Chapter 1. Introduction to NIOSH

1.1 Overview

The National Institute for Occupational Safety and Health (NIOSH) is the Federal agency responsible for conducting research and making recommendations for the prevention of occupational injury and illness. NIOSH is part of the Centers for Disease Control and Prevention (CDC) in the Department of Health and Human Services (DHHS).

Surveillance data published by the U.S. Bureau of Labor Statistics (BLS) documents the burden of injury and illness associated with work. In 2002, there were 5,524 occupational fatalities in the private sector, an average of 15 per day [BLS 2002]. In 2003, there were 4.4 million non-fatal injuries and illnesses in the private sector [BLS 2003]. This human toll is accompanied by significant economic cost. The Liberty Mutual 2004 Workplace Safety Index estimated that direct costs for occupational injuries alone were $49.6 billion in 2002 [Liberty Mutual Insurance Company 2005].

Changes in the work place will likely create new challenges for preventing occupational injury and illness. As the U.S. economy shifts from manufacturing to services and industries shift from older to newer technologies, there are resulting changes in the distribution of jobs and their associated hazards. Work force demographics are also changing. By the year 2008, the U.S. workforce will grow to an estimated 155 million, with minorities constituting 28 percent of the workforce and women 48 percent. The work force is also aging. By 2010, middle and older age workers will outnumber younger workers. Finally, there have been important changes in the conditions under which work is performed. Longer work hours, longer shifts and compressed work weeks; part-time and temporary work; around the clock shift work; and reduced job security are all realities of the modern workplace. NIOSH must work not only to prevent the occupational injuries and illnesses of today, but also to anticipate and prevent those of tomorrow.

To meet the challenges of occupational safety and health, NIOSH is guided by its mission to provide national and world leadership to prevent work-related illnesses and injuries [NIOSH 2004]. In carrying out this mission, NIOSH adheres to a core set of values:

- Relevance – Our programs are responsive to the occupational safety and health problems that are found in today's workplaces and the workplaces of tomorrow.
- Diversity – Our employees reflect the full spectrum of diversity found in the U.S. workforce and our research and interventions reflect the diversity of solutions needed for the U.S. workplace.
- Quality – We utilize only the best science, the highest level of data quality, and the most transparent and independent peer-review.
- Partnership – We accomplish our mission in partnership with employers and workers as well as in academia, industry, government, and scientific and professional communities, both nationally and internationally. These partnerships are formed strategically to improve planning, execution, and review of NIOSH research. They also help translate and transfer research outputs to the workplace

- Access – Our customers can obtain all NIOSH products and services through expanded traditional and electronic access.
- Performance – Our programs are results-oriented.
- Accountability – Our programs are evaluated by how well they solve the occupational safety and health problems found in today's workplaces and the workplaces of tomorrow.

1.2 Legislative Foundations

The main legislative underpinnings of NIOSH are the Federal Coal Mine Health and Safety Act of 1969 (amended in 1977) and the Occupational Safety and Health Act of 1970. The "Coal Act" was passed in the aftermath of a devastating coal mine explosion that occurred in Farmington, WV in 1968. It took the lives of 78 miners and crystallized public opinion that stronger measures were needed to protect coal miners at work. The Coal Act specified a comprehensive set of preventive measures, including dust exposure limits; frequent mine inspections with fines for noncompliance with safety regulations, respirator approval for use in mines, health screening and job transfer of miners with coal workers' pneumoconiosis, and research. Activities required by the Coal Act were split between the Department of Health, Education and Welfare, which engaged in non-regulatory activities such as health screening and research; and the Mine Enforcement and Safety Administration in the Department of the Interior (DOI), which engaged in developing and enforcing workplace safety and health regulations in the mining industry. NIOSH subsequently assumed the health screening and research responsibilities specified under the Coal Act after its creation by the Occupational Safety and Health Act of 1970 (see below). When the Coal Act was amended in 1977, the Mine Enforcement and Safety Administration was replaced by the Mine Safety and Health Administration (MSHA) in the Department of Labor.

The Occupational Safety and Health Act of 1970 (Public Law 91-596 [US Congress 1970]; http://www.osha.gov/pls/oshaWeb/owadisp.show_document?p_table=OSHACT&p_id=3355 (Appendix 1-01) followed closely after the Coal Act. It created both NIOSH and the Occupational Safety and Health Administration (OSHA), which is in the Department of Labor and is responsible for developing and enforcing workplace safety and health regulations in industries other than mining.

