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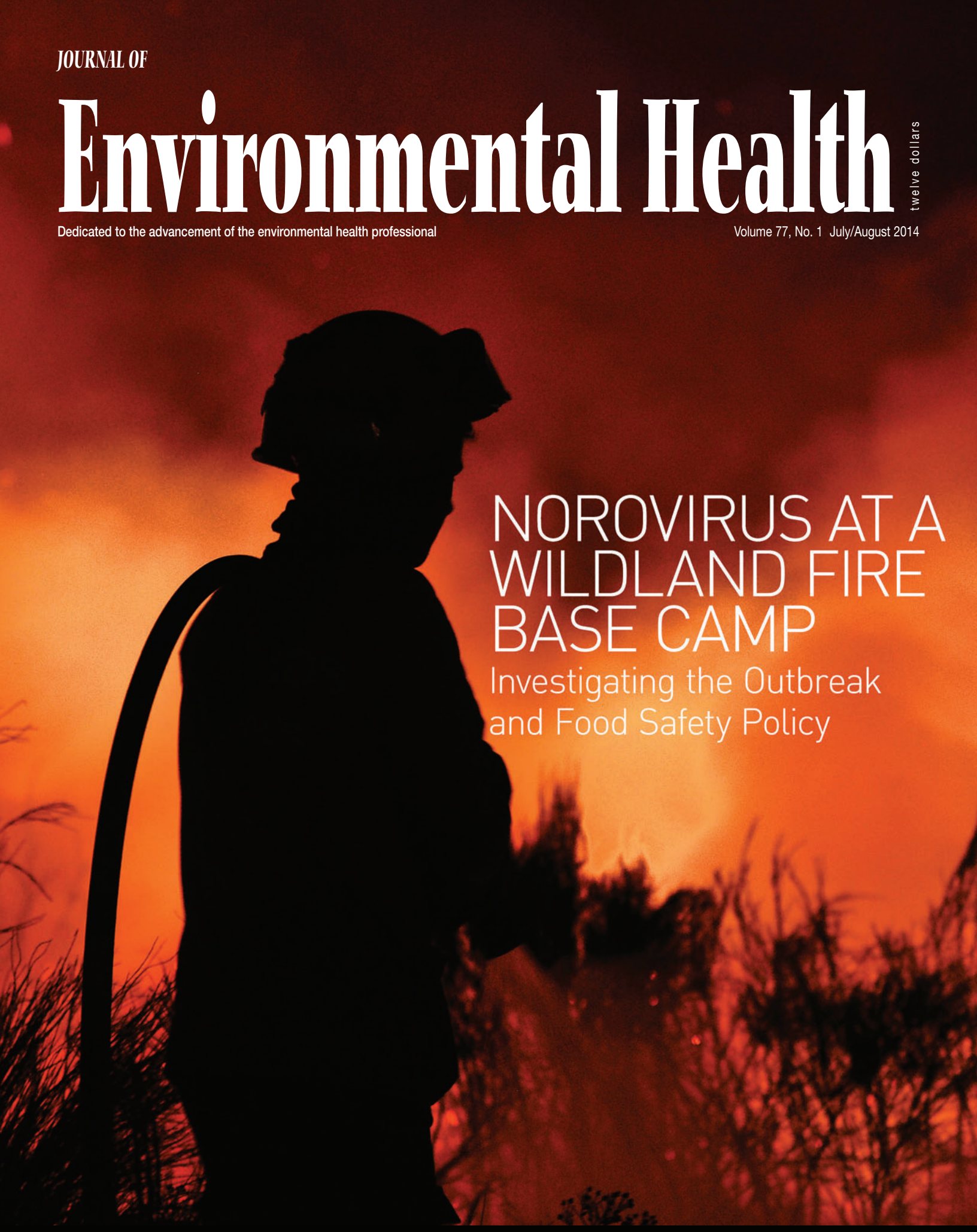

NOROVIRUS AT A WILDLAND FIRE BASE CAMP

Investigating the Outbreak and Food Safety Policy

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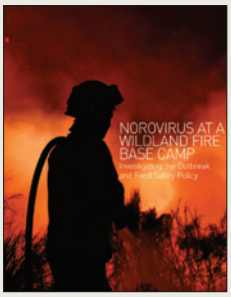

In this issue's cover feature, "Norovirus Outbreak at a Wildland Fire Base Camp Ignites Investigation of Restaurant Inspection Policies," the authors describe the investigation of a norovirus outbreak at a wildland fire base camp in Idaho in 2011. The investigation determined that a restaurant was the likely infection source and identified lack of managerial knowledge to protect against foodborne disease one year after the restaurant's opening. The authors also examined state laws by surveying 18 states about existing rules or policies related to postopening inspection requirements and timing.
See page 8.

