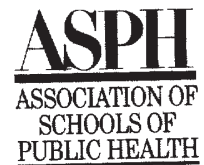


From the Schools of Public Health



ACADEMIC PUBLIC HEALTH COMMUNITY RESPONDS TO HURRICANES: A HISTORY OF THE UNIVERSITY OF NORTH CAROLINA SCHOOL OF PUBLIC HEALTH RESPONSE AND NEW INFRASTRUCTURE, 1999–2006

JENNIFER A. HORNEY, MA, MPH
PIA D. M. MACDONALD, PHD, MPH

Schools of public health have traditionally offered internships, practicums, and other placement programs to give students the opportunity to gain insight into applied public health careers and to participate in service learning. While valuable, these more formal placements may not provide needed support in public health emergency situations. In addition, they may not meet the need for additional resources for increased epidemiologic surge capacity identified by the Centers for Disease Control and Prevention (CDC) and state and local health departments.¹ To better address the need for surge capacity, schools of public health can provide just-in-time student volunteers to assist local, regional, and state public health agencies in response to public health emergencies and disasters. Schools of public health can provide technical assistance with the public health response to hurricanes. To maximize the potential benefit, both infrastructure and partnerships should be in place prior to an event and response.

A number of these surge capacity programs are associated with members of the CDC-funded network of Centers for Public Health Preparedness. Examples of these include: Team Epi-Aid at the University of North Carolina School of Public Health's North Carolina Center for Public Health Preparedness (NCCPHP), the Student Epidemic Intelligence Society at the University of Texas School of Public Health's Center for Biosecurity and Public Health Preparedness, the Student Outreach Response Team at the Emory University Rollins School of Public Health's Center for Public Health Preparedness, Student Surge Capacity

for Outbreak Investigation at the Columbia University Mailman School of Public Health's Center for Public Health Preparedness (as described in this column in the January/February issue of *PHR*), the Student Volunteer Corps at the Ohio State University School of Public Health's Center for Public Health Preparedness,² and the Public Health Action Support Team at the University of Michigan School of Public Health.

Several of these programs recently participated in the nationwide response to Hurricane Katrina.^{3–6} Immediately following Katrina, activities included rapid cot surveys among thousands of evacuees at the Houston Astrodome and the Reliant Center and George R. Brown Convention Center in Houston, Texas, and working with the American Red Cross to provide urgent care and other services to families displaced by Hurricane Katrina at the Georgia Dome and Dobbins Air Force Base. Six months after Katrina, forty members of NCCPHP's Team Epi-Aid traveled to the Mississippi Gulf Coast as part of a spring break service trip to conduct community assessments for the Mississippi Department of Health, while University of Michigan students conducted community-based research, environmental health data analysis, and health education outreach.

The University of North Carolina School of Public Health (UNC SPH) has a long history of partnering with local and state public health agencies to extend the school's service capabilities and promote the school's commitment to community service as its public responsibility. In 1999, the newly formed North Carolina Institute for Public Health (NCIPH), the service and outreach arm of the UNC SPH, formalized this service mission and provided the infrastructure for UNC SPH's response to the catastrophic flooding post-Hurricane Floyd. Since 1999, UNC SPH has developed new programs that have enhanced the school's ability to respond in a more timely, efficient, and specific manner to hurricanes.

New infrastructure within UNC SPH has resulted in an improved capacity for responding to hurricanes, leading to a greater variety of response activities and improvement in the timeliness of the response. This article will outline UNC SPH history of responding to

Articles for *From the Schools of Public Health* highlight practice-based activities at the schools. To submit an article, faculty should send a short abstract (50–100 words) via e-mail to Allison Foster, ASPH Deputy Executive Director, at afoster@asph.org.

hurricanes from 1999 through 2006 and discuss details of its success with a focus on the school's use of student volunteers to provide workforce surge capacity to public health agencies and key infrastructure components.

UNC SPH INSTITUTIONAL RESPONSE INFRASTRUCTURE

The North Carolina Institute for Public Health

The North Carolina Institute for Public Health (NCIPH) was established by the UNC SPH in August 1999 to develop links between public health scholarship and the public health practice community. NCIPH provides professional development, consulting, and evaluation services to state and local public health agencies, and mentors students through formal and informal practicums and service learning placements.

The North Carolina Center for Public Health Preparedness

In October 2000, the North Carolina Center for Public Health Preparedness was funded by the Centers for Disease Control and Prevention to improve the capacity of the public health workforce to prepare for and respond to terrorism and other emerging public health threats. Housed in the NCIPH, and with active collaboration with the UNC SPH Department of Epidemiology, NCCPHP focuses on assessment, training development, and improvement of applied epidemiology around public health preparedness and bioterrorism.

