III. Overview of the National Institute for Occupational Safety and Health

When the Occupational Safety and Health Act (OSH Act) of 1970[5] was signed into law by President Richard Nixon on December 29, 1970, NIOSH came into being. The Institute was officially initiated 120 days later (April 29, 1971). Since then, NIOSH has been the Federal agency responsible for conducting research and making recommendations for the prevention of occupational injury and illness.

Over a half century earlier, in 1914, the first Federal occupational safety and research program was initiated with the establishment of the Office of Industrial Hygiene and Sanitation in the Public Health Service Division of Scientific Research.[6] This early precursor to NIOSH was located at the U.S. Marine Hospital in Pittsburgh, Pennsylvania until it was transferred to Washington, D.C. in 1918.

This early Federal occupational safety and health research program went through various organizational, name, and location changes from 1937 through 1968, ultimately becoming (in December 1968) the Bureau of Occupational Safety and Health (BOSH) in the Environmental Control Administration. The Environmental Protection Agency (EPA) was established in 1970 and assumed most of the functions and offices of the Environmental Control Administration, except for a few offices, including BOSH.[6] Upon the passage of the OSH Act, BOSH was assimilated into the new Institute.

Legislative Authorities

The OSH Act created NIOSH in the Department of Health, Education and Welfare (DHEW) and the Occupational Safety and Health Administration (OSHA) in the U.S. Department of Labor (DOL). OSHA is responsible for developing and enforcing workplace safety and health regulations in industries other than mining.

Among other things, the OSH Act authorizes NIOSH to:

- Conduct research on worker safety and health, including new safety and health problems
- Develop recommendations for occupational safety and health standards
- Conduct training and employee education
- Develop information on safe levels of exposure to toxic materials and harmful physical agents and substance
- Conduct on-site investigations to determine the toxicity of materials used in workplaces
- Fund research by other agencies or private organizations through grants, contracts, and other arrangements.

The Federal Mine Safety and Health Amendments Act of 1977[7] (which superseded the Coal Act of 1969[8]) assigns additional authorities for NIOSH in coal mining health research. Among these health-oriented responsibilities, NIOSH was given a responsibility that had traumatic injury prevention implications: the testing and certification of personal protective equipment (along with hazard-measurement instruments).

Mining safety and health remain an ongoing concern of NIOSH. In 2006, the Mine Improvement and New Emergency Response (MINER) Act 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.

Through the legislative authorities that underpin NIOSH, 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.

Mission and Values

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.[9] 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.
- Performace – Our programs are results-oriented.
- Accountability – Our programs are evaluated by how ell they solve the occupational safety and health problems found in today's workplaces and the workplaces of tomorrow .[10]

Organization and Management

NIOSH is now part of the Centers for Disease Control and Prevention (CDC) in the U.S. Department of Health and Human Services (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 his or her 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. The main organizational units are divisions and laboratories. These are a mixture of disease and injury-specific divisions (safety research, respiratory diseases), 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, D.C. and Atlanta. To coordinate across these geographically dispersed units, NIOSH makes extensive use of modern information technology, including e-mail and video conferencing.

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.[11] One of the cross-Institute activities within the matrix management structure is the Cross-Sector Traumatic Injury (TI) Research Program, which will be described in more detail in the next section. The matrix management structure of the NIOSH cross-Institute Program Portfolio is depicted in Table 1.

NIOSH is committed to performance-based management and has recently developed several key indicators to track organizational performance. Examples include tracking financial performance by establishing and monitoring the percent of total funding to divisions/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 (GPRA)[12] 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) (A1-2)[13] used by OMB to assess Federal agency performance on measures including strategic planning, program management, and results. PART performance ratings are an important consideration in budget requests by the President. Current NIOSH key performance measures for PART, established in 2004, target the following safety and health-focused achievements by 2014 (note that two of the three are relevant to traumatic injuries):

- 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, and
- 75 percent of professional fire fighters and first responders have access to CBRN respirators.

A PART planning performance measure requires targeting 95 percent of new research to the areas of occupational safety and health most relevant to future improvements in workplace protection by 2009, as judged by independent panels of external customers, stakeholders, and experts. Finally, a PART training performance measure requires that 80 percent of companies employing those with NIOSH training rank the value added to the organization as good or excellent, and that 15 percent of practicing health and safety professionals have academic or continuing education training by 2009.