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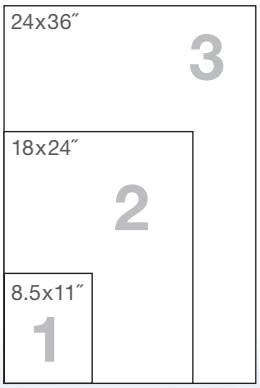

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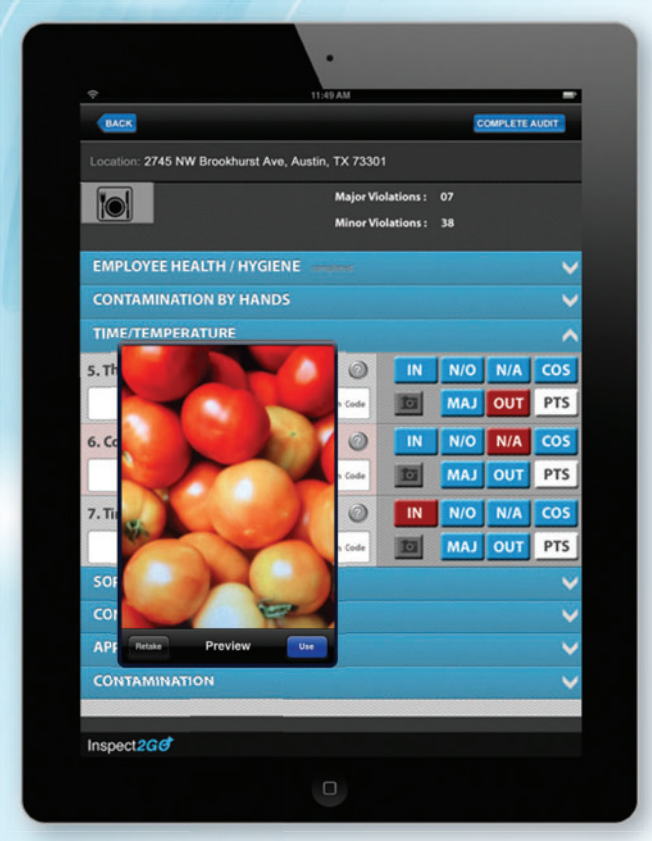

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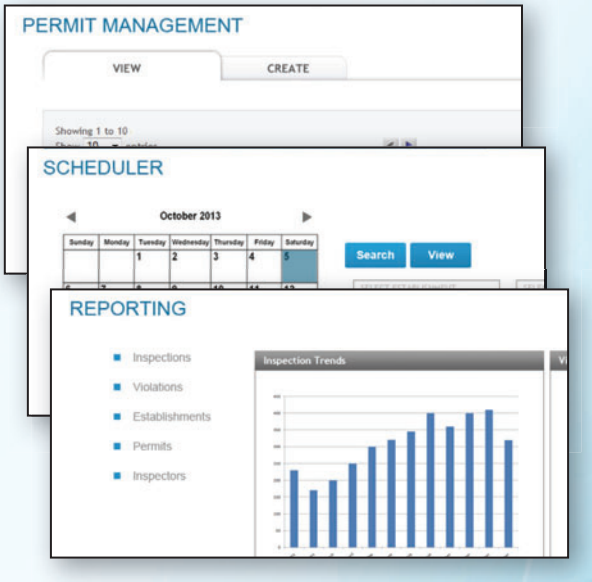

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PRESIDENT'S MESSAGE

Carolyn Hester Harvey,
PhD, CIH, RS, DAAS, CHMM

Opportunity to Forge a New Direction

In my first *JEH* column as the 80th president of NEHA, I am writing to introduce myself to those of you I have not met, but look forward to meeting in the near future. Change is on the horizon as my presidency begins without our executive director of 31 years, Mr. Nelson Fabian. I have been a member of NEHA for almost 20 years and a board member for the previous three years, and NEHA will now have a different captain at the helm. Nelson has been the face of NEHA throughout the world and the only executive director most of us have known. He will be sorely missed by everyone with whom he has interacted. Nelson has made NEHA into a robust, dynamic, and financially sound organization with over 5,000 members and approximately 4,000 Registered Environmental Health Specialist/Registered Sanitarian credential holders.

We have an opportunity to forge a new direction with our outstanding NEHA staff and enthusiastic members, like you, to make our organization even better. We want to continue Nelson's legacy to strive for excellence in all areas of our organization. Our credentialing programs are increasing in number and popularity. This is the foundation of NEHA and one of our flagship programs. Each of you can contribute by being active members. Recruitment of new members and increasing the credentialing of those new members as well as existing members will maintain NEHA as a strong, financially secure organization.

Opportunities are waiting for you to engage our colleagues and new environmental health professionals. Like any organization, the future is with students and our newest members. NEHA needs to utilize newer technologies including Facebook, Twitter, LinkedIn, and social media to engage our members and the public. NEHA now has an electronic version of the *Journal*, increasing our presence in both domestic and foreign arenas of environmental health. Our Web site is being updated weekly if not daily to keep all of us informed and aware of the latest developments in environmental health. This is an avenue for all our members to stay informed and involved in our profession.