Team Epi-Aid

As part of NCIPH, NCCPHP faculty saw an opportunity to provide additional service learning experiences for students from all departments of UNC SPH. In January 2003, NCCPHP established Team Epi-Aid. This program is organized, funded, and staffed through NCCPHP. Team Epi-Aid recruits and places UNC SPH students in the North Carolina Division of Public Health and local health departments across North Carolina to assist with outbreak investigations and other short-term applied public health projects, including disaster response. Participation in Team Epi-Aid activities provides students an opportunity to gain practical public health experience in the state and local health departments and provides needed workforce surge capacity for local public health agencies.

Team Epi-Aid students can be deployed quickly to provide just-in-time response. Announcements requesting volunteers are sent out via a Team Epi-Aid e-mail listserv and NCCPHP maintains a Team Epi-Aid database of all volunteers that includes the name, UNC department, computer skills, language skills, type and



Team Epi-Aid student volunteers and graduate students in the Department of Epidemiology at UNC SPH receive training on using handheld computers for field data collection in Mississippi following Hurricane Katrina.

level of public health experience, access to transportation for fieldwork, and experience with outbreak investigation.⁷

Information about the specific Team Epi-Aid activities is collected after each activity and evaluation data about the overall program is collected every year. After each activity, students complete forms with the following information: activity name and scope, location, partnering agency, number of hours worked, payment (if any), populations served, whether the activity provided insight into applied public health, augmented classroom training, or sparked interest in a career in applied public health, and if the student would recommend the activity to fellow students. Public health agency partners complete a questionnaire about their satisfaction working with the Team Epi-Aid program and the student volunteers.

UNC SPH HURRICANE RESPONSES

Hurricane Floyd—1999

Hurricane Floyd, a Category 2 hurricane, made landfall on the North Carolina coast on September 15, 1999, and led to extensive coastal and inland flooding. This event presented the newly formed NCIPH with its first challenge of coordinating relief efforts on behalf of the UNC SPH. Because the damages caused by Hurricane Floyd were so extensive—66 of the state's 100 counties were designated as disaster areas by the Federal Emergency Management Agency—the active response and recovery effort corresponding to this event lasted for several months, rather than the typical period of weeks.

NCIPH coordinated assistance from the departments of biostatistics, epidemiology, and environmental health to aid officials in the state's epidemiology and communicable disease section in screening emergency room data gathered during and after the hurricane. They also assisted state and local health officials in sampling and testing water quality. A little more than three weeks after landfall, NCIPH coordinated a service trip for 58 faculty, staff, and student volunteers who visited flooded neighborhoods, canvassed residents about their needs, and provided health and safety information in English and Spanish.⁸ Due to the awareness of volunteer opportunities raised through the NCIPH efforts, many others associated with the UNC SPH volunteered later for cleanup and rebuilding efforts.

While the service trip was very valuable for the students who saw a public health crisis firsthand, the UNC SPH was not directly involved in the NCDPH's immediate response to Hurricane Floyd as quickly or as specifically as they would be for future hurricanes.

Hurricane Isabel—2003

Severe weather tracking and early warnings made it possible to anticipate the need for volunteers to help with the aftereffects of Hurricane Isabel, a Category 2 hurricane that made landfall in North Carolina on September 18, 2003. On September 17, one day before the hurricane's anticipated arrival, representatives from NCIPH and NCCPHP attended a meeting with officials from the NCDPH at the state's new Public Health Command Center (PHCC). Later that day, NCCPHP held an orientation meeting for Team Epi-Aid students interested in being part of the response. Fifty volunteers were oriented to the types of activities that would be needed immediately after hurricane landfall.

On September 18, 2003, the day the hurricane made landfall, a website for UNC SPH relief efforts was organized and two Team Epi-Aid volunteers were sent

to the PHCC, which was now operating on a 24-hour schedule. The next day, four Team Epi-Aid students were deployed to three coastal counties as part of 10 NCDPH damage assessment teams. Students paired with NCDPH staff and administered rapid needs assessment surveys to residents regarding flood damage and power outages and distributed information concerning safe cleanup after the storm. Three of the students served as Spanish language interpreters for their teams. Team Epi-Aid volunteers also provided a wide range of assistance in the PHCC, including helping with emergency room surveillance, translating documents, designing databases and data collection forms, fielding calls from the public, and providing general administrative support. A total of 18 Team Epi-Aid volunteers provided 322 hours of surge capacity in planning and response activities for Hurricane Isabel (see Figure).

