

NIOSH Disaster Science Research Initiative to Enhance Responder Safety and Health

The National Institute for Occupational Safety and Health (NIOSH) is the only Federal agency charged by Congress in the Occupational Safety and Health Act of 1970 to conduct worker safety and health research. NIOSH has been a leader in the field of disaster science research especially with regard to finding new ways to ensure responder safety and health before, during, and after a disaster. In partnership with other Federal and state agencies, as well as private sector entities, NIOSH has made responder safety and health research an important part of its research portfolio. Nearly a decade ago, NIOSH established the NIOSH Emergency Preparedness and Response (EPR) Program to advance scientific research in the area of responder safety and health.

In 2002, NIOSH organized its disaster science activities in an Emergency Preparedness and Response Office (EPRO). Today, the EPRO coordinates NIOSH's preparedness and response activities during man-made and natural disasters as well as coordinates NIOSH's disaster science research activities. Based on NIOSH's experience in responding to disasters, the Institute led an interagency work group following Hurricane Katrina to develop the Emergency Responder Health Monitoring and Surveillance (ERHMS) Guidance, which was adopted by the National Response Team (<http://www.cdc.gov/niosh/topics/erhms/>) in 2012. ERHMS provides guidance and tools to assist public and private sector entities in protecting responders prior, during, and after an emergency response incident.

NIOSH's experiences in responding to emergencies including the World Trade Center disaster, Hurricane Katrina, and the Deepwater Horizon disaster have also stimulated scientific inquiry among occupational safety and health researchers with regard to the long-term health outcomes from disaster response and the use of biomonitoring in emergency responders. Scientific study can provide better understanding and mitigation of responder health effects from disasters and can lead to improvements in the effectiveness of emergency responses.

Disaster science as it relates to responder safety and health can present unique challenges to occupational safety and health researchers. First, a decision process needs to be in place in advance of a disaster to determine if a responder research study is warranted. Many factors need to be weighed, but it is imperative that a scientific study not interfere with actual response activities. Second, responder safety and health research studies are difficult to design and difficult to implement. Strategic thinking about what study designs and implementation plans are most feasible for responder safety and health studies is important. Third, research can be costly and scientists must assess whether studies are a worthwhile public health investment that will enhance future response efforts. The goal of disaster science research would be to produce useful, reliable results. As emergencies are by definition unpredictable, an accelerated decision-making process is necessary to determine if research should be undertaken.

In January 2014, NIOSH launched the *NIOSH Disaster Science Research (DSR) Initiative to Enhance Responder Safety and Health*. The DSR Initiative will concentrate on developing an approach to timely, scalable, scientifically sound responder-based research that can feasibly be implemented before, during, and after a large-scale disaster. The DSR Initiative is based on the framework developed in *A Decision Process for Determining Whether to Conduct Responder Health Research Following Large Disasters*,¹ which includes factors

to consider for a research study, critical gatekeeper functions, and a process of expert opinion consultation (see Appendix 1).

Some of the potential research questions under consideration by the *DSR Initiative to Enhance Responder Safety and Health* include:

1. Considering the possible types of responses and the responders involved, what are the primary questions needing research? Where are the major gaps in our understanding of exposures and other factors influencing responder health?
2. What disaster research is NIOSH uniquely positioned to do?
3. What is the role of the academic community in responder safety and health research? What is the role of emergency preparedness and response practitioners and consultants in responder safety and health research?
4. What role should biomonitoring play in responder disaster research and how is it best implemented?
5. What are the major barriers to disaster science research to enhance responder safety and health?
6. How can ERHMS best be used to complement responder disaster research?
7. How does disaster research best fit into existing national response policies and systems?

The *DSR Initiative* will explore the use of an All-Hazards Research Framework adaptable to different disaster scenarios. Special considerations would include the impact of a novel exposure, unexpected or severe health effects, the effectiveness of a proposed intervention, mental health/resilience issues, and disease outcomes with latency periods. Defining “research” in its broadest sense would include etiologic, intervention, applied, comparative effectiveness research, worker-based participatory research, meta-analyses, and survey research.

The NIOSH *DSR Initiative* is led by the NIOSH Deputy Director for Program and the NIOSH Associate Director for Emergency Preparedness and Response. An internal work group of NIOSH subject matter experts will assist in developing the *DSR Initiative*. To move the *DSR Initiative* forward, NIOSH plans to work with the responder community, including the incident command structure, Federal, state and local partners, academic institutions, labor, practitioners and consultants, and industry at an early stage to seek broad and comprehensive input. NIOSH invites partner participation in the *DSR Initiative* by all those interested in ensuring the safety and health of responders before, during, and after a disaster through research. Please contact CAPT Margaret Kitt at ajy8@cdc.gov or CDR Lisa Delaney at lkd2@cdc.gov if you have any questions about, or are interested in participating in, the NIOSH *Disaster Science Initiative to Enhance Responder Safety and Health*.

