National Conversation on Public Health and Chemical Exposures

Chemical Emergencies Work Group
Final Report
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Errata Sheet
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1. In the reference listed as: Auf der Heide, E. and Duckett, P. (1989). *Disaster response: principles of preparation and coordination*. St. Louis: Mosby. Retrieved from http://orgmail2.coe-dmha.org/dr/index.htm, the only author is Auf der Heide E.

2. The above should also be corrected in footnote 5, p.5; and the in-text citation on p.9

3. On p. 9, the paragraph under the heading, "*1) Limited funding*" should be attributed to Auf der Heide, 1989; the paragraph under the heading "*2) Inadequate coordination*" should be attributed to EPA, 2008.

I. INTRODUCTION

The *National Conversation on Public Health and Chemical Exposures* is a collaborative project, supported by the Centers for Disease Control and Prevention (CDC) and the Agency for Toxic Substances and Disease Registry (ATSDR). The *National Conversation* vision is for chemicals to be used and managed in ways that are safe and healthy for all people. The project's goal is to develop an action agenda with clear, achievable recommendations that can help government agencies, tribes, and other organizations strengthen their efforts to protect the public from harmful chemical exposures. The *National Conversation* Leadership Council will author the action agenda, utilizing input from six project work groups and members of the public who chose to participate in web dialogues and community conversations and offer comments.

National Conversation work groups were formed to research and make recommendations on the following six crosscutting public health and chemical exposures issues: monitoring, scientific understanding, policies and practices, chemical emergencies, serving communities, and education and communication.

This report is the product of the **Chemical Emergencies** work group's deliberations. While issued to the *National Conversation* Leadership Council, the work group hopes that this report will be of value to others in a position to act on the recommendations contained herein.[1]

CDC and ATSDR worked with several groups to manage the *National Conversation*, including RESOLVE, a nonprofit organization dedicated to advancing the effective use of consensus building in public decision-making, the American Public Health Association, the Association of State and Territorial Health Officials, and the National Association of County and City Health Officials. These organizations and others helped ensure that a broad range of groups and individuals were engaged throughout this collaborative process, including government agencies, professional organizations, American Indian/Alaska Native tribes (AI/AN), community and non-profit organizations, health professionals, business and industry leaders, and members of the public.

For more information on the *National Conversation* project, please visit www.atsdr.cdc.gov/nationalconversation.

a. Membership

Work groups were formed in 2009 following an open nomination process. Work group members were selected based on a three-stage process designed to ensure that each work group would have the capacity to address and reflect different individual and organizational perspectives.[2]

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[1] This report was developed as part of the *National Conversation on Public Health and Chemical Exposures*, an independent process facilitated by RESOLVE, a neutral non-profit consensus building organization. This report represents the work of one of six *National Conversation* work groups and reflects the consensus of the work group members. Consensus is defined as each member being able to "live with" the report taken as a whole, rather than as agreement with each recommendation. Members were asked to participate as individuals, rather than on behalf of their organizations or constituencies. The Centers for Disease Control and Prevention's National Center for Environmental Health and the Agency for Toxic Substances and Disease Registry provided funding for the facilitation, member travel, meetings, web dialogues, community conversations, and other costs associated with the *National Conversation*. This report does not necessarily reflect the views of the Centers for Disease Control and Prevention, the Agency for Toxic Substances and Disease Registry, RESOLVE, or other organizations involved in the *National Conversation*.

[2] For additional information on the work group member selection process, see http://www.atsdr.cdc.gov/nationalconversation/docs/membership_selection_process_report.pdf

In selecting members of the Chemical Emergencies work group, the following additional criteria were considered: 1) relevant area of expertise, 2) depth of experience and reputation in the individual's field, 3) an interest in serving on this work group, and 4) suitability for this work group as opposed to other work groups. In particular, the work group considered those who have been a voice for community and environmental justice concerns. Furthermore, to achieve overall balance, the team sought to compose a diverse work group in terms of work experience, perspective, gender, and geographic region.

Andrea Kidd Taylor, assistant professor, Morgan State University, served as chair of the Chemical Emergencies work group, and was supported by Rear Admiral Scott Deitchman of the U.S. Public Health Service Commissioned Corps, incident manager for the CDC Response to the Deepwater Horizon spill and NCEH/ATSDR senior liaison to the Chemical Emergencies work group; Dana Goodson, senior facilitator, and Jennifer Peyser, senior mediator, at RESOLVE; and Montrece McNeill Ransom, senior public health analyst, NCEH/ATSDR.

A full list of members of the Chemical Emergencies work group can be found in Appendix A.

b. Charge

After much discussion, the work group members agreed to the following charge to guide their work:

> *Chemical Emergencies: preventing, preparing for, responding to, recovering from, and mitigating chemical incidents.*
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> *Chemical emergencies can be devastating to human and animal populations, the environment, and the economy. Safeguarding public health requires analyzing and eliminating vulnerabilities; identifying and communicating information about hazards; and reducing risks through the development and implementation of effective emergency prevention, preparedness, and response plans. While many public and private agencies have roles in chemical emergency prevention, preparedness and response, coordination among concerned parties has not been optimized. Further, there remain shortcomings, gaps, and redundancies in the chemical emergency preparedness system.*
>
> *This group will make recommendations on issues including the prevention of chemical emergencies, chemical infrastructure security, monitoring of chemical facilities and events, and the preparedness and response capabilities of 1) emergency management officials; 2) state and local public health agencies and their governing boards; 3) responders, receivers, and providers on the local, state, tribal, and federal levels; 4) the chemical industry; and 5) affected, or potentially affected, communities .*

c. Process and Methods Used

The full membership of the Chemical Emergencies work group convened nine meetings (six conference calls and three in-person meetings) toward the development of this report. Two topical subgroups were formed, and a series of subgroup meetings were held, as described below.

<u>Caveats, Limitations, and Subgroup Formation</u>

The themes and concepts discussed in this report do not represent the entire range of issues related to chemical emergencies, nor do they reflect in entirety each focus area of the charge of the Chemical Emergencies work group. Work group members relied on research and professional

expertise. For example, while there are myriad issues concerning transportation-related chemical emergencies, chemical infrastructure security, monitoring of chemical facilities and events, and the preparedness and response capabilities of the chemical industry, the work group's range of expertise and time available did not allow for a comprehensive review of each of these subjects.

The membership of the work group decided to focus its considerations on the three themes that emerged from the Chemical Emergencies break-out session held at the June 26, 2009 *National Conversation Kick-Off Meeting*: 1) training and capacity building; 2) systems and coordination; and 3) community preparedness and response.[3] Therefore, the work group divided itself into two subgroups to accomplish the tasks outlined in the charge: 1) Training and Capacity Building and 2) Systems and Coordination. Work group membership considered developing a third subgroup that would focus specifically on community preparedness and response. However, given the crosscutting nature of community issues related to chemical emergencies, members decided to ensure that both the Training and Capacity Building and the Systems and Coordination subgroups closely consider community issues related to their focus areas during their deliberations.

Subgroup Processes and Methods

Training and Capacity Building Subgroup

Wanda Lizak Welles and Clark Phinney served as co-leaders of the Training and Capacity Building subgroup. Members of the subgroup included: Nathan Birnbaum, Jacque Darbonne, Jim Eaton, Joseph "Chip" Hughes, Nancy Hughes, Todd Jordan, Betsy Kagey, and Anthony Tomassoni.

This subgroup convened eight calls and focused on reviewing the current chemical response training of the nation's emergency response and receiver communities to identify the gaps in and needs of current capacity. This subgroup's determination of the current training status of selected response communities was based on several factors: 1) group consensus following discussion, 2) direct personal knowledge and involvement of subgroup members, 3) interviews and research performed independently by subgroup members and reported to the entire subgroup for review and discussion, 4) research and review of existing standards and regulations from various government, regulatory and certification bodies, as well as 5) knowledge of professional and trade association literature and training curricula.

Recognizing that the subject of emergency response training and capacity building is immense, the subgroup made a concerted effort to focus its attention and recommendations on the competencies and best practices of the response community. Subgroup members sought to use a common language that has been well established in the responder community. For purposes of its review, the subgroup focused on the first responders who are most likely to arrive on scene and provide immediate response to a chemical incident. These include, but are not limited to: fire, police, emergency medical services (EMS), and skill-specific response personnel such as hazardous materials (HAZMAT), public works, and industrial response teams. Within the first responder community, the fire service usually assumes lead command at a chemical emergency scene with EMS and law enforcement providing patient care and scene security respectively. While EMS and law enforcement may have national competencies and standards for responding to chemical emergencies, those standards and competencies are lacking in the hazardous materials content necessary to adequately prepare EMS and law enforcement personnel to respond to and identify chemical emergencies.

[3] To view the meeting notes from the Chemical Emergencies Break-out meeting at the National Conversation Kick-off Meeting, June 26, 2009, see http://www.atsdr.cdc.gov/nationalconversation/meeting_june_26_09.html.

While all three disciplines (fire service, EMS, and law enforcement), participate in some form of HAZMAT training, the continuity of response training to a chemical emergency seems the least consistent among fire service personnel, due in part to the two types of firefighters within the fire service: career (paid) and volunteer. The scope of the operations conducted by the fire service during chemical emergencies is broad, and providing public and responder protection is usually directed by fire service personnel. Therefore, the subgroup identified the training and capability needs among members of the fire service as a priority for protecting responders, receivers, and the public during chemical emergencies. The intent was to utilize this group as a prototype to identify the training and capability needs of all of first responder groups.

Systems and Coordination Subgroup

The co-leaders of the Systems and Coordination Subgroup were Darius Sivin and Fleming Fallon. Membership was comprised of the following: Bill Benerman, Kathy Curtis, Kim Jennings, Mark Kirk, Jacqueline McBride, Maureen Orr, Paul Orum, Derek Swick, and Connie Biemiller Thomas.

This subgroup convened four calls. Overall, the subgroup attempted to take a systems or "big picture" approach to chemical emergencies, looking at the overall response system, rather than specific parts, outcomes or events. The subgroup engaged in a number of activities that informed this report, although not all of the individual and background work products from those activities were incorporated into the final report. These included researching and reviewing various chemical emergency case studies and developing a matrix describing the roles of various public, private sector, and civil society actors during each phase of emergency prevention and response. The matrix was used to identify unmet needs for the various phases and actors.[4]

The subgroup made recommendations on developing or improving the systematic coordination of efforts by industry; local community organizations/groups; and city, state, and federal agencies in order to prevent chemical incidents, reduce hazardous chemical use, and provide communities with the appropriate education and skills necessary to gain access to chemical information and learn to respond effectively to chemical emergencies.