> *We want to continue Nelson's legacy to strive for excellence in all areas of our organization.*

I have been working for nearly 47 years in environmental health since my first job at Galveston County Health Department in La Marque, Texas. The health department was a great learning experience and it was the reason I obtained my next job at Union Carbide Chemicals and Plastics where I worked in water, air, and solid waste sampling and analyzing the effluents from our operating departments. I conducted research for a new wastewater treatment plant and became an industrial hygienist after the Occupational Safety and Health Act became law. I worked in occupational health for the next seven years. During my tenure at Carbide, I worked on most of the new environmental and occupational regulations written in the 1970s. After graduate school, I worked for several hazardous waste remediation companies and was an asbestos consultant for several years.

While working in environmental consulting, I completed my graduate education at the University of Texas School of Public Health where I received my PhD in occupational and environmental health. Shortly after receiving my doctorate, I began teaching at East Tennessee State University (ETSU) in the department of environmental health science (EHS). After leaving ETSU, I began teaching at Eastern Kentucky University (EKU). Currently, I am the chair of EKU's EHS department/medical laboratory science department and director of the master of public health program. Teaching EHS students is my favorite job, as it is enlightening, enjoyable, fun, and rewarding. The satisfaction and joy is immeasurable as you see former students begin productive and exciting careers in environmental and occupational health. I have been teaching for almost 18 years and have enjoyed seeing the variety of students I have taught making a difference in people's lives with the outstanding work they do every day.

My initial experience with NEHA was at the 1997 Annual Educational Conference (AEC) & Exhibition in Washington, DC,

when I took seven students from ETSU and we explored every aspect of the AEC. I have a photo on my office wall of my students and me at the UL event. With nine students I made a long road trip from ETSU to Denver via Estes Park for the AEC in 2000. Our students from ETSU and EKU have attended NEHA AECs from Alaska to Rhode Island and California to Texas. Many former students are NEHA members whom I see frequently at our AECs.

As a faculty member, through the Association of Environmental Health Academic Programs (AEHAP), I became involved in the student paper/poster session at NEHA and worked with students from many of the National Environmental Health Science and Protection Accreditation Council (EHAC)–accredited schools. I have served on the EHAC council for over 10 years and have interacted with most if not all of our accredited programs. Enabling students to attend the AEC has been my goal since that first trip to an AEC. In the past few years, NEHA has begun a student and young professional mentoring program. This program allows environmental health professionals to meet and discuss the many aspects of the profession and to assist students in internship placement, job searches, and employment. Many of these students and young professionals have support for their trip to the AEC from NEHA sponsors and the American Academy of Sanitarians. The CDC funds the student paper and poster session for 5–7 students for registration, travel, and lodging through a grant to AEHAP. The U.S. Public Health Service officers at the National Center for Environmental Health have been outstanding in their support of these very bright and articulate students from our accredited program schools.

I have been charged with chairing the selection committee to select a new executive director who will continue the great work NEHA has been doing with the help of our NEHA staff and our members' support. This may be the biggest and most important job I do as your president. I will be calling on you for advice, suggestions, and attributes important to you in a new executive director, and I will keep you informed as to the progress over the coming months. This is an inclusive process and I hope you will be an active participant. I want to express my thanks for your support and look forward to working with you as we move into the future.

carolyn.harvey@eku.edu

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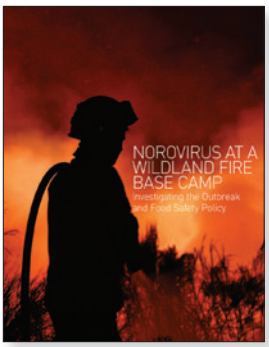

Norovirus Outbreak at a Wildland Fire Base Camp Ignites Investigation of Restaurant Inspection Policies

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Abstract **Norovirus outbreaks occur worldwide and have been associated with congregate settings (e.g., military and recreational camps). Investigation of a norovirus outbreak at a wildland fire base camp identified 49 (27%) illnesses among approximately 180 responders. Epidemiologic evidence implicated a restaurant as the infection source. Eight (89%) of nine wildland fire responder groups who ate at the restaurant had ill members; no groups who ate elsewhere reported ill members. An environmental health specialist restaurant inspection identified lack of managerial knowledge to protect against foodborne disease one year after the restaurant's opening; earlier inspection after opening might have led to earlier intervention. States were surveyed to determine existence of any policy or rule for food establishment inspection after opening and inspection timing. Among 18 states, five had no state rule or policy; nine had a policy in place; and four required postopening inspection by rule. Further research is needed to evaluate postopening inspection efficacy and timing.**

Introduction

Noroviruses cause acute gastrointestinal illness characterized by nausea, vomiting, stomach cramps, and diarrhea. Transmission occurs by ingestion of contaminated food or water, directly through the fecal-oral route, or indirectly through contact with contaminated fomites or environmental surfaces. Norovirus transmission can also occur through the ingestion of particles of aerosolized vomit (Centers for Disease Control and Prevention [CDC], 2011a).

Norovirus outbreaks are reported worldwide and have been associated with restaurants and hotels (CDC, 2006; Dippold, Lee, Selman, Monroe, & Henry, 2003; Guzman-Herrador, Heier, Osborg, Nguyen, & Vold, 2011; Smith et al., 2011), college campuses (CDC, 2009), recreational camps (CDC, 2007; Heijne et al., 2009), cruise ships (CDC, 2002b), and professional sports leagues (Desai et al., 2011). Outbreaks have also been reported on military ships, among deployed military units, and among U.S. Air Force Academy cadets participating in field training (Bailey et al., 2009; CDC, 2002a; Chapman et al., 2011; McCarthy, Estes, & Hyams, 2000).