NIOSH receives external guidance and advice from two Federal Advisory Committees. The Board of Scientific Counselors (BSC)[14] 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).[15] 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 not only a vehicle 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.

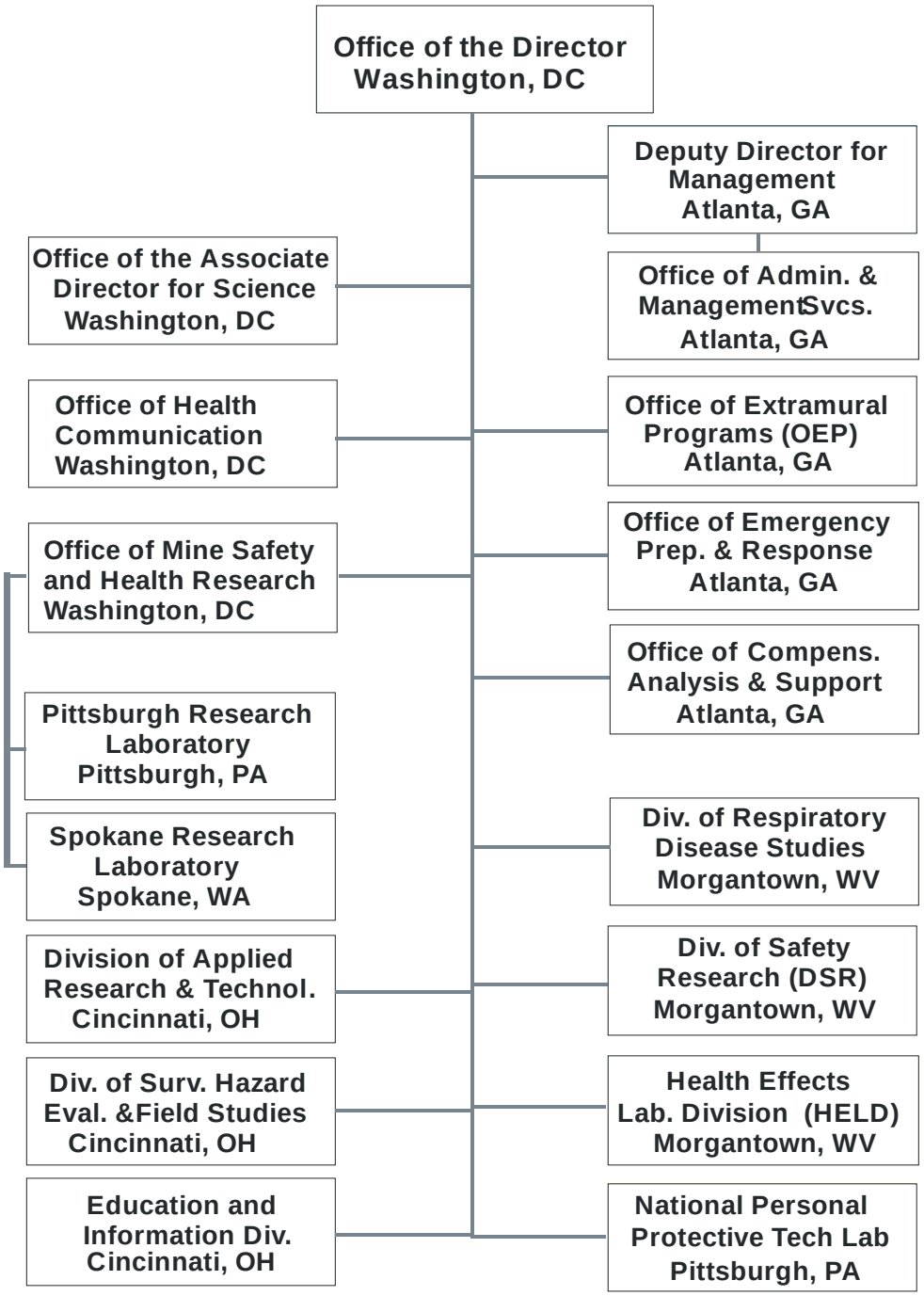

Figure 1: Organizational Components of NIOSH

Table 1: Matrix Management Components of NIOSH Program Portfolio.[13]		
NORA Sector Programs	**NIOSH Cross-Sector Programs**	**NIOSH Coordinated Emphasis Areas**
Agriculture, Forestry and Fishing	Authoritative Recommendations	Economics
Construction	Cancer, Repro and Cardiovascular	Exposure Assessment
Healthcare and Social Assistance	Communications and Information Dissemination	Engineering Controls
Manufacturing	Emergency Preparedness/Response	WorkLife Initiative
Mining	Global Collaborations	Occupational Health Disparities
Services	Health Hazard Evaluation (HHE)	Small Business Assistance and Outreach
Wholesale and Retail Trade	Hearing Loss Prevention	Surveillance
Transportation, Warehousing and Utilities	Immune and Dermal	
	Musculoskeletal Disorders	
	Personal Protective Technology	
	Radiation Dose Reconstruction	
	Respiratory Diseases	
	Training Grants	
	Traumatic Injury	
	Work Organization and Stress-Related Disorders	

Resources

The NIOSH budget is a direct appropriation from Congress, as a specific line item in the DHHS/CDC appropriation. The Congressional language which accompanies the funding appropriation often contains specific directives about the intended use of portions of the funds. These directives—or "earmarks"—instruct NIOSH to use specific portions of the funds to conduct research which targets certain industries such as agriculture or construction, or specific populations, such as young workers or fire fighters; or supports research or surveillance initiatives such as the National Occupational Research Agenda (NORA), Emergency Preparedness, the DOE special exposure cohort study, or the enhanced coal workers' health surveillance program.

