debate concerning research focused only on the need to enhance occupational safety and health research and to "elevate [its] status" (551).

Separating research from regulatory activity may also help ensure the quality and objectivity of the research. On the other hand, separation may lead to inefficiencies, especially when the activities of the two agencies are poorly coordinated. One observer argued in 1976 that "the enforcement function and priority setting in OSHA are barely connected to the research and manpower development mandated for NIOSH" (30). In 1977, the General Accounting Office concluded that OSHA and NIOSH needed to improve the coordination of their activities concerning the development of workplace health standards (501). In 1978, an Interagency Task Force also made recommendations to better coordinate NIOSH research with OSHA's needs (228). The two agencies have created mechanisms to coordinate activities, although OTA has not attempted to determine how well these agencies work together today.

Besides being separated from OSHA, NIOSH is lower than OSHA in the Federal bureaucracy. Since July 1, 1973, NIOSH has organizationally been part of the Centers for Disease Control. Thus the Director of NIOSH reports to the Director of CDC, who in turn reports to the Assistant Secretary for Health, who reports to the Secretary of HHS. OSHA, on the other hand, is headed by an Assistant Secretary of Labor who reports directly to the Secretary of Labor.

Some Members of Congress have criticized the placement of NIOSH within CDC. For example, in 1973, three Senators argued that this was "contrary to the expressly stated intent of Congress in creating NIOSH, which was to elevate the status of occupational safety and health research in HEW from its relatively low level in 1970. . . ." In addition, they criticized the average Federal personnel grade levels that had been established for NIOSH because they were substantially lower than those for OSHA personnel and personnel at the Environmental Protection Agency (232).

The geographical location of NIOSH has also generated considerable interest. In 1981, it was

announced that the NIOSH headquarters would be moved from Rockville, MD, to Atlanta, GA, where the headquarters of CDC is located. (Most NIOSH staff, however, continue to work in the NIOSH laboratories in Cincinnati, OH, and Morgantown, WV.) In support of the move of NIOSH headquarters, it was suggested that the scientific and technical base of NIOSH would be strengthened through greater interaction with other CDC programs (303). Further, it was thought that NIOSH would benefit from CDC's expertise in disease and health hazard surveillance and that there would be greater NIOSH involvement in environmental health. Cost savings of approximately \$1.5 million per year were predicted to result from this action.

But many people from labor, management, academia, and the occupational safety and health professions believed that moving would be detrimental to NIOSH's ability to perform its mandated responsibilities. In 1981 and 1982, Congress attached a restriction on the appropriations for NIOSH that prohibited this move. At the end of 1982, this restriction was lifted and the move to Atlanta was completed shortly thereafter.

Federal Spending for Occupational Health and Safety

Table 12-1 presents the total budgets (in current dollars and in real, inflation-adjusted dollars) for OSHA and NIOSH and the authorized personnel ceilings. Figures 12-1 and 12-2 present the budget totals graphically. Although OSHA's budget in current dollars has grown over time, in real dollars it peaked in fiscal year 1979, decreasing nearly 13 percent by fiscal years 1982 and 1983.

In current dollars the NIOSH budget grew from 1971 to 1980, but since then it has been substantially reduced, both in current, nonadjusted dollars, as well as in real terms. After adjusting for inflation, the 1983 NIOSH budget is the lowest since 1973 and represents a 42 percent decrease since the peak in 1980. The 1984 budget includes an increase in current dollars *over* 1983, largely because Congress restored NIOSH funding for professional training programs. The 1985 budget proposed by the President would reduce the NIOSH budget by completely eliminating these funds.

The reduction since 1980 is illustrated in figure 12-3, which shows the percentage changes in appropriations for several health-related agencies. Funding of agencies with responsibilities for regulating health and safety in the workplace has increased in current dollars over the last 4 years (OSHA and MSHA), while overall funding for NIOSH has consistently decreased. Overall, NIOSH's share of Federal spending for occupational health and safety has been declining. In fiscal year 1974, the NIOSH budget of \$35.4 million was about half as much as the OSHA budget of \$70.1 million. From fiscal year 1975 through fiscal year 1980, the NIOSH budget varied from being 34 to 42 percent as large as the OSHA budget. The President's budget request for 1985 proposed funding NIOSH at about 26 percent of the level of OSHA funding.

The authorized numbers of personnel for both OSHA and NIOSH generally rose from 1971 to peaks in 1980. From 1980 to 1984, the number of authorized OSHA positions decreased about 25 percent, while NIOSH positions dropped about 16 percent.

Assistant Secretaries and Directors

Table 12-2 lists the men and women who have served as Assistant Secretaries for Occupational Safety and Health and Directors of NIOSH. The first Assistant Secretary for OSHA was George Guenther, who had been head of the Bureau of Labor Standards (the Labor Department predecessor agency to OSHA). He was responsible for the issuance of OSHA's first standards and the beginnings of OSHA's inspection activity. Within 2 years he was replaced by John Stender, who had been an official of the Boilermaker's Union and a State legislator, but who had no previous professional background in occupational health and safety. He presided over the growth of the agency, dramatically increased the number of inspections conducted, and encouraged the development of State plans.

In late 1975 Stender was replaced by Morton Corn, a professor of industrial hygiene at the University of Pittsburgh, who served as Assistant Secretary for just over 1 year. Corn took steps to increase OSHA activity concerning health standards and to conduct more health inspections.

Table 12.1.--Federal Spending for Worker Health and Safety

Fiscal year	Occupational Safety and Health Administration			National Institute for Occupational Safety and Health			State programs		
	Budget (current dollars) (millions)	Budget (1972 dollars) (millions)	Personnel positions	Budget (current dollars) (millions)	Budget (1972 dollars) (millions)	Personnel positions	Federal grants ^b (current dollars) (millions)	Federal grants ^b (1972 dollars) (millions)	Inspector positions
1971	7.6 ^c	8.2	970	17.7	19.1	501	NA	NA	NA
1972	33.9 ^d	33.9	1,696	26.3	26.3	745	NA	NA	NA
1973	69.3	65.6	1,699	25.9	24.5	611	NA	NA	NA
1974	70.1	61.0	1,830	35.4	30.8	611	NA	NA	NA
1975	95.8	74.7	2,435	34.0	26.5	735	16.7	13.0	NA
1976	114.9	84.7	2,494	39.3	28.9	848	28.7	21.2	NA
1977	130.2	90.0	2,717	49.7	34.3	898	24.6	17.0	1,139
1978	138.7	90.2	2,817	56.3	36.6	913	31.4	20.4	1,116
1979	172.8	106.4	2,944	62.6	38.5	913	37.0	22.8	1,132
1980	186.4	103.1	3,015	80.4	44.5	932	40.0	22.1	1,175
1981	209.4	102.4	3,009	67.8	33.2	841	42.3	20.7	1,110
1982	195.5	93.1	2,354	62.1	29.6	784	44.1	21.0	1,105
1983	206.6	93.1	2,258	57.5	25.9	783	47.6	21.5	1,081
1984	212.6	NA	2,259	65.9	NA	785	49.6	NA	1,036
1985	217.8	NA	NA	56.4	NA	785	NA	NA	NA

^aAdjusted to constant (1972) dollars using the implicit price deflator for Federal Government purchases of goods and services. See *Economic Report of the President, (1984), table B-3*.

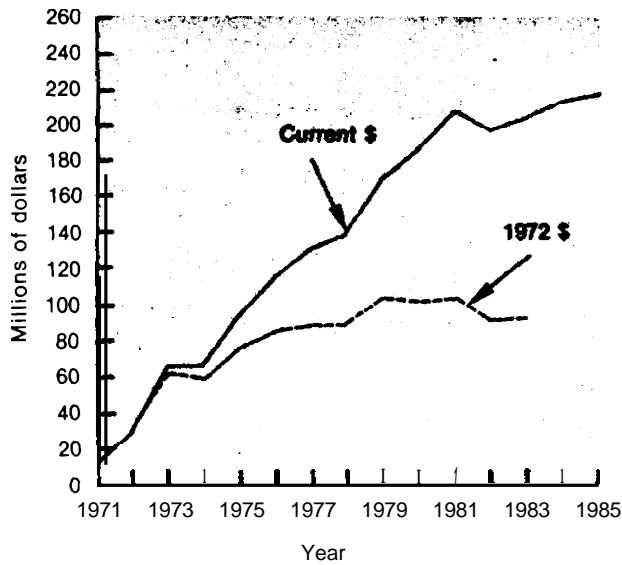
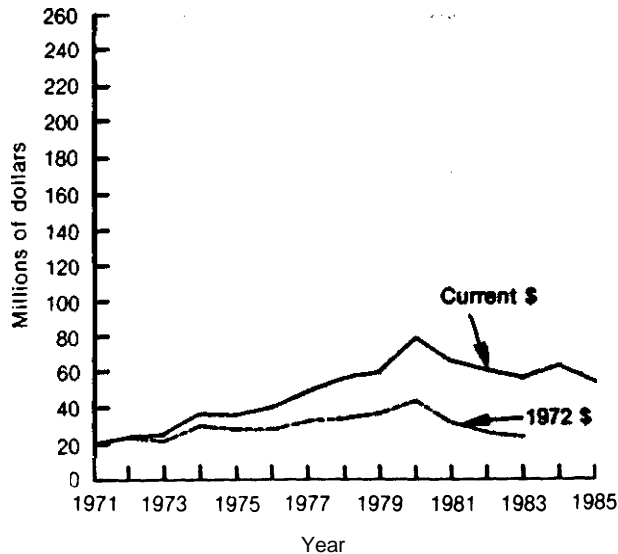
^bThese figures represent only the Section 18(b) grants given to the States by Federal OSHA. For the years presented in this table, these grants were generally for 50 percent of the operating costs of the State program.

^cActivities financed from the appropriation for the Workplace Standards Administration.

^dRequest.

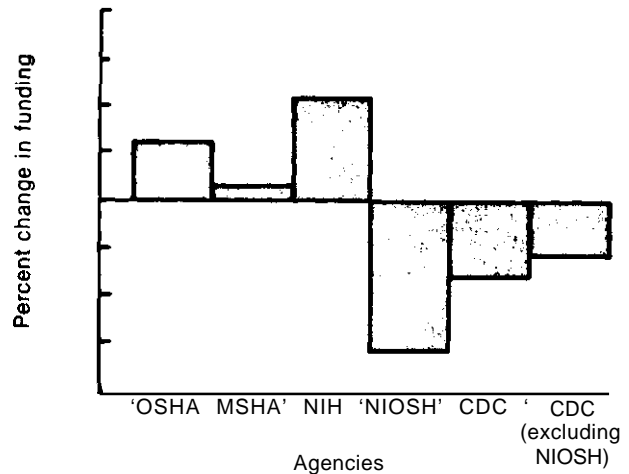
NA—Not available.

SOURCE: Office of Technology Assessment, based on data supplied by OSHA and NIOSH.

Figure 12-1.—OSHA Budget 1971-85**Figure 12-2.—NIOSH Budget 1971-85**

He also worked to improve the professional expertise of OSHA staff, especially its inspectors, who had been criticized for their inexperience.

In 1977, Eula Bingham was named to head OSHA. She had been a professor of toxicology and had served on an OSHA advisory committee concerning the coke oven emissions standard.

Figure 12-3.—Percent Change in Appropriations for Selected Health-Related Agencies 1980-84

SOURCE Budget of the United States Government

Table 12-2.—OSHA Assistant Secretaries and NIOSH Directors

OSHA

1. George Guenther April 1971-January 1973
2. John Stender April 1973-July 1975
3. Morton Corn December 1975-January 1977
4. Eula Bingham April 1977-January 1981
5. Thorne Auchter March 1981-March 1984
6. Robert Rowland July 1984-Present

NIOSH

1. Marcus Key June 1971-September 1974
2. John Finklea September 1974-January 1978
3. Anthony Robbins October 1978-May 1981
4. J. Donald Miller June 1981-Present

SOURCE Office of Technology Assessment

She acted to eliminate a number of the “nit-picking” standards, for which OSHA had been criticized, and emphasized the development of health standards and “generic standards” (those that would cover exposures to a group of substances, such as carcinogens, or would provide worker access to information, such as employer records concerning exposures, medical care, and chemical substance identity). She also established the New Directions grants program and increased the number of OSHA-funded onsite consultative visits, especially for small businesses.

Thorne Auchter, a construction firm manager, took office in 1981. He emphasized a “balanced” approach to OSHA activities and improved management of agency operations, established a new approach for “inspection targeting,” and en-

couraged cooperation with employers, especially concerning negotiations about citations, fines, and abatement. Auchter reconsidered a number of the standards issued in previous administrations, reduced the funding for the New Directions Program, increased the funding for onsite consultation, and encouraged the development of State programs. He resigned in March 1984.

In July 1984, Robert Rowland was named to head OSHA. An attorney, he had practiced law privately before being appointed as the Chairman of the Occupational Safety and Health Review Commission. He served in that position from August 1981 until his appointment as Assistant Secretary for OSHA.

In June 1971, Secretary Richardson of the Department of Health, Education, and Welfare announced the establishment of NIOSH. Marcus Key, M. D., previously chief of the Bureau of Occupational Safety and Health in the U.S. Public

Health Service, was appointed as the first NIOSH Director. He focused on making NIOSH a functioning organization. Key stepped down in September 1974, after 3 years of his 6-year appointment. John Finklea became the second Director of NIOSH in September 1974 and also served 3 years. He emphasized the production of NIOSH criteria documents to be delivered to OSHA.

