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Subject: Addendum to the Epi-Aid Trip Report: Elk River Chemical Spill, West Virginia, January 16–31, 2014 (Epi-Aid 2014-023)

To: Loretta E. Haddy, PhD, MS, West Virginia State Epidemiologist and Director of Office of Epidemiology and Prevention Services

Assessment of Disaster Epidemiology Capacity at the West Virginia Bureau for Public Health

Background

On January 9, 2014, approximately 10,000 gallons of 4-methylcyclohexanemethanol (MCHM) spilled into the Elk River 1.5 miles upstream from the Kanawha County municipal water intake in Charleston, West Virginia. The chemical spill contaminated the water supply of approximately 300,000 residents. West Virginia declared a State of Emergency, and a "Do Not Use Water" order was issued for 9 counties at 6:00 PM that evening. Subsequently, on January 21, it was disclosed that MCHM was not the only contaminant in the water supply. A mixture of propylene glycol phenyl ethers (PPH), 7.3 % by weight of tank contents, also entered the Elk River on January 9.

MCHM is a chemical used to process coal. It has an obvious odor and is reported to smell like licorice; odor recognition occurs at 2.2 parts per billion. Few animal studies have been conducted, and toxicological data on MCHM are limited. MCHM can be harmful at high doses as shown by animal studies; a study in rats showed blood, kidney, and liver effects at the highest dosage. Known human health effects of MCHM exposure include skin, eye, and respiratory tract irritation (Hazardous Substances Data Bank, National Library of Medicine's Toxicology Data Network**)**. Toxicological information for PPH is also limited, but the reported toxicity of this chemical appears lower than that of MCHM. Like MCHM, known human health effects include skin, eye, and respiratory tract irritation. The Centers for Disease Control and Prevention used available studies to calculate screening levels in drinking water for MCHM and PPH; MCHM and PPH levels below 1 part per million (ppm) and 1.2 ppm, respectively, are not likely to be associated with any adverse health effects.

Following the spill, patients began reporting to Emergency Departments (EDs). The Poison Center received calls about symptoms such as vomiting, nausea, diarrhea, rash, and headache. However, acute health effects of MCHM exposure in patients presenting to EDs were unclear. Because little is known about the health effects from exposure to MCHM, the West Virginia Department of Health and Human Resources (DHHR) Bureau of Public Health (BPH) asked CDC/ATSDR to assist with a rapid investigation of the health effects associated with MCHM exposure and assess the health needs of the affected population. The goals of the investigation were to: perform medical chart reviews of persons who presented to EDs because of exposure to MCHM and conduct a descriptive analysis of health effects associated with the chemical spill, survey staff of area hospitals to understand the impact of and evaluate the response to the chemical spill, and assess disaster epidemiology capacity at the Bureau for Public Health.

This report addresses the final objective of the Epi-Aid: the assessment of disaster epidemiology capacity at the Bureau for Public Health. It is an addendum to the *Epi-Aid Trip Report: Elk River Chemical Spill, West Virginia, January 16–31, 2014 (Epi-Aid 2014-023)* that was previously released to the state. The earlier report included findings from the other three objectives of the Epi-Aid.

Disaster Epidemiology

Disaster epidemiology is a relatively new field of epidemiology that seeks to produce actionable information for decision makers and planners following natural and man-made disasters. Some examples of types of epidemiologic responses to disasters include:

- Rapid needs assessment/Community Assessment for Public Health Emergency Response (CASPER)
- Surveillance for morbidity, injury, or mortality
- Surveillance for disease outbreaks in emergency shelters or the general population
- Formation of a registry of persons exposed to radiation or a chemical that can produce serious delayed health effects
- Assessment of the impact of the disaster on affected populations or the health care system
- Evaluation of emergency responder safety and health
- Assessment of the mental health impact of a disaster on the affected population or responders
- Evaluation of the effectiveness of public health interventions or disease control efforts and making recommendations to improve effectiveness
- Review of response to the disaster

Data should be collected, analyzed and reported within sufficient time to inform decision-makers and the general public about health effects; make recommendations for prevention and control of diseases and conditions; dispel rumors and myths; gather credible evidence to support information and health services needed by the affected population; as well as develop strategies to better respond to similar situations.

Typically, the epidemiologic response to a disaster is smoother when it is a "ramp up" of normal activities according to plans developed in advance of a disaster, instead of trying to figure out what to do in the middle of the disaster. If it is an activity that they do as part of their routine work, personnel already know how to accomplish it and have preexisting relationships with partners. Personnel know who to call for information and how to work with them to accomplish mutual goals. Personnel also know where to find needed resources for their day-to-day jobs that can be critical in a disaster setting. They know how to use the needed computer programs and have access to the required software. In addition, personnel who routinely work in a field know how to interpret scientific data for agents involved in a chemical, radiological, or infectious incident. This knowledge is critical in designing investigations and interpreting findings.

Epidemiology staff whose skill sets include data abstraction from medical records, conducting interviews, and managing data in a database are usually needed during a response and increase efficiency of a disaster epidemiology team. Staff with logistical expertise are also valuable for procurement of state vehicles, radio and telephone communications, supplies and equipment needed for field work such as a CASPER. Additionally, Geographic Information System (GIS) mapping capability can be critical for mapping epidemiological and environmental data as part of a disaster response.

In addition to personnel with disaster epidemiology skills and experience and support staff, lead epidemiology staff needs access to information about the situation in order to make good decisions about the types of epidemiological studies to implement or recommend. Without that information, it is possible that epidemiological studies may not result in complete or accurate or timely information to inform decision-makers and the general public.