Information pertaining to the responsibilities of NIOSH are found in Section 22 of the Occupational Safety and Health Act of 1970 [29 Code of Federal Regulations (CFR) § 671]. The Institute is authorized to:

- Develop recommendations for occupational safety and health standards
- Perform all functions of the Secretary of Health, Education and Welfare (subsequently Health and Human Services) under Sections 20 and 21 of the Act
- Conduct research on worker safety and health (Section 20)
- Conduct training and employee education (Section 21)
- Develop information on safe levels of exposure to toxic materials and harmful physical agents and substance
- Conduct research on new safety and health problems

- Conduct on-site investigations to determine the toxicity of materials used in workplaces (Health Hazard Evaluations [HHEs] - 42 CFR Part 85; and General Research Authority – 42 CFR Part 85a)
- Fund research by other agencies or private organizations through grants, contracts, and other arrangements

The Federal Mine Safety and Health Amendments Act of 1977 (which superseded the Coal Act of 1969) specified a number of authorities for NIOSH in coal mining health research. The Mine Safety and Health Law authorized NIOSH to:

- Develop recommendations for mine health standards for MSHA
- Administer a medical surveillance program for miners, including chest x-rays to detect pneumoconiosis (black lung disease) in coal miners
- Conduct on-site investigations in mines similar to those authorized for general industry under the Occupational Safety and Health Act
- Test and certify personal protective equipment and hazard-measurement instruments

Mining safety and health remain an ongoing concern of NIOSH. This year, the Mine Improvement and New Emergency Response (MINER) Act of 2006 was enacted in the wake of the Sago Mine explosion. The MINER Act amends the Federal Mine Safety and Health Act of 1977. The act creates regulations enforceable by MSHA to improve accident preparedness and response. The act also specifies that NIOSH create an Office of Mine Safety and Health. The purpose of the office is, "to enhance the development of new mine safety technology and technological applications and to expedite the commercial availability and implementation of such technology in mining environments." The office is to achieve this purpose through competitive grants, contracts, and by establishing an interagency working group for mine safety.

Thus, Congress has set a clear division between the research function of NIOSH; and the regulatory and enforcement functions of MSHA and OSHA. Although NIOSH works together with MSHA and OSHA to achieve the common goal of protecting worker safety and health, NIOSH simultaneously maintains its unique identity as the sole Federal government organization primarily charged to conduct occupational safety and health research.

Through its legislated authorities, NIOSH gathers information, conducts scientific research, and translates the knowledge gained into products and services. NIOSH's mission is critical to the health and safety of every U.S. worker.

1.3 Organizational Structure and Management

NIOSH is located within the CDC. CDC, in turn, is located within DHHS. The NIOSH Director is appointed by the DHHS Secretary and reports to the CDC Director. DHHS has recently implemented performance-based management, in which management responsibilities cascade through the administrative structure. Thus, each manager has formal responsibilities written into their performance plan specifically tailored to support the responsibilities of others higher in the management chain. Under this system of management, responsibilities ultimately derive from priorities established by the Office of Management and Budget (OMB), a component of the White House.

The administrative structural components of NIOSH are shown in Figure 1-1. The main organizational units are divisions and laboratories. These are a mixture of disease and injury-specific divisions (respiratory diseases, safety research), expertise-specific divisions (applied research and technology, laboratory research, surveillance and field studies, education and information dissemination), and industry-specific units (mining). The divisions and laboratories are geographically dispersed in Cincinnati, Morgantown, Pittsburgh, and Spokane. NIOSH leadership is located in Washington, DC, and Atlanta. To coordinate across these geographically dispersed units, NIOSH makes extensive use of modern information technology, including e-mail and video conferencing ("envision").

