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DEMONSTRATING AND COMMUNICATING RESEARCH IMPACT

Preparing NIOSH Programs for External Review

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Sponsored by the National Institute for Occupational Safety and Health



Safety and Justice

A RAND INFRASTRUCTURE, SAFETY, AND ENVIRONMENT PROGRAM

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Summary

The evaluation of research impact is a topic of enduring interest to research funders and performers of research. *Research impact* refers to the contribution of research activities to desired societal outcomes, such as improved health, environment, economic, and social conditions. In recent years, this interest has grown because of governments' desire to understand the impact of publicly funded research for the purpose of budgeting and resource allocation decisions, both nationally and internationally. In the United States, the 1993 Government Performance and Results Act (GPRA) (Pub. L. No. 103-62) and the 2002 Program Assessment Rating Tool (PART) are the most recent manifestations of the public's concern about the payoff of federally funded research. These policies, which require all federal programs to conduct assessments of their own performance, present special challenges for research programs because of the methodological difficulty of measuring the impact of research.

The difficulties associated with tracking and measuring the societal outcomes of research has caused this area of evaluation to lag other types of evaluation that seek to assess other dimensions of research, such as quality, relevance, and productivity. Despite these difficulties, approaches to evaluating the impact of research have progressed substantially in the past decade. Technometrics, sociometrics, bibliometrics, value-mapping, expert review, and case studies represent both quantitative and qualitative means of assessing the benefits of research to industry, government, and the public.

Federal agencies often employ multiple types of expert review to evaluate research impact. In the past few decades, use of expert panels has become commonplace for evaluating larger units, such as research groups, institutes, and research programs. In addition to evaluating scientific merit, these panels often assess the socioeconomic impact of research.

Expert Review of NIOSH Programs by the National Academies

In September 2004, the National Institute for Occupational Safety and Health (NIOSH) contracted with the National Academies to conduct external reviews of up

to 15 of its research programs. The purpose of the reviews was to judge the extent to which each program's research was relevant to real-world occupational safety and health (OSH) problems; contributed to reductions in occupational hazardous exposures, illnesses, and injuries; and was effective in targeting new research areas and identifying emerging issues.

Eight research programs were reviewed by individual evaluation committees (ECs) composed of persons with expertise appropriate to evaluating the specific program. In many cases, experts were recruited from stakeholder groups (such as labor unions and industry). Experts in technology transfer and program evaluation were also included. In conducting their evaluations, the ECs ascertained whether NIOSH is doing the right things (relevance) and whether those things are improving health and safety in the workplace (impact).

To maintain consistency in the evaluation across the independent ECs, the National Academies appointed a committee of 14 members, including persons with expertise in occupational medicine and health, industrial health and safety, industrial hygiene, epidemiology, civil and mining engineering, sociology, program evaluation, communication, and toxicology; representatives of industry and of the workforce; and a scientist experienced in international occupational-health issues. This committee, referred to as the Framework Committee, developed a guide to provide a common structure for the review of the different research programs. The guide, called the framework document, outlines the evaluation criteria to be used by the ECs, the information needs, and the specific evaluation questions to be considered.

The framework document recommended that the ECs consider the available evidence of reduced work-related risks and adverse effects (hazardous exposures, illnesses, fatalities, and injuries) and external factors related to the changes. A finding of high impact required the EC's judgment that the research program had contributed to these end outcomes. So, for example, *high impact* could mean that outcomes had occurred earlier than they otherwise would have or were better than they would have been in the absence of the research program. A finding of high impact could also result if external factors beyond NIOSH's control had impeded achievement of end outcomes. The criteria for assessing relevance centered on whether the program appropriately set priorities among research needs and the assessment of how engaged the program is in appropriate transfer activities.

NIOSH asked RAND to assist it in preparing for and engaging in external program reviews. Our activities took place in two phases: research and design (phase I) and implementation (phase II). In phase I, we met with other federal agencies to gain perspective about different approaches to external review; developed a set of guidance principles to assist NIOSH programs throughout the external review process; and created a detailed set of specifications for preparing a model package of information, or *evidence packages*, to give to the reviewers (Greenfield, Balakrishnan, et al., 2006). In phase II, we worked with selected NIOSH programs undergoing external review,

which included assistance with preparing evidence packages. Phase II efforts led to the development of a set of tools that were instrumental to demonstrating and communicating the impact of research activities on achieving outcomes.

This document reports on phase II of the project. In particular, it describes the tools developed—logic models, outcome worksheets, and outcome narratives—and examines their use in preparing evidence packages.

Demonstrating Impact

Logic models and outcome worksheets were used primarily to help NIOSH programs demonstrate how their research was intended to achieve program outcomes. Each is discussed in more detail in this section.

Logic Models

A central challenge in demonstrating the impact of research programs is describing the path by which research achieves its intended outcomes (in NIOSH's case, reductions in work-related hazardous exposures, illnesses, or injuries). Logic models can help with this demonstration. A logic model is a visual depiction of the stages across which research inputs are translated into outcomes. Such depictions can help reviewers understand how research activities achieve societal objectives or impacts. Logic models provide a comprehensive view of a research program: what it does, whom it affects, and the expected outcomes that can form the basis of the evaluation. Logic models can also define the domain of analysis for evaluating impact. By showing the multiple contributors to any given end outcome, the logic model helps define the program's sphere of influence—i.e., for what the program can take credit and for what it can be held responsible.