Methods

To assess disaster epidemiology capabilities at the BPH, semi-structured interviews were conducted with nine state authorities, including representatives from the BPH Office of Epidemiology and Prevention Services, Office of Environmental Health Services, and Center for Threat Preparedness. Representatives surveyed included directors of offices, directors and assistant directors of divisions, and public health advisors. All concerned parties described their disaster epidemiology capabilities, including their workforce, subject matter expertise, and role in response efforts and follow-up.

Results

There are a total of 34 epidemiology positions at the BPH, although currently five are vacant. Positions are located in the: Office of Epidemiology and Prevention Services (16), Office of Maternal Child and Family Health (9), Health Statistics Center (5), Office of Community Health Systems and Health Promotion (2), Office of Environmental Health Services (1), and in the Bureau for Behavioral Health and Health Facilities (1). There is an epidemiologist journal club that meets monthly which includes all the epidemiologists at the agency.

During an activation of the state's Emergency Operations Center, a desk is staffed for DHHR, which is supported by activation of the DHHR Health Command Center. During a response, there are both Office of Epidemiology and Prevention Services and Office of Environmental Health Services leads within Operations of the Health Command Center.

Epidemiologists who normally work in infectious disease led the epidemiologic response to the Elk River spill, with the assistance of CDC and ATSDR. The epidemiologic investigation of acute health effects from an incident this large took almost six weeks, with over a dozen staff contributing to the work, and hundreds of hours of their time.

Staff at BPH have training and experience for some of the possible disaster responses but not all. They have experience conducting CASPERs in partnership with county health departments. They performed surveillance for disease outbreaks at the 2013 Boy Scout Jamboree in Fayette County, which is similar to surveillance done at a large emergency shelter. BPH staff have conducted paper-based emergency department (ED) syndromic surveillance during the Boy Scout Jamboree and during the derecho of 2012. However, preparation for ED-based surveillance during the Boy Scout Jamboree required months of planning including outreach visits to each of the emergency departments enrolled in the surveillance; during a disaster, that level of extensive preparation is not possible. Electronic syndromic surveillance may be an option in the future because BioSense, a CDC program for increasing health response capability, is now being implemented in a few hospitals in the northern part of the state. BPH has GIS capability located within the Office of Environmental Health Services that might be able to

support a disaster epidemiology response. There is a behavioral health epidemiologist within DHHR. Currently, there are no epidemiologists in positions that respond to acute chemical or radiological releases, or specifically tasked with natural disaster response. There also are no programs to enhance occupational safety and health of responders.

Recommendations

Plan for an epidemiologic response to different types of disasters that might occur in West Virginia. There is potential for many different types of disasters to occur in West Virginia, such as an infectious disease pandemic, winter storms with widespread power outages, wind disasters such as tornados or derechos, flooding, wildfires, and extreme heat. Man-made disasters such as chemical or nuclear incidents, or mass casualty incidents like bridge collapses, could occur as a result of an accident or be deliberate terrorist attacks. Each of these disasters could require a different epidemiologic response. Planning for different types of responses includes: identifying which group will be the lead, what will be needed for the response, and which other groups can provide expertise to augment the resources of the lead group. Maintaining a list of epidemiologists with specific skills and disaster epidemiology experience could streamline identification of personnel who could assist in a response. In addition, establishing a mechanism for recruiting and reassigning staff rapidly within the agency can enable a rapid response.

Build up environmental epidemiology capacity within the agency. DHHR may want to consider additional resources such as hiring an epidemiologist who would lead the response for environmental disasters and acute environmental incidents. Since this would be a new position within the agency, the epidemiologist would need sufficient training and experience in environmental epidemiology to be able to effectively develop the agency's program. This position could include performing surveillance for acute chemical releases, possibly working with the ATSDR National Toxic Substance Incidents Program. The surveillance data could be used to target prevention outreach activities and improve response to chemical releases so that morbidity and mortality are decreased. Participating in the CDC Environmental Public Health Tracking Program or ATSDR's Cooperative Agreement Program would be other ways to increase environmental epidemiology capacity in the agency.

Join with other states working in the field of disaster epidemiology. By participating in the Council of State and Territorial Epidemiologists (CSTE) Disaster Epidemiology Subcommittee and CDC Disaster Epidemiology Community of Practice, BPH epidemiologists will have ongoing access to tools that have been developed and subject matter expertise.

Train epidemiologists in disaster epidemiology. BPH epidemiologists were able to take advantage of a regional disaster epidemiology course that offered training in Assessment of Chemical Exposures (ACE), CASPER, and Emergency Responder Health Monitoring and Surveillance (ERHMS) in Richmond, VA on March 26–27, 2014. ACE training helps build capacity in responding to acute chemical incidents. ERHMS currently has on-line training available through the CDC for those who were unable to attend the class in person. ACE and CASPER on-line training is currently under development and will be available soon. The epidemiologist journal club could also serve to educate epidemiologists on response to disasters. This could be done by reviewing a paper on disaster epidemiology, such as "The role of applied

epidemiology methods in the disaster management cycle" that should be published in the *American Journal of Public Health* soon, and follow with a discussion of best managing a response to the next West Virginia disaster.

Summary

The BPH has personnel trained and experienced in many types of disaster epidemiology response. Others have backgrounds and training in aspects of epidemiology that can play a large role in a public health disaster response. There is not a program for epidemiologic response to chemical or radiological incidents or other emergency environmental issues; an epidemiologist working in this area would be the ideal leader for epidemiological response to environmental disasters. This person could use their experience and contacts to rapidly coordinate a response, drawing on epidemiologists from other parts of the agency that have needed skill sets.