Terms and Definitions

For the purposes of this document, a **chemical emergency** is defined as any actual or imminent threat of a hazardous chemical release that has the potential for causing harm to people, plants, animals, property, or the environment. Chemical releases can be unintentional, such as an industrial accident; deliberate, such as a terrorist attack; or a result of actions that are non-compliant with laws and policies (CDC, 2010). Chemical releases associated with food and crop contamination and natural disasters were also considered within the definition of chemical emergencies.

The terms **first responders** and **first receivers** include persons involved in the initial aspects of emergency response. Although both are critical in the initial stages of a response, there are differences in the types of response they provide and in their training and experience. According to the Occupational Safety and Health Administration (OSHA), first responders are individuals who, in the early stages of an incident, are responsible for the protection and preservation of life, property, evidence, and the environment, including emergency response providers, as well as emergency management, public health, clinical care, public works and other skilled support personnel that provide immediate support services during prevention, protection, mitigation, response and/or recovery operations (OSHA 2007).

[4] The work product of the systems subgroup can be found under the Chemical Emergencies work group at : http://www.atsdr.cdc.gov/nationalconversation/work_groups.html

First receivers typically include personnel in the following roles: clinicians and other hospital staff who have a role in receiving and treating contaminated victims (e.g., triage, decontamination, medical treatment and handling their clothing or personal effects) (OSHA 2007). First receivers often are the first to provide care to victims and those otherwise affected by a chemical emergency following initial field-based care that has been provided by the first responder personnel[5].

OSHA has specific requirements for what the agency refers to as **skilled support personnel**. The agency defines this group as "Personnel, not necessarily an employer's own employees, who are skilled in the operation of certain equipment, such as mechanized earth moving or digging equipment or crane and hoisting equipment, and who are needed temporarily to perform immediate emergency support work that cannot reasonably be performed in a timely fashion by an employer's own employees, and who will be or may be exposed to the hazards at an emergency response scene . . ."[6]

A **system** can be generally defined as a group of interacting, interrelated or independent elements that form a complex whole. For the purposes of the work of this work group, a chemical emergency system in general has parts spread across the federal, state and local levels, depending upon the size and type of the emergency, and involves the environmental, emergency management, public safety, and public health agencies of the three levels of government. In addition, industry has a very important role to play in preparing for and responding to emergencies (EPA 2010). Such a system is composed of, but not limited to, the following elements:

- One or more identified chemicals with toxic or other undesirable properties
- A source of the chemical(s)
- Method(s) for transporting the chemical(s)
- Facilities for storing the chemical(s)
- Plan(s) for containing an accidental spill or discharge
- Appropriate equipment for cleaning up (containment and recovery) an accidental discharge
- Standards for certifying that an accidental discharge has been contained and recovered or removed
- Facilities for storing and disposing of contaminated items (environmental or synthetic)
- Resources to control, coordinate and finance all emergency operations
- Health care
- Appropriate personnel

The term **community**, as defined by the work group, includes, but is not limited to, those groups that are typically formed by artificial boundaries such as zip codes or political subdivisions. The term also includes communities of interest that may share a common interest or focus. When things go wrong, those affected create an ad-hoc community. Their shared focus is the accidental chemical discharge; their common interest is protecting people's health and returning the affected region to the status quo that existed prior to the emergency (remediating).

[5] Empirical observations in actual events suggest that the majority of victims (especially in multiple casualty chemical emergencies and disasters) self-transport to the closest hospitals, without having received any care from first responders. See Auf der Heide and Duckett, 1989.

[6] 29 C.F.R. § 1910.120 (q) (4), (2010).
http://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=STANDARDS&p_id=9765.

For the purposes of this report, **industry** includes, but is not limited to, manufacturers, processors, transporters, and producers, and includes those industries involved in the production of petrochemicals, agrochemicals, pharmaceuticals, polymers, paints, oleochemicals, and other chemical products.

Green chemistry can be defined as chemical research and engineering that encourages the design of products and processes that minimize the use and generation of hazardous substances.

A **vulnerable population**, as discussed in this document, includes those with functional or developmental needs, disabilities, and activity limitations (FEMA 2010). It also includes those who are made vulnerable by their financial circumstances or place of residence, health, age (e.g., children and seniors), personal characteristics, ability to communicate effectively, or presence of chronic illness (President's Advisory Commission 1998).

II. CURRENT STATUS OF ISSUES UNDER CONSIDERATION

a. Training and Capacity Building

All response agencies have one thing in common: they have dedicated men and women who answer the call when things go wrong. Whether first responders are paid or volunteer, the drive to help those in need is a trait possessed by all. Across agencies, first responders have the desire and the ability to be trained and learn the skills necessary to recognize and respond to chemical emergencies. As the number of public health emergencies has increased, training has become very broad and not well integrated. As a result, critical first responders are handling chemical emergencies without adequate training.

Chemical Emergency Training

In order to improve chemical emergency response training, there are three main areas to address: a) access to training; b) consistency of the types and levels of training; and c) coherent local, state, tribal, and federal competency standards for responding to chemical emergencies.

There is a discrepancy in access to training between the career and volunteer fire service, as well as between different law enforcement agencies and EMS departments due to the availability of both time and money. Large metropolitan areas have more resources and thus greater access to training compared to rural fire service forces, law enforcement agencies, and EMS departments. Fire service within rural areas and small towns primarily consists of volunteers; some law enforcement agencies and EMS departments may have personnel who are either volunteer or part time workers. Volunteer fire services, rural law enforcement agencies, and rural EMS departments do not always have the financial resources to support training; moreover, as their volunteers or employees often work other jobs, they may not be able to take time off to do extensive training.

There are three levels of chemical emergency response training, which are geared to different job functions: the awareness, operational, and technician levels.

Awareness Level: At a minimum, all first responders - including all fire, law enforcement, and EMS personnel - need to be trained to a HAZMAT awareness level. (Ideally, these personnel would be trained to the HAZMAT operational level so that they could act to reduce the impact of a chemical emergency.) The International Fire Service Training Association (IFSTA) states in "Hazardous Materials, Managing the Incident" (3rd ed.), that first responders at the awareness level are those individuals who are likely to witness or discover a hazardous substance release and who have been trained to initiate an emergency response notification process. The most common examples of first responder-awareness level personnel are law enforcement and plant security personnel, as well as some public works employees.

Operational Level: Most fire department suppression personnel fall into the first responder-operational level and are those individuals who respond to releases or potential releases of hazardous substances as part of the initial response for the purpose of protecting nearby persons, property, or the environment from the effects of the release. All firefighting personnel should be trained to the HAZMAT operational level. This training is for those personnel who have some protective equipment and other resources that would enable them to take further defensive actions at a hazardous materials scene.

Technician Level: Responders working on the scene in the contamination zone for the purpose of stopping the release need to be trained to the HAZMAT technician level, which includes the basic knowledge and skills to take appropriate offensive or defensive action requiring level A or level B personal protective equipment. This training needs to include monitoring for the hazardous material involved and knowledge of action levels for materials.

Inconsistencies exist between federal and state regulations and enforcement of training and capability requirements. The U.S. Environmental Protection Agency (EPA) and the Occupational Safety and Health Administration (OSHA) have standards which cover employees with regard to chemical exposures and Hazardous Waste Operations and Emergency Response (HAZWOPER) training standards. HAZMAT teams receive training, but are not licensed. First responder training is provided by multiple agencies, organizations and programs; however, there is no set of consistent standards which addresses the core competencies for first responder activity during chemical emergencies. First responders do not have proper guidance as to what standards or protective levels to use during an incident. OSHA standards and EPA environmental standards were not developed for responding to chemical emergencies. There is a need for consistent training and national competency standards for responding to chemical emergencies. In addition, there should be more options for *performance-oriented* training and competency development.

First responders may become involved in an incident before they realize a potential exposure hazard exists, and they may not have the proper training or resources to recognize and mitigate the presence of hazardous chemicals at a chemical emergency scene. When a chemical is not recognized or identified at the scene, contamination of responders, vehicles, equipment, and victims may carry through and contaminate the hospital emergency department, and in some cases, serious illness and injury, as well as death, can occur to exposed patients and responders. In areas where an incident overwhelms local support, the capacity to respond varies. Coordination of HAZMAT team support may be dependent upon local funding as well as the support of regional HAZMAT teams. There is a need to continuously foster cooperation and coordination between response agencies, jurisdictions and support agencies.

Skilled support personnel may not be readily available to assist with the response, and chemical emergencies may go on for hours before mitigation actions are undertaken. Capacity building should also include training of first receivers and the community in HAZMAT awareness.
Hospitals currently plan and train for mass casualty events and need to be included in chemical emergency planning within their communities. Communication between first responders and health care providers should be strengthened so hospitals receive adequate warning of chemical emergencies in order to prepare for the potential decontamination, triage, or treatment of incoming patients. Emergency department staff, as well as clinic and all hospital staff, should have chemical hazard awareness-level training, with some key designated personnel receiving training to the operational level to facilitate safe and effective response and treatment.

The private sector should work with local emergency management agencies to help plan for response, as well as to address inconsistencies in communication and messaging during an event. In addition, the public needs to have an understanding of the type of response required during a chemical emergency and

of the need for compliance with instructions from law enforcement, emergency managers, and public health officials during such an event.

While the fire service generally abides by stringent standards established by the National Fire Protection Association (NFPA) and follows training guidelines set by organizations such as the International Fire Service Training Association (IFSTA) (Noll & Hildebrand 2005) and the Rural Domestic Preparedness Consortium (RDPC), the current training for firefighters is not federally regulated for content, competency testing, or certification. The only OSHA stipulation with regard to chemical emergency response training is that an individual involved in responding to a chemical emergency must have HAZWOPER training to the awareness level (29 C.F.R. § 1910.120). There are no uniform, nationwide criteria to define the required composition of HAZMAT teams. Furthermore, there is no national certification process or licensing entity that oversees these groups.

At the state level, individual states have differing guidelines that suggest different competency levels. Some states inconsistently use Emergency Management Agency (EMA) guidelines for training their personnel, but again there is no requirement that the responders meet these guidelines. Most municipal employees and other groups that receive federal funds are required to undergo the National Incident Management System (NIMS) training (at a minimum, NIMS training levels 100, 700 and 800). While this training is not incident-specific, it does contribute to overall incident management. The NIMS courses would qualify as an across-the-board type of required training that most responding firefighters would probably have.