In the U.S., noroviruses cause an estimated 21 million illnesses annually (CDC, 2011a). During 2008, norovirus was the most common cause of confirmed single-etiology foodborne disease outbreaks in the U.S., accounting for about 49% of these outbreaks and about 46% of associated illnesses (CDC, 2011b). To reduce the incidence of norovirus and other pathogen-associated foodborne illnesses associated with food establishments, federal, state, and local regulatory and public health agencies have instituted standards, rules, and policies for inspection of such establishments to ensure that facilities meet minimum standards. These standards include facility construction (to aid in ability to maintain sanitary conditions), employee health practices, employee behaviors related to food safety practices, and management knowledge of foodborne illness prevention techniques such as safe food storage and proper cooking of potentially hazardous foods.

Similar to military encampments, wildland fire base camps are established to provide logistical support for operations, including sleeping areas; food, water, and sanitary services; and limited medical care for incident responders. Because many wildland fires are in remote locations, sleeping arrangements are often in designated tent

camping areas. Sanitary facilities consist of mobile shower units and portable toilets; water for drinking and bathing is provided from portable tanks. Meals in camp are provided by contracted mobile catering units. A camp might exist from a limited number of days to weeks, and accommodate less than 100 to more than 1,000 responders, depending on fire size and complexity.

On August 31, 2011, lightning ignited the Black Canyon Fire in Idaho's Salmon-Challis National Forest. An incident command post and associated base camp were established in a nearby rural town (population approximately 300). Firefighting resources began arriving on August 31; a majority arrived on September 1. Until food was available in camp on September 2, firefighting resources ate at local restaurants or ate food brought from home. On September 2, the incident safety officer reported to the Idaho state emergency medical services (EMS) communications center (StateComm) that more than 35 of about 180 responders at the base camp had reported acute gastrointestinal illness. StateComm notified Southeastern Idaho Public Health, which requested epidemiologic assistance from the Idaho Division of Public Health.

We report on the ensuing public health investigation of the second known foodborne outbreak of acute gastrointestinal illness caused by norovirus at a wildland fire base camp. We also report on a subsequent informal survey of states about the presence and required timing of postopening food establishment inspections to advise policy updates currently under consideration in Idaho.

Methods

Outbreak Investigation

A retrospective cohort study by using the wildland fire responder group as the unit of analysis was conducted on September 3 to identify risk factors for illness. A group-level unit of analysis was chosen for both time efficiency and because persons within each resource group (e.g., firefighting hand crew) shared common exposures (low within-group variability) that might have differed among resource groups (high between-group variability). Resource groups with at least one person reporting the presence of vomiting or diarrhea were categorized as ill. After a likely exposure was identified, food histories were obtained from individual exposed responders.

A clinical case was defined as vomiting or diarrhea of any duration on or after September 2 in a person associated with the fire camp. Cases were identified through the fire camp medical unit and anecdotally. The medical unit leader maintained a list of ill persons who had been treated by onsite medical personnel or emergency medical responders or had been transported to local hospitals.

On September 2, an initial walk-through of the camp was performed to observe camp operations, identify meal sources and obvious contamination sources, and ensure that any food items that might have been vehicles of infection remaining from past camp meals were held for analysis.

All hospitals represented on state EMS communications conference calls regarding the outbreak and able to receive ill patients were contacted and asked to collect stool samples from patients who were associated with the fire camp and to forward these samples to the Idaho Bureau of Laboratories. Stool samples were cultured for Shiga toxin–producing *E. coli*, and *Salmonella*, *Shigella*, and *Campylobacter* species. Real-time reverse transcriptase polymerase chain reaction (RT-PCR) was used to detect genogroup GI and GII norovirus. Conventional PCR and sequencing were used for genotyping.

On September 4, an epidemiologist visited Restaurant A to observe operations and determine if any leftover food from September 1 was available. On September 6, a registered environmental health specialist (REHS) conducted an unscheduled routine food establishment inspection of Restaurant A for compliance with the Idaho *Food Code* (Idaho Department of Health and Welfare [IDHW], 2008).

Surveys of State Food Inspection Practices, January–April 2012

We conducted an informal survey of state food protection program managers from states located within the Food and Drug Administration (FDA) Pacific Region (Alaska, Arizona, California, Hawaii, Idaho, Montana, Nevada, Oregon, and Washington). State managers were contacted by e-mail by the Idaho state food protection program manager and queried about restaurant inspection timing and practices within their states. The Sidebar lists the questions included in the e-mail query. We subsequently requested assistance from FDA regional retail food safety specialists to distribute the query by e-mail to state food protection program managers in all 50 U.S. states and territories. Additional verbal queries focusing on presence and timing of a postopening inspection were made by the Idaho delegate to the remainder of the Body of State Delegates to the Conference for Food Protection (CFP) during the state caucus meetings at CFP biannual meetings in April 2012.