In addition, NIOSH may be charged by Congress or DHHS to lead or participate in evolving public health activities such as the World Trade Center health surveillance 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.[16] Beginning in 2006, Congress moved the charges associated with business support services from the NIOSH appropriation and directly to the CDC (approximately $35 million). Continuing "earmark" obligations, coupled with escalating personnel costs and projections of diminished appropriations, create significant challenges as NIOSH strives to fulfill its mission and optimize its impact on occupational safety and health problems.

In Fiscal Year 2006, $255 million was appropriated for NIOSH. Table 2 shows NIOSH funding for the years 1996 through 2006, with adjustments for inflation and application of the biomedical research index. (Note that funding targeted to the World Trade Center Response discussed in Chapter 10 is not reflected in these figures.) 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,[17] 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.

Table 2: NIOSH Budget, 1996 – 2007

	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Budget (in millions)	$161	$173	$184	$204	$226	$260	$276	$273	$277	$286	$255*	$253
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).[17] Figures shown as millions of 1996 dollars.*

- Data not provided to allow calculation of index:
http://officeofbudget.od.nih.gov/UI/GDP_FromGenBudget.htm

The NIOSH staffing level is approximately 1,414 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 U.S. Bureau of Mines (USBM) 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 2.

NIOSH has a long history of organized planning to optimize its relevance and impact. During the 1980s, NIOSH conducted two national symposia on the leading causes of occupationally-related illness and injury. Those meetings resulted in 10 written strategies for prevention that guided NIOSH research programs during the early 1990s (including severe traumatic occupational injuries).[18-27]

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.[28] 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 (including traumatic injuries) in occupational safety and health.[29] 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.