There are extensive training classes both online and in person throughout the country. These classes cover almost every eventuality that one could expect to see in a chemical incident. However, no single repository for cataloguing or evaluating available courses currently exists. There are no evaluation measures to determine a course's ability to provide students with a certain level of competency. Without a standardized curriculum or measurable target capabilities, training is unfocused. The variation in the quality of training has resulted in inconsistent and inadequate training of the workforce.

Furthermore, the level of training and experience can vary greatly from organization to organization (urban vs. rural, large vs. small, professional vs. volunteer). A national certification program that establishes minimum qualifications for hazardous materials response should be offered to all first responders at no cost to the local entity. In addition, the nation's emergency response plan must include training in diagnosing and treating vulnerable populations' exposures to chemical emergencies and spill events, including pesticide exposures. Any attempt to require such training and certification as an unfunded mandate, however, would only produce additional stress on already overextended public finances. As this national certification program will take some time and effort to develop, fund, and implement, it is recommended in the interim that emergency management departments ensure that training at the HAZWOPER awareness level is provided to all emergency responders. Key district or regional staff members should be required to receive training at the HAZWOPER operational level.

b. Systems and Coordination

Barriers and Impediments

The success of the U.S. chemical emergency response system is hampered by the following widespread impediments: organizations that are insular by nature, mission or past experience; interests and goals that are specific to particular organizations or types of groupings (i.e., not held in common or shared); channels of communication that are limited by custom, particular types of organizations and levels within

those organizations; and personal factors such as ego, power, secrecy, and control that impede information-sharing at times when speed is essential. Additional barriers include 1) limited funding; 2) inadequate coordination; 3) insufficient laws; 4) insufficient communications systems; and 5) insufficient data.

1) *Limited funding*

In 1989, a phenomenon called the "paper" plan syndrome was identified (EPA 2008). This syndrome is described as the illusion of preparedness based on written plans that are not tied to the funding and resources necessary to carry them out. Given that the acute chemical emergencies and disasters that cause injuries and illnesses are high-consequence but low-probability events, they compete for attention with the priorities of everyday business. Often, getting the public, elected officials, and organizational leaders to support preparedness is just as difficult, if not more so, than developing the countermeasures. Planning for low-probability events is typically plagued by the difficulty of obtaining and maintaining sufficient funding.

Funding is clearly needed for preparedness, but one critical challenge is *how to motivate* policymakers to make sustainable funding available. For example, could chemical company insurance coverage be linked to prevention and preparedness standards? Could tax breaks be used to motivate preparedness? How can government funding of preparedness be increased in the context of the country's ongoing economic crisis and reduced programs and budgets? These questions should be answered, but are beyond the scope of the Chemical Emergencies work group. They are, however, amenable to empirical study and work group members support efforts to further explore them.

2) Inadequate Coordination

In 1984, in response to the Bhopal Disaster, there was a national effort to improve coordination of chemical responses, resulting in the passage of the Superfund Amendments and Reauthorization Act (SARA) and the establishment of state and Local Emergency Planning Committees (LEPCs). However, a 2008 national survey of LEPCs revealed that only 9% of LEPC members were very familiar with the emergency response plan, only 60.2% of these plans integrated with other applicable state plans, and only 15.9% of LEPC members strongly agreed that their LEPC has had a positive impact on chemical safety in the community. In fact, of the 2,670 LEPCs sent survey questionnaires, only 39.8% even returned them (Auf der Heide and Duckett 1989).

Clearly, there are several gaps in the coordination of chemical emergency prevention, preparedness, and response. In addition to those mentioned above, significant gaps exist in jurisdictional responsibility and authority, real or perceived. Such gaps can be exacerbated by the complicated and confusing system of government agency responsibility for different aspects of a chemical emergency. Moreover, local health departments (LHDs), the public, and many partners do not fully understand the LHD role in chemical emergencies. Finally, poor funding of chemical emergency engagement contributes to a lack of communication and of established capacity to communicate among LHDs and other relevant actors.

When preparing for and responding to a public health emergency, there are many different groups that state health agencies must work with to maximize the efficiency of response and recovery efforts. State health agencies feel that coordination efforts should first focus on collaboration with the local health agencies, and then with the state environmental agencies. Given that local health agencies are "on the ground," better in touch with what is happening in a specific community, and often the first to respond to an emergency, state agencies should prioritize coordination and training with the local health agencies. Once this training and relationship is well established, the state health agencies should then turn to bringing the state, tribal (where applicable), and local environmental agencies into the partnership and

strengthening collaboration with them. This procedure will help build the network of collaboration and communication needed to be effective. In cases where environmental health staff members are located in environmental agencies, the relationship between the health and environmental agencies should already be reinforced.

3) Insufficient Laws

Current major federal laws governing chemical emergencies generally cover cleanup, planning, response, and risk management, but do not explicitly encourage or require facilities to assess or use alternatives that could eliminate the danger of a sudden chemical release. As a result, many communities host chemical hazards that may be simply unnecessary.

- The Comprehensive Environmental Response Compensation and Liability Act of 1980 (CERCLA) and the Superfund Amendments and Reauthorization Act of 1986 (SARA) address *cleaning up after* chemical emergencies.

- The Emergency Planning and Community Right-to-Know Act of 1986 (EPCRA), a freestanding title of SARA, addresses *preparing for* spills or emergencies, primarily through LEPCs and by communicating chemical hazards to emergency responders and the public. The OSHA Hazard Communication Standard informs workers of chemical hazards in the workplace.

- The Clean Air Act of 1990 includes Risk Management Planning (RMP) requirements that address *managing the risks of* emergencies, as do the Process Safety Management (PSM) standards of the Occupational Safety and Health Administration.

- On April 9, 2007, the U.S. Department of Homeland Security (DHS) issued the Chemical Facility Anti-Terrorism Standards (CFATS). The CFATS require high-risk facilities to conduct a security vulnerability assessment (SVA) and then develop and implement a site security plan (SSP), which entails implementing site-specific security measures that meet the Risk-Based Performance Standards (RBPS) that the Department identified in the interim final rule.

None of these laws regulate the vulnerability zones that chemical facilities present to surrounding communities in terms of distance, chemical intensity, or population at risk. At this time, these laws do not require companies to assess safer and more secure alternatives that can reduce or eliminate many existing chemical hazards.[7] The CFATS reauthorization currently pending congressional approval contains some language requiring companies to document that they have considered safer, more secure options. Should this requirement be passed, it could have a positive impact on chemical safety; however, it is encountering significant resistance and may not pass.

4) Insufficient Communication Systems and Strategies

Inadequate communication is also a significant barrier to effective chemical emergency preparedness and response. Improving communication would involve establishing formal channels as well as promoting informal channels of communication. Communications should not only be restricted to organizational

[7] Some other laws have additional impact on chemical emergencies: The Resource Conservation and Recovery Act (RCRA) includes limited requirements for hazardous waste sites to "prevent the unknowing entry, and minimize the possibility for the unauthorized entry, of persons or livestock…."40 C.F.R. §§ 264.14, 265.14 (2010). The Toxic Substances Control Act (TSCA) Section 6 gives EPA broad power to control any chemical that poses an "unreasonable risk of injury to health or the environment." 15 U.S.C. § 2605(b) (2010). This standard is cumbersome and ineffective in practice. The Pollution Prevention Act (PPA) makes it the national policy of the United States to reduce toxic waste at the source wherever feasible. 42 U.S.C. §§ 13101-13109 (2010). This law also directs the EPA to consider how agency actions affect source reduction of toxic waste.

peers, but should also involve individuals with the knowledge or experience needed to address particular problems. Formal channels are well-defined but require time for messages to move through them. Informal channels are very efficient and move quickly, and often integrate professionals at all levels of organizations, although they sometimes proceed without regard to established positions and roles.

5) *Insufficient Data*

Successful planning depends on the incorporation of appropriate measures into national and regional development planning. Its effectiveness will also depend on the availability of information on hazards, emergency risks, and countermeasures. Barriers to achieving the vision of a successful system include:

- The lack of a single repository or clearinghouse of information for planners, first responders, first receivers, or the community
- Little data for evidence-based planning
- Less funding to do chemical emergency planning than other types of planning (e.g., infectious disease)
- The fact that not all industries are covered by existing planning and hazard mitigation laws (RMP/PSM/CFATS)

It is impossible to be well-prepared for a chemical emergency or to avert one altogether when there is a lack of data to help determine the risks and best practices. While EPA, the Department of Transportation (DOT), the Department of Health and Human Services (HHS), DHS, the Chemical Safety Board (CSB), and others do currently have some programs that attempt to collect these data, much more is needed. More importantly, there is a need for coordination among the agencies. Disjointed activities serving each agency's own mission would much better serve the public if they were coordinated.

Specific data needs include:

- ***Green chemistry research*** is needed and is currently gravely underfunded. A green chemistry approach to chemical emergencies should systematically generate solutions through the assessment and development of technological options that reduce or remove chemical hazards. This approach should not only promote expertise in government, industry, academia, and other communities of interest, but should also tap existing expertise through systematic review of and communication about safer alternatives.

- ***A scientific field research program*** to study actual chemical emergency hazards and responses and provide an evidence-base for best practices for prevention, planning, comprehensive training, and coordination is sorely needed. While there are some steps in this direction, such as the ATSDR Assessment of Chemical Exposures (ACE) program, which draws on different expertise and tools within ATSDR and CDC to lend assistance when there is a chemical emergency affecting a large number of people, more is needed.

- ***Incident data are*** needed as it is impossible to know what to prepare for when there is a lack of complete data on what chemical emergencies are occurring. There are disparate systems that are not working in a coordinated fashion, including the National Response Center (NRC) Incident Reporting System; American Association of Poison Centers (AAPC) National Poison Data System (NPDS); ATSDR National Toxic Substance Incidents Program (NTSIP) state surveillance system (severely cut back in recent years); the NIOSH Sentinel Events Notification System for Occupational Risk (SENSOR); the Department of Transportation Hazardous Materials Information System (HMIS); the EPA Risk Management Plan (RMP) five-year accident history;

EPA Toxic Release Inventory (TRI) program data; and states' spill reporting systems. There are many lessons to be learned from these data, yet these systems are not maximally interacting and coordinating.

When the CSB was created, it was tasked with creating an incident database that may need regulation to require reporting. The CSB placed an advanced notice of proposed rulemaking in the Federal Register in 2009, soliciting feedback on a regulation requiring accidental chemical releases to be reported to the CSB or to the National Response Center. While this comment period closed on August 4, 2009, to date CSB has not yet announced any intention to proceed. NTSIP does make an attempt to reconcile the disparate spill data and to gather complete and accurate date on chemical incidents. Yet its support has been severely cut in recent years and it can only collect accurate data for the seven states funded by ATSDR. NTSIP attempts to estimate national data by forging data sharing arrangements with other agencies. This estimating activity is also limited to those agencies wishing to share their data.