Anthony Robbins, a former Commissioner for Public Health in Vermont and Colorado, became the third Director in October 1978. He deemphasized criteria documents and focused on health hazard evaluations and epidemiological field studies. He, too, did not complete a 6-year term, but was fired by HHS Secretary Schweiker in 1981. J. Donald Millar took office as the fourth NIOSH Director in June 1981. Millar has taken several steps to improve the quality of NIOSH research.

THE OCCUPATIONAL HEALTH AND SAFETY ADMINISTRATION

Figure 12-4 presents the organization of OSHA. The main activities of its national office in Washington, DC, are performed by seven directorates, which specialize in developing health and safety standards, coordinating operations of OSHA's inspectors, providing educational and service programs, monitoring State plans, and furnishing administrative and technical support. However, the majority of OSHA staff, including its inspectors, are assigned to area offices that are grouped into 10 different regions.

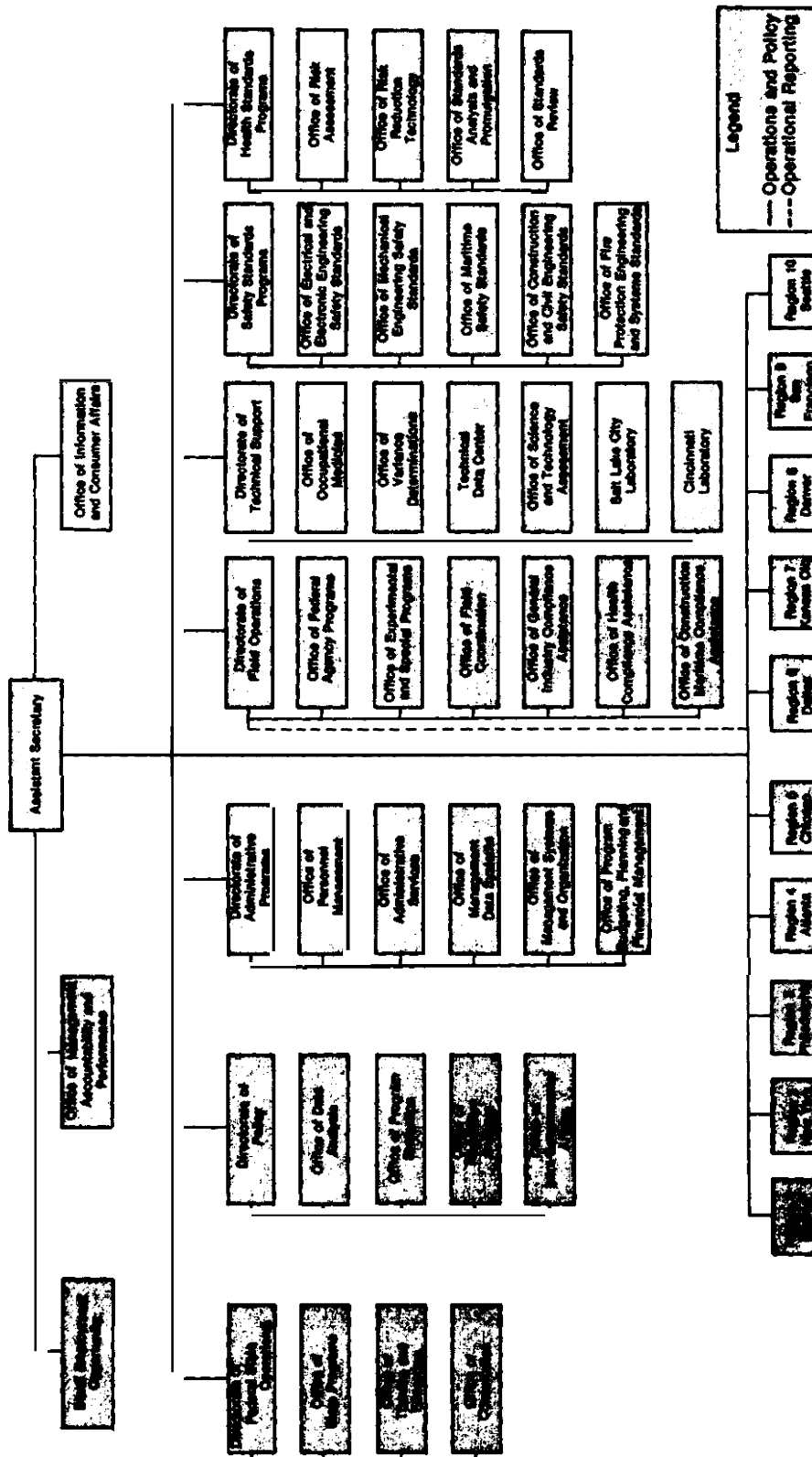
OSHA Standard-Setting

Section 5(a)(1) of the OSH Act, the "general duty clause," imposes a general requirement that workplaces must be kept safe and healthful. It provides that each employer:

. . . shall furnish to each of his employees employment and a place of employment which are free from recognized hazards that are causing or are likely to cause death or serious physical harm to his employees; . . .

The purpose of the general duty clause is to provide employee protection from some of the hazards that are not currently addressed by OSHA's more detailed regulations. The interpretation of the "general duty clause" is complex and controversial (see brief discussion later in this chapter).

Section 5(a)(2), the "specific duty clause," requires employers to comply with the more detailed standards issued by OSHA. These standards are Federal regulations that, for example, require employers to observe certain precautions, conduct their operations in specified ways, or install and use certain kinds of equipment. The OSH Act provided OSHA, in sections 6(a), 6(b), and 6(c), with three different methods to issue health and safety standards. The standards issued under these three methods have been termed interim, new or permanent, and emergency temporary standards (333,408). But many of the "interim" standards have not been changed since OSHA began. At the same time, OSHA has taken actions to change some of the "permanent" stand-



ards. Mintz (307) suggests that OSHA standards be termed: startup standards, standards issued after rulemaking, and emergency temporary standards.

Startup Standards

Congress mandated that OSHA adopt, without additional rulemaking¹, those health and safety standards that had already been established by Federal agencies or had been adopted as national consensus standards (OSH Act, section 6(a)). This authority was limited to the first 2 years after the act went into effect (April 1971 to April 1973).

The established Federal standards had been adopted by the Department of Labor using procedures that included publication of the proposed requirements and provided the public with an opportunity to comment. The national consensus standards, issued by groups such as the American National Standards Institute (ANSI) and the National Fire Protection Association, were defined by the OSH Act as standards created in ways that allowed the consideration of diverse points of view and the formation of a substantial consensus or agreement by interested persons (Section 3(9)). During hearings before the passage of the OSH Act, industry representatives had argued that the consensus standards were already widely accepted by industry (300).

Congress concluded that because these established Federal standards and national consensus standards were already in effect or represented a voluntary consensus, there was no need for further rulemaking. Rather, the existing standards could be used to provide a minimum level of protection until OSHA could issue its own standards.

Many believe that the new agency, however, acted more quickly than required, by completing work on these standards in only 2 months. Unfortunately, a number of the national consensus standards adopted by OSHA were outdated, unnecessarily specific, or unrelated to occupational health and safety. These included a regulation that prohibited the use of ice in drinking water and

a regulation that mandated a specific shape for toilet seats (406). In 1978, under Eula Bingham, OSHA rescinded about 600 of these "nit-picking" provisions that applied to general industry and about 300 that applied to several special industries. However, the process of revising the startup standards continues.

Of more serious consequence, many types of hazards are not adequately addressed by the startup standards. A Presidential task force in 1976 estimated that the OSHA machine-guarding standards (which had been adopted in 1971) covered only 15 percent of the types of machines in use (276). As of 1984, that standard had not yet been revised or expanded. In many cases the organizations that wrote the standards adopted by OSHA in 1971 have revised their standards. OSHA, however, cannot incorporate these changes without going through rulemaking.

Moreover, many of the startup standards specified in great detail the kinds of equipment necessary for compliance. As pointed out by the 1976 task force, this can hinder the development of improved control techniques and lead to unnecessarily costly expenditures for compliance. This task force recommended, and OSHA has accepted, the goal of developing *performance standards* that require employers to control workplace hazards without specifying the details of equipment design. (The task force also recommended that OSHA publish nonmandatory appendixes to provide information on designs that OSHA considers acceptable to meet its performance standards.)

The startup standards were almost exclusively safety standards. Most of the relatively few startup *health* standards had originated in Federal standards adopted under the Walsh-Healey Act prior to the creation of OSHA. These included the Threshold Limit Values for nearly 400 substances that had been set by the American Conference of Governmental Industrial Hygienists (ACGIH) in 1968. In addition, OSHA adopted about 20 ANSI consensus standards that set exposure levels for toxic substances. After eliminating the overlap between these two lists, the startup permissible exposure limits covered nearly 400 toxic substances. Since 1971, the agency has adopted new or revised standards for 23 substances and one physical agent (discussed in the

¹"Rulemaking" refers to the procedures that Federal regulatory agencies use for adopting regulations.

next section). Some of these were revisions of OSHA's startup standards. Thus the total number of OSHA-regulated substances stands today at about 410.

The latest Registry *of the Toxic Effects of Chemical Substances* (586) compiled by NIOSH (as discussed later in this chapter) lists nearly 60,000 separate chemical substances. Not all the 60,000 are found in the workplace and not all are toxic, but there is uncertainty concerning how many hazardous substances are missing from the OSHA list of regulated chemicals. Most of the exposure limits adopted by OSHA have not been revised, and many are now outdated due to increased knowledge about the hazards posed by particular substances. Furthermore, all the startup standards set only a permissible exposure limit. None includes additional requirements for exposure monitoring, medical surveillance, employee training and education, record keeping, or warning labels and signs. (In the mid-1970s, OSHA and NIOSH started actions to add these requirements in what was called the "standards completion project." No regulatory actions were ever completed under that project and it is now "dormant." The only result of that effort is a series of NIOSH publications with recommendations concerning use, monitoring, surveillance, and protective equipment for workers exposed to these substances.)

Standards Issued After Rulemaking

OSHA also has the authority to issue new standards and to modify or revoke existing ones through informal rulemaking. This is authorized by section 6(b) of the OSH Act, which provides for a multistep process. This may start with the receipt of a criteria document from NIOSH, with reports from employers, labor unions, or academics concerning a hazard, or with a petition for a standard from an interested group.

ONHA may convene an ad hoc advisory committee for recommendations. If appointed, such a committee must have an equal number of representatives from labor and management, as well as at least one representative from State health and safety agencies. In addition, other persons with professional expertise may be appointed to the committee. For standards affecting the con-

struction industry, OSHA has adopted a regulation requiring consultation with a standing Construction Safety Advisory Committee. Except for construction standards, OSHA has not used advisory committees to assist in developing standards since the mid-1970s.

In some cases, OSHA publishes an "Advance Notice of Proposed Rulemaking" in the *Federal Register* to solicit information from the public. This step, however, is not required.

The first mandatory step is to publish a "Notice of Proposed Rulemaking" that describes the proposed new rule, modification to existing rules, or revocation of existing rule, and that gives interested persons and organizations time in which to comment. An informal, administrative hearing will often take place, which any interested person or organization can attend to present testimony and to cross-examine other witnesses. The agency may later receive written, posthearing comments. After the final decisions have been made, the agency publishes the text of the standard and a statement of reasons in the *Federal Register*.

A standard typically has staggered startup dates and deadlines. Some provisions go into effect shortly after publication, while others are delayed to allow employers time to plan for compliance. Standards that involve the installation of engineering controls generally allow employers a year or more to complete installation. For example, the OSHA lead standard allows some industries up to 10 years to comply with the requirements for engineering controls.

The agency is also required to develop an economic analysis of the expected effects of the standard. This analysis and the content of the proposed and final regulations are now subject to review by the Office of Management and Budget prior to publication by OSHA. In addition, after final publication by OSHA, a major standard is almost invariably the subject of review by one of the U.S. Courts of Appeals after an interested party challenges its validity. One major issue in the legal challenges to 6(b) rulemaking actions has concerned the interpretation of "feasibility" under the OSH Act, including the extent to which the agency could or must consider employer costs when setting standards (see ch. 14).

Emergency Temporary Standards

OSHA is authorized by section 6(c) of the OSH Act to issue emergency temporary standards (ETS) that require employers to take immediate steps to reduce a workplace hazard. As outlined by the OSH Act, an ETS can be issued after OSHA determines that employees are exposed to a “grave danger” and that an emergency standard is “necessary to protect employees from such danger.” An ETS, issued without providing an opportunity for comments or for a public hearing, goes into effect immediately upon publication in the Federal *Register*. The ETS also initiates the process of setting a standard under section 6(b), with the published ETS generally serving as the proposed standard. The act mandates that a final standard be issued within 6 months of publication of the emergency standard.

Major OSHA Rulemaking Actions

Table 12-3 lists the major health standards issued by OSHA since 1971. Through 1984, OSHA issued 18 separate health standards after rulemaking, or about 3 rules every 2 years. The

average time required from first announcement of proposed rulemaking until final publication amounts to a little more than 2 years, although the time for particular standards varied from 6 months to 6 years. (This does not include additional time for resolution of legal challenges after publication of a final rule, nor does it consider the standards that OSHA has begun to develop but has not issued in final form.)