Table 1-1: NIOSH Program Portfolio

NORA Sector Programs (n=8)
Agriculture, Forestry and Fishing
Construction
Healthcare and Social Assistance
Manufacturing
Mining
Services
Wholesale and Retail Trade
Transportation, Warehousing and Utilities
NIOSH Cross-Sector Programs (n=15)
Authoritative Recommendations
Cancer, Repro and Cardiovascular
Communications and Information Dissemination
Emergency Preparedness/Response
Global Collaborations
Health Hazard Evaluation
Hearing Loss Prevention
Immune and Dermal
Musculoskeletal Disorders
Personal Protective Technology
Radiation Dose Reconstruction
Respiratory Diseases
Training Grants
Traumatic Injury
Work Organization and Stress-Related Disorders
NIOSH Coordinated Emphasis Areas (n=7)
Economics
Exposure Assessment
Engineering Controls
WorkLife Initiative
Occupational Health Disparities
Small Business Assistance and Outreach
Surveillance

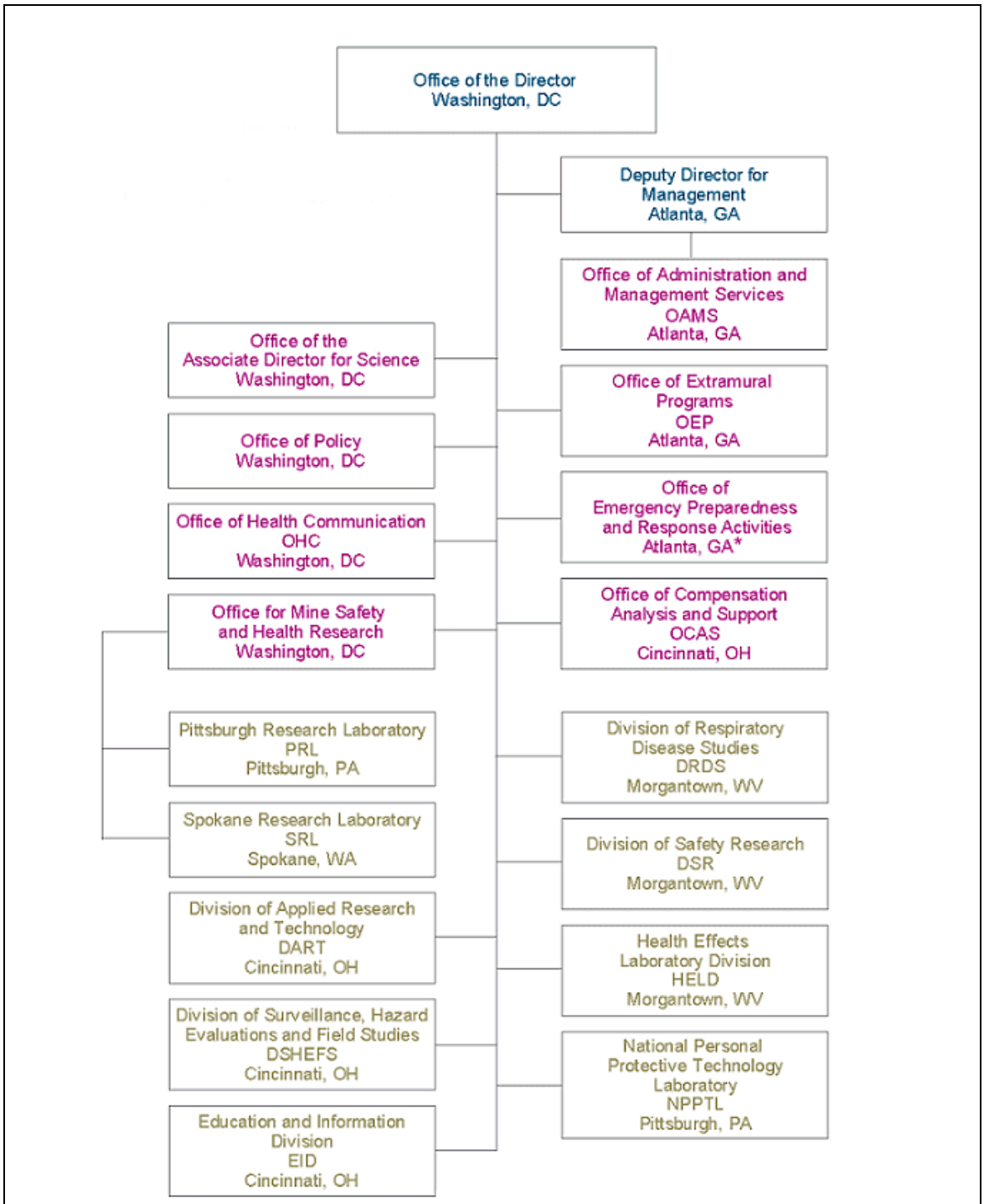

Figure 1-1. Organizational Components of NIOSH

Beginning in 2005, NIOSH developed and implemented a matrix management structure to coordinate cross-institute programmatic activities. This "Program Portfolio" created formal management for such activities. One of the industry sector activities within the matrix

management structure is the Agriculture, Forestry, and Fishing (AFF) Program, which will be described in more detail in chapter 2. The industry sector, cross-sector, and the emphasis areas programs are listed in Table 1-1.