- ***Commodity flow data,*** or materials accounting data, on what is being stored, used, manufactured, or transported for every locality is needed to fully understand what the risks are, what to plan for, and how to eliminate exposure risks when feasible. For example, local emergency responders who would respond to a leak, spill, or fire, have limited knowledge of what is being transported by railroad companies through their communities. Railroad authorities argue that providing this information is a matter of national security. The result is inadequate planning for potential hazardous materials derailments (Hunter 2010). While a community's "Right to Know" is well established as a principle, it has in many instances effectively been rescinded under the guise of national security, confidential business information, or trade secrets. This issue is even more pronounced for vulnerable and overburdened populations.

  Risk assessment data can inform policy and planning decisions on the prioritization of funds and the focus of training and research. Only by assuring a scientifically rigorous risk assessment process and the education of policy and decision-makers regarding the use of risk assessments (making decisions in the face of uncertainty) will risk assessments play an important role.

  Toxicological data on the health risks from acute exposure are still needed to inform immediate protective actions, medical countermeasures, safe clean-up measures, accurate risk communication, and a better understanding of the potential long-term effects of exposure.

<u>Status of Tribal Chemical Emergency Management</u>

Federally-recognized tribes, as sovereign nations, have the authority to develop emergency management systems. Tribes may use a variety of terms to describe their emergency management systems, such as LEPC (Local Emergency Planning Committee) or TERC (Tribal Emergency Response Commission). Due to a lack of capacity, however, some tribes have not yet been able to establish such systems. For federally-recognized tribes with reservation boundaries, jurisdiction does not reside with state, county, or local entities, and tribes should not be considered public entities, but rather sovereign nations. There are also tribes without reservation boundaries that have federal-recognition status. Additionally, individual tribal infrastructure varies. Some tribes have their own fire departments and police or other form of security, some tribes require services from adjacent entities, and some have tribal members who volunteer as first responders. It is also important to remember that each tribe is unique in its status of working with the federal government. There are federally-recognized tribes, state-recognized tribes, and tribal groups who are seeking federal recognition. Regardless of status, tribes are also negatively affected by the impediments and barriers highlighted above and need access to training and funding to increase their

capacity and expertise in the emergency management arena. As has been discussed, there are opportunities to overcome system-wide impediments, and it is critical that any such efforts include consideration of tribal concerns. Clear communication and coordination with tribes early and often would help to yield synergistic benefits and more effective chemical emergency preparedness and response efforts.

III. CEWG VISION OF A SUCCESSFUL SYSTEM

Four themes emerged from the work of the Chemical Emergencies work group, and these themes are critical components of any emergency preparedness and response system. These four themes — prevention, planning, comprehensive training, and coordination and integration — form the framework of the Chemical Emergencies work group's vision of a successful system, and the foundation for the recommendations which appear in Section IV.

Prevention

The CEWG envisions a system where the focus is first on the prevention of chemical emergencies. A successful chemical emergencies response system would feature the use of safer technologies, including green technology; strategic outreach and communication; and enhanced training for and coordination among government agencies, tribes, community residents, academia, industry, non-governmental organizations (NGOs), and voluntary organizations active in disaster (VOADs) during all phases of emergency management; and adequate resources for all phases of implementation.

For many industries, safer technologies can remove the possibility, or significantly reduce the potential scope, of a chemical emergency. Yet these options frequently do not enter into the emergency management conversation. As a result of a successful implementation of the envisioned system, government, industry, tribes, and the public would be given the opportunity to suggest and be informed about affordable and practical ways to remove or reduce chemical hazards, especially where the scope of the hazard exceeds realistic forecasts of emergency response system capacity to effectively protect people, property, and the environment. Agencies and organizations at all levels – federal, state, local, tribal, workplace, community, industry, academic, and other non-governmental organizations – would have reliable information and technical expertise about specific chemical hazards and alternative technologies that can remove those hazards.

Prevention includes assessing the risk, prioritizing actions, securing dangerous chemicals and finding safer alternatives to dangerous chemicals. Programs should assure the security of dangerous chemicals by preventing accidental or intentional releases during manufacture, storage, transport, use and disposal. Security programs must collaborate with programs that support alternate technologies. These programs would complement one another by changing what can be changed and securing what cannot. Such collaboration would better identify the priority areas that need focused research for safer alternatives.

In this vision, all states would be covered by legislation similar to the Massachusetts Toxics Use Reduction Act (TURA), a law passed in 1989 to encourage a reduction in the amount of toxics used and the amount of toxic byproducts generated (TURA 1989). Toxics use reduction is the best method for protecting public health and the environment from hazardous pollutants. This method has decreased the risk of major accidents from transportation and storage, protected workers from dangerous workplace exposures and created safer products. Furthermore, in a successful system there would be a federal counterpart to the Toxic Use Reduction Institute (TURI) that provides training, services and grants to reduce toxic chemical use and advance energy and water efficiency while enhancing the economic competitiveness of businesses. As a result of TURA and TURI, Texas Instruments Incorporated in

Attleboro, Massachusetts reduced its reliance on trichloroethylene from 850 tons a year in 1985 to less than two tons. Other victories include eliminating over two million pounds of anhydrous ammonia and cutting its use of cyanide compounds from 35,000 pounds in 1996 to just 5,000 pounds in 2000, for which Texas Instruments received the Massachusetts Governor's Award for Excellence in Toxics Use Reduction (TURI 2009).

In a successful system, hazardous chemical facilities would develop knowledge and awareness of the potential harm, feasibility, costs and savings, and advantages and disadvantages of the best available technology options. The government would systematically compile and disseminate knowledge of these options to foster a culture of awareness of prevention options. The choice of technology determines the associated hazards. A robust examination of prevention options would come first — before management, control, or response options that all too often prove insufficient in an emergency. Facilities that can remove or reduce chemical hazards not only reduce their own regulatory burden, but also reduce the burden on regulatory agencies and emergency response systems. Information on chemical hazards and alternatives would be effectively organized and managed to reduce the burden on data providers as well as data users. An outreach strategy would be developed and implemented in order to disseminate information and materials to vulnerable populations within the nation’s diverse communities.

Prevention must be implemented at the top of the hierarchy — before risk management, engineering or administrative controls, or cleanup. Arguably, many of the recommendations in this report could be costly to implement. However, if implementation of these recommendations leads to the prevention of or early mitigation of chemical emergencies, the result will be a decreased need for regulation and thus a reduction in the regulatory burden. Focusing on prevention also will likely lead to significant savings in health care costs. As such, aspects of prevention should be incorporated throughout the cycle of prevention, planning, preparedness, response, and recovery. For example, the CSB is an independent agency that arrives after major incidents and makes recommendations to prevent similar events in the future. A successful system could call for inspections of facilities and industries prior to an incident to identify high-risk facilities, potential problems that may lead to a chemical emergency, and potential solutions. Localities and tribal governments would actively consider the use of zoning, fire codes, land use planning, and ordinances to mandate alternative assessments. Ideally, local agencies and tribes would develop a working relationship with industry to foster a partnered inspection program in an attempt to prevent chemical emergencies by identifying potential problems or issues and bringing them to the attention of industry representatives. The federal government would provide funding for this partnership to local and tribal agencies, demonstrating a commitment to the prevention of chemical emergencies. Finally, in order to prevent chemical emergencies, it is critical that all persons in all states have access to data that tracks chemical emergency incidents and measures where preparedness and response efforts have been successful. Planning, preparedness, response and recovery activities are especially needed, however, where a hazard cannot be prevented.

Planning

A successful system, from the Chemical Emergencies work group’s perspective, will ensure that all communities, including rural and tribal communities, have adequate resources and legal authority to complete thorough vulnerability analyses, promote chemical emergency hazard reduction, establish effective plans, and take immediate steps to mitigate any hazardous effects of a chemical emergency. Planning forms the foundation for a community's long-term strategy to reduce chemical emergency losses and break the recurring cycle of exposures. The planning process creates a framework for risk-based decision-making that reduces harm to lives, property, and the economy from future chemical emergencies.

Hazard reduction is sustained action taken to reduce or eliminate long-term risk to people and their property from hazards, thereby creating safer communities and reducing loss of life and property. Adopting zoning ordinances that steer chemical facility development away from populated areas, designing roads that carry traffic away from vulnerable areas, acquiring damaged homes or businesses in areas prone to chemical releases, and requiring businesses to switch to safer available alternative substances or processes are all examples of chemical emergency planning strategies.

Ideally, all federal agencies engaged in chemical emergency planning, other government agencies, the private sector and NGOs/VOADs would unite to create and promote a central clearinghouse for planning (i.e., databases, regulations, and planning tools). A thorough review of all federal, state, and local statutes on chemical planning would also take place, followed by the creation of model legislation that can be enacted at the federal, state, and tribal levels. Lastly, in a successful system, the planning bodies that exist (e.g., LEPCs) would all have the financial and informational resources needed to perform their jobs properly.

Comprehensive Training

"Once we have good plans in place, we must invest far more in leadership training for first responders. We must make sure that they have all the resources and practice they need. After that, we must unleash them to attack a crisis with full force and authority. To paraphrase Winston Churchill in World War II, let us give them the tools they need so they can finish the job (Gergen 2010)*."*

The Chemical Emergencies work group envisions a system in which, if preventative measures fail and a chemical emergency takes place, the roles and responsibilities of those involved in chemical emergency management would be predetermined and clearly defined. Those charged with the response would be trained to a level that supports a successful response resulting in no deaths or injuries and completed with successful mitigation of the hazards associated with the emergency. Simply put, responders and receivers would have the "tools they need so they can finish the job." Lines of communication, structures and procedures for collaboration among relevant local, state, tribal, and federal actors would be established prior to the chemical emergency. Effective coordination of chemical emergency engagement would be accomplished because of the increased amount and better quality of training for relevant actors, especially emergency responders.

The 2010 Deep Water Horizon Gulf oil spill provides timely, salient examples of why training is the foundation of successful preparedness and response to chemical emergencies. One lesson learned from the Gulf oil spill response is that clear information and training must be provided and repeated for all contractors, clean-up workers and volunteers based on an analysis of job tasks and potential exposure to oil waste and weathered by-products. This is particularly true for first receivers who, as this report has indicated, are often inadequately trained. Risk protection messages are most effective when they are delivered often and in close proximity to the occurrence of targeted behavior.

