

The Great Lakes Center's Health Hazard Evaluation Program: Promoting Community Environmental Health Through Partnerships Between Academic and Public Health Departments

Salvatore Cali, M.P.H., C.I.H.
Peter Scheff, Ph.D., C.I.H.
Amy Mucha, Ph.D.
Leslie Nickels, M.Ed.
Irene Oliynyk, M.P.H.
Daniel Hryhorczuk, M.D., M.P.H.

Abstract

The Great Lakes Center of Excellence in Environmental Health (GLCEEH), an innovative capacity-building component of the University of Illinois, performs health hazard evaluations in collaboration with the Illinois Department of Public Health and local health departments. GLCEEH has provided state and local health departments with faculty, industrial-hygiene expertise, and research expertise to help them investigate a variety of environmental health issues. This article describes health hazard evaluations performed with support from the National Center for Environmental Health, lessons learned, and recommendations for successful collaboration between academic and public health departments. From the academic perspective, health hazard evaluations are beneficial because they provide faculty and students with the opportunity to engage in public health practice and encounter new issues that advance the science of environmental health through research. From the perspective of a public health department, health hazard evaluations are beneficial because they address priority environmental health concerns and build the capacity of department personnel to conduct health hazard evaluations with internal resources. A collaborative health hazard evaluation program increases public health capacity by developing new approaches to environmental health problems and by sharing limited resources.

Introduction

State and local health departments tend to receive attention mostly when there is a public health problem, such as an outbreak of foodborne or waterborne disease. While the public expects food, air, and water to be safe, outbreaks of environmental illnesses

are common occurrences (Olsen, MacKinon, Goulding, Bean, & Slutsker, 2000). These outbreaks have ranged from the recent *E. coli* contamination of fresh spinach across 25 states (Centers for Disease Control and Prevention [CDC], 2006) to the 1993 *Cryptosporidium* contamination of the public

water supply in Milwaukee, which resulted in an estimated 403,000 cases of human illness (Mac Kenzie et al., 1994).

The current structure of public health departments is based on historical need and political response to perceived problems. In most states, public health functions are carried out by a variety of organizations, including state and local health departments, air and water pollution agencies, departments of natural resources, occupational health agencies, and others, such as building inspection departments. These agencies may regulate by local, state, or federal authority, depending on the nature of the issue and the location. The system has some overlaps and redundancies, but there are also critical gaps. While the system works well most of the time, some issues or problems do not fit within existing programs, enforcement criteria, or authorization. For example, indoor-air-quality issues and ambient releases of certain contaminants may not fall under regulatory authority. Cases like these illustrate how the multi-disciplinary, global, and research-based perspective provided by a university can provide assistance to public health agencies. This article presents case studies that demonstrate the benefits of collaboration between health departments and universities.

In 2001, CDC's National Center for Environmental Health (NCEH) funded a number of universities to develop models for collab-



Children's playground near elevated track structure.

oration between university and public health departments on local environmental health issues. The Great Lakes Center for Occupational and Environmental Safety and Health (GLC) at the University of Illinois School of Public Health received a three-year cooperative agreement to strengthen these partnerships in Illinois. The cooperative agreement established the Great Lakes Center of Excellence in Environmental Health (GLCEEH) within GLC. GLC is a constellation of academic organizations that also includes the National Institute for Occupational Safety and Health (NIOSH) Education and Research Center and the World Health Organization Center for Global Environmental and Occupational Health. It is funded in part through the National Institutes of Health Fogarty International Center, the Pediatric Environmental Health Specialty Unit (supported by the Agency for Toxic Substances and Disease Registry [ATSDR]), the U.S. Environmental Protection Agency (U.S. EPA), and the Occupational Health Service Institute.

The health hazard evaluation program began in 1993, when GLC pioneered a joint initiative with the Toxicology Section of the Division of Environmental Health in the Illinois Department of Public Health. The initiative was based on the NIOSH model of interdisciplinary occupational health hazard evaluations but included environmental health issues. This program had no core

funding and relied on goodwill and in-kind support from the state health department and university faculty. Officials of GLC and the state health department formalized this relationship through a memorandum of understanding signed in 1998. A variety of health hazard evaluations were performed throughout the 1990s, utilizing faculty, staff, and students. Sometimes funding for a portion of the cost of health hazard evaluations was available through grants or service fees paid by interested parties such as local municipalities. Almost every health hazard evaluation necessitated donation of labor from UIC faculty and personnel, as well as donations of equipment and laboratories from the School of Public Health Environmental & Occupational Health Sciences Division and the state health department. Despite resource constraints, the collaboration offered university faculty opportunities to perform public health service and research. The GLCEEH cooperative agreement provided partial support for an industrial hygienist, purchase and calibration of sampling equipment, and laboratory analysis of samples. In 2003, GLC received a second NCEH grant to continue the GLCEEH program and perform outreach to other states in the Midwest region.