NIOSH is committed to performance-based management. It has recently developed several key performance indicators to track organizational performance. Examples include tracking of financial performance by establishing and monitoring the percent of total funding to divisions and laboratories used for discretionary purposes (i.e., not personnel, salary, and benefits). The NIOSH target is 25 percent discretionary by 2010. The FY 2006 ratio was 20 percent. Another example is optimizing the ratio of supervisory staff to non-supervisory staff. CDC established a FY 2006 goal of 1:10. In FY 2006, the NIOSH ratio was 1:13.

NIOSH management occurs within the context of broader federal management requirements and initiatives. The 1993 Government Performance and Results Act mandated that federal agencies develop multiyear strategic plans, annual performance plans, and annual performance reports.

Another management requirement is responsiveness to the OMB Program Assessment Rating Tool (PART) (Appendix 1-02) which is used by OMB to assess federal agency performance on a number of measures including strategic planning, program management, and program results. PART performance ratings are an important consideration in budget requests by the President. Current NIOSH key performance measures for PART were established in 2004. They target the following safety and health-focused achievements by 2014:

- 50 percent reduction in the respirable coal dust overexposures of operators of longwall and continuous mining machines, roofbolters, and surface drills
- 40 percent reduction in the number of workers being struck by construction vehicles and equipment in the road construction industry
- 75 percent of professional firefighters and first responders have access to CBRN respirators

NIOSH receives external guidance and advice from two Federal Advisory Committees. The Board of Scientific Counselors (BSC) is composed of external authorities from a variety of fields related to occupational safety and health. The BSC members provide advice and guidance to NIOSH in developing and evaluating research hypotheses, systematically documenting findings, and disseminating results that will improve the safety and health of workers. They also evaluate the degree to which NIOSH activities: 1) conform to standards of scientific excellence in accomplishing objectives in occupational safety and health; 2) address currently relevant needs in the field of occupational safety and health, either alone or in collaboration with activities outside of NIOSH; and 3) produce their intended results in addressing important research questions in occupational safety and health, both in terms of applicability of the research findings and dissemination of the findings. The Mine Safety and Health Research Advisory Committee performs a similar function, except it is focused on issues related to occupational safety and health in mining.

Another source of external input is the National Advisory Committee on Occupational Safety and Health (NACOSH). NACOSH was created under Section Seven of the Occupational

Safety and Health Act of 1970 to advise NIOSH and OSHA on occupational safety and health programs and policies. Members of the 12-person advisory committee are chosen on the basis of their knowledge and experience in occupational safety and health. Two members represent management, two members represent labor, two members represent the occupational health professions, two members represent the occupational safety professions and four members represent the public. Two of the health representatives and two of the public members are designated by the Secretary of Health and Human Services, although actual appointment of these members, as well as all other members, is by the Secretary of Labor. The members serve two-year terms. NIOSH and OSHA provide staff support for NACOSH. The Director of NIOSH and the Assistant Secretary of Labor for Occupational Safety and Health both usually attend NACOSH meetings. It is a vehicle not only for external input for the agencies but also a body to whom the agencies must be responsive. NACOSH meetings are held twice each year and are open to the public.

1.4 Resources

The NIOSH budget is a direct appropriation from Congress, as a specific line item in the DHHS/CDC appropriation. The Congressional language that accompanies the funding appropriation often contains specific directives about the intended use of portions of the funds. For example, these "earmarked" directives instruct NIOSH to use specific portions of the funds to conduct research which targets certain industries such as agriculture or construction, or to support research or surveillance initiatives such as the National Occupational Research Agenda (NORA), Emergency Preparedness, the Department of Energy special exposure cohort study, or the enhanced coal workers' health surveillance program. In addition, Congress or DHHS may charge NIOSH to lead or participate in evolving public health activities such as the World Trade Center health surveillance efforts; however, funding is not always provided to support these efforts. Prior to fiscal year 2006, the CDC tapped a portion of the NIOSH budget to offset the cost of administrative and infrastructure support provided by the CDC and to fund the NIOSH portion of costs associated with business consolidations established under the President's Management Agenda. Beginning in 2006, Congress moved the charges associated with business support services from the NIOSH appropriation and appropriated the funding directly to the CDC (approximately $35 million). Escalating personnel costs, combined with projections of diminished appropriations and continuing "earmark" obligations, create significant challenges to NIOSH as it strives to fulfill its mission and optimize its impact on occupational safety and health problems.