Ten of OSHA’s final actions on health standards established new Permissible Exposure Limits (PELs) and other requirements for monitoring and medical surveillance (asbestos, vinyl chloride, coke oven emissions, benzene, DBCP, arsenic, cotton dust, acrylonitrile, lead, and ethylene oxide). Two others did not institute or change a PEL: the “14 carcinogens” standard created new requirements for work practices and medical surveillance for a group of carcinogens, while the hearing conservation amendment modified an existing standard with requirements concerning noise monitoring, audiometric testing, hearing protection, employee training, and record keeping.

Thus 12 separate proceedings resulted in new or revised requirements concerning 24 specific substances and 1 physical agent. However, the hearing conservation amendment, the 1978 standard for benzene, and the requirements for one of the 14 carcinogens have been ruled invalid by the courts. (As described in table A-1 in app. A, some of these standards are still under judicial review and several are being reconsidered by OSHA. The application of some requirements in several industries has also been delayed by OSHA or the courts.)

Three regulatory proceedings established new “generic” requirements. The access to records standard created requirements concerning the keeping of exposure and medical records and for providing employee access to those records, while the hazard communication standard requires that hazardous substances be labeled and information provided to employees about the substances and the precautions to be taken. The cancer policy set a general OSHA policy concerning future standards regulating carcinogens. Finally, three proceedings reconsidered and then modified existing requirements (respirator fit-testing for lead exposure, coal tar pitch volatiles, and hearing conservation).

Table 12-3.—OSHA Health Standards

OSHA regulation	Final standard
1. Asbestos ^{a,b}	6/07/72
2. Fourteen carcinogens	1/29/74
3. Vinyl chloride ^a	10/04/74
4. Coke oven emissions	10/22/76
5. Benzene ^a	2/10/78
6. DBCP ^{a,c}	3/1 7178
7. Inorganic arsenic.	5/05178
8. Cotton dust/cotton gins	6/23/78
9. Acrylonitrile ^a	10/03/78
10. Lead.	11/14/78
11. Cancer policy.	1/22/80
12. Access to employee exposure and medical records	5/23/80
13. Occupational noise exposure/hearing conservation.	1/16/81
14. Lead—reconsideration of respirator fit-testing requirements	11/12/82
15. Coal tar pitch volatiles—modification of interpretation	1/21/83
16. Hearing conservation-reconsideration	3108/83
17. Hazard communication (labeling)	1/25/83
18. Ethylene oxide	6122184

^aSubject of an Emergency Temporary Standard.

^bEmergency standards were issued for asbestos in 1971 and 1983 c1,2-dibromo-3-chloropropane.

NOTE: Additional details on these standards can be found in table A-1 of appendix A.

SOURCE: Office of Technology Assessment.

Table 12-4 lists the safety standards issued by OSHA after rulemaking. In OSHA's first 13 years there were 26 such regulations. Many of these safety standards have involved rewriting regulations adopted as startup standards, while two proceedings have revoked a number of specific provisions and advisory language that OSHA inherited from the consensus standards adopted in 1971. In general, these changes in safety standards did not impose large increases in costs to employers. Most of them can be grouped by subject: electrical, mechanical, fire protection, construction, or maritime safety.

Tables 12-3 and 12-4 also indicate the hazards and substances for which OSHA has published emergency temporary standards. In all, there have been seven separate emergency actions concerning 19 specific substances, one ETS concerning an activity (diving), and an attempt to regulate a

group of 21 pesticides with an emergency standard. (It should be noted that asbestos has been the subject of an ETS twice—in 1971 and in 1983.) Of the 11 completed proceedings on specific substances, six began with the issuance of an ETS. But because an ETS requires employers to take action before giving them an opportunity to file comments or objections, these emergency actions have often been controversial and several of them have been ruled invalid by reviewing courts. OSHA's successes with emergency standards have been those cases in which labor, management, and professionals all agreed that a problem existed and that swift action was appropriate. But in those cases challenged by employers, the courts have been reluctant to allow OSHA to impose an ETS.

Box N outlines OSHA's regulation of vinyl chloride monomer. See Ashford (30), Kelman (245), and McCaffrey (290) for short histories of

Table 12-4.--OSHA Safety Standards

OSHA regulation	Final Standard
1. Miscellaneous amendments for construction	2/17/72
2. Cranes/derricks (load indicators)	7/14/72
3. Roll-over protective structures (construction)	4/05/72
4. Miscellaneous amendments for construction	11/16/72
5. Power transmission and distribution	11/23/72
6. Scaffolding, pump jack scaffolding, and roof catch platforms	12/02/72
7. Lavatories for industrial employment	5/03/73
8. Trucks, cranes, derricks, and indoor general storage	6/01/73
9. Temporary flooring—skeleton steel construction	7/02/74
10. Mechanical power presses—"no hands in dies")	12/03/74
11. Telecommunications.	3/26/75
12. Roll-over protective structures for agricultural tractors	4/25/75
13. Industrial slings.	6/27/75
14. Guarding of farm field equipment, farmstead equipment, and cotton gins	3/09/76
15. Ground-fault protection	12/21/76
16. Commercial diving operations.	7/21/77
17. Standards revocation	10/24/78
18. Servicing multi-piece rim wheels	1/29/80
19. Fire protection	9/12/80
20. Guarding of low-pitched roof perimeters during the performance of built-up roofing work.	11/14/80
21. Design safety standards for electrical standards	1/16/81
22. Latch-open devices (on gasoline pumps)	9/07/82
23. Diving exemptions	11/26/82
24. Marine terminals	7/05/83
25. Servicing of single-piece and multi-piece rim wheels	2/03/84
26. Revocation of advisory "should" and repetitive standards	2/10/84

^aSubject of an Emergency Temporary Standard

NOTE: Additional details on these standards can be found in table A-2 in appendix A.

SOURCE: Office of Technology Assessment.

Box N.—Regulation of Vinyl Chloride

Vinyl chloride was first synthesized in the 19th century, but it did not become commercially important until the 1930s when it was discovered that its polymer, polyvinyl chloride (PVC), could be used to make products that resembled natural rubber. By the 1970s, PVC had become the second most widely used plastic in the United States, used in the production of a large number of industrial and consumer goods.

Prior to 1970, several health effects had been associated with exposures to vinyl chloride, including liver damage, dermatitis, effects on the central nervous system, and a bone disease known as osteosarcoma. In 1966, the American Conference of Governmental Industrial Hygienists adopted a Threshold Limit Value of 500 parts per million (ppm) for vinyl chloride, based on its acute liver toxicity. This limit was adopted by OSHA in 1971 as a startup standard under section 6(a) of the OSH Act.

A group of Italian scientists first discovered that vinyl chloride was a carcinogen when they found tumors in rats that had been exposed to very high levels (30,000 ppm) of vinyl chloride vapors. This finding was reported at a U.S. conference in July 1970. In January 1973, another Italian researcher confirmed the cancer-causing properties of vinyl chloride, this time at levels (250 ppm) below the OSHA standard, but these results were not widely disseminated. There was no regulatory activity based on these animal studies.

In December 1973, the plant physician at a B.F. Goodrich PVC plant in Louisville, KY, learned that a worker had died of a very rare form of cancer—angiosarcoma of the liver. The physician recalled that another worker from the same plant had also died of this disease and began to investigate the possible work-relatedness of these two deaths. Shortly thereafter, a third angiosarcoma death was discovered, and B.F. Goodrich informed NIOSH and the public about these deaths in January 1974. NIOSH and personnel in several plants with vinyl chloride exposures, conducted industrial hygiene surveys, and made recommendations for controls.

Shortly later, OSHA announced that it would hold a public fact-finding meeting in mid-February 1974. In the meantime, Goodrich had discovered two additional angiosarcoma deaths and at about the same time the results of the study linking exposures of 250 ppm to cancer in rats were publicly released. In April 1974, OSHA issued an emergency temporary standard limiting exposures to a 50 ppm ceiling.

By May 1974, OSHA learned that two exposed to 50 ppm had also developed liver tumors. In the months after the original Goodrich announcement, a number of other worker deaths from angiosarcoma had been discovered. (By August 1974, 21 such cases had been uncovered, and preliminary autopsy results also indicated an increase in lung, brain, and the lymphatic system cancers among workers exposed to vinyl chloride (224,371)). With this accumulating evidence, OSHA decided to promulgate a permanent standard. In May 1974 it published a proposal to limit employee exposures to 1 ppm of vinyl chloride using a specified measurement technique. This followed an earlier NIOSH report (224,371), which had concluded that this method of measurement could be used to detect exposures as low as 1 ppm.

OSHA then conducted the public hearings held in June; first, whether the standard was supported by scientific evidence, and second, whether it was technologically and economically feasible. Industry representatives did not dispute the evidence that vinyl chloride was a carcinogen, but they did argue that there was not enough evidence to show that it was a human carcinogen at levels below 250 ppm. They also argued that it was technologically impossible to meet the "no detectable liver" standard. If OSHA issued this standard, these representatives argued, the entire vinyl chloride industry would shut down. A study they had commissioned concluded that if such a standard were issued, it would lead to a loss of 1.7 to 2.2 million jobs and a loss of \$45 billion to \$70 billion in gross national product. Labor unions and a public interest group, on the other hand, strongly supported the OSHA proposal at the hearings.

OSHA published the final standard for vinyl chloride in October 1974. Instead of setting an exposure ceiling at a "no detectable level," it issued a limit of 1 ppm, measured as an 8-hour time weighted average (TWA), and a ceiling limit of 5 ppm measured over any 15-minute period. Setting a TWA of 1 ppm, instead of an exposure ceiling set at a "no detectable level," represented some concession to the concern about the feasibility of the standard. But in the subsequent court challenge, industry attorneys argued that even this standard was technologically impossible. The Court of Appeals for the Second Circuit, however, rejected the industry arguments and upheld the OSHA standard.

Actual compliance with the standard occurred almost as swiftly as the regulatory proceedings. The technology to reduce worker exposures to within the allowable limits was developed quickly (see ch. 5). Some of these control techniques also increased productivity by reducing leaks, improving product quality, reducing the time for cleaning the reactor vessels, and combining previously separate processes. Several companies were able to sell the new production techniques to other companies, thus obtaining income through licensing fees (142). Only a few months after the standard went into effect, it was reported by a trade journal that compliance would "not . . . be a serious operating or cost problem" (142, 149). OSHA inspection data from 1976 and 1977 revealed that more than 90 percent of the samples taken were in compliance with the standard (142).

A trade association estimated in 1975 that the vinyl chloride industry invested \$200 million in capital expenses and \$100 million in research costs (142). A group of researchers at the University of Pennsylvania concluded that the industry spent between \$158 million and \$182 million in capital costs for compliance with the standard. In addition, they estimated that compliance might increase annual operating costs by \$7 million to \$10 million (332). These estimates, however, do not take into account the increases in production efficiency, the reduction in raw materials costs, and the licensing revenues that resulted from the standard (142).

The Pennsylvania researchers also concluded that several vinyl chloride plants had shut down or reduced production after the standard was issued, resulting in the loss of 375 production jobs (although only 60 workers were actually laid off) and a 15 to 20 percent cutback in industry capacity. The researchers noted that these plant cutbacks are the result of several factors, although the industry representatives they interviewed frequently cited the OSHA standard as "the straw that broke the camel's back" (332). The production cutbacks, however, appear to have occurred in older plants and at a time of slack demand for vinyl chloride products (142). The other existing plants appeared to have had little difficulty in complying with the standard.

In addition, construction costs for new plants were not significantly increased by the OSHA standard. In fact, by 1979, the industry had added new plants that increased vinyl chloride production capacity by 41 percent and PVC capacity by 85 percent over 1974 levels. Since the standard was issued in 1974, several existing producers of vinyl chloride and PVC have expanded their operations and a number of firms have entered these markets for the first time (142, 332). These expansions have created an estimated 2,000 jobs since 1974, more than offsetting the estimated job losses. In addition, during the years immediately after the issuance of the standard, the growth rates for these industries were substantially above the average for U.S. industry and profits increased (142).

Irving Selikoff has summarized the events surrounding the regulation of vinyl chloride:

It was a success for science in having defined the problem; success for labor in the rapid mobilization of concern; success for Government in urgently collecting data, evaluating it, and translating it into necessary regulations; and success for industry in preparing the necessary engineering controls to minimize or eliminate the hazard (671).

SOURCES: (36, 75, 142, 149, 225, 245, 332, 365, 381, 412, 561, 571, 615, 616, 617, 671.)

some of OSHA's standards. Mintz (307) provides a number of excerpts of the formal documents concerning many of these standards.

Enforcement

Inspections and enforcement are the heart of the regulatory scheme in the OSH Act. Congress created an agency that is predominantly an enforcement agency conducting unannounced inspections and levying penalties for the "first instances" of violations, as well as for repeated violations.

The goals of enforcement are both to correct identified hazardous conditions in inspected plants and to provide an incentive for uninspected plants to eliminate or reduce hazards. This second goal has often been called "voluntary compliance," although it is misleading to label as "voluntary" actions taken by employers in the face of mandatory standards with the potential threat of inspection and civil penalties. "Reinspection compliance" is perhaps a better term (408). In practice, the incentive for preinspection compliance is actually quite small, because of both the low probability of inspection and the low level of penalties (see discussion later in this section).

Inspection Types and Priorities

OSHA conducts a number of different kinds of inspections. The first basic division is between in-

spection for safety hazards and those for health hazards (table 12-5). The percentage of health inspections increased from about 6 percent in the early 1970s to a peak of about 19 percent in fiscal year 1979. This has fallen slightly to a range of 17 to 18 percent in the last three fiscal years. (The decline would be larger, to about 15 percent, if "records review" safety inspections were included in the totals on table 12-5.)