Coordination and Integration

In the context both of federalism and ever-increasing global inter-connectivity, effective coordination is more crucial than ever (Kouzoukas 2007). A successful system also would be a coordinated system, with little to no unnecessary fragmentation. There would be improved coordination and integration among different governmental jurisdictions, as well as across multiple sectors and disciplines (Moulton, Gottfried, Goodman, and Murphy and Rawson 2003).

Under the current system, federal efforts for spill prevention and security of chemical facilities include both regulation and collaborative initiatives. The chemical industry is subject to regulations addressing

health, safety, accident prevention, emergency response, and the environment. Identifying high-risk chemicals and high-risk facilities as well as developing site security and emergency response plans are key components of regulations such as the Chemical Facility Anti-Terrorism Standards, the Maritime Transportation Security Act, the Environmental Protection Agency's Risk Management Program, the Resource Conservation and Recovery Act, and the Occupational Safety and Health Act. The Chemical Sector Specific Agency (SSA), within the U.S. Department of Homeland Security's Office of Infrastructure Protection, works with chemical industry trade associations to share best practices with the larger industry through a collaborative partnership, as outlined in the National Infrastructure Protection Plan. The SSA has also partnered with private and public sector organizations to develop new prevention and preparedness programs, such as the Security Seminar & Exercise Series for Chemical Industry Stakeholders, National Level Exercises, and information-sharing tools that link critical facility information with their respective chemical inventories to first responders and emergency planners at the local, state and federal levels.

These efforts notwithstanding, existing government jurisdictions can be visualized as silos. Silos emerge as organizations expand in size, assume new responsibilities and become insular, resulting in a growing sense of self-importance. Silos promote exclusivity among their members, allowing them to surround themselves with like-minded persons. This fosters familiarity but impedes progress in emergencies. Response efforts may require coordination across various silos and multiple levels, including local, state, tribal, and federal governments, and even international organizations.

Silos create barriers to communication. Reducing or eliminating silos would change organizational channels of communication and accelerate sharing information and addressing problems. As barriers are eliminated, new channels of communication should emerge. Communications should not be restricted to organizational peers, but should involve individuals with the knowledge or experience needed to address particular problems. Integrating people at different levels in a variety of organizations enhances information exchange. An apt metaphor for the ideal scenario is that of a crystal lattice where energy (communications) can flow easily and without barriers.

Coordination of legal responses to chemical emergencies also may involve a horizontal dimension comprising numerous and diverse sectors, such as public health, environmental protection, emergency management, public and private health care, education, law enforcement, and the chemical industry (Moulton, Gottfried, Goodman, Murphy and Rawson 2003).

Lessons learned from the 2010 Gulf oil spill also underscore how critical coordination is to successful chemical emergency preparedness and response. Work group members active in the response noted that state and federal health and safety agencies need access to all oil response areas on water and land to assure the safety of response workers. In order to assure safe operations while handling absorption booms and conducting skimming operations on the water, the U.S. Coast Guard must ensure that the right to entry in order to assure responder safety is not dependent on the responsible party and its contractors.

Successful coordination for chemical emergency preparedness and response also requires solid and established public- private relationships. For example, another key lesson learned from the Gulf oil spill is that the responsible party should establish, in conjunction with the Incident Commander, a comprehensive injury and illness reporting system to be collected by diverse sources and reported to government public health agencies in order to ensure full reporting of ALL safety and health related issues experienced by cleanup workers. In this particular instance, British Petroleum (BP) and public health agencies should partner in establishing diagnostic criteria and population surveillance for all responders and not rely solely on contractors for diagnosis and reporting. In addition, collaborative processes should be established to share data among the responsible party and federal, state, and tribal health agencies. In a collaborative and transparent manner, they should gather, tabulate and analyze information related to exposure of cleanup

workers to oil, degreasers, and detergents. As part of the current Job Hazard Analysis (JHA) process, the Incident Commander should require representative individual exposure monitoring of critical job tasks during the time that cleanup workers are engaged in response tasks. In this way, the mechanisms of relaxing barriers (reducing silo structure) and encouraging open exchanges of information (sanctioning informal channels of communication) have the potential to speed up the recovery process.

IV. ACTION RECOMMENDATIONS

RECOMMENDATION #1: The federal government should establish an office or program whose goal would be to serve as a coordinating unit, unifying and integrating the efforts of federal, state, local, and tribal government agencies, with responsibilities related to preventing, preparing for, responding to, recovering from, and mitigating chemical emergencies, and serving as a central program charged with creating consistency and avoiding redundancy of information on chemical emergencies on the national, state, local, and tribal levels.

Establishing an Office of the Chemical Emergencies Coordinator could accomplish a variety of goals. First, this office would integrate the often disparate data developed by federal agencies before, during, and after a chemical emergency, and proactively disseminate it to planners, responders, and, where appropriate, the public via a National Clearinghouse for Chemical Emergencies. Second, the work group envisions this office as having a role in community outreach and volunteer training on personal and community responsibilities as well as roles in chemical emergency prevention, preparedness and response. Third, much of the focus of those agencies charged with this area of work has been on catastrophic emergencies. This office would ensure that chemical emergency prevention, preparedness, and response are prioritized.

Ideally, this office would establish a National Clearinghouse for Chemical Emergencies. In part, the office should collect, develop and disseminate toxicological informational tools. The office would be charged with receiving reports of chemical emergencies and guiding timely responses through referrals to the agencies with proper jurisdiction (for instance, through public health, first response, first receiver and Poison Control Center channels). In addition, this office would be responsible for ensuring that responders at all levels have access to real-time information on regional resources and response capabilities.

The recommended clearinghouse could emulate the national system of Poison Control Centers (PCCs), already partially funded by the Health Resources and Services Administration (HRSA). Advantages of using the existing hotline structure for access include:

- Immediate access to medical toxicologists
- Availability of specialists in poison information trained to collect exposure data (including the collection of blood, urine, and other samples)
- Real-time response and staff trained in risk communications targeted at both the public and at professional audiences
- Alignment with academic resources
- Public and professional familiarity with the existing phone number and service
- Economies of scale
- Robust regional knowledge of response partners and public health agencies

A structure utilizing one or more regional PCCs might form the backbone of the emergency reporting and response system under this office. The availability of clinical toxicologists and other specialists may yield high-quality interpretation of exposure data (often incomplete in the literature or requiring collection from

several esoteric sources), provide real-time treatment recommendations for first responders and first receivers, and offer direct access to the system for the public and other professionals. PCC personnel routinely capture, record and report emergency events, exercises and drills, and engage in related public health notifications and risk communications. Mechanisms for raising awareness of PCC services already exist, and a modest expansion in function and an increase in dedicated funding to allow one or more PCCs to adopt this important function would shorten turn-around time for the creation of this office and to make it operational. Re-branding of the PCCs should be advertised to the public, chemical industry and professionals. Moreover, contact data for the office and for the Poison Control system (1-800-222-1222) should be included on all Material Safety Data Sheets (MSDS) and similar chemical datasheets. In addition, web searches of terms such as "chemical emergency," should yield this site among the first listed. The website should be easy to navigate and, if additional assistance is needed, there should be the option to talk with a live operator.

Given that there are many potential actors involved with preventing, preparing for, responding to, recovering from, and mitigating chemical emergencies, with varying levels of skill, education and training, it will be difficult to develop such a clearinghouse without a unifying body. Thus, this recommendation focuses first on the establishment of an Office of the Chemical Emergencies Coordinator whose goal would be to coordinate and integrate the efforts of all relevant federal government agencies.

In addition, there are multiple local, state, tribal, and federal agencies and NGOs that have the resources and expertise to assist communities and industries during a chemical release. Another goal of this office would be to establish outreach and volunteer training programs to promote and support individual and community preparedness (e.g., public education, training sessions, and demonstrations), including preparedness of those with functional needs. The creation of this office would provide agencies and NGOs with a centralized location to report their activities and programs, which would serve to avoid duplication of efforts and to update stakeholders. A comprehensive, easily accessible website should also be established for this service, with an eye toward providing ongoing education on chemical releases and their prevention.

The Department of Health and Human Services (DHHS), in coordination with the Department of Homeland Security, the National Response Center, the Federal Emergency Management Agency, the Environmental Protection Agency, the Commission on Children and Disasters, and other appropriate agencies, should be considered as key resources during the establishment of this office. The office may draw upon other resources, such as medical toxicologists, clinical toxicologists, or basic science toxicologists (available through organizations such as the American College of Medical Toxicologists, the American Academy of Clinical Toxicology, the American Association of Poison Control Centers, and the Society of Toxicology); the chemical industry; industrial hygienists; academia; ATSDR; OSHA; NIOSH; and EPA.

Although establishment of the Office of the Chemical Emergencies Coordinator could be led by DHHS, it might be more effective if it is established as an independent entity, and not under the ownership or control of any one agency. In addition, the Office of the Chemical Emergencies Coordinator should be free from political influence, with major funding coming either from a pool of contributions by all relevant federal agencies or from funding triggered by a federal emergency declaration.

RECOMMENDATION #2: Federal government agencies with responsibilities for providing applied research funding and other funding to tribes and state and local government agencies on chemical emergencies should require that relevant funding announcements include language strongly encouraging the development of partnerships with non-governmental organizations (NGOs) and community-based organizations, academia, labor unions, and industry.

Partnerships are an important tool in preventing, preparing for and responding to chemical exposures. To quote the Institute for Homeland Security Solutions, "NGOs, such as community-based, faith-based, or national organizations, play vital roles in emergency management and incident response activities. NGOs that have the capacity and desire to be involved should be fully integrated into a jurisdiction's preparedness efforts, especially in planning, training, and exercises. Furthermore, a memorandum of agreement should be established with each NGO prior to an incident so that each organization is aware of the capabilities, expectations, and roles of others (Institute for Homeland Security Solutions 2005)."

Academia is a highly untapped resource in chemical emergency preparedness and response. The resources that academia brings to the table are highly trained people with expertise in chemistry, public health, environmental health, engineering, emergency management, biology, etc. Similarly, industry often has extensive knowledge of particular chemicals (either individual molecules or classes of compounds), employees with high levels of expertise and modern (state-of-the art and frequently expensive) equipment. Partnerships must be balanced; each partner must gain from any alliance, and a win-win situation must be established.

Optimally, partnerships with industry will focus at least in part on encouraging the use of safer alternatives and green chemistry technologies with the goal of preventing chemical emergencies. Ideally, these partnerships will lead to information-sharing on processes and technologies that can remove major chemical hazards.