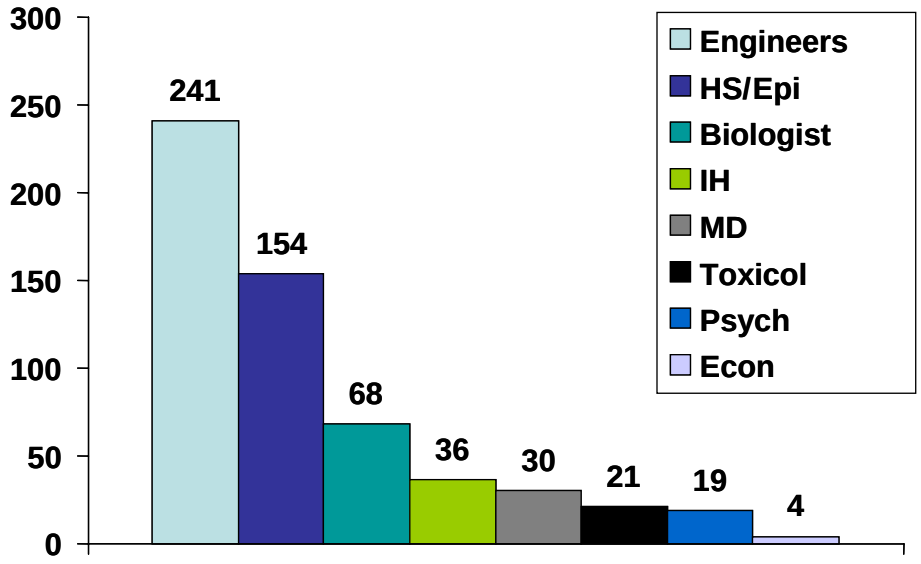

Figure 2: NIOSH Research Staff by Professional Discipline.

Planning and Logic Model

During the NORA process, NIOSH developed a strategic plan from 1997 and followed it until 2002.[30] A new plan was developed for 2004 to 2009.[10] The strategic goals of this plan are to:

Goal 1: Conduct research to reduce work-related illnesses and injuries.

- Track work-related hazards, exposures, illnesses and injuries for prevention.
- Generate new knowledge through intramural and extramural research programs.
- Develop innovative solutions for difficult-to-solve problems in high-risk industrial sectors.

Goal 2: Promote safe and healthy workplaces through interventions, recommendations, and capacity building.

- Enhance the relevance and utility of recommendations and guidance.
- Transfer research findings, technologies, and information into practice.
- Build capacity to address traditional and emerging hazards.

Goal 3: Enhance global workplace safety and health through international collaborations.

- Take a leadership role in developing a global network of occupational health centers.
- Investigate alternative approaches to workplace illness and injury reduction and provide technical assistance to put solutions in place.
- Build global professional capacity to address workplace hazards through training, information sharing, and research experience.

NORA has recently been updated to address the needs of another decade.[31] 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 and appropriate, and that they optimize NIOSH relevance and impact (Figure 3). The logic model formally depicts the NIOSH operational 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.