¹ Decker JA, Kiefer M, Reissman DB, Funk R, Halpin J, Bernard B, Ehrenberg RL, Schuler CR, Whelan, Myers K, Howard J. A Decision Process for Determining Whether to Conduct Responder Health Research Following Large Disasters. *American Journal of Disaster Medicine*, 2013, 8(1):25-33.

² Decker JA, Debord DG, Bernard B, Dotson GS, Halpin J, Hines CJ, Kiefer M, Myers K, Page Elena, Schulte P, Snawder J. Recommendations for Biomonitoring of Emergency Responders: Focus on Occupational Health Investigations and Occupational Health Research. *Military Medicine*, 2013, 178(1):68-75

Appendix 1: Tables and Figures extracted from *A Decision Process for Determining Whether to Conduct Responder Health Research Following Large Disasters*¹

Table 1. Factors to Consider for a Responder Health Research Study	
Exposure-related factors	<ul style="list-style-type: none"> • Presence of exposures to hazardous substances, conditions, trauma, etc. • Existence of unique, novel, or unusual exposures • Presence of complex environments or combined exposures • Potential implications of exposures on worker health • Types of science/research methodologies necessary to address/answer exposure questions
Adverse health event-related factors	<ul style="list-style-type: none"> • Observance or anticipation of unique, novel, particularly serious, or unusual adverse health events • Occurrence of unexpected or unforeseen occupational health issues during or following an event • Presence of higher than expected numbers or rates of a specific adverse health event – or of overall events • Occurrence of adverse health problems associated with exposures below applicable occupational limits
Public health significance and scientific importance	<ul style="list-style-type: none"> • Ability to provide new knowledge or information about an exposure-outcome relationship • Ability to evaluate specific exposures or outcomes that have not been adequately studied • Ability to generalize to other situations or populations • Ability to confirm or refute a preliminary or pre-existing hypothesis or theory • Ability to answer questions that need to be answered and cannot be answered in any other way • Ability to contribute to or directly improve the public health response to disasters • Magnitude of event, for example, a large number of workers exposed or considered at risk
Societal factors	<ul style="list-style-type: none"> • High profile or traumatic event • Beliefs about harm or resource disparities, particularly among high-risk groups • Unique vulnerability of the worker population • Socioeconomic, legal, political, and psychological implications of the event
Feasibility factors	<ul style="list-style-type: none"> • Access to the work site(s) • Ability to quickly collect reliable data, particularly if data could be lost if not collected immediately • Ability to document or validate human health outcomes • Ability to assign workers into exposure categories to permit exposure-response assessment • Adequate study size and statistical power • Ability to identify and locate subjects and records • Availability of an appropriate control or comparison population • Ability to address potential confounding factors • Ability to measure and disentangle the relevant environmental, behavioral, or other factors • Ability to reasonably estimate or document individual exposure • Adequacy of resources to support, conduct, and complete the study • Adequacy of support from employers and unions or other relevant stakeholders (e.g., other federal agencies, state or local agencies or components, trade groups, etc.) • Ability to provide participants with necessary confidentiality • Ability to address potential ethical issues and obtain expeditious Institutional Review Board (IRB) approval for time-sensitive research • For federal agencies, ability to obtain timely emergency clearance from the Office of Management and Budget (OMB) for survey instruments that fall

	<p>under the jurisdiction of the Paperwork Reduction Act</p> <ul style="list-style-type: none"> • Adequacy of preliminary or baseline data to support the study (this is implied in some of the above bullets)
Level of research interest	<ul style="list-style-type: none"> • Research arising from academic/research areas of interest • Contribution to established institutional program goals, such as emergency response research priority areas

Table 2: Critical Gatekeeper Factors

Scientific Query	<ul style="list-style-type: none"> • Scientific queries must be based on sound theoretical foundations—the hypothesis (or set of hypotheses) must be testable and precise in construction, makes specific and unambiguous predictions, and clearly defines the research questions that the study will address.
Exposure-Related	<ul style="list-style-type: none"> • Actual exposures must be present, as well as a mechanism to characterize and document exposures. Without exposure, or exposure data, the research has a low probability of providing useful public health information. • The proposed research should result in information about an exposure-outcome relationship.
Study Design	<ul style="list-style-type: none"> • Critical questions cannot be answered through any other less-costly or simpler way than through a responder research study. • The research has sufficient scientific validity and the ability to answer questions that need to be answered. Confounders can be successfully addressed.
Feasibility Factors	<ul style="list-style-type: none"> • Identification and location of subjects and records are possible. • Funding, other resources, and available expertise are sufficient to conduct the study through to its conclusion. • Data-related logistic hurdles, including those related to study size, statistical power, availability of exposure-outcome data, etc., can be overcome. • Regulatory-related clearances can be expeditiously obtained (i.e., OMB approval for federal agencies and Institutional Review Board (IRB) clearance).

Figure 1. Process for determining whether to conduct responder research utilizing expert opinion