Table 1-2: NIOSH Budget, 1996 – 2006

NIOSH Budget: 1996 – 2006

	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Budget (in millions)	**$161**	**$173**	**$184**	**$204**	**$226**	**$260**	**$276**	**$273**	**$277**	**$286**	**$255***
Adjusted (BRDPI)**	**$161**	**-**	**-**	**-**	**$199**	**$221**	**$227**	**$217**	**$212**	**$211**	**$182**

* In 2006, Congress redirected $35M from the NIOSH budget appropriation to CDC for Business Support Services.
** NIH-Biomedical Research and Development Price Index (BRDPI). Figures shown as millions of 1996 dollars.
- Data not provided to allow calculation of index: http://officeofbudget.od.nih.gov/UI/GDP_FromGenBudget.htm

In fiscal year 2006, $255 million was appropriated for NIOSH. Table 1-2 shows NIOSH funding for the years 1996 through 2006, with adjustments for inflation and application of the biomedical research index. The reduction between 2005 and 2006 reflects costs to NIOSH of CDC business consolidations. After adjustment of funding for the Biomedical Research and Development Price index, which adjusts not only for inflation but also for increased costs of conducting scientific investigation due to new technologies, etc., NIOSH has had only a modest increase in funding since 1996. Essentially all of the increase is the result of funding earmarked for NORA priorities.

The NIOSH staffing level is approximately 1413 Full-Time Equivalents (FTE). This level has fluctuated over the past decade from a low of 1364 FTE in 1996 to a peak of 1521 FTE in 2003 and then a subsequent steady decline to the current level. The increases leading to the peak in 2003 can be attributed, in part, to NIOSH absorbing the research teams of the former Bureau of Mines and the establishment of a new Health Effects Laboratory Division (HELD) and National Personal Protection Technology Laboratory (NPPTL). A breakdown of NIOSH research staff by professional discipline is shown in Figure 1-2.