Because briefings for NCIPH and NCCPHP staff on the surge capacity needs of NCDPH and recruitment, training, and orientation for Team Epi-Aid members were all completed prior to landfall, deployment of assessment teams took place on the day after landfall. This rapid deployment increased the value of the assessment information collected and assisted in the efficient deployment of other public health and emergency management resources to the areas that were most severely impacted by Hurricane Isabel.

In the months following Hurricane Isabel, NCCPHP staff examined NCDPH's capacity to respond to such public health emergencies. Investigators compared planning, preparation, and response to Hurricanes Floyd and Isabel, evaluating North Carolina's public health preparedness and response performance between the two hurricanes. The differing levels of preparedness for these two major hurricanes were indicative of the impact of major investments in North Carolina's public health preparedness between 1999 and 2003. The study demonstrated that NCDPH used federal bioterrorism cooperative agreement funding to implement capacity building activities and functional capabilities that improved public health preparedness planning, preparation, and response from 1999 to 2003 in areas including assessment, surveillance, communications, and command and control.⁹

Hurricane Charley—2004

Hurricane Charley made landfall in North Carolina as a Category 1 hurricane on August 14, 2004. Similar to Hurricane Isabel, advance notice made it possible to anticipate the need for volunteers. NCDPH used experience gained during Hurricane Isabel to conduct a rapid needs assessment and enhance logistic operations and methods for data collection after Hurricane

Figure. Summary of Team Epi-Aid hurricane-related activities, 2003–2006

Hurricane name	Total students	Total hours	Activities	Evaluation from student	Evaluation from partner
Isabel	18	322	45% of students did data entry; 17% did data collection; 11% did active surveillance; 11% assisted training other volunteers; 6% translated material into Spanish; 6% assisted in the command center.	78% would recommend experience to others.	Not available
Charley	4	83	100% did RNA data collection.	100% said activity provided insight into applied public health, would recommend Team Epi-Aid to others.	Partner comments: Team Epi-Aid support was readily offered. Students and staff were capable and cooperative. Some difficulty finding students apparently because school was not in session. Quicker response on availability of support, such as identification of students and staff available, would make the services more useful, particularly for emergency response activities such as post-disaster surveillance.
Wilma	4	378	100% did RNA data collection and entry; 25% supervised volunteers.	100% said activity provided insight into applied public health, augmented classroom learning, piqued interest in applied public health career, and would recommend to others.	Partner comments: Excellent program, excellent students, excellent supervision. Very eager to learn and work. Very energetic. Always on time. Long-standing collaborations and historically good interactions.
Katrina	8	547	100% did assessment data collection and entry; 22% supervised volunteers; 88% did community clean-up and provided other health-care services.	75% said activity provided insight into applied public health, piqued interest in applied public health career, and would recommend to others. 63% said activity augmented classroom learning.	Not available
Total	26	783			

RNA = rapid needs assessment

Charley. On August 17, 2004, less than 72 hours after landfall, NCDPH reported the results of the Hurricane Charley needs assessment to the CDC.¹⁰

Hurricane Charley was a less severe storm than Hurricane Isabel, and UNC SPH was able to provide a timely response to a request from NCDPH for surge capacity assistance. Following a conference call with NCDPH staff on August 11, 2004, a message was sent to the Team Epi-Aid listserv to recruit volunteers for identified workforce surge capacity needs. On the day of landfall, four Team Epi-Aid volunteers attended orientation and training at NCDPH and were deployed to the coastal town of Wilmington, NC. The following day, the Team Epi-Aid volunteers were part of 10 interview teams collecting data from residents in a three-county sample area on handheld computers utilizing Geographic Information Systems (GIS) software. Team Epi-Aid volunteers contributed 83 hours of surge capacity in response to Hurricane Charley.

Hurricane Katrina—2005

Hurricane Katrina, a Category 3 hurricane, made landfall in the Gulf Coast region on August 29, 2005. On Thursday, September 1, 2005, NCIPH began to coordinate the UNC SPH response, including the relocation of displaced students and faculty from the Gulf Region to Chapel Hill, NC, and school fundraising efforts for the American Red Cross. By September 15, 2005, the director of the UNC SPH Certificate Program in Community Preparedness and Disaster Management was leading a two-week deployment of a 12-person team coordinating the delivery of supplies, medicine, and veterinary care to animal shelters and local clinics affected by the hurricane in coordination with the Mississippi Board of Animal Health. A student in the certificate program and veterinarians with the North Carolina Department of Agriculture were also part of the team.