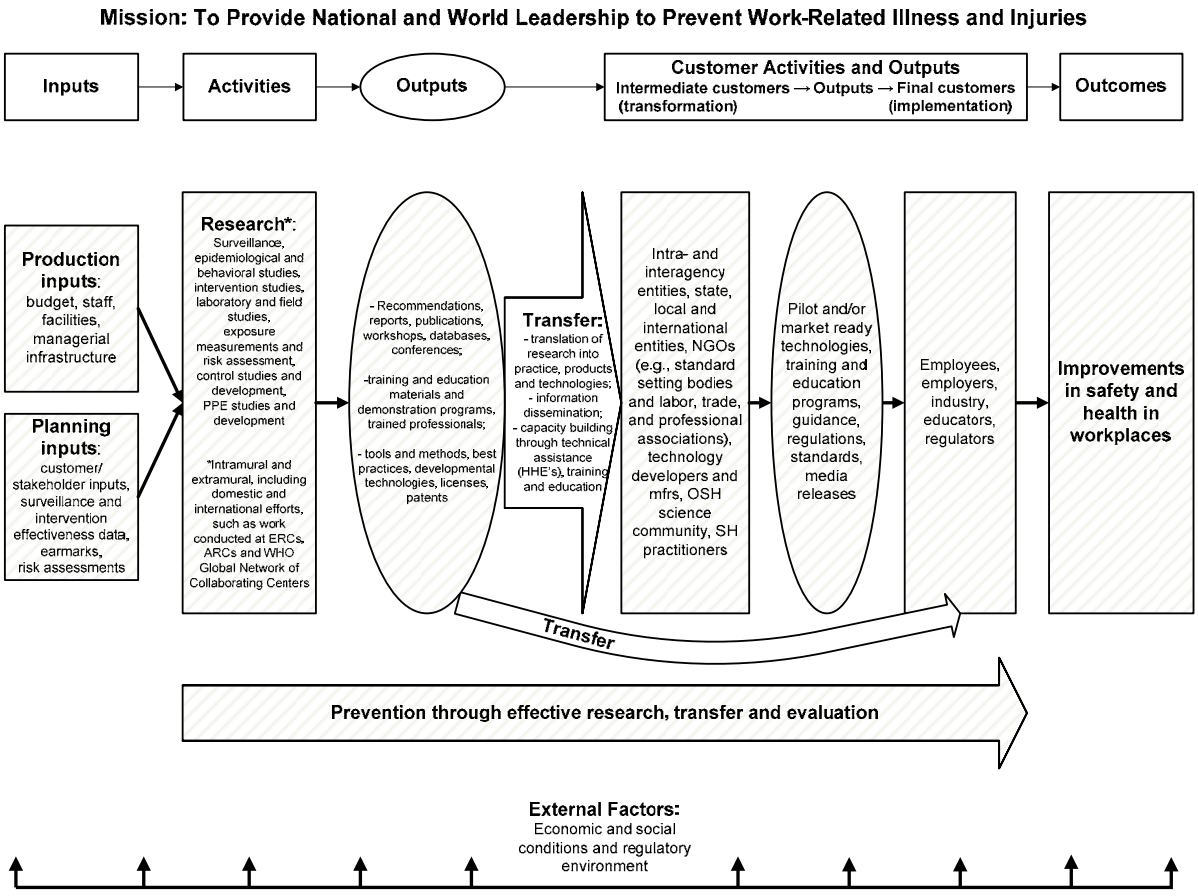

Figure 3: The NIOSH Operational Logic Model.

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 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 Health Chartbook,[32] now in its second edition, is an important source of occupational health surveillance data.

An often-overlooked issue is that inputs are not only used to determine which activities should occur, but also which activities should not occur because they 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 workplaces, surveillance, policy development, and health communications. More than 1,000 active research projects are being conducted at NIOSH by researchers in a broad array of disciplines, including (but not limited to): behavioral scientists, biologists, chemists, economists, engineers,

epidemiologists, toxicologists, etc. In broad terms, these projects encompass a diverse set of areas, such as:

- Performance of research—both laboratory- and field-based research; both intramural and extramural; both domestic and international
- Development of practical hazard controls and other workplace interventions, testing them, and when they are effective, promoting their adoption in the workplace
- Development and testing of personal protective equipment
- Development of environmental sampling and testing methods,
- Field investigations of injuries, fatalities, and workplace hazards.

An example of the latter activity is the Health Hazard Evaluation (HHE) Program.[33] 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 in a similar vein is represented by two programs in fatality investigations, both a part of the TI Research Program—one which investigates selected fatalities among all groups of workers, and another which investigates line-of-duty fatalities among fire fighters. The former program, known as the Fatality Assessment and Control Evaluation (FACE) Program,[34] currently focuses on deaths of workers under 18 years of age, deaths of Hispanic workers, deaths in roadway construction work zones, and deaths involving machinery. In addition to the in-house program, a State-based program is currently active in nine States. In both programs, investigators assess the circumstances surrounding each fatality to formulate strategies to prevent future similar deaths. Plans are then designed to disseminate those strategies. The fire fighter fatality investigations seek causal information for deaths from trauma (fire ground deaths, motor-vehicle deaths, etc.) and from line-of-duty cardiovascular events.[35] Reports and alerts, with risk information and prevention recommendations are then distributed widely to the fire service.

Another activity supported by NIOSH is training of occupational safety and health professionals. 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.[36] 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, engineering, epidemiology, 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: A principal activity of NIOSH is research, and the desired 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 (OHC). The NIOSH OHC 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.

Since its inception, NIOSH has been strongly committed to transferring its outputs to customers. In recent years, this effort has been enhanced by newer electronic media. NIOSH has a Website that supports approximately 500,000 user sessions (and about 2.8 million page views) per month.[37] NIOSH also operates a technical information inquiry service that includes an 800 number and an Internet inquiry response service.[38] 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.[39] 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 transferring knowledge and products to those who can implement them in the workplace. A key to the r2p process is involving appropriate partners at the appropriate stages of 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 produce an effect are less predictable, the outcomes are less certain, 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 may result in **intermediate outcomes**.

It is often difficult to effectively trace the NIOSH contribution to reductions in morbidity or mortality due to occupational injuries or diseases, or **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.