GLCEEH defines health hazard evaluations (HHEs) as assessments of known or perceived adverse health effects related to exposure to an environmental or occupa-

tional disease agent. Health hazard evaluations investigate problems that are in the public interest, and the investigation is performed for the benefit of public or non-profit institutions. Some health hazard evaluations require multi-disciplinary interventions that involve but are not limited to medical practitioners, epidemiologists, statisticians, and industrial hygienists. Innovative components of the HHE model include 1) a focus on environmental health; 2) collaboration with local, state, and federal departments of health; and 3) utilization of School of Public Health faculty and students, who work in cooperation with state environmental health specialists. This successful program has addressed many environmental health issues in Illinois, has improved the capacity of the state and local agencies to respond to adverse health outcomes and disease occurrences, and has trained many physicians, nurses, and industrial hygienists.

HHE Case Studies

Since GLCEEH received NCEH support in 2001, it has completed four health hazard evaluations in cooperation with state and local health departments and three technical consultations for CDC and the state health department. A fifth health hazard evaluation is in progress. All of the GLCEEH projects involved community environmental health issues and governmental, educational, or health care facilities with less-than-adequate resources. The efforts were supported by the NCEH grant and state funds. The collaborations that made the health hazard evaluations and technical consultations possible are briefly explained below.

Air Quality at a Suburban High School

A suburban high school undergoing major renovation activities received numerous and persistent complaints about indoor air quality during and after major renovation. Many of the complaints came from school staff. The complaints continued for months despite environmental remediation and risk communication efforts.

GLCEEH collaborated with the state and county health departments and reviewed environmental reports and health complaints. On-site evaluations identified ventilation system deficiencies and a potential source of bioaerosols. The collaborative nature of this HHE effort appeared to provide the credibility and the responsiveness that the oc-

cupants were seeking. Recommendations for corrective actions were made in a comprehensive report, and no further requests for assistance or complaints were received. The investigation received approximately \$8,400 in supplementary funds from the Illinois Department of Commerce and Community Affairs. This health hazard evaluation affected approximately 3,500 staff and students.

Soil Lead in Playgrounds Near Elevated Trains

This health hazard evaluation developed after an inspector from the Chicago Department of Public Health Childhood Lead Poisoning Prevention Program observed unsafe track renovation practices by Chicago Transit Authority (CTA) track maintenance personnel and found paint chips containing lead-based paint near a child care playground. CTA was notified and upgraded its maintenance practices and training. GLCEEH collaborated with the Childhood Lead Poisoning Prevention Program to research possible soil contamination at child play areas near train tracks (see photo on page 43). The goals were to identify the number of child playgrounds located adjacent to CTA elevated tracks, determine the soil lead concentration in the child playgrounds, and evaluate the hazard potential for children. The collaboration indicated that paint deterioration and uncontained CTA track renovation work had the potential to contaminate soil adjacent to elevated tracks. Child playgrounds that were near recently renovated structures, however, showed no evidence of soil contamination.

Investigation of *Phialemonium curvatum* Infections at a Dialysis Clinic

GLCEEH provided technical assistance to the state health department and CDC in an outbreak investigation. Four patients at an outpatient dialysis clinic were found to have systemic infection with a rare fungal pathogen. GLCEEH helped perform environmental sampling to locate the source of the pathogen. The local department of public health was kept informed about progress in the investigation and participated in some site visits. This investigation was interdisciplinary in nature, involving medical practitioners, epidemiologists, an industrial hygienist, and experts in infection control and dialysis. Sampling did find a reservoir of the target organism, although the route of exposure was not determined. GLCEEH and state health department personnel made recommendations to the facility for decontamination and



Building materials at North Unit, Illinois Beach State Park.

modification of the reservoir, and no subsequent cases have been reported. This was the first published incident in which the organism *P. curvatum* was found in an environmental sample during a case investigation (Clark et al., 2006). The fact that the organism was discovered in an environmental niche may be useful for future investigations. This health hazard evaluation affected approximately 180 to 250 monthly patients of the clinic.