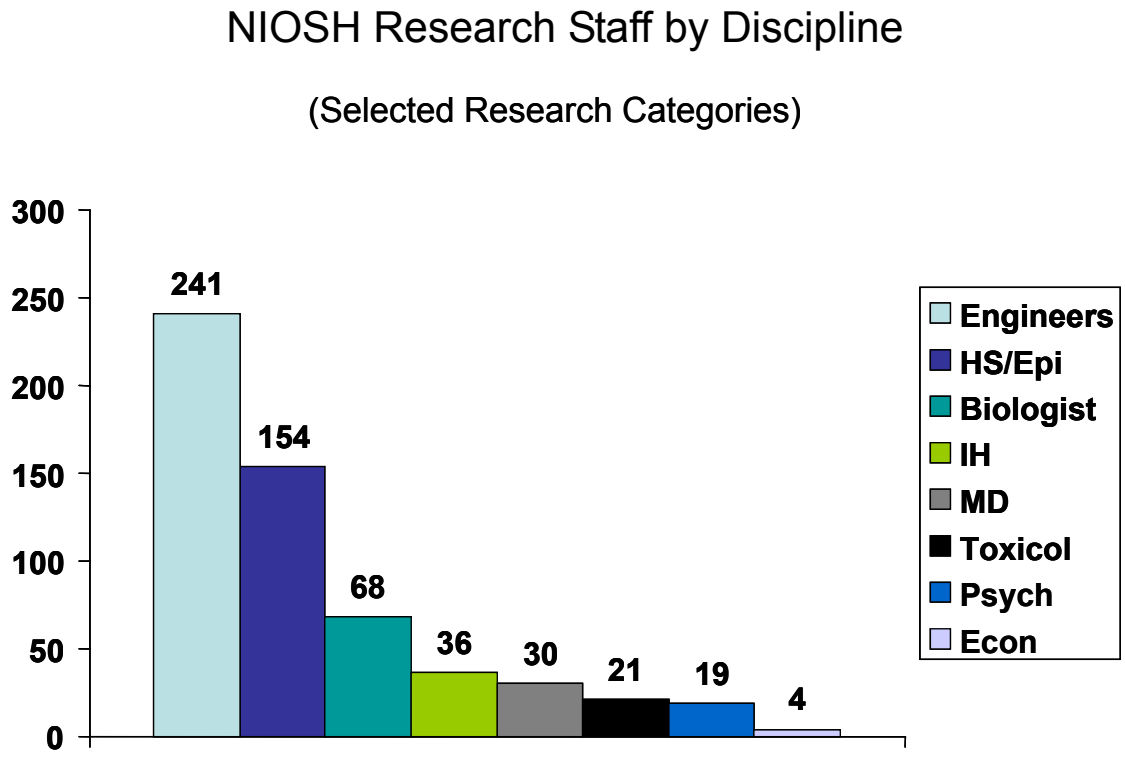

Figure 1-2: NIOSH research staff by discipline

1.5 Planning and Logic Model

NIOSH has a long history of organized planning to optimize its relevance and impact. During the 1980s, NIOSH conducted a series of national symposia on the leading causes of occupational-related illness and injury. Those meetings resulted in 10 written strategies for prevention that guided NIOSH research programs during the early 1990s (including occupational lung diseases). In April 1996, NIOSH and its partners unveiled NORA, a framework to guide occupational safety and health research into the new millennium—not only for NIOSH but for the entire occupational safety and health community. Approximately 500 organizations and individuals outside NIOSH provided input into the development of NORA. The NORA process resulted in a list of 21 research priorities in occupational safety and health (www2a.cdc.gov/nora/). Teams of researchers and other stakeholders were organized primarily according to types of health problems or disciplinary approaches for each of these priority areas. Many of the teams published agendas for research. NIOSH researchers were prominent in those efforts.

During the NORA process, NIOSH developed a strategic plan from 1997 and followed it until 2002 (http://www.cdc.gov/niosh/gpran1a.html). A new plan has been developed for 2004 to 2009 (http://www.cdc.gov/niosh/docs/strategic/). The strategic goals of this plan are to:

- Conduct research to reduce work-related illnesses and injuries
- Promote safe and healthy workplaces through interventions, recommendations and capacity building
- Enhance global workplace safety and health through international collaborations

NORA is being updated to address the needs of another decade (http://www.cdc.gov/niosh/NORA/). The second decade of NORA is being organized to prepare research agendas primarily along the lines of major industrial sectors. As was the case in the initial NORA process, research agendas are being developed with broad involvement and input from all parties with an interest in occupational safety and health. This renewal for NORA is intended to bring NIOSH even closer to the problems of U.S. industries and workers.

NIOSH has developed an operational logic model to assure that its strategic planning activities are logical, appropriate, and optimize NIOSH's relevance and impact (Figure 1-3). The logic model formally depicts the planning process. It moves from left to right across the chart, beginning with production and planning inputs. Those inputs lead to NIOSH research activities. The outputs of NIOSH research activities lead to customer activities. Some NIOSH customers are intermediaries who use or adapt NIOSH outputs before they reach the final customers: employers, employees, industries, educators, and regulators. Their actions help NIOSH to contribute to the improvement of safety and health in the workplace. This process is affected by a variety of external factors including economic and social conditions and the regulatory environment.