OSHA also classifies its inspections by priority. It attempts to investigate first those hazards posing the greatest threat to employee health and safety. The order of priority is:

- Imminent danger
- Catastrophe and fatality investigations
- Employee complaints
- Special inspection programs
- Programed inspections.

Imminent danger inspections are conducted when OSHA learns of a hazard that can be expected to cause death or serious physical harm before it could be eliminated through normal enforcement activity. Catastrophe and fatality investigations, second on the list, are spurred by reports of fatal occupational injuries or of incidents that result in the hospitalization of five or more employees.

The third priority is employee complaints. Under section 8(f) of the Act, employees and their representatives who believe that an employer is

Table 12-5.--Federal OSHA Safety and Health Inspections

Federal OSHA fiscal year	Establishment Inspections (number)	Safety Inspections (number)	Safety Inspections (percent)	Health Inspections (number)	Health Inspections (percent)
1973	48,409	45,225	93.4	3,184	6.6
1974	77,142	73,189	94.9	3,953	5.1
1975	80,978	75,459	93.2	5,519	6.8
1976	90,482	82,885	91.6	7,597	8.4
1977	60,004	50,892	84.8	9,112	15.2
1978	57,278	46,621	81.4	10,657	18.6
1979	57,734	46,657	80.8	11,077	19.2
1980	63,404	51,565	81.3	11,839	18.7
1981	56,994	46,236	81.1	10,758	18.9
1982	52,818 ^a	43,609	82.6	9,209	17.4
1983	58,516 ^b	48,269	82.5	10,247	17.5
1984 (first six months)	30,606 ^c	25,086	82.0	5,520	18.0
Total	734,365	635,693	86.6	98,672	13.4

^aDoes not include 8,444 "Records Review" inspections.

^bDoes not include 10,402 "Records Review" inspections.

^cDoes not include 4,953 "Records Review" inspections.

SOURCE: Office of Technology Assessment, based on data supplied by OSHA.

violating a health and safety standard may request an inspection. OSHA schedules inspections to respond to what it determines are valid complaints. The fourth priority-special inspection programs—includes programs to give special attention to certain designated hazards and industries. Over the last decade, the agency has announced several such programs: the Target Industries Program, the Target Health Hazard Program, and the National Emphasis Program. Currently, OSHA is giving special attention to the construction industry, oil-well drilling, and grain elevators.

The lowest priority inspections, but by far the most frequent, are programmed ones. (In the past, these have been termed “general schedule” inspections.) Although sometimes called “random inspections,” they now focus on industries with high injury rates or those with known health hazards. Over the past 12 years, OSHA has used a series of different scheduling systems. For safety inspections, industries are ranked using injury rate information from the Bureau of Labor Statistics (BLS) Annual Survey. Only industries with injury rates above the national average for the private sector are now selected for safety inspections. For health inspections, OSHA now selects industries based on the last 5 years of OSHA health inspections. Industries are ranked based on their respective violation rates. Individual establishments are selected by using commercially available lists of employers to identify the establishments with 10 or more employees in these selected industries (635).

One other inspection category should be noted. Follow-up inspections can be conducted at any time to determine if workplace conditions have changed following an inspection. In particular, OSHA is interested in verifying that abatement of a hazard has taken place by a scheduled date. (For information on the types of inspections, see 307,333,408,635.)

OSHA has, through policy changes, varied the distribution of inspection activity among these categories. For example, the proportion of inspections triggered by employee complaints increased from about 10 percent in fiscal year 1976 to over 30 percent in fiscal year 1977. In recent years the percentage of complaint inspections and follow-

up inspections has declined, while the percentage devoted to programmed inspections has increased (see table A-5 in app. A).

Enforcement Procedures

The conduct of all these inspections follows the same general outline. The inspector (formally, the Compliance Safety and Health Officer) arrives at the workplace, almost always without advance warning, presents his or her credentials, and speaks with the employer, manager, or other person in charge. An opening conference is held with the employer (and a union representative, if any) to describe the purpose of the visit. The inspector asks to see any employer-maintained records that might be relevant (logs of injuries and illnesses, exposure and medical surveillance records, etc.).

Then the inspector conducts a “walk-around,” visiting all or part of the workplace. Both the employer and an employee representative have the right to accompany the inspector on this tour. The inspector observes workplace conditions and takes notes, photographs, and exposure samples as may be appropriate. After the walk-around, a closing conference is held (either jointly with both employer and employee representatives, or separately), at which time apparent violations of OSHA standards are discussed. Normally, citations are not issued at this closing conference, but are mailed later. This is to allow consultation between the inspector and the area director and to obtain the results of laboratory analysis of exposure samples.

The Fourth Amendment to the U.S. Constitution generally protects persons from “unreasonable searches and seizures” by government officials. There are certain circumstances in which police are allowed to search without consent, but in general a warrant must be obtained for such a search. The question of whether OSHA is also subject to these requirements in conducting its inspections of workplaces was raised most prominently in a 1976 case concerning an Idaho employer, *Barlow's Incorporated*. The case was ultimately appealed to the Supreme Court, which ruled that OSHA had the constitutional authority to conduct inspections, but that if the employer

did not voluntarily consent to the inspection, the agency would need to obtain a court-issued warrant (see 307,333,408).

Although Congress has never amended the OSH Act, it has limited OSHA inspection activity by attaching restrictions to OSHA's appropriations. Currently OSHA is prohibited from conducting programmed safety inspections in establishments with 10 or fewer employees in an industry with a led-workday rate lower than the national average; from assessing penalties for the "first instances" of nonserious violations (unless 10 or more total violations are cited); from assessing penalties against an employer with 10 or fewer employees who had requested an onsite consultation and is acting to eliminate identified hazards; from issuing or enforcing standards for small farming operations (10 or fewer employees); and from activities that would affect recreational hunting, shooting, or fishing. There are also restrictions on visits designed to monitor State programs and on OSHA activities on the Outer Continental Shelf (489a).

Current Inspection Targeting

A new procedure for safety inspections was instituted on October 1, 1981. Since then, OSHA inspectors conducting programmed safety inspections have also examined the injury and employment records of the employer and calculated an average lost-workday case rate for the previous 2 years (or 3 years, for establishments with 10 to 20 employees). If the lost-workday case rate is less than the national average rate for manufacturing, the inspection is terminated. The national average injury rate is derived from the BLS Annual Survey and currently is 4.2 cases per 100 full-time employees (644). (In table 12-5, these visits are termed "records review." Termination of inspection because of a below-average injury record does not currently apply to safety inspections in the construction industry, nor does it apply to health inspections in any industry.)

In theory, this policy of ending inspections for "low-hazard" establishments can create an incentive for employers to take steps to reduce injury rates. It also may help OSHA to use its scarce inspection resources efficiently by concentrating attention on establishments with higher-than-average

injury rates. There is concern, however, that this policy may also serve as an incentive for systematic underrecording of the number of injuries, although inspectors are instructed to verify the accuracy of employer injury records.

Compliance with Standards and the General Duty Clause

Unless they have obtained a variance, employers are required by section 5(a)(2) of the OSHA Act (the specific duty clause) to comply with the terms of OSHA standards and regulations. During inspections, inspectors look for any violations, following the procedures and interpretations issued by OSHA in its *Field Operations Manual*, *Industrial Hygiene Manual*, and program directives.

Employers must also comply with section S(a)(1) of the act—the general duty clause. This has been used to cover hazards not treated by OSHA's more specific standards. There has been controversy concerning the interpretation of this clause and its application to employers by OSHA.

To prove a violation of the general duty clause, OSHA must demonstrate that the employer failed to render the workplace free of a "recognized" hazard that was causing or was likely to cause death or serious physical harm. OSHA and the courts have held that a hazard is recognized if the employer had knowledge of the hazard or if it is of common knowledge in the industry in question and detectable by the senses or by techniques generally known and accepted by the industry (307, 333,408). OSHA uses a number of different sources of information to demonstrate that a hazard is "recognized," including voluntary standards, statements of industry experts, implementation of abatement programs by other companies in the same industry, manufacturers' warnings, or studies conducted by the industry, its employees, the government, or insurance companies (203).

The Role of OSHRC

An employer who disagrees with OSHA concerning a citation, a proposed penalty, or the date for abatement of the hazard can file a notice of contest. Employees also have an independent right to contest the reasonableness of the length of the

proposed period of time for abatement of a hazard. Unless contested within 15 days, an OSHA citation becomes final. When contested, a hearing is held before an Administrative Law Judge (ALJ), who is an employee of the OSHRC, an independent review body.

At the hearing before the ALJ, both OSHA and the employer present their sides of the case. Affected employees and their representatives have a right to participate in these proceedings. During the period when the citation is under contest, no abatement is required.

The ALJ examines the evidence and decides whether to affirm, vacate, or modify OSHA's citation and proposed penalties. After this decision, any party can petition the Occupational Safety and Health Review Commission to review the decision of the ALJ. The Commission can grant such review either upon request or by its own choice. Unless it is ordered to be reviewed within 30 days by a member of OSHRC, the ALJ decision becomes a final order of the Commission. Any adversely affected person can then petition a U.S. Court of Appeals for judicial review (307,333,408).

Informal Conferences

Current OSHA policy encourages the use of informal conferences between employers and OSHA's area directors to reach settlements concerning citations. Using such conferences to settle citations might facilitate prompt abatement of hazards and improve employee health and safety, as well as reduce the time spent by government personnel, employers, employees, and their representatives resolving contested citations. The first directive on this was issued by Eula Bingham in 1980.

Assistant Secretary Theme Auchter strongly encouraged the use of these settlements by OSHA's Area Directors. During his tenure as head of OSHA, the number of informal settlements increased dramatically. But there have been suggestions that some of these settlements may not sufficiently protect worker health and safety (440). Moreover, if the settlement agreement provides for eliminating penalties, or reducing them to very low levels, the incentive for preinspection compliance is virtually eliminated.

Recent court decisions limit the rights of employees and unions to object to settlements that they view as insufficiently protective. If the employer is no longer contesting the citation, the rights of employees and unions to object is limited to the "reasonableness of the abatement period."

(In addition, OSHA enforces the provisions of the OSH Act that prohibit employers from discriminating against employees who exercise any of the rights provided by the OSH Act. See ch. 15 for a discussion of this protection and other employee rights.)

Incentives for OSHA Compliance

In theory, OSHA's enforcement activities will lead employers to comply with OSHA regulations and to improve employee health and safety. But in practice OSHA has never had the resources to inspect more than a relative handful of the Nation's workplaces. In addition, the average penalties levied for violations uncovered in the "initial" visits to workplaces are very small, especially when compared with the costs of many types of controls (see box T in ch. 15). Thus, there is only a weak incentive for employers to comply prior to an OSHA inspection.

In fiscal year 1983, OSHA conducted about 58,500 establishment inspections and about 10,400 "records *review*" visits. The various State programs conducted an additional 104,000 establishment inspections and about 2,500 "records review" visits. This makes for a Federal-State total of about 162,000 establishment inspections and 13,000 "records review" visits. As there are about 4.6 million private sector establishments in the United States (553), OSHA and the State programs can inspect less than 4 percent of U.S. establishments.

The probability of a health inspection is substantially less than the probability of a safety inspection. Of all fiscal 1983 inspections, about 21,000 were health inspections. Thus, of each 1,000 establishments, about 31 receive a safety inspection, 3 receive a "records review" visit (which covers only safety), and fewer than 5 receive a health inspection.

OSHA and the States do, however, concentrate their activities on certain industries. For example,

in fiscal year 1983 the agency conducted about 58 percent of its establishment inspections in construction and about 33 percent in manufacturing. This would imply about 54,000 establishment inspections in the approximately 321,000 manufacturing establishments nationwide (assuming that the State plans conduct the same proportion of inspections in manufacturing as does OSHA). Therefore, OSHA and the State programs are currently able to inspect a maximum of about 17 percent of manufacturing establishments (assuming one inspection per establishment in any given year).

At this rate of inspection, OSHA and the State programs can inspect each establishment in manufacturing only once every six years. The inspection rate for most other industries with fixed establishments—transportation, wholesale and retail trade, finance, services, and agriculture—is substantially less than this. (Because of the limits of available statistics, it is difficult to estimate the probability of inspections at construction sites.)

Even if an establishment is inspected, the penalties for violations are quite low. The average proposed penalty for a “serious” violation (one that creates a “substantial probability [of] death or serious physical harm”) for OSHA and the State programs in fiscal year 1983 was about \$172. Of course, this is only for violations that are actually discovered and cited, and does not include the penalties levied for “other than serious,” “willful,” “failure to abate,” and “repeat” violations. In fiscal year 1983, OSHA and the State programs proposed penalties totaling about \$13.4 million for all violations in the 162,000 establishment inspections that were conducted, an average penalty of about \$83 per inspection.

As discussed in chapter 14, employers making decisions to maximize profits will tend to choose the least costly alternative. Thus the employer faces a choice of spending a certain sum to control a hazard and comply with OSHA standards, or not controlling a hazard and possibly being inspected and penalized for noncompliance. The decision will be based on a number of factors, including the probability of inspection and the likely penalties if an inspection takes place and the hazard is detected.

As discussed above, for establishments in manufacturing, the probability of inspection is only about one in six, while the average proposed penalty for “serious” violations was about \$172. A decision based purely on a desire to maximize profits would be to spend on controls only when the annual cost of controls is less than the annual expected costs of noncompliance. If it is assumed that the inspection will detect the violation, the expected costs for each serious violation equals one-sixth of \$172 or about \$29. The average proposed penalty for all violations was \$39. With a one in six probability of inspection, this implies an expected penalty for noncompliance of about \$6.50. (See 64,127,287, and 685 for similar estimates based on older data.)