Where appropriate, proposals for funding that include representatives from industry, academia, and community organizations/NGOs as co-equal partners should be encouraged and incentivized, and should receive priority for acceptance and funding. Roles and responsibilities should be shared and clearly delineated to avoid enlisting and creating participants in name only. Proposals that include more than one institution or industry partner (again, as co-equal partners) should receive bonus points during the review process. External auditors (one each from the funding source and recipient institutions) should annually review the structure, operating efficiency and results of any partnerships created as a result of grant-related activities. If recipients are found to be non-compliant with the terms of this recommendation, funding may be reduced or withheld.

RECOMMENDATION #3: A Presidential Executive Order or Homeland Security Presidential Directive should be established that calls for the development of an overarching national vision for chemical emergencies and for each federal agency to develop its own supporting strategy for preventing, preparing for, responding to, recovering from, and mitigating chemical emergencies, and ensuring that preparedness momentum is maintained.

An executive order would be a legally binding order given by the president, acting as the head of the executive branch, to the federal administrative agencies. Homeland Security Presidential Directives are issued by the president on matters pertaining to homeland security.

Successful implementation of this recommendation will require a commitment by all federal agencies and will indicate a significant paradigm shift. Such a commitment affects all programs and activities involving chemicals. The outcomes created from its implementation should more than justify the investment of time and commitment to government preparedness and response to chemical emergencies across all agencies and levels of government.

This executive order or directive would apply to all agencies and would include the creation of an Interagency Working Group on Chemical Emergencies (Working Group). The Working Group should be formed within three months of the date of the order and will be responsible for developing a common and shared overarching vision to help guide the agencies as they develop agency-specific strategies.

The administrators of the EPA and DHHS or their designees shall convene the Working Group on Chemical Emergencies. The Working Group shall be comprised of the heads of the following executive agencies and offices or their designees: the Department of Defense; the Department of Health and Human Services; the Department of Housing and Urban Development; the Department of Labor; the Department of Agriculture; the Department of Transportation; the Department of Justice; the Department of the Interior; the Department of Commerce; the Department of Energy; the Environmental Protection Agency; the Department of Homeland Security (to include the Federal Emergency Management Agency, the Coast Guard, the Transportation Security Administration, the Science and Technology Directorate, the Office of Infrastructure Protection, and the Office of Health Affairs); the Office of Management and Budget; the Office of Science and Technology Policy; Office of the Deputy Assistant to the President for Environmental Policy; and such other government officials as the president may designate. The Working Group shall report to the president through the deputy assistant to the president for environmental policy.

Ideally, the Working Group will collaborate with the federal Office of Chemical Emergencies Coordinator, discussed in recommendation #1, to (1) coordinate with, provide guidance to, and serve as a clearinghouse for each federal agency as it develops a chemical emergencies strategy in order to ensure that the administration, interpretation and enforcement of programs, activities and policies are undertaken in a consistent manner; (2) assist in coordinating research by and stimulating cooperation among the EPA, DHHS, the Department of Education, and other agencies conducting research or other activities related to chemical emergencies; (3) assist in developing sources of information on safer chemicals and coordinating data collection; (4) examine existing data and studies on chemical emergencies; and (5) develop interagency model projects on chemical emergencies that demonstrate cooperation among federal agencies.

This recommendation might also lead to the establishment of a National Chemical Emergencies Awareness Day.

RECOMMENDATION #4: ATSDR and its partner agencies should establish a collaborative program that promotes the capacity across government agencies, industry, and academia for the development of technical and policy expertise in green technologies that remove or reduce the possibility of a significant chemical emergency.

The principle of eliminating or vastly reducing chemical hazards is inherent in the theories supporting green chemistry. “Green chemistry” is a broad term with many definitions. As defined by the EPA, green chemistry, also known as sustainable chemistry, is the design of chemical products and processes that reduce or eliminate the use or generation of hazardous substances, thus preventing a chemical emergency from occurring. Green chemistry should be applied across the entire life cycle of a chemical product, including its design, manufacture, use and disposal. The green chemistry movement seeks to align science, the environment, and economics to create more innovative, efficient and safer product and business designs. Industry should be provided regulatory incentives to assess, use, and develop such technologies.

EPA, through its Green Chemistry Program, should expand its funding program to provide research grants for resolving practical problems in the implementation of technologies that design out the potential for a chemical emergency. Security programs must collaborate with programs that support alternate technologies. These programs would complement one another by changing what can be changed and securing what cannot. Such collaboration would better identify the priority areas that need focused research for safer alternatives. Collaboration between security and alternative technology programs would be complementary by changing what can be changed and securing what cannot. Such collaboration would better identify the priority areas that need focused research for safer alternatives. This collaborative

program should work in coordination with other programs to ensure the security of dangerous chemicals during manufacture, storage, transport, use, and disposal. Federal agencies should develop program coordination for the promotion of green technologies, including dedicated expertise in engineering, policy, and alternatives assessment. The results of any related research should be made available through the clearinghouse discussed in recommendation #1.

RECOMMENDATION #5: ATSDR, in collaboration with other federal government agencies, should develop an ongoing national program to assess and improve the health care response to hazardous chemical releases, and to develop an evidence base for chemical emergency planning.

One of ATSDR's missions is to prevent exposure and adverse health effects from unplanned releases of hazardous substances. In order to achieve this mission, ATSDR educates physicians and other health care providers and provides technical support and advice to other federal agencies, states, and local and tribal governments that respond to hazardous chemical releases. Hospital preparedness programs include planning for mass casualty events and decontamination. In many communities, public health agencies, EMS, local emergency management agencies, law enforcement, and other responders are engaging in ongoing health care preparedness planning. An important component of hospital preparedness is undertaking training and practice exercises as part of any hospital preparedness plans that are developed. Efforts toward preparing the health care sector for chemical and other emergencies take place on the federal level and, in theory, are funneled down to local public health agencies and hospitals. As such, hospital preparedness programs should be integrated with state, tribal, local planning and capacity-building protocols for response to chemical emergency events.

The passage of SARA Title III and the Nunn-Lugar Anti-Terrorism Act reflect increasing concern in recent decades about the country's preparedness to manage adverse health effects due to hazardous chemical incidents. Unfortunately, there is a lack of empirical studies that would allow for the evaluation of the country's current levels of preparedness or guide the establishment of effective preparedness programs. Limited data suggest that the level of preparedness is not adequate. Since planning is only as good as the assumptions on which it is based, it is important that planning assumptions are correct.

To address this deficiency, ATSDR should work with its partners to 1) develop an ongoing national program that includes the following elements and 2) provide the necessary funding to make it sustainable[8]:

1. Establishment of a regularly updated national collection of published and unpublished documents, reports, and research papers on the responses to chemical emergencies and the lessons learned from them, which would be made available to planners, policymakers, practitioners, and the public. This collection closely relates to the clearinghouse mentioned in Recommendation #1.
2. Establishment of a standing national rapid-response field chemical emergency research team that would mobilize quickly to gather data on the operational lessons learned and best practices from responses to chemical emergencies. This can occur in conjunction with the ATSDR Assessment of Chemical Exposures (ACE) program teams that collect data on chemical emergency exposures and both short- and long-term outcomes. It is important to collect information from multiple events to identify common trends and patterns and to generate a large enough sampling for analysis.
3. Utilization of the data from points #1 and #2 above to establish evidence-based criteria for effective chemical emergency preparedness that can be housed in a clearinghouse, such as the one proposed in recommendation #1.

[8]Note that these elements could be extrapolated to all-hazards preparedness as well.

4. Regular national randomized surveys of chemical response organizations and institutions to assess their levels of preparedness using the criteria from point #3. (One might consider this a national "preparedness surveillance system.")
5. Funding to establish additional NTSIP states and promote the sharing of existing chemical emergency incident data. Without an understanding of the chemical emergencies that are occurring and their effects, it is impossible to effectively plan for a chemical emergency. The types of surveillance data collected on chemical emergencies also need to be expanded.
6. The development of recommendations for chemical emergency/disaster preparedness that are based on information generated from the above elements. These can be included in training materials for first responders and receivers.

RECOMMENDATION #6: Congress should pass a law requiring facilities to assess, and in certain cases, to implement safer and more secure alternatives that can reduce or eliminate the possibility of toxic gas releases. [9]

This report has recognized that while there are laws addressing risk management preparedness and response, there are no federal laws addressing the primary prevention of chemical emergencies. Such a law should establish policies, resources, and practices that encourage and develop the use of safer, more secure technologies. In following this approach, hazardous chemical facilities should evaluate and document the site-specific technological and economic feasibility of relevant options. These assessments will inform a hazard reduction program that encourages innovation and investment in safer technologies as a means not only to protect people, property, and the environment, but also to obviate the need for certain chemical safety and security regulation at specific facilities. The House of Representatives has acted to fill this gap in federal law by passing H.R. 2868, the Chemical and Water Security Act of 2009.[10] The act would require facilities to assess, and in certain cases, to implement safer and more secure alternatives that can reduce or eliminate the possibility of an acute release of toxic inhalable gases.[11] The legislation authorizes funds for implementation. It assigns authority over private sector facilities to DHS under the existing Chemical Facility Anti-Terrorism Standard. It assigns EPA authority over drinking water facilities under the Safe Drinking Water Act and over wastewater facilities under the Clean Water Act. For this legislation to be implemented successfully, it will require cooperation between these and other agencies as well as the development of relevant expertise.

The only certain way to protect our communities is to remove the possibility of a toxic gas release by converting facilities to safer, more secure alternative technologies. Such approaches employ innovation and adaptation as well as many existing technologies. For example, bleach plants can reduce the danger to employees and surrounding populations by generating chlorine on-site without rail shipment and bulk storage. Many drinking water utilities have converted from chlorine gas to liquid bleach. Many wastewater utilities have converted chlorine gas and/or sulfur dioxide gas to liquid bleach and/or sodium bisulfite, or to ultraviolet light. Developing commercial-scale solid acid catalyst alkylation methods could provide a new generation of refinery technology. Primary prevention approaches should reduce the number of people potentially exposed to acute toxic gases releases by, for example, using alternate chemicals or processes, using chemicals in less dangerous forms, or generating chemicals only as needed and without storage. Additional methods should be used to reduce the probability of release and/or to reduce the toxicity of the material that would potentially be released.

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[9] Work group members Derek Swick of the American Petroleum Institute and Clark Phinney of Maine Oxy do not support recommendation #6.
[10] As of the writing of this report, HR 2868 has passed the House, but not the Senate.
[11] Under HR 2868, only the highest-risk facilities can be required to implement safer technologies, or some two percent of the highest-risk facilities. Where such alternatives are feasible, even the highest-risk facility is permitted the flexibility to apply other measures, or "layers of protection" to the process.