Evaluation of Air Quality at an Office Facility

This health hazard evaluation began when the state health department asked GLCEEH to perform a statistical analysis of data from two sets of bioaerosol sample results. Environmental consultants had collected the samples at a large office building where the primary concerns were chronic moisture intrusion and exposure to bioaerosols. The samples had been collected before and after remediation of moisture damage. The data review indicated that the data sets were not statistically comparable. A site visit, however, identified several sources of past and current water intrusion. Two significant problems that could cause bioaerosol proliferation were also discovered. These problems were related to deficiencies in HVAC system infrastructure and controls that hindered proper intake of conditioned fresh air into the building. The synthesis of insights from state health department and GLCEEH personnel resulted in recommendations that were feasible and acceptable to the building managers. No new complaints

have been reported. This health hazard evaluation affected approximately 1,800 facility occupants.

Illinois Beach State Park (IBSP): Determination of Asbestos Contamination

GLCEEH personnel participated in an Asbestos Task Force convened by the Illinois Attorney General's Office along with numerous other agencies, including the state health department, the Illinois Department of Natural Resources, the Illinois Environmental Protection Agency, the U.S. EPA air and Superfund divisions, the Waukegan Park District, and the U.S. Army Corp of Engineers. Numerous pieces of asbestos-containing material had been found on the beaches and in nature preserve areas over the past six to eight years (see photo above). The findings of asbestos-containing materials were consistent with products manufactured at a nearby asbestos-manufacturing plant and with remnants of residential property previously located in or near the park. The task force was convened to determine whether additional action should be taken to resolve potential asbestos exposure at the park.

GLCEEH personnel performed site visits and reviewed numerous reports from evaluations in and around the park. They also recommended state-of-the-art sampling and analytical techniques that could detect low-level concentrations of asbestos, and they outlined an environmental sampling and analytical plan. The plan involved sampling of two target beaches, three background comparison beaches, and two lake-bottom sources of



Petroleum product pipeline near Hartford, Illinois.

nourishment sand. The plan was implemented, and GLCEEH personnel used the results to model and predict potential air emissions from recreational activities. The modeling and a screening risk assessment indicated that the beaches and replenishment sand represented a minimal risk, but GLCEEH personnel recommended an accelerated schedule for surveillance and removal of debris. The project provided a model for interagency cooperation and investigation. This health hazard evaluation affected approximately 1.4 million annual visitors to the park and was supported by approximately \$250,000 in funds from the Illinois Capital Development Board.

Occupationally Acquired Histoplasmosis

State health department personnel and the local CDC Epidemiology Information Service Officer asked GLCEEH to use its microbiology microscope laboratory to attempt to culture *Histoplasma capsulatum* from bat guano. The guano had been collected at a road bridge after an outbreak of histoplasmosis had occurred in a crew of workers that had performed repair and renovation on the bridge. The attempt to isolate the organism was unsuccessful, but the link between the organism and the outbreak was determined by other techniques (Huhn et al., 2005). This health hazard evaluation affected 20 to 30 employees of the bridge renovation company.

Investigation of *Phialemonium curvatum* Infections at a Dialysis Clinic (II)

An outbreak of two cases of systemic infection from *Phialemonium curvatum* occurred

in a dialysis clinic at a federally owned hospital. State health department personnel requested technical assistance from GLCEEH for environmental sampling and liaison with a CDC Epidemiology Information Service officer. The investigation identified the probable source of *P. curvatum*. This health hazard evaluation affected 150 to 200 monthly patients of the clinic.

Vapor Intrusion in Residential Properties

Reports and complaints about hydrocarbon odors and even fires in residential housing had occurred in Hartford, Illinois, for more than 40 years (see photo above). The apparent cause of the problem was leaks of various types from storage and transport facilities at area oil refineries located adjacent to the town. GLCEEH personnel have consulted with state health department personnel about Hartford over the last few years. A health hazard evaluation is in progress, investigating the links between meteorological factors and complaints or incidents. This health hazard evaluation affects 100 to 200 people living in the immediate area.