Of course, employers may take actions out of altruistic concern about the health and safety of their workers or because of the other incentives described in chapter 15. In addition, for employers who have been inspected recently, there is the threat of a repeat inspection. In these cases, the fines for “failure to abate” an identified hazard can be very substantial. Thus the incentives for compliance are much larger after an OSHA inspection. What is clear, however, is that the economic incentive for *preinspection* compliance is small.

In fiscal year 1983, compared with fiscal year 1980, OSHA issued 40 percent fewer serious violations, 55 percent fewer repeat violations, and 85 percent fewer willful violations. Consequently, the total penalties it has proposed declined by nearly 60 percent (see tables A-8 and A-10 in app. A). This change has also been accompanied by a decline in the number of inspections with contested citations (from nearly 12 percent of inspections to less than 2 percent) and may lead to prompt abatement of hazards in firms that have been inspected. However, the reduction in penalties also significantly weakens the small economic incentive for employers to comply with OSHA standards.

At least one commentator has suggested that “OSHA will not be a meaningful deterrent until the cost of noncompliance becomes greater than the cost of compliance” (406). Violations of some requirements for pollution control have been

penalized with fines that are equivalent to the financial benefits that a firm receives from noncompliance. This began in 1973 in Connecticut, and at the Federal level with the 1977 Clean Air Act Amendments. Recently, the Environmental Protection Agency announced plans to extend this policy to other pollution control requirements, along with other changes in its policies concerning civil penalties (163).

An Interagency Task Force on Workplace Safety and Health recommended that OSHA develop procedures to set its penalties at levels equal to the benefits of noncompliance (228). Such a change, although clearly providing employers a larger incentive to comply with OSHA standards, would probably increase the level of controversy in OSHA enforcement proceedings.

Public Education and Service

The third major category of OSHA activities can be called public education and service. This includes OSHA-funded consultation, the projects assisted by grants under the New Directions program, and OSHA's "voluntary protection programs." These activities, although different in many ways, are all designed to improve workplace health and safety through methods other than direct standard-setting and enforcement.

The OSH Act devotes only a few lines to education and service activities, in contrast to the many paragraphs establishing the new agencies and specifying the authority of these agencies for standard-setting, enforcement, and research. Section 2(b)(2) declares that one purpose of the Act is to

... encourage] employers and employees in their efforts to reduce the number of occupational safety and health hazards at their places of employment, and to stimulate employers and employees to institute new and to perfect existing programs for providing safe and healthful working conditions; . . .

Section 21(c) provides specific authorization for OSHA to conduct "education and training of employers and employees in the recognition, avoidance and prevention of unsafe or unhealthful working conditions" and to "consult with and advise employers and employees, and organizations

representing employers and employees as to effective means of preventing occupational injuries and illnesses. "

Consultation

Consultation is the provision of information, measurements, and advice about controls without threat of citation or penalty. Section 9(a) requires that when OSHA personnel discover violations of standards, the agency "shall with reasonable promptness issue a citation to the employer" (emphasis added). This absolute language has been interpreted to prohibit the agency from engaging in employer consultation at the worksite. Rather, OSHA personnel must issue citations if violations are found. This language originated in response to the history of frequently ineffective State health and safety agencies, which prior to 1970 often gave inspectors the discretion of issuing or not issuing citations and penalties.

OSHA, therefore, has limited its direct consultation to phone calls, letters, office visits, and speeches at employer gatherings. Partly from congressional interest, expressed through proposed legislation and the appropriations process, and partly from OSHA itself, actions have been taken to provide for onsite consultation for employers desiring this service. Because of the section 9 language, Federal OSHA personnel do not themselves conduct these visits. Rather, through various contractual and grant mechanisms under sections 18(b) and 7(c)(1), OSHA pays for visits by State personnel (usually in departments of labor, industry, or health) or private consultants.

The purpose of the onsite consultation program is to provide employers with a confidential evaluation of the health and safety hazards in their workplaces, and to recommend means of hazard abatement. An onsite consultation will let an employer know how the business measures up to the relevant OSHA standards. This service is provided at no cost to the employer, and priority is given to requests from small businesses. Visits occur only at the request of the employer and the results of the visit are provided only to the employer. Consultation is not available to employees or their unions, nor do they have a right to the information provided to the employer by the

consultant, although employers may voluntarily turn that information over to employees. This program has increased substantially from 1975 to today. In fiscal year 1983, OSHA funded about 28,000 onsite visits, at a cost of \$23.4 million (see table 12-6).

In 1978, the General Accounting Office (GAO) issued a report criticizing OSHA's management of the consultation program, suggesting that OSHA's policies were not sufficient to ensure protection of worker health and safety (505). Changes in the program have been made since then, but a continuing controversy concerns the relative emphasis of enforcement versus consultation, which parallels the debate about the relative merits of mandatory standards versus voluntary efforts. Many think that Government should engage in consultation in order to assist well-meaning but ignorant employers to improve health and safety. Others suggest that such an approach is largely ineffective and tends to divert resources from enforcement activities that require, rather than merely encourage, health and safety improvements.

In 1982, OSHA began an experimental program in two regions to grant employers a one-year exemption from programmed inspections if they apply for and receive a health and safety consultation. In 1984 that program was made permanent and extended nationally. Now employers who agree to a comprehensive onsite consultation, correct all hazards detected during the consultation, and implement the "core elements of an effective safety and health program" can be given a one-year exemption from programmed inspections (355, 648). However, given the low probability of an inspection, this one-year exemption may not represent a very large incentive to participate in this program.

OSHA has also modified its policy concerning the provision of onsite information by agency inspectors. OSHA still issues citations for apparent violations, but inspectors are now required to provide "general assistance" to employers in identifying abatement methods for alleged violations (629). In addition, OSHA has recently announced plans to create "full-service area offices." The goal is the creation of "resource centers" that employers can use to obtain information on occupational safety and health and on compliance with OSHA standards.

New Directions Program

The New Directions program was established by OSHA in 1978 to provide grants to employee, employer, educational, and nonprofit organizations for the purpose of providing workplace health and safety training, resources, and services for employers and employees. Grantees have used these funds to develop educational materials, conduct training sessions, provide technical assistance concerning health and safety hazards, and hire technical staff. OSHA has provided the bulk of the funds for this program, and additional money has come from the National Cancer Institute, NIOSH, the Federal Emergency Management Agency, and the National Institute of Mental Health (636).

The program has recently been cut back substantially, from \$13.9 million in fiscal year 1981, to \$6.8 million for fiscal years 1982 and 1983. (This does not, however, include funds from the National Cancer Institute that are also included in this program.) Similarly, the number of organizations receiving grants has declined from 156 in fiscal year 1980 and 142 in fiscal year 1981 to 100 in fiscal year 1983 (34).

Table 12-6.—OSHA Onsite Consultation Program

	1975	1976	1977	1978	1979	1980	1981	1982	1983
Budget (in millions of dollars)	3.0	9.0	9.0	11.5	17.0	17.0	21.0	21.0	23.4
Requested consultations (estimated) . .	3,500	10,500	11,750	17,400	20,750	22,650	22,304	28,192	30,706
Visits conducted	3,357	10,527	11,326	16,882	20,231	22,110	21,820	27,477	28,272
Serious hazards			Data not available					25,361 ^a	28,849
Other-than-serious hazards			Data not available						68,059 ^b
Cost per consultation	\$ 894	\$ 855	\$ 795	\$ 681	\$ 840	\$ 769	\$ 962	\$ 764	\$ 827

^aSerious hazards total is for the last three quarters of fiscal year 1982 only.

^bOther-than-serious hazards total is for the last two quarters of fiscal year 1983.

SOURCE: OSHA.

Voluntary Protection Programs

In 1982, OSHA created three programs that both recognize the achievements of companies that are “leaders” in providing health and safety to their employees and provide additional opportunities for OSHA-employer consultation and cooperation. Collectively referred to as “voluntary protection programs,” they are individually named: “Star,” “Try,” and “Praise.” They are a mixture of consultation and recognition for superior performance. In the course of developing a program, OSHA personnel may make an onsite visit and offer suggestions for program improvement. So far, only a handful of companies have applied to participate in these programs. Participating companies are exempted from OSHA programmed inspections and are promised expedited action on variance applications.

These programs represent a more cooperative approach toward employers than OSHA has taken in the past and are intended to enhance worker health and safety. Critics of voluntary protection, on the other hand, are concerned about the general policy of exempting participating companies from scheduled inspections and fear that these programs divert OSHA resources away from inspections and standard-setting activity,

Other Programs

OSHA has also, from time to time, set up cooperative programs with trade associations, unions, etc. to disseminate health and safety information. In 1982, for example, OSHA agreed to assist the American Electronics Association with its efforts to conduct training courses and prepare booklets on health and safety. Another agreement was signed with the National Agricultural Chemicals Association to develop a slide/tape program on good workplace practices for pesticide manufacture and formulation (632).

OSHA also has an in-house training institute in Des Plaines, IL. It offers 52 health and safety courses of 1 to 2 weeks each at no cost to the students. Since its start in 1972, approximately 40,000 trainees have attended the institute. The training is generally designed to meet the advanced training needs of OSHA Compliance Officers, State agency personnel, and staff from

other Federal agencies who need health and safety training. OSHA also makes available a certain number of classroom spaces for private sector personnel. In fiscal year 1983, approximately 6,700 trainees completed a course at the OSHA institute—nearly 1,850 from Federal OSHA, about 1,650 from State agencies, 2,800 from other Federal agencies, and about 500 from the private sector (34,630,636).

State Programs and Other Federal Agency Activities

State Programs

Many who supported passage of the Occupational Safety and Health Act in 1970 believed that a Federal program was necessary because existing State programs were inadequate. But during congressional consideration, a coalition of business leaders, State officials, a number of State-oriented members of Congress, and the Nixon administration pushed for the inclusion of State-run OSHA programs in the act. It has been suggested that the act could not have passed without a provision allowing State plans (30,460).

In passing the OSH Act, Congress established a mechanism that enables States to regulate worker health and safety subject to Federal monitoring and approval. A State program must, in general, “provide for the development and enforcement of safety and health standards which . . . are or will be at least as effective” as Federal standards (OSH Act, Section 18).

The development of a State program is a step-wise process. After application and initial approval from OSHA, the State can begin to enforce health and safety standards. States can adopt the existing Federal standards, as have 18 of the 24 plans approved before 1984. Half of these 18 also enforce some State standards. The other 6 States enforce mostly their own standards, which OSHA has deemed to be “at least as effective” as the corresponding Federal ones.

The first 3 years of a State plan are called the developmental stage. At the time of initial plan approval, both OSHA and the State agency have concurrent jurisdiction—both have the authority to conduct inspections and cite employers, and

employers must therefore comply with both Federal and State standards. (Any time after initial approval, however, as soon as the State is “operational,” OSHA may suspend its concurrent enforcement jurisdiction through an “operational status agreement.”) After all developmental steps are completed and approved, OSHA can issue a certification of the plan. If the State meets all of OSHA’s requirements, it becomes eligible for “final approval” 1 year after certification. Even after “final approval,” Federal OSHA still monitors the State program.

The requirement that States maintain a program “at least as effective” as OSHA’s means that if OSHA issues new or revised regulations, State agencies must follow suit by adopting the change, issuing an equivalent change, or making the case that, for local reasons, there is no need to alter the regulation. (For example, a State without textile mills need not adopt the OSHA cotton dust standard.)

There are also procedures for OSHA to withdraw approval and/or reintroduce Federal enforcement for a State that does not comply with OSHA’s requirements (307,333,408). In all stages of its operation, OSHA monitors the quality of the State program. Monitoring may involve “spot checks” (inspections by Federal personnel after a State-conducted inspection) or “accompanied” monitoring visits in which Federal personnel observe a State inspector during an inspection. (More recently, a computerized data system has replaced much of this onsite monitoring.)

History of State Programs Under the OSH Act

The policies of OSHA toward State programs have varied—sometimes permitting State programs to operate relatively free from oversight, while at other times setting high standards for State programs. OSHA’s efforts to allow and encourage or disallow and discourage State programs have also been subjects of litigation (249,307).

From 1978 to 1983, 24 State programs were in operation—21 States plus Puerto Rico and the Virgin Islands covered private and public employment and one program (Connecticut’s) covered only public employment. In 1984, New York be-

came the 25th State program, although it applies only to State and local government employees (table 12-7). “Final approval” had not been granted to any jurisdiction until 1984, when the Virgin Islands, Hawaii, and Alaska received this designation.

An important issue for OSHA policy concerning State programs has been a continuing dispute concerning the level of funding and the number of compliance personnel a State must have to meet the requirements of the OSH Act. In the mid-1970s OSHA had interpreted this to mean that State staff levels need only be equivalent to those of OSHA, even though OSHA’s staffing levels were not considered optimal. The AFL-CIO sued OSHA on this issue.

In a major decision in 1978 (*AFL-CIO v. Marshall*), the reviewing court agreed with the AFL-CIO. According to its opinion, the “at least as effective” requirement applies only to the *standards* issued by the State program. For staffing and funding, the court ruled that Congress intended that OSHA could use “current Federal levels of personnel and funds as benchmarks for State programs, provided they are part of a coherent program to realize a fully effective enforcement effort at some point in the foreseeable future.” Thus while current Federal levels, described by OSHA itself as only “a percentage of what is really needed,” were deemed to be adequate as *interim* benchmarks, they were not adequate as goals for “fully effective” State programs (307).