There are several ways to develop and customize logic models for specific research programs. Because a logic model is an abstraction that omits detail for the sake of clarity of representation, the trade-off between detailed accuracy and clarity of presentation varies according to context and purpose. In developing logic models with NIOSH programs, clearly depicting the paths to outcomes was the priority. Thus, we maintained the linear flow of the logic model, using feedback loops and other divergent pathways only in rare cases. Moreover, these logic models were accompanied by text in the evidence packages, and many of the complex details that were omitted in the logic model were explained in these narratives.

Outcome Worksheets

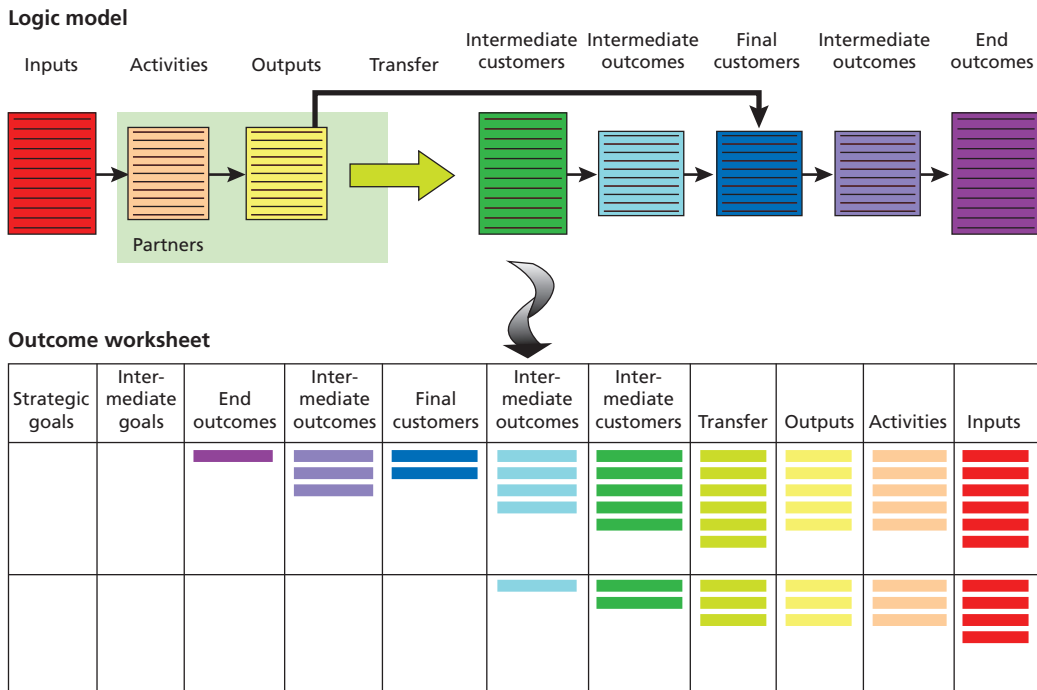
Logic models were used to assist NIOSH programs in presenting an overarching view of their programs and, in so doing, articulate their program theory. However, the evidence of impact needed for the evidence packages required descriptions of cases in

which NIOSH programs achieved specific outcomes. The guidance we provided to NIOSH research programs for describing their path to outcomes is based on the historical tracing method. This method traces a series of interrelated events either going forward from the research activities to downstream outcomes or working backward from an outcome to precursor research. A tool that supported the use of this method was the outcome worksheet. An outcome worksheet is a spreadsheet that details how specific outcomes were achieved, based on the path described by the logic model. Figure S.1 illustrates the creation of the outcome worksheets from the logic model.

As shown in Figure S.1, the logic model begins with the “Inputs” box in red and ends with the “End outcomes” box in purple. The outcome worksheet (shown in the lower half of Figure S.1) includes the strategic and intermediate goals and reverses the order of the logic model elements, with the end outcomes at the far left end and the inputs at the right.

We developed the outcome worksheet to assist NIOSH researchers in thinking through the causal linkages between specific outcomes and research activities,

Figure S.1
Moving from the Logic Model to the Outcome Worksheet



determining the data needed to provide evidence of impact, and structuring the evidence in a systematic framework.

The first step in creating an outcome worksheet involves deciding whether to trace the research path forward (i.e., from research activities to outcomes) or backward. Forward tracing can capture a comprehensive view of a research project's or program's effects. Because the path leads from the research, the connection to the research is ensured. In contrast, backward tracing usually focuses on a single outcome of importance and follows the trail back through those developments that were critical in reaching the identified outcome. One implication of backward tracing is that it highlights activities that led to anticipated outcomes and may not capture the broader range of outcomes to which forward tracing may lead or may select only the most-positive cases of outcomes. In NIOSH's case, the National Academies' review focused on impact, and, as shown in Figure S.1, outcomes were the natural starting point, followed by customers, transfer activities, outputs, research activities, and, finally, inputs. Not only did this backward tracing reinforce the emphasis on outcomes, it also oriented researchers toward a collective body of research rather than on individual research projects.