Conclusions and Lessons Learned

The health hazard evaluation program has been an especially strong, dynamic, and productive element in the collaboration between public health agencies in Illinois and GLCEEH. This program works hand in hand with other components of the environmental health capacity-building grant. The other components include continuing education

and outreach to public health departments, environmental health needs assessments, sharing of best practices, and construction of an electronic library of training materials in environmental and occupational health (www.geolib.org).

The health hazard evaluation program provides a model for collaboration between academia and public health departments that offers benefits to both parties. University faculty members are evaluated on the basis of teaching, research, and service. Health hazard evaluations provide opportunities for these activities as well as for practical training and graduate research for students. Experience shows that health hazard evaluations often involve emerging environmental health issues and that investigation can lead to publishable research.

The obstacles to faculty engagement include limited support for faculty time spent on service activities. The scarcity of faculty time may prolong the time necessary to complete projects, although some of the projects that became health hazard evaluations had already reached an impasse before the departments of health requested assistance. In the technical-assistance cases that involved disease outbreaks, involvement by GLCEEH personnel clearly increased response time because the personnel had to prioritize their efforts. Despite the difficulties created by competing priorities, the advantages of faculty and student participation outweigh the obstacles, as demonstrated by the large number of faculty and students who have participated in health hazard evaluations.

From the public health department perspective, collaborative health hazard evaluations are beneficial because they provide expertise in specific disciplines that may be outside of normal health department responsibilities. Health hazard evaluations offer health department personnel opportunities for research-based education in nonroutine environmental health investigations. Health department personnel may also gain opportunities to participate in or lead scientific research.

Health hazard evaluations often lead to the collaborative development of creative investigative approaches and standard operating procedures that can be applied to other investigations. Partnerships provide access to equipment and analytic capabilities for health departments and universities. Collaborative health hazard evaluations have inspired at least two public health department leaders to pursue advanced degrees in environmental health. Joint collabora-

ration on health hazard evaluations has also stimulated other collaborations. For example, the professional relationships that began with the environmental investigation of *Phialemonium curvatum* infections at a dialysis clinic resulted in multi-disciplinary collaboration on two subsequent outbreak investigations. In addition, the investigation of soil lead contamination in playgrounds near elevated train lines was the first of several collaborations between GLCEEH and the Childhood Lead Poisoning Prevention Program of the Chicago Department of Public Health. Other collaborations included a community-based educational intervention research project on lead-safe work practices, through hardware stores, to provide consumers with information about lead-based paint. This initiative compiled findings that were used to inform certain provisions of the Illinois Lead Poisoning Prevention Act passed in 2006.

In addition to learning to appreciate the benefits of collaboration, GLCEEH personnel learned several important lessons about implementing a successful collaborative health hazard evaluation program. A successful program requires communication and trust between university faculty and public health department leadership. Every field investigation has its twists and turns, and both parties

must be committed to working together. A formal memorandum of understanding greatly facilitated the ability of GLCEEH to work with the Illinois Department of Public Health. This agreement is important in the long term because changes in leadership at both institutions continuously occur. Environmental health outbreaks are local, and involvement of local health department personnel is important for success. Even the combined resources of a university and a public health department are not going to provide all of the required expertise, and contacts with experts at other public agencies, such as CDC, ATSDR, and U.S. EPA, are often necessary.

The funding for health hazard evaluations may come from a variety of sources, including federal grants and municipalities, in addition to in-kind support from a university or a department of public health. To the extent possible, health hazard evaluations need to be transparent, and reports should be made available to the public. Finally, health hazard evaluations should provide opportunities for capacity building, training, and research, not only to serve the general public, but also to maintain the interest and involvement of academic institutions and public health departments.

GLCEEH personnel believe that this model for collaboration between academic institu-

tions and public health departments in the investigation of local environmental health hazards is applicable to other states and universities. The model addresses the specific environmental health needs of local communities while building the capacity of both public health departments and academic institutions to fulfill their respective missions. 🌐

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Corresponding Author: Salvatore Cali, Senior Industrial Hygienist, HHE Project Director, University of Illinois at Chicago, School of Public Health, Great Lakes Regional Center of Excellence in Environmental Health, 2121 West Taylor Street, Chicago, IL 60612-7260. Email: scali@uic.edu.

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