Table 12-7.—State Programs (1984)

Jurisdictions with approved plans:

Alaska	North Carolina
Arizona	Oregon
California	Puerto Rico
Hawaii	South Carolina
Indiana	Tennessee
Iowa	Utah
Kentucky	Vermont
Maryland	Virgin Islands
Michigan	Virginia
Minnesota	Washington
Nevada	Wyoming
New Mexico	

Plans cover/rig only pub/c employees:

Connecticut	New York
-------------	----------

SOURCE: (408).

In 1980, with the concurrence of the AFL-CIO, OSHA submitted to the court staffing-level “benchmarks” designed to achieve the goal of State programs becoming “fully effective” rather than only “at least as effective” as Federal operations. This plan would have required the jurisdictions with approved State programs to increase the total number of safety inspectors from 849 to 1,154 within 5 years and of health inspectors from 332 to 1,683 (subject to an annual reassessment of the availability of qualified health personnel). The agency also released a “benchmark model” that could be used to generate or revise staffing levels as necessary. The model considered the hazard rank of various industry sectors and the number of establishments of each rank in each State when calculating the number of programmed inspections, the factor that ultimately determines State health and safety staffing requirements.

Since then, OSHA has taken steps to change these required benchmark levels. Beginning in 1981, it has sought congressional approval to prohibit the spending of any funds to achieve State staffing levels that are greater than current Federal levels. Although enacted in two continuing resolutions concerning appropriations in fiscal years 1982 and 1983, this language was not included in the final appropriations actions for those years (34). In 1984, it was reported that OSHA is no longer seeking this appropriations language (350). In 1982, OSHA also formally proposed to recalculate the benchmark formula. One result of this would be the lowering of the required State staffing levels (249).

Pros and Cons of State Programs

A number of arguments have been made for and against State takeover of OSHA responsibilities. Proponents of State programs argue that they can adapt to local needs better, are more efficient and more fairly enforced, and continue the traditional State and local roles in occupational health and safety regulation. Opponents argue that, compared with OSHA, these programs are less effective, understaffed, underfunded, inefficient, less evenly enforced, and more susceptible to local political influence (408).

Organized labor, especially at the national level, is principally concerned that many State

programs devote insufficient resources to health and safety and are ineffective. Although many people in the business communities of affected States support such programs, large businesses with establishments in more than one State often express a desire for regulatory consistency—something that is hard to achieve with a variety of different State standards. Recent employer support for an OSHA “labeling” standard, for example, derives in part from a desire to preempt State and local laws on this subject.

Local control over job safety and health could be desirable in its own right, and the use of State programs can create a combined Federal and State effort that is larger than the Federal effort alone could be. But most States do not have the research capability needed to set standards, nor would it be efficient to have each conducting the same research for standards development (30). However, because they can simply adopt Federal standards verbatim, it is usually not necessary for them to have such a capability (34).

But the possibility exists that States may compete with each other in order to attract new businesses by relaxing the enforcement of health and safety standards. In theory, this should be restricted by the requirement that State programs be “as effective as” Federal OSHA. Examination of inspection data shows that, on average, State programs issue fewer serious violations and, for this reason, propose lower penalties overall than OSHA does. Moreover, the States with programs, as a group, devote a smaller fraction of their inspection resources to health inspections than does OSHA (see tables A-1 to A-11 in app. A). On the other hand, State programs conduct proportionately more inspections than OSHA does and some States have proportionately larger enforcement staffs, particularly in safety (34). In 1976, the GAO criticized OSHA’s policies toward the development of State programs and expressed concern that these policies were not sufficient to ensure employee health and safety (500).

The friction over benchmarks, final approval, and Federal monitoring of State programs reflects the underlying tension between the national and the State governments, which historically had been responsible for job safety and health. Federal policies concerning State programs have re-

sponded to those tensions, as well as to more general views concerning the rightful role of the Federal Government.

For example, the 1973 President's Report on Occupational Safety and Health referred to the approval of 20 State programs in 1973 as a step that moves the United States closer to the "Federal/State occupational safety and health partnership intended by Congress." Assistant Secretary Bingham took a very different view, stating that "[t]he Federal agency is given a leadership role which does not lend itself to a traditional partnership of equality as I believe a number of States desire." Thorne Auchter returned to an earlier policy of actively encouraging State programs. In his words, "It is my belief—and the belief of this administration—that in the last analysis, local problems are best addressed by those closest to them" (249).

Other Federal Agencies

Although OSHA and the State programs are directly responsible for ensuring the health and safety of most private sector workers in the United States, some workers are the responsibility of other agencies. The OSH Act does not apply to

"working conditions" for which other Federal agencies and certain State agencies "prescribe or enforce standards or regulations affecting occupational safety or health" (OSH Act, Section 4). For example, the health and safety of coal miners is regulated by the Mine Safety and Health Administration, while protection of certain railroad employees is provided by the Federal Railroad Administration.

Health and safety conditions for most public sector workers are not directly regulated by OSHA. State and local employees, however, are covered by State programs in the 25 States with approved plans. The heads of Federal agencies are required by the OSH Act to provide their employees with an occupational safety and health program that is "consistent with" OSHA standards. Three different Executive Orders have been issued concerning health and safety protections for Federal Government employees.

Lastly, the regulations issued by several other Federal agencies also affect job safety and health, even though workplace conditions are not the primary focus of these agencies. The constellation of governmental bodies with workplace safety and health responsibilities is summarized in table A-12 in appendix A.

THE NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH

The need to provide for research to identify, evaluate, and control work-related illness and injury, to disseminate information to workers, employers, and health professionals, and to train occupational safety and health professionals did not provoke much controversy during the debate about passage of the OSH Act. All parties agreed there was overwhelming evidence that scientific knowledge about work-related injury and illness was lacking, that the supply of trained personnel was inadequate, and that meaningful statistical data were unavailable.

The OSH Act established the National Institute for Occupational Safety and Health within the Department of Health and Human Services (then called the Department of Health, Education, and

Welfare) to carry out research and related activities. Congress listed several major activities for NIOSH:

- develop criteria for recommended occupational safety and health standards;
- conduct educational programs to provide an adequate supply of qualified personnel;
- conduct informational programs on the importance of the use of adequate safety and health equipment;
- conduct Health Hazard Evaluations; and
- conduct industry-wide studies of the effects of chronic or low-level exposures.

In contrast to OSHA, most NIOSH personnel work in only two locations, at the NIOSH facil-

ities in Cincinnati, OH, and Morgantown, WV. As mentioned earlier in this chapter, NIOSH headquarters are now in Atlanta, GA. There are also very small staffs, usually two to three, in the 10 HHS regional offices (located in the same cities as OSHA regional offices).

NIOSH's organization reflects the various topics of its research and dissemination program. These activities are conducted by NIOSH's seven divisions, each of which conducts research concerning a particular aspect of occupational health and safety or provides for the dissemination of information or training and education (fig. 12-5).

For this description, OTA divides NIOSH activities into three major program areas:

- **Identification** of occupational health and safety problems;
- Development **of controls** to prevent work-related illnesses and injuries; and
- **Dissemination** of findings and recommendations and provision of **Professional Training and Education**.²

²NIOSH itself divides its activities into five areas: identification, evaluation, control, dissemination, and administration (§79). The first three appear to have derived from the language of industrial

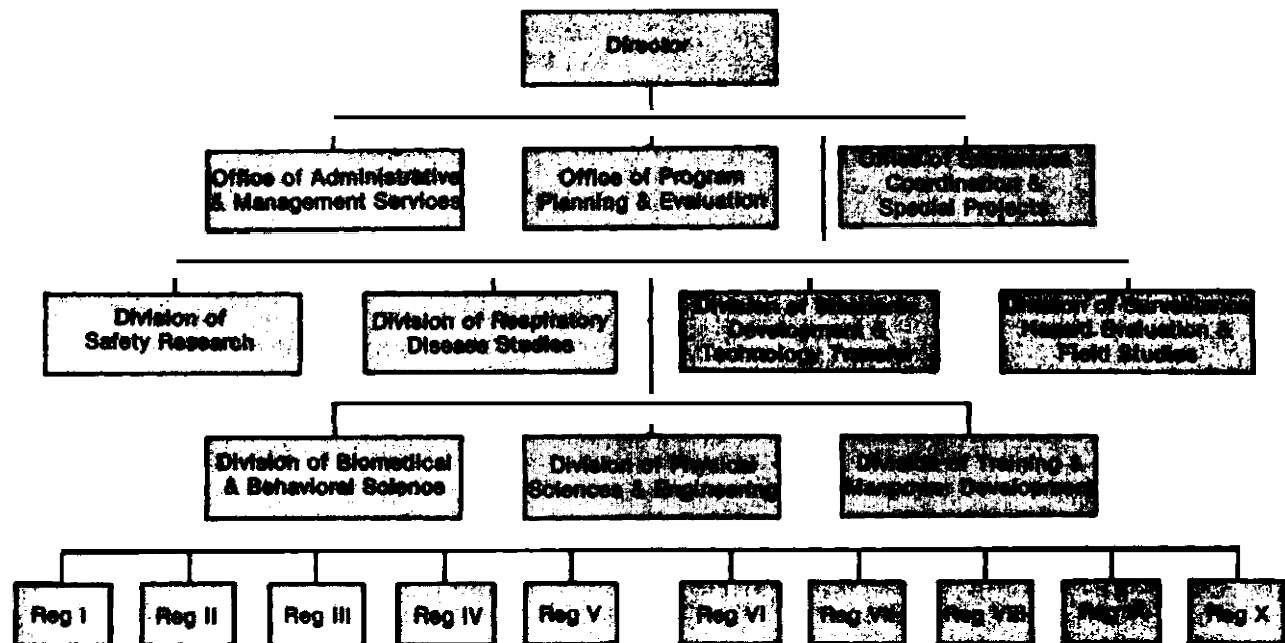
The funding for the three activities is not equal. Identification now receives the largest share of NIOSH's budget, with information dissemination and control technology research receiving substantially less funding. In addition, although its mandate extends to both health and safety, NIOSH has concentrated almost exclusively on questions of occupational health.

Identification

Identifying work-related illness and injury and understanding the mechanisms of disease and injury causation involve using the skills of medicine, industrial hygiene, safety engineering, epidemiology, toxicology, and statistics. It is the first step toward prevention (chs. 3 and 4). The specific NIOSH activities directed toward identification include illness and injury surveillance sys-

hygiene, which refers to recognition, evaluation, and control. OTA has grouped what NIOSH calls identification and evaluation into one category, largely because there really are no clear boundaries between these two activities, and both depend on a variety of professional skills. Moreover, the term "evaluation" is commonly used in the Federal Government to refer to the process of assessing the administration and impacts of particular programs. Administration, the fifth NIOSH program area, is not a research area and is not discussed in detail in this chapter.

Figure 12-5.—National Institute for Occupational Safety and Health



terns, Health Hazard Evaluations, and NIOSH's toxicologic and epidemiologic research programs.

Surveillance

NIOSH surveillance systems identify workplace hazards and work-related injuries, diseases, disabilities, or deaths, and generate hypotheses concerning the possible relationships between workplace exposures and adverse effects. NIOSH conducts work-related illness and injury surveillance in several ways. For illnesses, NIOSH's activities have included two large surveys of working conditions and the Health Hazard Evaluation program (discussed in detail below).

Until relatively recently, NIOSH did very little on the identification of the causes of injuries. Now it collaborates with the Bureau of Labor Statistics and OSHA in conducting work injury surveys, which are special-topic mail surveys of injured workers. Epidemiologic methods for injury investigation are being developed. National work-related injury data are being collected in conjunction with the Consumer Product Safety Commission's National Electronic Injury Surveillance System.

National occupational hazard and exposure surveys.—The first NIOSH survey of working conditions, called the National Occupational Hazard Survey (NOHS), was completed in 1974. Presently, a major task of NIOSH's surveillance program is analysis of data collected in the second national inventory of potentially hazardous exposures to workplace agents, the National Occupational Exposure Survey (NOES).³ The data for both of these surveys were collected through visits to a random sample of workplaces. Potential exposures to workplace hazards were observed and recorded during comprehensive tours of these worksites. The surveyors collected information on the nature of the potential hazards, the number of workers at risk, and the controls in place to protect them.

³The word "hazard" in the title of the NOHS survey was changed to "exposure" in the second survey in part because employers' representatives argued that the survey was really an inventory of all potential exposures, of which hazardous ones were only a part.

These surveys represent a large effort. The recent survey, patterned after the first one, covered a random sample of nearly 5,000 worksites in 67 major metropolitan areas over a 2-year period starting in 1981. Potential exposure estimates for the Nation are based on the probability sample in which over 9,000 chemicals and physical agents were observed in industrial use. These observations included exposures of workers in 450 separate occupational classifications.

The results of these two surveys can provide national estimates of potential exposure to workplace hazards by industry and occupational groups that can be useful for research planning, for estimating the impact of proposed standards, and for planning OSHA's enforcement activities. For instance, occupational safety and health professionals have used the 1974 NOHS to identify groups of workers exposed to various hazards or combinations of hazards. One finding from NOHS was that over 22 million of the 38 million workers in the survey universe were exposed to at least one potential hazard.