Questions About Restaurant Inspections Included in the E-mail Query to State Food Protection Program Managers

1) Has your jurisdiction (state) adopted the Food and Drug Administration's Model *Food Code* Section 8-203.10 or similar language specific to preoperational inspections?
2) Does your jurisdiction (state) have any specific language about conducting, after a preoperational inspection, another regular inspection within a defined time after opening or after changing ownership?
   a) If yes, what is the defined time?
   b) If yes, is this language included in statute, rule, or policy? (Please state which.)
      i) If in policy, may local jurisdictions modify the policy?
3) After a food establishment opens, what is the inspection frequency in your state or jurisdiction?
   a) May local jurisdictions modify this frequency?
   b) Is the frequency related to other factors (e.g., past performance or risk category)?

Results

Outbreak Investigation

Table 1 describes the resource groups assigned to the fire on September 1. One firefighting hand crew, one camp crew, three fire truck crews, shower crew, supervisory personnel, and portable toilet contractor all reported at least one ill person among their resource group. Four firefighting hand crews, three fire truck crews, water truck personnel, and cater-

ing crew reported no ill persons among the resource group. Definitive information about dinner location on September 1, 2011, was obtained for 13 (76%) of 17 resource groups who had arrived at the fire camp by September 1. All resource groups categorized as ill reported having members who had eaten dinner at Restaurant A on September 1. Among resource groups who ate at Restaurant A, 89% were categorized as ill (Table 2). Resource groups with no members who had eaten at Restaurant A on September 1 had eaten at other restaurants or had eaten food brought from home. Subsequent food exposures were consistent across all resource groups when the contract caterer began service with breakfast on September 2. Individual food histories of responders who had eaten at Restaurant A were similar because fire managers had arranged for service of a limited menu to responders. No food item was associated with an increased risk for illness.

Forty-nine persons who met the clinical case definition were identified; 46 persons were identified by the fire camp medical unit and three were identified anecdotally. Among persons who met the clinical case definition, 47 (96%) were directly associated with the fire response and two (4%) were emergency medical personnel who had responded to the outbreak. Among 47 persons for whom time of onset was known, five (11%) had onset 24 hours or more after the first reported onset, had no restaurant exposure, and were considered secondary cases. The overall attack proportion among all responders was about 27%.

Among 48 patients for whom sex was known, 41 (85%) were men; among 15 patients for whom age was known, the age range was 20–58 years. Among 24 patients for whom signs and symptoms were known, six (25%) reported vomiting; five (21%) reported diarrhea; 13 (54%) reported both vomiting and diarrhea; 12 (50%) reported nausea; three (13%) reported muscle aches; four (17%) reported chills; and six (29%) reported headache. Mild fever (<100.5°) was reported by seven (78%) of nine patients treated at any hospital. The incubation period was calculated from 7:00 p.m., the midpoint of dinner service on September 1, yielding a median incubation period of 31 hours (range: 21–55 hours; n = 42) (Figure 1). The estimated mean duration of illness was 32 hours (range: 13–44 hours; n = 42), calculated from the reported time of onset to midday September 4, when all ill firefighters had returned to work.

TABLE **1**

Personnel Assigned to the Black Canyon Fire (Idaho) by Group—September 1, 2011

Group	# of Groups	# of Personnel Per Group
Supervisory personnel	1	~35
Firefighting hand crew	5	20–22
Camp crew	1	9
Fire truck	6	3–5
Water truck	3	1
Portable toilet contractor	1	1
Caterer	1	~10
Shower	1	3

TABLE **2**

Distribution of Resource Groups by Dinner Location and Gastrointestinal Illness Status—Idaho, September 1, 2011

Exposure	Ill Resource Groups (#)	Well Resource Groups (#)	Total (#)	Risk Among Exposed (%)
Ate at Restaurant A	8	1	9	89
Ate elsewhere	0	4	4	0
Total	8	5	13	–

No obvious sources of contamination were identified during the initial camp survey, at which time meals were being provided to fire camp personnel by a contract caterer hired by using a mobile food service contract through the National Interagency Fire Center (NIFC).

Stool samples from two patients were submitted to the Idaho Bureau of Laboratories for analysis. Stool samples were negative for Shiga toxin–producing *E. coli*, and *Salmonella*, *Shigella*, and *Campylobacter* species. Norovirus genogroup GII was detected in samples from both patients.