Although primary prevention will not be possible in every case and some risks will always need to be managed, prepared for and responded to, the above examples of existing technologies indicate that there are many opportunities for primary prevention that have not yet been realized. A law requiring the assessment of opportunities for, and, in some cases, the implementation of safer technologies will lead to significant risk reduction.

RECOMMENDATION #7: The EPA, OSHA, Consumer Product Safety Commission (CPSC), DOT, and the U.S. Coast Guard should be mandated by law to follow the United Nations' (UN) Globally Harmonized System of Classification and Labeling of Chemicals (GHS) safety data sheet (SDS[12]) format and content requirements for providing information on chemicals.

Requirements for providing information about the hazards of chemicals and their safe use and handling are inconsistent among agencies, both domestically and internationally. The diverse and sometimes conflicting domestic and international requirements can create confusion among those who seek to use hazard information. SDSs may include symbols and hazard statements that are unfamiliar to readers or not well understood, and information may not be easy to find. In chemical emergencies, easy access to information that is readily understandable is a critical response factor.

The GHS is a common and coherent approach to defining and classifying hazards and to communicating information on labels and SDSs. To address the needs of the diverse audiences for SDSs, a standardized format was seen as a way to make the information on SDSs easier for users to find, to segregate technical sections of the document from more basic elements, to facilitate computerized data retrieval systems, and to simplify training for those who use SDSs. The GHS establishes a sixteen-section SDS format for presenting information with standardized headings. In the recommended GHS SDS format, the information of greatest concern to emergency responders is featured at the beginning of the SDS, including information on composition, fire-fighting and accidental release measures.

The GHS is in the process of being implemented globally and domestically.[13] The European Union has adopted all of the GHS classifications, including ecotoxicity, and the United States should do the same. DOT has essentially implemented the necessary changes to align with the GHS, and OSHA has published a Notice of Proposed Rulemaking (NPRM) to align its current Hazard Communication Standard with the GHS. However, EPA and CPSC are not making progress in implementing the GHS, and the Coast Guard's support of the International Maritime Organization (IMO) SDS format and content is not consistent with the harmonized, UN-endorsed GHS SDS. These Coast Guard activities will impede emergency response to affected cargoes carried in international waters (i.e., International Convention for the Prevention of Pollution from Ships [MARPOL] Annex I cargoes and marine fuel oils) because conflicting and non-harmonized hazard communication information will be provided to SDS users, including chemical emergency response personnel. Coordination among agencies in the adoption of the GHS should be improved. One agency should be designated the lead agency for this purpose.

In practice, collaboration is needed with the Canadian authorities, including Health Canada (Workplace Hazardous Materials Information System [WHMIS]/SDSs, pesticides, and consumer products) and Transport Canada. Canada has similar hazard communication/SDS systems and conflicting requirements, yet it is in the process of implementing the GHS.

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[12] Safety Data Sheets (SDS) is the international designation, as well as the terminology used in the GHS field, for what is often referred to as Material Safety Data Sheets (MSDS) in the U.S.

[13] Note that the U.S. approach to hazard communication and the UN GHS framework do not require the generation of hazard information on chemicals. All classification decisions are based only on available data. Thus, it is also important to support more research and pursue the compilation of more comprehensive data on chemicals.

A uniform domestic SDS format is needed to ensure emergency response personnel and community members have complete and consistent access to information on chemical exposures and hazards. To accomplish domestic harmonization of the SDS requirements:

1. Agencies need to have adequate resources/funding to accomplish the consistent adoption of the GHS. Agencies also need adequate resources/funding to ensure industry compliance with SDS requirements.
2. With regard to the timeline, the implementation could be phased in over a three-to-five-year transition period. Either the GHS or domestic hazard communication/SDS requirements could be used during the transition period, and then the GHS requirements would be mandated.
3. OSHA should work closely with other government agencies to ensure consistent and timely implementation of the GHS and alignment to the UN-endorsed version of the GHS.
4. Within three years, EPA should align the SDS requirements in Title III of the Superfund Amendments and Reauthorization Act (SARA, also known as the Emergency Response and Community Right-to-Know Act of 1986) with the OSHA/UN endorsed version of the GHS. This effort would harmonize SDSs made available to state emergency response commissions, local emergency planning committees, and fire departments in order to assist in planning and response to emergencies, as well as provide members of the public with information about chemicals used in their communities.
5. Within three years, EPA should align the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) hazard communication requirements with the UN-endorsed version of the GHS as far as is feasible.
6. The recent International Maritime Organization (IMO)/Coast Guard activities related to SDSs do not promote global harmonization and a consistent SDS format. Within three years, the Coast Guard should align its SDS requirements for MARPOL Annex I cargoes and marine fuel oils with the OSHA/UN-endorsed version of the GHS.
7. Within three years, CPSC should align its hazard communication requirements with the UN-endorsed version of the GHS as far as is feasible.

RECOMMENDATION #8: All first responder and first receiver organizations should be provided with a core competency curriculum of training on basic chemical emergency response, communication and coordination of the prevention, planning, response and recovery phases to ensure that there is a common foundation on which all further training can be based.

All first responders, including, but not limited to, fire service (both career and volunteer), law enforcement and emergency medical services personnel, and first receiver organizations should possess a basic core knowledge and competency in responding to chemical emergencies. Training should include HAZMAT response, terminology, communication and incident command structure to optimize both their response capability and responder/receiver safety.

The Department of Homeland Security (DHS) and the Department of Health and Human Services (DHHS) are best suited for this as both agencies already provide multiple trainings either directly or through funded/contracted third parties to the target receiver and responder populations. The work group recommends a model similar to that used to train individuals on the concepts of Incident Command System (ICS) and the National Incident Management System (NIMS). The country needs a series of successive and interrelated trainings, delivered through existing training providers and funded by federal agencies, including DHS and DHHS, that all build upon each other to strengthen capacity related to chemical emergency event planning, response and clean up. Existing training partners, such as the International Fire Safety and Training Association (IFTSA) and the Rural Domestic Preparedness Consortium (RDPC), are ideal resources for the development and delivery of training.

The Emergency Management Institute (EMI), coordinated by FEMA, already provides multiple self-study courses and would be an ideal delivery mechanism. FEMA has developed Target Capability Lists (TCL) to define the essential tasks for response areas, including hazmat response. Coordination of the TCL, core curriculum and training courses could help to build a better prepared response workforce. Building on this work, measures of competency should be developed for essential aspects of the core curriculum. These measures should be applied at multiple levels, including individual, team and community levels. In addition, decision support tools for responders to use during an event, along with just-in-time training for rapid dissemination at the time of the event, should all be aligned with the core curriculum. A clearinghouse of training courses with an evaluation of their intended audience, core competencies covered, and previous attendees' feedback should be readily available for potential students or agencies seeking specific training.

The Chemical Emergencies work group strongly encourages FEMA to expand the community education offerings already a part of the EMI training to include chemical awareness and basic emergency response topics geared toward community members and the public. If DHS coordinates and approves all trainings, the integrity of the topics and information will be ensured, as will the consistency of a common curriculum. An additional benefit would be a seamless integration with the existing NIMS and ICS trainings.

Success of this program could be measured by the decreased number of responder and receiver injuries and deaths, as well as by better-controlled responses to chemical emergencies where the impact to the public is reduced due to fewer incidents, or through better management of the incidents and increased protection of the public through various protective measures. Implementation of this program should occur within one year.

RECOMMENDATION #9: Since all emergency responses occur at the local level, the Department of Homeland Security should partner with the Department of Health and Human Services to provide both funding and logistical support for hands-on, real-time training, including functional drills, to support local interagency emergency response to chemical events.

One of the common concerns and barriers to competency identified by members of the responder and receiver communities is the lack of opportunity to translate a book, seminar or web-based training into real-time and real life training scenarios. While hands-on, full-scale drills are becoming more accepted and widely used in the responder and receiver communities, they often focus on scenarios built around a large-scale, mass casualty event such as a bus or plane crash or pandemic viral outbreak (pan flu). The work group calls upon DHS and DHHS to provide both the financial and logistical support to enable communities and the responders and receivers who service them to plan and execute training drills directly related to chemical emergencies in their specific areas. The chemical scenarios drilled should be relevant and related to specific threats or chemical-related hazards present in the community, such as a leak at a local manufacturing plant or train derailment. This process must involve not only responders and receivers, but also members of industry and the business community. Tribes, communities, and the public and their specific needs related to notification, evacuation and awareness education should be considered and taken into account when planning and performing a drill.

Members of the Chemical Emergencies work group are also very aware of the need to provide continuing training, including refresher training, to address the issue of complacency, as well as resources for all first responders (including volunteers), at hours and locations that are accessible. DHS and DHHS should look for ways to partner with state and local resources to ensure the highest possible participation from all members of the responder and receiver communities. This is particularly true in rural areas where many of the intended training participants are volunteers and hold regular full-time employment elsewhere. Night and weekend trainings are necessary to allow these members an opportunity to attend training.

The success of this program should be measured by tracking the total number of personnel trained, as well as their performance during drills, exercises, and responses to events. Implementation should occur in the near-term.

RECOMMENDATION #10: OSHA, EPA, and NIOSH, together with other federal and state response agencies, need to develop clear, easy-to-understand chemical emergency exposure standards or guidance values which better represent real-life risks incurred by first responders at chemical emergencies. These standards should require protection of responders according to the hierarchy of controls.

Current resources used to determine the potential risk of chemical specific exposures include, but are not limited to, OSHA Permissible Exposure Limit (PEL) standards, NIOSH Recommended Exposure Limit (REL) and Short Term Exposure Limit (STEL) guidance values; current American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Value (TLV) guidance; EPA Acute Exposure Guideline Limits (AEGL); American Industrial Hygiene Association Emergency Response Planning Guidelines (ERPG); and US Department of Energy (DOE) Temporary Emergency Exposure Limits (TEEL). For responder/receiver members, there is a gap between the recognized legal exposure values provided by OSHA and the exposure values provided by other entities such as NIOSH and the ACGIH. These values were developed for specific populations and circumstances. None of these values were developed for guiding response and limiting exposures during an emergency situation. As a result of this gap, there is great concern and debate in the responder and receiver community, as well as the public, regarding which exposure value is applicable in an emergency. Further work is needed to develop similar protective standards that are tied directly to the current state of knowledge and research regarding community exposure levels.