Trade-name chemical products (products with a commercial name but often lacking information about the identity or properties of the chemical constituents on their containers) are prevalent in the workplace. Analysis of the NOHS data showed that potentially toxic substances are frequently present in them. About 70 percent of 86,000 products identified in NOHS (made by 10,500 manufacturers) had trade names. NIOSH requested information about the composition of these approximately 60,000 separate trade-name products from the 10,500 manufacturers. The manufacturers supplied information on 45,000 trade-name products. Of these, 40 percent contained at least one OSHA-regulated substance and over 400 of these trade-name products contained at least one of the OSHA-regulated carcinogens.

However, while NOHS estimates are the only national base of information on exposure to potential workplace hazards, they have been questioned for their accuracy, for being nonquantitative, and for their validity. NOHS estimates for agents for which there is a high degree of awareness (such as asbestos) sometimes appear

at odds with figures put forward by others. Estimates of the numbers of people exposed to low-toxicity substances, such as sodium chloride, dominate some parts of the data base, leaving a casual observer with the impression that the data are weak for determining exposure to more hazardous substances. Many users have wished for quantitative estimates of actual exposure levels, since these would strengthen the data and increase its usefulness. Collecting actual exposure data, while theoretically possible, would be expensive since accuracy and validity would depend on collection and chemical analysis of a large number of samples taken over sufficient time to make sure the results were representative of workplace conditions.

The usefulness of NOHS is reflected by requests for it and reports developed from the collected data. In fiscal year 1982 alone, there were over 5,000 requests for data from NOHS. Further analysis of potential exposures to hazardous substances, including analysis of trends, will be possible when analysis of NOES, the second survey, is completed. A similar NIOSH environmental survey focusing on the mining industry is planned to comply with the mining surveillance mandate of the Mine Safety and Health Act of 1977.

Health hazard evaluation and technical assistance programs.—The identification program area also includes the Health Hazard Evaluation (HHE) and Technical Assistance (TA) programs. The HHE program responds to employee and employer requests from the private sector for evaluation of specific hazards, while the TA program responds to requests from government agencies.

However, the technical aspects of HHEs and TAs are the same. The purpose of both of these programs is to “determine toxic effects of chemical, biological, or physical agents . . . in the workplace” through medical, epidemiologic, and industrial hygiene investigations of the worksite of concern. Upon completion of an evaluation, NIOSH reports the results back to the worker and to the employer. If the substance proves to be toxic as it is used and exposure is not covered by any standard, NIOSH is required to report its findings to OSHA.

In fiscal year 1981, NIOSH received 513 requests for mining and general industry HHEs, a 10 percent increase over 1980. Twenty-one percent of these requests came from employers, 55 percent from employees or unions, 23 percent from Government agencies, and 4 percent from other sources. Twenty percent of these requests came from establishments with fewer than 100 employees. NIOSH investigators made over 600 site visits and produced 234 final reports documenting HHEs conducted.

In 1978, the General Accounting Office criticized the administration of the HHE program (503). GAO suggested that NIOSH needed to publicize the program more, issue HHE reports more quickly, establish an evaluation program, and disseminate HHE reports more widely. When Anthony Robbins was its Director, NIOSH quadrupled the number of evaluations (465). This rapid growth of the HHE program created some concern in the business community. It has also been suggested that the HHE program has reached too few workers, that the investigations take too long, that NIOSH has attempted to reach conclusions about toxicity based on too few data, and that the program has not found many new work-related illnesses and injuries, especially when compared with the expense of conducting the studies.

In some cases, the data gathered by an HHE are insufficient to identify a particular cause for worker health complaints. For instance, individual HHEs concerning health problems from unknown sources of indoor air pollution have seldom identified a causal agent. The accumulated findings from these studies, however, have pointed to lack of ventilation as a common factor. Frequently, reported illnesses disappear after improvements in ventilation.

State surveillance programs.—NIOSH is now attempting to involve State health departments in surveillance programs for identifying work-related illness and injury. After surveying State Health Officers to learn about their current capabilities for carrying out surveillance and prevention programs, NIOSH established agreements to cooperate with five States. NIOSH is devising methods to assign Epidemic Intelligence Service

Officers to State Health Departments for general epidemiological duties related to preventing work-related illness and injury.

Epidemiologic and Toxicologic Studies

The goal of epidemiologic and toxicologic studies is to understand the causes of occupational health and safety problems and thus reveal areas for preventive actions. Since 1971, NIOSH has sponsored a number of studies through its research grants programs and NIOSH staff have themselves conducted important studies.

NIOSH describes its current research efforts by referring to its list of 10 leading work-related diseases and injuries. These are occupational lung diseases; musculoskeletal injuries; occupational cancers; amputations, fractures, eye loss, lacerations, and traumatic deaths; cardiovascular diseases; reproductive disorders; neurotoxic disorders; noise-induced hearing loss; dermatoses; and psychologic disorders. As examples of current NIOSH activities, a few studies of lung disease, cancer, and reproductive health are discussed.

Work-related lung disease. -Lung disease is the highest priority work-related health problem and includes a number of debilitating diseases. The health and safety HHS prevention objectives (see discussion below) set a goal of virtually no new cases of asbestosis, byssinosis, silicosis, and coal workers' pneumoconiosis. NIOSH efforts concerning lung disease focus on these four diseases plus lung cancers and occupational asthma.

NIOSH studies in this area include animal testing to study the carcinogenicity of short asbestos fibers, those less than 5 μ m in length. The study lasted 2 years, at which time the animals' lungs were examined. Asbestos fibers were found in the lung, but fibrosis, lung tumors, and other lesions were absent. The researchers concluded that although short asbestos fibers did not by themselves appear to cause tumors, there is still a need for further study of the possible interactions between short asbestos fibers and other substances that cause cancer.

NIOSH researchers have sponsored the development of criteria for the pathologic diagnosis of pleuro-pulmonary disease associated with as-

bestos dust exposure and a method for grading disease severity. An expert committee of pulmonary pathologists assembled in cooperation with the College of American Pathologists reviewed surgical and autopsy evidence and reached a consensus as to what the criteria should be.

There have also been investigations of the immunologic aspects of work-related lung disease to examine the natural defense systems of the lung and potential ways they are stressed by work-related exposures. For instance, the effect of certain particulate matter often found in the workplace was tested on the interferon system in a laboratory experiment. One finding was an association of inhibition of interferon production with increasing coal rank (coal, that is, with higher carbon content such as anthracite). The growth of influenza virus, introduced into a treatment system, increased more among those treated with coal particulate than among controls.

Work-related cancer. —Both laboratory and epidemiologic studies are conducted to determine the carcinogenic potential of workplace exposures. In cooperation with the National Toxicology Program, NIOSH sponsors carcinogenicity assays for workplace chemicals.

As an example of epidemiologic studies, a NIOSH retrospective cohort mortality study of paper and pulp workers found a suggestive increase in lymphatic disease, although associations with exposure to workplace agents including wood dust, formaldehyde, sulfur compounds, and other chemicals were unclear. A proportional mortality study of automotive workers suggested that makers of wood dies and models suffer more often than expected from fatal colorectal cancer, leukemia, and other cancers.

NIOSH has developed a registry of workers exposed to dioxins that contaminate certain chemicals. Follow-up studies of the members of the registry will, it is hoped, provide clarifying information about the possible carcinogenicity of dioxin. Although information about the exposure levels of these "dioxin workers" is limited, at least some of them were exposed to much higher levels than any "environmental" exposure through air, water, or soil. Therefore, the registry will be important in the dioxin controversy. This activity

also illustrates that studies of industrial exposures, often carried out by NIOSH, have important impacts on other aspects of public health.

Work-related reproductive health problems.—Studies of work-related reproductive system health problems include both animal studies and pregnancy outcome studies among wives of male workers. NIOSH tested several industrial chemicals—ethylene oxide, propylene oxide, and n-butyl acetate—for teratogenicity in exposed female animals. Rats and monkeys were exposed to high levels of these substances prior to breeding. The test animals had a significant reduction in the number of fetal implantation sites and live fetuses, but it was not possible to conclude that these were definitely teratogenic effects. The investigators did conclude that in these cases teratologic effects did not occur at exposure levels below those that are toxic to the mother animals.

Epidemiologic studies are being conducted among workers exposed to polychlorinated biphenyls (PCBs) to determine the effect of exposure on pregnancy outcome among women. Animal studies of PCB suggest that it is toxic to the fetus and that it may be teratogenic. NIOSH investigators are conducting a case-control study of neonatal deaths and infants with low birth weight among infants of women workers at a capacitor plant using PCBs.

The effects of carbon disulfide, which is used to manufacture rayon, on the central nervous system have long been known, but recent studies have suggested that its health effects also include increased risk of death and illness from cardiovascular disease and increased risk of reproductive system effects among both men and women. Sexual dysfunction, loss of libido, semen abnormalities, and impotence have all been found among exposed male workers and menstrual abnormalities and increased risk of fetal loss and premature births among exposed female workers. NIOSH is now conducting a case-control study of the wives of exposed workers to determine the potential effects on pregnancy outcome from fathers exposed to carbon disulfide.

Development of Controls

Development of control technologies includes developing, assessing, and improving measures to reduce workplace hazards, especially through control technology, protective equipment, work practices, and hazard-detection devices. NIOSH investigations of control technologies commands a smaller proportion of NIOSH resources than any other research area. In fiscal year 1983 only 12.8 percent of the NIOSH budget of \$57.5 million and less than 14.0 percent of the 911.7 person-years of staff time were allocated to the control-technology budget.

NIOSH's efforts in control technologies are divided into three research program areas: about 21 percent of the control technology budget is spent for control systems research; 14 percent for respirator research; and 3 percent for other personal protective equipment research (table 12-8). However, the control technology budget also includes funds for performing chemical analyses in support of NIOSH industrial hygiene studies (37 percent); for developing methods for sampling and analyzing airborne contaminants (15 percent); and for testing respirators (10 percent) (584).

Control Systems Research

NIOSH conducts Control Technology Assessments (CTAs) to identify, evaluate, and document the most effective engineering controls used for particular hazards within a given industry. Information collected in a CTA is reported back to the industry so that other plants can use it to solve problems. Table 12-9 shows some of the areas in which CTAs have been done. Other research has been done concerning improved local exhaust ventilation and in the use of air recirculation for general dilution ventilation.

Engineering control research concentrates on industrial processes, since it is here that toxic substance emissions can be controlled. Research is split by industry: chemicals, mining and minerals, materials processing, and general industry. Recent research includes evaluation of emission con-

Table 12-8.—NIOSH Budget for Control Technology

Program area	Projects	Person years	Nonstaff (dollars in thousands)	Total (dollars in thousands)	Percent
Control systems.	10	29.0	542.9	1,535.8	20.86
Respirator research	10	16.7	462.6	1,000.0	13.58
Other PPE	3	4.8	99.3	253.7	3.45
Sampling/analysis	12	36.9	1,500.8	2,751.8	37.38
Method development, . . .	6	24.2	272.8	1,090.5	14.81
Respirator testing	4	15.7	224.2	729.4	9.91
Totals	45	127.3	3,102.6	7,361.2	100.00

SOURCE (584)

Table 12-9.—Control Technology Assessments Performed by NIOSH in Fiscal Year 1982**Completed:**

Seals and fittings in chemical processing technology
 Nonferrous metals production including aluminum reduction and nonferrous smelters
 Fire building
 Foundries
 Spray painting
 Pesticide manufacture
 Dry cleaning

Ongoing:

Dust control in dusty unit operations
 Chemical processing unit operations
 Unit processes used in general manufacturing

SOURCE: (584)

trol of the suspected carcinogen formaldehyde (both in its manufacture and as it is found in adhesives during hot-press wood veneering) and control of worker exposure to styrene, an agent that can cause dermatitis and neurotoxic illness, in boat building plants.

NIOSH is also conducting control technology research in selected petroleum-refining operations. Although most processes in this industry are contained, workers may be exposed to toxic substances through leaks, during equipment failure or maintenance, while collecting quality control samples, while loading or unloading materials, and during waste treatment. NIOSH investigated engineering and work practices at a hydrogen fluoride acid alkylation unit, at a benzene-loading facility, and during other processes in petroleum refining.

CTAs have been conducted in some unit processes. In the pharmaceutical industry, for example, the substances used to manufacture contraceptives are capable of causing gynmastia or enlarged breasts among both exposed female and

male workers, and menstrual irregularity among exposed female workers. Because the batches of these products are relatively small, the process has not been mechanized and there are many opportunities for worker exposures. Good engineering controls used in these situations included isolation, highly efficient local exhaust ventilation and, as an additional safeguard, the use of supplied-air suits.

Other assessments have been made in industries expected to grow in future years. These include hazardous waste disposal, semiconductor manufacturing, and fermentation processes. The studies of waste disposal included investigations of waste incinerators and automated drum handling.

Toxic materials used or found in the manufacture of microelectronic components include lead, arsine, phosphine, boron trifluoride, carbon tetrafluoride, phosphorous oxychloride, and hydrofluoric acid. In many cases, NIOSH found well-designed and effective engineering controls and ventilation systems for these hazards, but also discovered one previously unidentified exposure problem—arsenic off-gassing of silicon wafers impregnated with arsenic.

Fermentation processes are expected to be used more frequently in biotechnology. NIOSH is investigating the enzyme production industry to learn which control technologies are most effective in containing potentially hazardous biological material (582).

Respirator Certification and Research

NIOSH, in conjunction with the Mine Safety and Health Administration, tests and certifies respirators. During fiscal year 1982, 44 new res-

pirators were evaluated for approval and 60 were evaluated for extension of approval. Audits were conducted of 33 off-the-shelf respirators to ensure that certified respirators continue to meet test requirements. Respirator quality-control programs are also reviewed to make sure that certified respirators continue to meet requirements. As detailed in chapter 8, however, there are many complaints about respirators and about NIOSH's inability to publish new regulations concerning respirator-testing requirements.