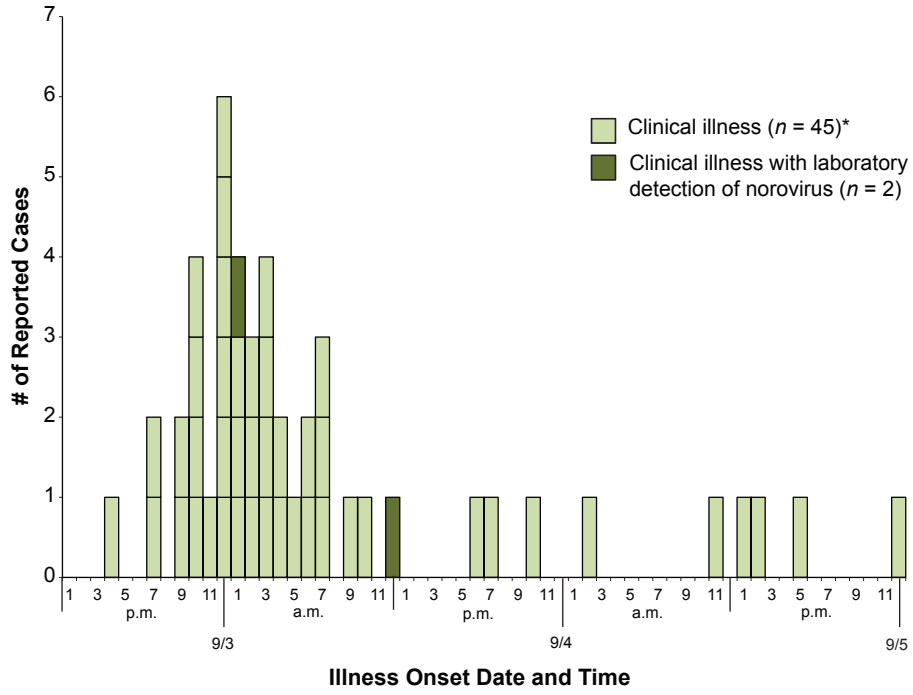
The camp had designated areas for camping, eating, and bathing. Portable toilets were located near camping and common areas and were equipped with portable hand-washing stations. Additional hand-washing stations were located at the food service line entrance. An NIFC-contracted, truck-mounted mobile shower was available for camp personnel. The national shower contract specifies both method and frequency of sanitization (National Interagency Fire Center [NIFC], 2014).

All food served to fire camp personnel at Restaurant A the evening of September 1 had been consumed on that day. Hamburgers had been hand formed from meat purchased the same day from a local supplier. French fries had been hand cut from fresh potatoes. Ketchup and mustard were available on the table in the multiserving containers in which they were purchased. All meals were served on disposable plates. On September 4, the epidemiologist observed two young children in the food preparation and eating areas. In addition, fire personnel who had eaten at Restaurant A on September 1 and were interviewed to obtain food histories reported that on September 1 young children had been present in the food preparation area, and that one young child was being carried by the Restaurant A server when serving food. One firefighter reported observing a restaurant server arrive from outside and go directly to work without hand washing.

Deficiencies noted by the REHS when conducting the unscheduled routine food estab-

FIGURE **1**

Epidemic Curve (*n* = 47)*, Norovirus Outbreak in a Fire Camp—Idaho, September, 2011



*Two clinical illnesses not listed because onset date was unknown.

TABLE **3**

Timing of Postopening Food Establishment Inspection by State Rule or Policy

Days to Routine Inspection After Opening (at State Level)	Rule or Policy	# of States (*N* = 18)	Comments
30 days	Rule	2	
45 days	Rule	1	
60 days	Rule	1	
30 days	Policy	7	Can vary by local health department
Variable	Policy	1	Depends on preopening inspection results
None	Policy	1	Preopening and regular inspection may be completed at the same time
No requirement	None	5	Decision might be delegated to local health department

lishment inspection as a result of the outbreak included lack of knowledge about safe food handling practices such as bare hand contact with ready-to-eat foods and improper sanitization of food contact surfaces, impeded access to hand-washing facilities, and incorrect food item storage to prevent cross contamination. In response to the query to the Restaurant A manager as to whether any of the children observed in the food preparation areas on multiple occasions had been ill recently, statements were made that one child had an episode of vomiting on August 31; no stool sample was obtained. Restaurant A was reinspected one week later to ensure that deficiencies noted at the routine inspection following the outbreak had been remedied.

Survey of State Food Inspection Practices

Eight states responded to one of two e-mail queries and 10 states responded in person at the 2012 CFP. States that responded represented geographic areas of the U.S. from Alaska to Florida. Four states require a postopening inspection by rule at 30, 45, or 60 days after opening. Seven states have a policy that a postopening inspection should be completed in less than 30 days; however, this can be at the discretion of the local health department. One state reported that three of eight responding local health departments perform a full inspection 30 days after the preopening inspection; four place the establishment into the regular rotation on the basis of risk category derived from establishment characteristics that might contribute to foodborne illness; and one department returns 7–14 days after the preopening inspection. One state reported a policy whereby the timing of any postopening inspection depends on findings at the preopening inspection. One state reported that the preopening and regular inspection could be completed at the same time. Five states had no requirement at the state level, but inspection frequency regulation and timing might be delegated to the local health department (Table 3).

Discussion

Epidemiologic investigation of a norovirus outbreak among responders to a wildland fire base camp implicated a restaurant as the source. A contributing cause might have been a child ill with vomiting on August 31, who might have contaminated environmental surfaces or food at the restaurant. A second contributing cause might have been the general lack of knowledge of managerial roles and responsibilities to protect against foodborne disease outbreaks and associated risk factor behaviors demonstrated by restaurant management during the routine

inspection conducted as a result of the epidemiologic investigation.