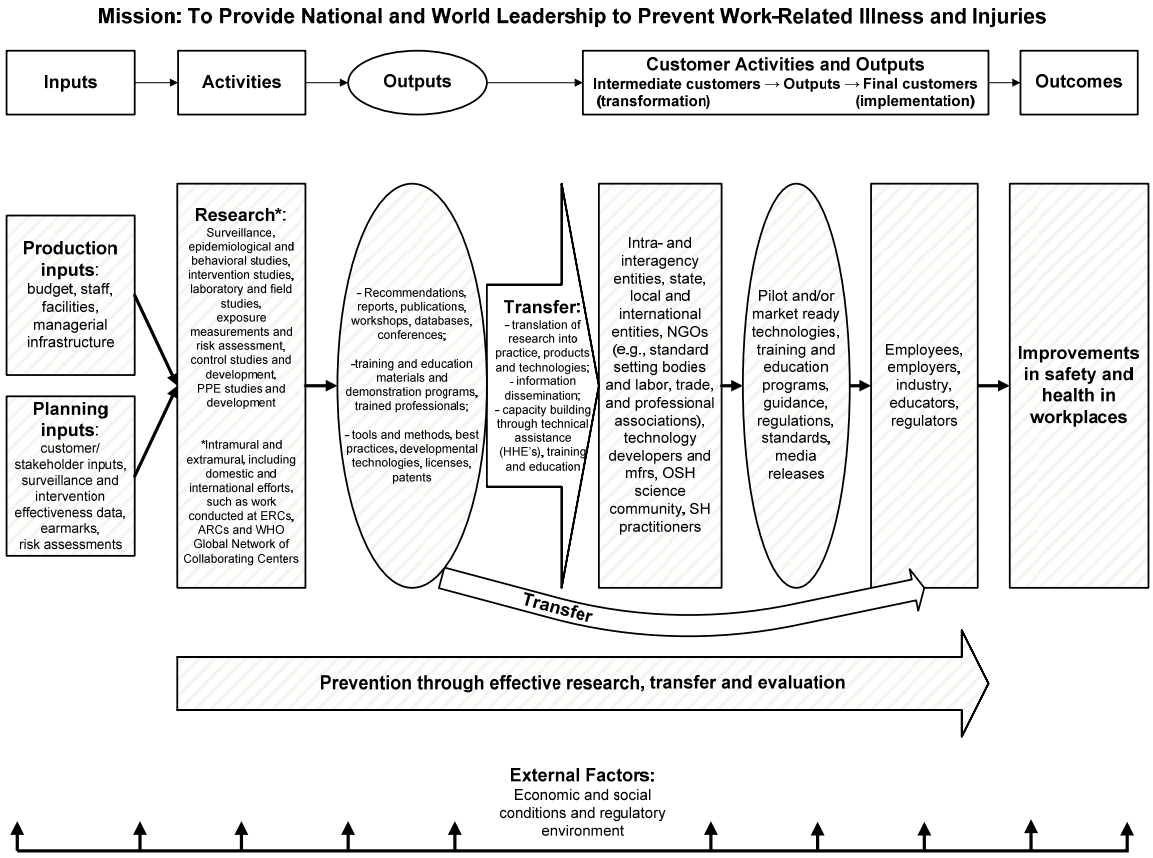

Figure 1- 3. The NIOSH Operational Logic Model

A brief discussion of logic model elements follows.

Planning inputs are data that guide NIOSH to research action. Many sources, in addition to NIOSH sources, build these data summaries. They come from workplaces, surveillance, risk assessments, intervention effectiveness data, and from the Institute's stakeholders and customers. One of the major planning activities for NIOSH is the collection, analysis, and interpretation of health and hazard data. NIOSH uses illness, injury, fatality, exposure, and hazard data for those purposes. NIOSH actively engages in surveillance to obtain data that can guide its efforts. The "NIOSH Worker Chartbook," now in its second edition, is an important source of occupational health surveillance data (Appendix 1-03).

An often-overlooked issue is that inputs do not only turn activities on. They also serve to turn off activities that have been completed, have become lesser priorities, or have otherwise outlived their usefulness.

Activities encompass a broad range including many types of research; field investigations of work places; surveillance; policy development; and health communications.

There are over 1,000 active research projects being conducted at NIOSH. In broad terms these projects encompass a large number of areas and disciplines, such as:

- Hazard control development and testing, epidemiology, behavior, toxicology, biology, and risk assessment
- Development and testing of personal protective equipment for the workplace
- Development of environmental sampling and testing methods
- Performance of both laboratory-based and field research: intramural, extramural, domestic, and international
- Developing practical workplace interventions, testing them, and when they are effective, promoting their adoption in the workplace

Another type of activity is the Health Hazard Evaluation (HHE) Program. Under Section 20 of the Occupational Safety and Health Act of 1970, NIOSH performs inspections and investigations into workplace hazards. This activity frequently results in development of research knowledge that is beneficially applied in the workplace. All programs contribute to this effort, and a broad range of expertise is required. The goal is to assist employers and employees by evaluating and recommending solutions to workplace safety and health issues. Typically between 300 and 500 HHE requests are received annually. HHE reports are available to other customers and stakeholders.

Another NIOSH activity is operation of two programs in fatality investigations, one in fire fighter fatality investigation and prevention and another in fatalities among other groups of workers. In 2003, the latter program focused on deaths of workers under 18 years of age, deaths in roadway construction zones, and deaths involving machinery. This program is currently active in 21 states. In both programs, investigators assess the circumstances around each fatality to formulate prevention strategies. Plans are then designed for the dissemination of those strategies.