These standards should require protection of responders according to the hierarchy of controls. The hierarchy of controls is a list of steps that employers must take to prevent or reduce exposure to a hazard, ranked from most to least effective in terms of effectiveness. At the top of the hierarchy is the substitution of a safer material, machine, or process; followed by the use of engineering controls like mechanization, enclosure, and ventilation; then by the institution of administrative controls such as limiting exposure time and distance, housekeeping, hygiene facilities, medical surveillance and air monitoring; and finally, the use of personal protective equipment like hearing protection, respirators, gloves, goggles, and clothing forms the last rung of the hierarchy.

Congress should streamline or remove the impediments that make it more difficult for OSHA to accomplish these goals. Congress should authorize and appropriate sufficient funds for the agencies to carry out this recommendation. Congress should examine and modify, and where appropriate, remove legislative and legal, as well as any other impediments, to the fulfillment of this recommendation. Finally, the Office of Information and Regulatory Affairs in the Office of Management and Budget should do everything in its power to facilitate its swift fulfillment.

Success of this program could be measured by the reduced exposure of responders, tribal communities, and the public as reported to various state and federal agencies, including the military. Implementation may take one to three years. OSHA shall continue to regularly evaluate standards established by this program to ensure proper protection of responders and the public and adjust those standards as the need arises.

RECOMMENDATION #11: There is a need for a single, user-friendly, accessible planning tool for toxicological hazard and hazard vulnerability analysis (HVA) for local response to chemical emergencies.

This database must be a tool that is accessible to responders in the field by way of laptop, PDA, mobile smart phone, etc., as well as to receivers and members of the public via the internet.

The DHS should support the National Library of Medicine (NLM) and EPA in further developing, integrating, and disseminating modern response tools, including training for all district and local emergency management agencies and first responders. Existing tools such as NLM's Wireless Information Systems for Emergency Responders (WISER) and National Oceanic and Atmospheric Administration's (NOAA) Computer Aided Management of Emergency Operations (CAMEO) provide partial data to support a response; however, they are lacking full functionality as a complete one-stop resource. Each program has been developed as a stand-alone function, and each contains information missing from others. WISER is the preferred tool for many in the responder and receiver community and has wide name recognition. We envision an expanded body of information within WISER to fully inform and educate planners, responders and receivers on chemical emergency response steps and needs.

A critical component of this expanded body of information would be a functioning toxicologic hazard-vulnerability assessment tool that allows planners, responders, and receivers to correctly identify the nature and potential magnitude of a chemical event. The ability to access this information in both the planning and the response phases would allow those involved in the mitigation/planning and the response/clean-up phases to better assess and plan for the community impact. With better planning and response information, those involved will have consistent guidance on multiple issues, such as selecting the most appropriate personal protective equipment (PPE) for responders, deciding on evacuation or shelter-in-place for the community, selecting an antidote, and locating an antidote stockpile. We envision a comprehensive tool that bridges the gaps between scientific knowledge, risk management and best practices response planning.

Two future resources are in development. The NLM is currently developing an internet-based web portal to assist first responders, first receivers and emergency planners in preparing for and responding to chemical emergencies. The Chemical Emergency Medical Management (CHEMM) portal is under development and is similar to the popular internet site Radiation Emergency Medical Management (REMM). This portal will interact with WISER. Ideally, these products would be able to interact with tools such as CAMEO and MARPLOT that can help both identify and pinpoint hazards and assist with evacuation and containment modeling.

This tool should be made available to everyone, potentially through the clearinghouse discussed in recommendation #1. A public side of this program should also be developed that allows local citizens and tribal communities access to information on known chemical storage and use sites in the community as well as basic education on health effects and response procedures. Information such as Material Safety Data Sheets (MSDS) and local response planning via a local emergency management agency could also be linked to the tool for public use.

Training should be provided on the use and function of the program at no cost to the response community. DHS should task NLM and EPA with continuously upgrading and updating the program in order to meet the constantly changing needs of the response community. Success of this program could be measured by the number of response agencies that download versions of this program and continue to upgrade the programs as updates and upgrades are issued by NLM and EPA. Implementation should be planned to occur within two years.

Tracking program usage, updates, and upgrades will serve as an indicator of the value to responders and the success of the training. Implementation should occur within two to three years.

RECOMMENDATION #12: The federal government should provide support in concept and through funding for the ongoing development of a cadre of trained and experienced Emergency Support Function 8 (ESF 8 health and medical) planners and responders who will improve emergency operational capabilities and critical decision-making as well as better integrate the tiers of private sector and government responses to public health emergencies during chemical disasters/events.

To quote Dr. Margaret Chan of the World Health Organization, "*As the determinants and consequences of health emergencies become broader, so has the range of players with a stake in the security agenda. The new watchwords are diplomacy, cooperation, transparency and preparedness* (WHO 2007)." To this end, planners must be educated and prepared to plan responses that integrate the capabilities and capacities of the many diverse agencies and organizations that may be called upon to respond to a chemical emergency at any geopolitical level. The strategic objectives of such a training program should be to:

1. Educate medical, public health, and emergency management professionals to serve as ESF #8 (health and medical response) planners and response coordinators and to become leaders in this field
2. Provide an experienced and ready cadre of personnel that can coordinate or assist in ESF #8 planning and can augment ESF #8 response activities at the local, tribal, state and national levels
3. Enhance effectiveness of ESF #8 regional planning and response partners at the local, state, tribal, and national levels by standardizing theory and methods
4. Create a highly competent and dynamic faculty/staff that trains organizations by coordinating or assisting in multi-jurisdictional planning and responses, as well educating students participating in the program

Such an ESF-8 program is currently in the pilot-testing phase of development and is demonstrating promising results. The Yale/Tulane ESF-8 Planning and Response Program is a collaborative program bringing in diverse partners from academia; public health; and civilian, governmental and military sectors and is rooted in extensive after-action analysis of large-scale disasters impacting health.[14] It is also a multi-disciplinary, multi-center, graduate-level certificate program designed to produce ESF #8 planners and responders with standardized skill sets that are consistent with evolving public policy, technologies, and best practices (Yale New Haven Center for Emergency Preparedness and Disaster Response 2010). The program is intended to be accessible, sustainable, and replicable on a large scale. The education and training provided focus on a set of base competencies. In its current format, the training addresses planning for chemical emergencies and includes internship placement for practical experience to improve translation from classroom theory to actual planning practice.

Through prior planning and training, leaders at the federal, tribal, state, and local levels will be better prepared to help coordinate response planning involving all stakeholders. Planners trained to optimize information flow and facilitate decision analysis through emergency operations will help to provide response plans designed to lessen the impact of chemical emergencies on public health, continuity of operations, and local economies. As a result of more effective planning and training, local responders will possess the improved skills and knowledge to properly place outside resources and governmental agencies most efficiently and in the greatest area of need as they arrive on-scene to support operations. Additionally, as federal, tribal, and state agencies arrive, local responders will have a clearer understanding of the capabilities, resources, and needs that accompany those federal, tribal, and state responders.

[14]For more information on the Yale/Tulane ESF-8 (Public Health and Medical Services) Planning and Response Program, see http://drlatulane.org/community/groups/haiti-recovery/resources/esf-8-haiti-updates.

The success of this program might be measured through improved plan quality, and by increased collaboration between local, state, tribal, and federal agencies that may need to respond to chemical emergencies on scene or by transporting and/or treating victims. As planners and plans bring diverse response agencies together prior to a chemical emergency, an integrated response to an actual chemical emergency may be enhanced. Implementation of the training program should occur within one to two years and be sustained over the long term.

V. CONCLUSION

Several key themes are consistent throughout this report. When attempting to prevent, prepare for, respond to, recover from, or mitigate chemical incidents, there is a need for the following: (1) developing improved channels of communication and better coordination among federal, state, local, and tribal agencies; (2) improving communication and outreach to community groups and residents, including answering the need for a single, centralized communications system that can serve as a more easily accessible portal for chemical safety information that is sometimes technical in nature, but available and in language that is understandable by the "lay-person"; and (3) developing improved and more extensive training and education for responders, receivers, and providers, particularly those at the local level. Realizing and recognizing the need for more resources may not always translate into increased funding for agencies at the federal, state, and/or local levels. Consideration should be given to re-evaluating the distribution of current expenditures and resources available for chemical emergency prevention to determine where there is redundancy and duplication, identify priorities, and make any necessary adjustments to ensure that citizens and communities across the country are prepared for and more adequately protected from major chemical incidents. Lastly, the nation and its people will benefit most as the vast resources and energies that have been required until now for the reclamation of the environment and the care of people injured by chemical emergencies can be re-directed by our leaders toward the future protection of all through a consummate intent and a deliberate design that strives to prevent chemical emergencies, reduces their frequency, and when all else fails, responds immediately and cohesively to minimize their impact.

VI. APPENDICES

a. Full membership list
b. Acknowledgments

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Appendix A
Full Membership List

Leadership Team
Andrea Kidd Taylor, Morgan State University, *chair*
Scott Deitchman, NCEH/ATSDR *senior liaison*
Dana Goodson, RESOLVE *facilitator*
Jennifer Peyser, RESOLVE *facilitator*
Montrece Ransom, NCEH/ATSDR *staff*

Members
Bill Benerman Denver Department of Environmental Health
Nathan Birnbaum, USDA Animal and Plant Health Inspection Service
Kathleen Curtis, Clean New York
Jacque Darbonne, Harris County Public Health & Environmental Services
James Eaton, Maine Health and Environmental Testing Lab
Fleming Fallon, Bowling Green State University
Joseph Hughes, National Institute of Environmental Health Sciences
Nancy Hughes, American Nurses Association
James James, American Medical Association
Todd Jordan, Occupational Safety and Health Administration
Betsy Kagey, Division of Emergency Preparedness and Response, Georgia Department of Community Health
Mark Kirk, U.S. Department of Homeland Security
Wanda Lizak Welles, New York State Department of Health
Jacqueline McBride, Love, Peace and Prosperity International, Inc
Maureen Orr, Agency for Toxic Substances and Disease Registry
Paul Orum, NGO Chemical Safety Consultant
Clark Phinney, Maine Oxy
Darius Sivin, Ph.D.
Syndi Smallwood, Pechanga Band of Luiseno Indians
Derek Swick, American Petroleum Institute
Connie Biemiller Thomas, South Fulton and Fayette Community Task Force
Anthony Tomassoni, Yale University School of Medicine

Appendix B
Acknowledgments

The membership of the Chemical Emergencies work group would like to acknowledge that this report was improved by conversations with and reviews by the following individuals:

- Sharon D. Beard, Industrial Hygienist, National Institute of Environmental Health Sciences
- Erik Auf der Heide, Medical Officer, ATSDR
- Peter A. Petch, Industrial Hygiene Program Manager, US Department of Agriculture