A preopening inspection focusing on facility characteristics was conducted prior to Restaurant A opening in accordance with Idaho regulations, but no routine inspection was conducted shortly after establishment opening. If more frequent inspections had occurred, managerial and behavioral risk factors that contribute to foodborne illness might have been noted and corrected earlier, thus avoiding a major contributing cause of this outbreak.

One method advocated to improve foodborne illness knowledge and improve food safety behavior is to have an education or certification requirement for food service managers or food handlers. The 2009 FDA *Food Code* (Food and Drug Administration [FDA], 2009) and the Idaho *Food Code* (IDHW, 2008) require demonstration of knowledge; certification by an accredited program is one way to meet the requirement. Evidence varies, however, as to effectiveness of this strategy. A limited number of studies have reported that having a trained and certified food manager is associated with reducing or improving control of certain inspection violations or risk factors (Cates et al., 2009; FDA, 2010; Kassa, Silverman, & Baroudi, 2010).

One study conducted by the Environmental Health Specialists Network reported that the presence of a certified kitchen manager was associated with a reduced likelihood that the restaurant was associated with an outbreak (Hedberg et al., 2006). Training is not necessarily linked with consistent behavioral change as evidenced by one study where, in a group of food handlers with a high proportion who had received food hygiene training, approximately half admitted to not always adhering to food safety behaviors (Clayton, Griffith, Price, & Peters, 2010). Evidence of the effectiveness of routine inspection to reduce foodborne illness is limited, and some studies provide evidence that no difference exists in outcomes, either in violations or illness outbreaks on the basis of inspection frequency or scores (Mullen, Cowden, Cowden, & Wong, 2002; Newbold, McKeary, Hart, & Hall, 2008). Another study, however, indicated a substantial association between lower routine inspection score and likelihood of foodborne outbreak (Irwin, Ballard, Grendon, & Kobayashi, 1989). No research is available that has specifically investigated the association of foodborne disease outbreaks with routine inspection within a defined time after a restaurant opens for business or changes ownership. Our surveys of state-level food safety regulators identified that although the requirement for and timing of postopening food establishment inspections varies by jurisdiction, an inspection during this time is considered sufficiently important that 13 (72%) of 18 states that chose to respond to our surveys have a rule or policy at the state level.

Although an outside restaurant was implicated as the illness source in this outbreak, food service provided in camp represents another possible avenue for the introduction of foodborne illness that must be evaluated in an outbreak investigation. Meals are often provided in camp by mobile food service units (MFSU) that are staged near where fires might occur for prompt dispatch. These units operate under a national contract that outlines requirements for equipment and certification of staff (NIFC, 2013). Each MFSU manager and supervisory cook must have a completion certificate for food service management, handling, and sanitation training. MFSU managers are responsible for training employees in safe food handling practices. Each MFSU is required to have a copy of the latest FDA *Food Code* available and is contractually obligated to meet those standards.

Toilet and shower facilities are other shared areas where contamination with norovirus could contribute to transmission among wildland fire responders and should also be evaluated during an outbreak. Toilet and shower facilities are portable units provided under contract. Portable toilets are contracted locally; sanitization frequency is at the discretion of incident staff. Sanitization frequency was increased from once per day to 2–3 times per day after the outbreak was identified. Shower facilities are provided under a national contract that details frequency and sanitization method. Hand-washing sinks are situated near portable toilets, showers, and food service areas to encourage appropriate hand hygiene.

Both the mobile shower contract and the MFSU contract provide for notification of local health authorities of the time, location, and type of services that are being performed. In the event of an illness outbreak among responders at a base camp, a local environmental health specialist (EHS) might need to inspect camp facilities. The EHS should be aware that these service providers have a contractual obligation to meet applicable federal, state, and local laws and regulations and should work in partnership with incident managers to inspect these facilities to the same standard as other establishments within their jurisdiction.

Despite responder vulnerability to infectious disease transmission because of the closely shared quarters and challenging conditions for good hygiene, this is only the second norovirus outbreak reported at a wildland fire base camp. In response to the first reported norovirus outbreak in a wildland fire base camp during 2009, the National Wildfire Coordinating Group (NWCG) published the *Infectious Diseases Guidelines for Wildland Fire Incident Management Teams* to help fire managers minimize risk to responders and to manage identified outbreaks more effectively (NWCG, 2010). These guidelines include recommendations for notifying and cooperating with public health authorities and were followed during this outbreak to reduce risk of norovirus transmission in camp. This likely contributed to the low number of secondary cases associated with this outbreak.

The findings in our study are subject to at least three limitations. First, a limited proportion of the persons who ate at Restaurant A were interviewed, reducing our ability to identify a specific food item. Second, stool samples were obtained from only two ill persons; other organisms might have been present. Finally, less than 40% of state food protection managers responded to our inquiry, possibly limiting the generalizability of our findings.

Conclusion

Poor restaurant practices contributed to an outbreak of norovirus among wildland firefighters. A postopening restaurant inspection might have identified and corrected deficiencies that contributed to the outbreak. Among states responding to our query, about 75% indicated that although not an FDA *Food Code* component, postopening restaurant inspection was included in a rule or policy. State food safety regulators might consider proposing that the CFP recommend language about a postopening inspection for inclusion in future FDA *Food Code* revisions to aid in

the adoption of this practice by state and local government. Further research is needed to evaluate efficacy and most effective timing for this inspection.