Another activity supported by NIOSH is training. NIOSH-supported training prepares professionals in occupational safety and health and also serves the function of transferring NIOSH research into the workplace. NIOSH developed university-based Education and Research Centers (originally named Educational Resource Centers) in 1977 to meet the needs for trained safety and health professionals. NIOSH currently funds 16 Education and Research Centers at leading universities to provide graduate and continuing education programs in occupational medicine, occupational health nursing, industrial hygiene, safety, and other related disciplines. These centers also serve as regional resources for all those involved with occupational safety and health including industry, labor, government, academia, and the general public. The centers are funded for up to five years through a competitive peer-review process. NIOSH also supports approximately 40 smaller training project grants that are also focused on providing qualified professionals for the field.

Outputs and Transfer: The result of research is new knowledge. New knowledge serves society by providing practical guidance on matters of importance to the population. Research programs are obligated to contribute to the advancement of society by integrating this new knowledge. NIOSH carries out the responsibility to disseminate results of its research with a

variety of outputs such as: reports, publications, recommendations, workshops, databases, tools and methods, training and education materials, demonstration projects, best practices, developmental technologies, and licenses and patents.

Efforts to maximize the impact of NIOSH outputs through effective transfer to customers are coordinated by the Office of Health Communications. This office works with each research program to plan and execute communications strategies designed to reach a variety of customers for those outputs. Customers include employers and their groups, employees and their groups, standards-setting organizations, professional associations, and the general public. NIOSH researchers publish in peer-reviewed publications and present their work at conferences. They also publish NIOSH documents and other information products. The NIOSH publications office stocks more than 4,200 NIOSH document titles. It distributed nearly a million printed publications and CD-ROMs in 2003. A survey of four occupational safety and health professional organizations indicated that NIOSH is effectively reaching several of its intended audiences with credible and useful information.

A special kind of output is NIOSH documents, testimony, and other communications on criteria for recommended standards for safety and health hazards in the workplace. These criteria represent the formal link between NIOSH and OSHA or MSHA; and between research and rule-making. For example, NIOSH scientists recently testified to OSHA about their proposed new rule on hexavalent chromium, a carcinogen and skin irritant. In FY 2003, NIOSH prepared science-based comments on 15 regulatory activities at the Departments of Labor, Transportation, and Justice. NIOSH also provided testimony for CDC at two Congressional hearings in 2003, one on the subject of aircraft cabin air quality and one on anthrax detection and sampling.

Since its inception, NIOSH has been strongly committed to transferring its outputs to customers. In recent years, newer electronic media has enhanced this effort. NIOSH has a Web site that supports approximately 500,000 user sessions (and about 2.8 million page views) per month. NIOSH also operates a technical information inquiry service that includes an 800 number and an internet inquiry response service. In FY 2003, NIOSH responded to more than 100,000 inquiries by phone and almost 3,800 by Internet.

In 2004, NIOSH created an Office of Research and Technology Transfer to provide formal administrative support for the concurrently developing NIOSH Research to Practice (r2p) Initiative. The office and r2p policies help ensure that NIOSH considers these issues in making funding decisions and that NIOSH researchers consider issues such as translating their research findings into best practices, products, and technologies and dissemination of those products from the very beginning of their research projects.

Outcomes: As NIOSH research is transferred, the Institute often moves into more dependent partnerships with others, and has less control of what happens. The resources required to have an affect are less predictable, the outcomes are less sure, and the results harder to verify. These partners include employers, labor and industry groups, and regulatory bodies. In addition, there are manufacturers who adopt new NIOSH technologies as products for the marketplace, or help develop them further. These *customer activities and outputs* are crucial

to NIOSH having real-world impact. Influencing and motivating the actions of others is an *intermediate outcome*.

An *outcome* is a NIOSH contribution to reducing morbidity or mortality due to occupational injuries or diseases. Especially for diseases of long latency, such as induction of cancer by carcinogens, objective evidence of reduction in causative exposures may be considered a surrogate outcome, as in the NIOSH PART goal specifying reduction in coal mine dust exposure.

In many instances it is difficult to effectively trace the contribution of NIOSH to end outcomes. Many groups contribute to reducing occupational injuries and illnesses and to creating safer places to work. Still, NIOSH is strongly committed to developing objective measures of its real-world performance. If the best measures of performance relate to motivating and enabling others to make work safer, this in no way diminishes the importance of the accomplishment.

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