In addition to identifying and structuring information, the format of the outcome worksheet also enabled quick review and analysis of a large amount of information. Finally, the outcome worksheet was critical in helping research programs prepare outcome narratives, our final tool, for communicating impact.

Communicating Impact

The logic models and the information from the outcome worksheets became part of a larger set of materials assembled in the form of an evidence package and submitted to the reviewers. A key component of the package was the outcome narrative, which helped to communicate the impact of NIOSH programs by describing how specific research activities contributed to intermediate or end outcomes. The outcome narrative served as our primary tool in communicating impact and is described in more detail in this section.

Outcome Narratives

The central purpose of the evidence package is to communicate to reviewers how research activities have contributed to societal outcomes. The reviewers were expected to use their expert judgment and knowledge of the field to evaluate the claims in the evidence package about the role of NIOSH programs in achieving intermediate outcomes (such as changes in workplace practices) or end outcomes (such as reductions in hazardous exposures). These claims of impact were presented in the form of outcome narratives that described specific instances of research that led to outcomes. To structure the outcome narrative, we again drew on the elements of the logic model.

Figure S.2 illustrates the connections among the tools we developed, including the outcome narrative.

The outcome narrative had five major sections, accompanied by specific questions.

- *Issue: What is the major societal problem?* The narrative should begin by defining the issue and its significance, why it exists, and who is affected.
- *Approach: What approach has been used to address this issue?* This section describes the research strategies that have been used to address the issue.
- *Outputs and Transfer: What were the major outputs from this research area? How and to whom were the products transferred?* This section highlights the relevance of outputs and transfer activities.
- *Intermediate Outcomes (or End Outcomes): What effect did the outputs have on the broader community?* This section emphasizes the effect of program outputs and establishes a causal thread by describing intermediate and final customers' responses to program outputs. The discussion plausibly links to some output.
- *What Is Ahead: What are some specific research activities currently under way or in planning in response to the problem?* This is an optional section that showcases activities or outputs currently in progress or in the planning stages. It should include work that has not yet achieved intermediate outcomes status but that is clearly on the horizon (three to five years out).

Other Applications of These Tools

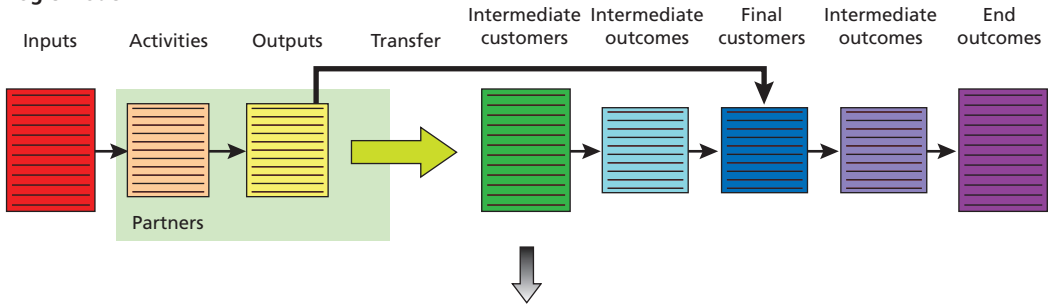
The tools described in this book have uses beyond supporting preparations for external review. They can also be used by research programs to conduct outcome monitoring, which can assist program managers in thinking through the data they will need to demonstrate program effectiveness.

Logic models can also support project planning and management, as they provide a structure for determining whether existing strategic, intermediate, and annual goals are aligned with program operations. These goals can drive the development of measures that can gauge the progress of the program toward achieving outcomes.

The outcome worksheets are useful for determining the appropriate data required for outcome monitoring and tracking. Using these, research programs can identify which set of research activities have been linked to outcomes, assess the extent to which transfer activities have led to intended customer outcomes, and identify the range of intended and unintended outcomes from their outputs. Over time, these worksheets can become the foundation of a database that tracks uptake, adoption, and utility of research outputs by different customers. This could enable better strategic planning of transfer activities and working more effectively with partners at early project phases.

Figure S.2
Relationship Among the Three Tools

Logic model



Outcome worksheet

Strategic goals	Inter-mediate goals	End outcomes	Inter-mediate outcomes	Final customers	Inter-mediate outcomes	Inter-mediate customers	Transfer	Outputs	Activities	Inputs

Outcome narrative

Goal

Subgoal

Issue
Description of the issue the research activities are designed to address

Approach

Outputs and transfer

Outcomes (intermediate or end)

What's ahead
Description of research activities currently being done to achieve specific intermediate or end outcomes

Finally, the outcome narratives are useful tools for communicating impact to audiences beyond reviewers. An effective outcome narrative can convey the value of research to key stakeholders, who often prefer reading documents that get to the point quickly and clearly. The concise format and readable layout of the outcome narrative ensures that the investments to demonstrate impact can be accessed and appreciated by a broader community.