In the months following Katrina, several other opportunities arose for UNC SPH participation in the recovery efforts. In early 2006, the Mississippi Department of Health (MDOH) requested assistance from the North Carolina Division of Emergency Management in conducting an after-action report to evaluate MDOH response activities. Due to an existing collaboration established during previous hurricane-related response and evaluation activities, the NCDPH Office of Public Health Preparedness and Response requested that NCIPH provide assistance with the collection and analysis of data as part of the project. An online survey was completed by 359 public health and medical responders, while 14 trained interviewers from NCIPH and several North Carolina agencies including emergency

management, emergency medical services, and public health conducted 100 face-to-face or telephone interviews with MDOH personnel. In addition, more than 400 community assessment interviews were completed in an urban and rural sample area in Mississippi with 10 teams of newly trained MDPH personnel. The North Carolina Division of Emergency Management provided a final report to the MDOH in May 2006.

In March 2006, a one credit service learning course was offered to students enrolled at UNC SPH. The course involved travel to the Mississippi Gulf Coast region for one week during spring break. Forty students from the UNC SPH and the UNC School of Nursing enrolled. In addition to staffing medical clinics, community work crews, a distribution center, and a food kitchen, 10 teams of students completed an additional 210 community assessment interviews in the Mississippi coastal region including Jackson and Hancock counties. Interview teams included eight Team Epi-Aid volunteers and faculty and staff from NCCPHP and the Public Health Leadership Program at the UNC SPH. Team Epi-Aid members contributed 547 hours of volunteer service to this project.

Hurricane Wilma—2005

On October 24, 2005, Hurricane Wilma made landfall as a Category 3 hurricane near Naples, Florida, and quickly crossed the state causing severe damage. Several days later, NCDPH received a request from the Florida Department of Health through the Emergency Management Assistance Compact to conduct interviews as part of several rapid needs assessments being undertaken in the most affected areas. On Friday, October 28, 2005, NCCPHP received a request for Team Epi-Aid volunteers to join NCDPH assessment teams traveling from North Carolina to Florida. By Saturday, four Team Epi-Aid volunteers had been recruited through the Team Epi-Aid listserv.

On Sunday, October 30, the four Team Epi-Aid volunteers joined NCCPHP and NCDPH staff and traveled to Broward and Hendry Counties, Florida, conducting interviews of local residents for three days in the field. Findings were immediately provided to Florida Department of Health authorities, who were able to respond quickly to the most urgent public health needs.¹¹ This was the first formal Team Epi-Aid deployment outside of North Carolina, with the Team Epi-Aid members contributing 378 hours to the assessment effort.

Although this deployment took place nearly one week after hurricane landfall, it illustrates the specific capacity of Team Epi-Aid to quickly provide surge capacity to NCDPH. In addition, it demonstrates how volunteers can fill specific needs, as two of the four

students provided Spanish language skills to their assessment team.

DISCUSSION

New infrastructure at UNC SPH, including NCIPH, NCCPHP, and Team Epi-Aid, have contributed to improvements in the timeliness, efficiency, and specificity of UNC SPH responses to hurricanes. Facilitated by the CDC's funding of NCDPH and the UNC SPH through the Cooperative Agreements for Public Health Preparedness and the Centers for Public Health Preparedness, the state and the school share a strategic focus on public health preparedness that has fostered a strong partnership and led to an improved awareness of each other's assets.

The infrastructure of NCCPHP's Team Epi-Aid, including a listserv and just-in-time online training opportunities, has proven to be a very timely and efficient way to recruit volunteers to meet the surge capacity needs identified by NCDPH and other groups who request assistance and support from North Carolina following hurricanes. The Team Epi-Aid database improves the ability of UNC SPH to meet identified needs specifically, since it includes many characteristics of potential volunteers including language ability, statistical training, and previous work experience. Such specific data allows for targeted recruitment when specific skills are needed.

Through their involvement in hurricane response, UNC SPH students have gained experience with disaster epidemiology, sampling methodology, rapid needs assessments, GIS, data analysis, health education, and risk communication. Partners requesting UNC SPH assistance often get students who can provide specific language or data analysis skills required for the response.

Challenges for schools of public health to respond to real-time crises

Although the previous examples have illustrated the positive role NCIPH, NCCPHP, and Team Epi-Aid have had in responding to public health emergencies, some may argue that this type of response goes beyond the educational missions of schools of public health. While disaster response may be a relatively new area, schools of public health have strong traditions of service learning. At UNC SPH, such service learning activities are encouraged at the University's highest levels.¹²

There may also be concerns that participation in such response efforts may expose students to physical and emotional stress, as well as to potential liability for their actions. Team Epi-Aid protocols address these con-

cerns by providing specific guidelines regarding supervision and deployment, as well as guidelines regarding the liability of volunteers that were developed with the guidance of the Office of the University Counsel.