Field testing is conducted to measure certified respirator performance in actual working conditions. Research is under way on sorbent efficiency for organic vapor respirators, filter efficiency and optimum flow rates for aerosol air-purifying respirators, the effects of filter resistance and efficiency on protection factors and reduced air flow use in powered air-purifying respirators, and the physiological effects of using respirators simultaneously with protective clothing.

Other Personal Protective Equipment Research

Chapter 8 outlines NIOSH investigations of various types of personal protective equipment, including head protection (hard hats), eye protection (protective glasses), face protection (face shields), foot protection (steel-toed shoes and metatarsal guards), hand protection (protective gloves), motion restraints, and protective clothing. All of those studies were done in the late 1970s. Currently, resource constraints have limited research in this area to chemical protective clothing. The absence of assurance that personal protective equipment works as advertised could be addressed by NIOSH, with sufficient funds and effort, or by NIOSH in cooperation with other organizations.

Sampling and Analysis

Analysis of chemical samples is necessary for many industrial hygiene and medical studies. In fiscal year 1982, 17,200 exposure samples were analyzed for 42,000 determinations. About one-quarter of the samples were done in NIOSH laboratories and three-quarters on contract.

NIOSH also has a role in laboratory quality control. Approximately 375 private and govern-

ment industrial hygiene analytical labs participate in the NIOSH Proficiency Analytical Testing program, which periodically sends out reference samples for analysis. For example, a sample of airborne lead dust would be analyzed by each laboratory, NIOSH then collates results from all of the participating laboratories and reports them back in summary so each lab can see how closely its results match those of other laboratories. Participating in this program and performing analyses within the quality control boundaries for the tested substances is required for maintaining laboratory certification by the American Industrial Hygiene Association.

Sampling and Analytical Methods Development

To facilitate accurate and precise assessment of worker exposure to chemical hazards, NIOSH develops and refines methods for sampling and analysis. In 1981, it published the seventh volume of the *Manual of Analytical Methods*, which added 21 methods for monitoring chemical hazards.

NIOSH has also participated in the development of new sampling devices. In 1981, it developed performance specifications, testing protocol, and evaluation criteria for passive monitors, which are devices requiring only the natural motion of contaminant molecules in air, thus saving the costs of sampling pumps. NIOSH and the Bureau of Mines collaborated in a comparison of X-ray diffraction and infrared spectroscopy for analyzing quartz or crystalline silica. These tests were done to help refine reliable, low-cost analytical methods. Other sampling research has led to real-time, direct-reading sampling methods. Such devices, while costing more at the outset, will reduce the overall cost of monitoring chemical workplace hazards by eliminating the costs, risk of error, and delays in obtaining results that are associated with laboratory analysis.

Dissemination

NIOSH disseminates its research findings through criteria documents, reports, and published papers informing professionals and the public of identified problems and solutions, as well as through Health Hazard Evaluation reports. Efforts are now

being made to disseminate HHE findings to hard-to-reach audiences. For example, a finding that irritating vapors from duplicating machines were affecting teachers' aides and that an easy way to control the exposure was available was disseminated through teachers' organizations.

The OSH Act provides that NIOSH shall make recommendations to OSHA concerning health and safety standards. Since 1971, NIOSH has transmitted to OSHA over 100 "criteria documents," which contain extensive bibliographies of available scientific literature on the chemical or process in question, followed by an analysis and assessment of the substance's toxicity and a recommendation to OSHA for a potential standard. The criteria documentation process has covered about 151 substances since 1970. Priority for the substances for which criteria documents were written was based in part on estimates of the number of workers exposed, the volume of production of the substance, and the severity of toxicity.

The third NIOSH Director, Anthony Robbins, deemphasized the production of criteria documents in part because many of them "were mostly toxicological reviews" that "... did not contain a great deal of epidemiology, which is needed. They were inconsistent" (482). In addition, as discussed in chapter 13, OSHA has not issued standards for most of the hazards addressed by NIOSH criteria documents.

Few criteria documents are being developed now, but from time to time NIOSH has prepared other kinds of reports, transmitting them to OSHA, as well as disseminating them to the public. These include **Occupational Hazard Assessments**, which contain recommendations but that are less thorough and less specific than criteria documents. In addition, NIOSH prepares **Current Intelligence Bulletins**, which contain new findings about workplace hazards, are also published and transmitted to OSHA, to worker and employer representatives, and to health and safety professionals. NIOSH also participates in the public hearings that are part of OSHA's standard-setting process and provides recommendations concerning the standard under consideration.

NIOSH technical publications are widely disseminated. In fiscal year 1982, for example, one

research division—the Division of Surveillance, Hazard Evaluation, and Field Studies—submitted over 300 reports on industrial hygiene and medical studies to the National Technical Information Service, published 63 articles in technical journals, published 3 articles on research findings describing hazards and means for reducing them in industry and labor trade journals, had 6 articles in the **Morbidity and Mortality Weekly Report**, published 2 summaries of approximately 80 recently completed HHEs, and provided over 200 reports to people requesting information from NOHS.

The OSH Act requires that MOSH publish annually a list of all known toxic substances or groups of toxic substances, their observed effects, and the concentrations at which they occurred. In compliance with this requirement, NIOSH publishes the **Registry of the Toxic Effects of Chemical Substances**. The current edition contains 218,746 listings of chemical names, of which 59,224 are different chemicals (the rest of the names are synonyms). The listings are extracted from the published literature, including journals published abroad, but are not evaluated for quality, accuracy, or reproducibility. The substance name is given, followed by its synonyms, chemical data, and toxicity data by the general categories of irritation, mutation, reproductive effects, tumorigenic effects, and general toxicity. The citation for each toxic effect reported is included so that the original article can be found for further detail.

NIOSH is also becoming involved in education to prevent work-related illness and injury. A health motivation working group has been formed to examine ways in which NIOSH's research could be applied to combine health protection (control of work-related illness and injury) and health promotion (improvement of personal health behaviors).

In addition, NIOSH has responsibility for the education of occupational safety and health professionals through both direct short-term training and academic programs. It is estimated that over 5,000 professionals have received training through these NIOSH programs. (These activities are described in detail in ch. 10.) Training grants for Educational Resource Centers have

been successful in establishing coordinated multi-disciplinary programs. They have received some attention recently because of proposals by the current administration to eliminate their Federal funding (102).

NIOSH Priorities

Setting priorities for preventing work-related illness and injury has been a challenge to NIOSH management. During John Finklea's tenure as Director, NIOSH activity was concentrated on the production of recommendations to OSHA concerning health and safety standards—NIOSH's "criteria documents." He believed that the criteria documents should be the primary product of NIOSH and that once published would be considered public health policy documents that would force OSHA into setting and revising health standards.

Anthony Robbins, the next NIOSH Director, reemphasized criteria documents and focused NIOSH activity on health hazard evaluations and epidemiologic studies (465,482). The fourth NIOSH Director, Donald Millar, has set special emphasis on efforts to assure high-quality research and focus research on the most important work-related problems. He is also working to expand the participation of State and local health agencies and to increase workplace health promotion efforts (584).

Present research priorities are influenced by the HHS Prevention Objectives for the Nation, the NIOSH list of 10 leading work-related health problems, and the HHS National Toxicology Program. These are used to identify subjects for criteria document development and to set priorities for research on hazard assessment and control.

The Prevention Objectives include 20 objectives for preventing work-related injury and illness. Thirteen of these have been designated priority

objectives. The Prevention Objectives, shown in Box O, are divided into several categories:

- **Improved health status** (measured by fewer deaths, injuries, and illnesses);
- **Reduced risk factors** (by implementing hazard controls);
- **Improved public/professional awareness** (as reflected by increased worker, employer, and professional knowledge about occupational hazards);
- **Improved services/protection** (through the use of generic standards and increased NIOSH activity in studying hazards); and
- **Improved surveillance/evaluation** (including creation of coding systems and enhancing existing efforts to include occupational factors) (556).

The NIOSH list of 10 leading work-related health problems (see table 5 in ch. 3) was compiled by NIOSH's division directors. Frequency of occurrence, severity, and amenability to prevention of the work-related injury and illness were the criteria used for selection (583). This priority list is used by NIOSH to identify subjects for criteria document development and to set priorities for research for hazard assessment and control. It was also published to encourage discussion among occupational safety and health professionals and to assist them in setting their control priorities. NIOSH intends to collect data on the 10 and periodically update it as conditions change (581).

The National Toxicology Program coordinates the Federal Government's testing of chemicals for possible human health hazards. Two of its activities are important for NIOSH. First, it carries out the testing of substances that NIOSH identifies as possible concerns, and NIOSH contributes to the costs of those tests. Second, the results of tests requested by other agencies are also provided, so NIOSH can evaluate the potential workplace hazards presented by these substances.

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Improved services/protection:

- 16. By 1990, generic standards and other forms of technology transfer should be established, where possible, for standardized employer attention to such major common problems as: chronic lung hazards, neurological hazards, carcinogenic hazards, mutagenic hazards, teratogenic hazards, and medical monitoring requirements.
- 17. By 1990, the number of health hazard evaluations being performed annually should increase ten-fold, and the number of industry-wide studies being formed annually should increase three-fold. (In 1979, NIOSH performed approximately 450 health hazard evaluations; 50 industry-wide studies were performed.)

Improved surveillance/evaluation:

- 18. By 1985, an ongoing occupational health hazard/illness/injury coding system, survey, and surveillance capability should be developed, including identification of workplace hazards and related health effects, including cancer, coronary heart disease, and reproductive effects. This system should include adequate measurements of the severity of work-related disabling injuries.
- 19. By 1985, at least one question about lifetime work history and known exposures to hazardous substances should be added to all appropriate existing health data reporting systems, e.g., cancer registries, hospital discharge abstracts, and death certificates.
- 20. By 1985, a program should be developed to: 1) follow up individual findings from health hazard and health evaluations, reports from unions and management, and other existing surveillance sources of clinical and epidemiological data, and 2) use the findings to determine the etiology, natural history, and mechanisms of suspected occupational disease and injury.

"Priority objectives of NIOSH.

SOURCE: (556).

SUMMARY

OSHA and NIOSH were created by the Occupational Safety and Health Act of 1970 and both began operations in 1971. The separation of regulatory activities from research may help ensure the objectivity of the research, but it has also been criticized because oftentimes the two agencies have not coordinated their activities. After a period of growth during the 1970s, the budgets for both OSHA and NIOSH have declined in recent years. After adjusting for inflation, OSHA's has decreased nearly 13 percent since its peak in 1979. NIOSH's has declined 42 percent since a peak in 1980 and is now lower, in real terms, than any NIOSH budget since 1973.

OSHA's main activities are setting occupational health and safety standards, conducting workplace inspections to ensure compliance with those standards, monitoring State programs, and providing for several different types of educational and service programs. Although many of OSHA's

startup standards have provided some worker protection, there were many problems with these standards and OSHA has been slow in revising them. Since 1971, OSHA has completed 18 separate proceedings for setting health standards and 26 proceedings for safety standards. However, the scope of some of these standards has been very limited, and several involved only a rewriting of requirements that had been issued earlier by OSHA. Those that involved major changes have frequently been the subjects of judicial review. OSHA has also published nine emergency temporary standards, but the courts have been reluctant to support these standards.

OSHA inspection activity has generated a great deal of controversy because employers can be compelled to install health and safety control technology. Together, Federal OSHA and the State programs operating under the OSH Act conducted about 162,000 establishment inspections

and 13,000 “records review” visits in fiscal year 1983. However, for most workplaces, the threat of an inspection is quite low. On average, OSHA penalties are also low, often lower than the costs of many controls.

OSHA’s public education and service activities include its consultation program, New Directions grants program, and Voluntary Protection Programs. All these programs attempt to approach health and safety in a way that is more cooperative than OSHA citations and penalties. But there have been concerns expressed about OSHA’s management of funds in these areas, the quality of the work performed, and the relationship of these activities to OSHA’s inspections.

Federal OSHA also monitors the 25 jurisdictions that have assumed responsibility for the health and safety of all or some of the work force within their borders. These State programs can potentially meet local needs better than a centralized Federal agency and can enhance the total governmental resources devoted to worker health and safety. But there has been controversy here too, especially concerning appropriate staffing levels for these operations.

NIOSH activities are chiefly related to hazard identification, research on control technology, and providing for information dissemination and

professional education. The largest share of the NIOSH budget is now devoted to identification of hazards. This includes a large survey of workplaces to determine the extent of potential exposures to toxic substances, the Health Hazard Evaluation program, and NIOSH research in epidemiology and toxicology.

Control technology receives a relatively small portion of the NIOSH budget. This research includes Control Technology Assessments, respirator certification and research, research on other types of personal protective equipment, as well as developing sampling and analytical techniques and performing laboratory analysis of exposure samples. Information dissemination includes the preparation of reports on Health Hazard Evaluation, industry-wide studies, Control Technology Assessments, and guides to good practice. Several NIOSH publications are standard reference sources for industrial hygiene, and the ***Registry of the Toxic Effects of Chemical Substances*** is a comprehensive listing of the literature about the toxicity of over 59,000 different chemicals. NIOSH has also prepared Criteria Documents containing recommendations to OSHA concerning new or revised health and safety standards. Finally, NIOSH grant programs have provided for the education of a number of health and safety professionals.