Utilizing students for surge capacity can sometimes be unpredictable. Student availability varies according to the academic calendar, and deployments during summer, holidays, or exam times can make it difficult to find adequate numbers of volunteers.

Much of the success of UNC SPH response activities has been due to strong partnerships that allowed NCDPH to be aware of UNC SPH ability to provide volunteer surge capacity. UNC SPH provided volunteer surge capacity and technical expertise only at the request of NCDPH, avoiding the problems associated with self-deployment. The students work under supervision of the NCDPH or NCCPHP staff at all times.

NCIPH, NCCPHP, and Team Epi-Aid are experienced with the programmatic issues surrounding surge capacity and have discussed the issues with practice partners in advance of any event requiring a response. The training, content, and individual expertise that these organizations can bring to a response have been further developed through the experiences of the past seven years. Team Epi-Aid, NCCPHP, and NCIPH can provide useful lessons for other schools of public health in providing timely, efficient, and innovative surge capacity.

Jennifer A. Horney, MA, MPH, is Assistant Director, North Carolina Center for Public Health Preparedness, NC Institute for Public Health. Pia D. M. MacDonald, PhD, MPH, is Director, North Carolina Center for Public Health Preparedness, NC Institute for Public Health, and Research Assistant Professor, UNC Department of Epidemiology.

This publication was supported by Cooperative Agreement U90/CCU424255-02 from CDC. The contents are solely the responsibility of the authors and do not necessarily represent official views of CDC.

REFERENCES

1. Assessment of the epidemiologic capacity in state and territorial health departments—United States, 2001. *MMWR Morb Mortal Wkly Rep* 2003;52(43):1049-51.
2. Graduate Student Epidemiology Response Programs Exemplar Group, Centers for Public Health Preparedness. Graduate student epidemiology response programs at Centers for Public Health Preparedness report [cited 2006 Sep 5]. September 2005. p. 6-7. Available from: URL: <http://www.asph.org/CPPH/documents/GSRP.pdf#search=%22Student%20Surge%20Capacity%20for%20Outbreak%20Investigation%20Columbia%20%22>
3. Student Epidemiologic Intelligence Society activated [cited 2006 Sep 5]. Available from: URL: http://www.uthouston.edu/katrina/university_response0904.html
4. North Carolina Center for Public Health Preparedness. Team Epi-Aid lends a hand to Mississippi's recovery from Katrina [cited 2006 Sep 5]. Available from: URL: <http://www.sph.unc.edu/nccphp>
5. Center for Public Health Preparedness and Research, Rollins School of Public Health, Emory University. What SORT of activities?

- [cited 2006 Sep 5]. Available from: URL: <http://www.sph.emory.edu/sort/activities.htm>
6. Lewis MB. Fieldwork on the Gulf Coast [cited 2006 Sep 19]. *Findings Magazine*. Spring-Summer 2006. Available from: URL: http://www.sph.umich.edu/news_events/findings/spring06/features/two.htm
 7. MacDonald PDM. Team Epi-Aid: UNC graduate students assist state and local health departments with urgent public health response. *Public Health Rep* 2005;120(Suppl 1):35-41.
 8. Briggs M. After the flood: a Carolina tide [cited 2006 Sep 5]. *Endeavors Magazine*. Winter 2000. Available from: URL: <http://research.unc.edu/endeavors/win2000/flood.htm>
 9. Davis MV, MacDonald PDM, Cline JS, Baker EL. Evaluation of public health response to hurricanes finds North Carolina better prepared for public health emergencies. *Public Health Rep* 2007;122:17-26.
 10. Rapid community health and needs assessments after Hurricanes Isabel and Charley—North Carolina, 2003–2004. *MMWR Morb Mortal Wkly Rep* 2004; 53(36):840-2.
 11. Rapid needs assessment of two rural communities after Hurricane Wilma—Hendry County, Florida, November 1–2, 2005. *MMWR Morb Mortal Wkly Rep* 2006;55(15):429-31.
 12. Moeser C. State of the University address [cited 2006 Sep 28]. Presented at: University of North Carolina at Chapel Hill; September 15, 2005; Chapel Hill, NC. Available from: URL: http://www.unc.edu/chan/speech_archive/05stateofuniv.html