The NWCG infectious disease guidelines provide a useful tool for fire managers for mitigating norovirus outbreak consequences in a wildland fire base camp setting. Public health authorities responding to infectious disease outbreaks at wildland fire operations could consider reviewing the guidelines to gain familiarity with NWCG expectations for fire incident command's response to outbreaks.

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Disclaimer: The findings and conclusions in this article are those of the author(s) and do not necessarily represent the official position of the Centers for Disease Control and Prevention.

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Incorporating Occupational Risk in Heat Stress Vulnerability Mapping

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Abstract **Both obesity and strenuous outdoor work are known risk factors for heat-related illness (HRI). These risk factors may be compounded by more and longer periods of extreme heat in the southeastern U.S. To quantify occupational risk and investigate the possible predictive value of a GIS-based tool, a weighted occupation-based metabolic equivalent (MET) index was created. The correlation between current MET-weighted employment rates or obesity rates and 2012 HRI report rates in Alabama were then determined. With the current dataset, results indicate occupational and obesity rates may explain some of the geographical variation seen in HRI report rates, although results are not statistically significant with this limited dataset. Mapping occupational and physiological risk factors with HRI rates may be useful for environmental and occupational health professionals to identify "hotspots" that may require special attention.**

Introduction

Heat stress is a serious health threat during the summertime for a large portion of the U.S. population, particularly during physical exertion. According to the Centers for Disease Control and Prevention (CDC), from 1979 to 2003 heat killed 8,015 Americans—more than hurricanes, lightning, tornadoes, floods, and earthquakes combined (CDC, 2009). Recent government statistics on heat-related fatalities indicate, "Between 1999 and 2003, a total of 3,442 deaths resulting from exposure to extreme heat were reported (annual mean: 688) and males accounted for 66% of those deaths (CDC, 2006a)." In 2011, 206 people died as a result of extreme heat, up from 138 fatalities in 2010 (National Oceanic and Atmospheric Administration [NOAA], 2012). The 10-year average for heat-related fatalities is 119 (NOAA, 2012).

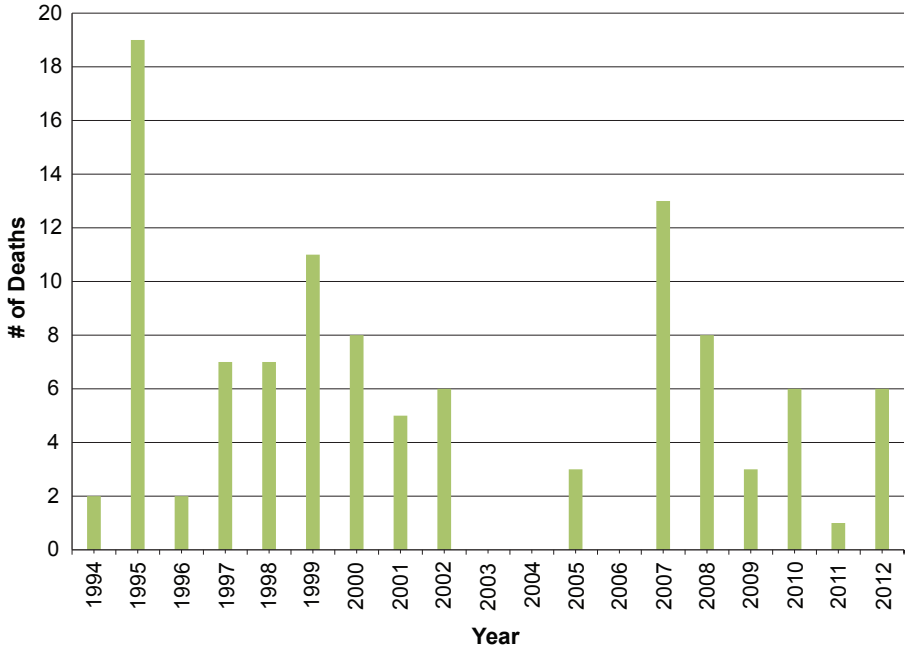
In 2012 the Intergovernmental Panel on Climate Change (IPCC) released a special report on extreme events, concluding that increases in the frequency and magnitude of warm daily temperature extremes and decreases in cold extremes will occur in the 21st century at the global scale with 99%–100% probability (IPCC, 2012). The report also states that daily temperature extremes will increase this century, with 90%–100% probability that heat waves will increase in length, frequency, or intensity over most land areas. Observations since 1950 document changes in daily temperature extremes and heat waves (IPCC, 2012) and a recent analysis of extreme heat events in the U.S. between 1979 and 2011 suggests the number of heat wave days has been increasing in the southeast (Smith, Zaitchik, & Gohlke, 2012).

Anderson (2011) estimated that limiting the global mean temperature to 2°C of warming will still result in current historical temperature extremes becoming the norm for 70%–80% of the Earth's surface. Hyatt and co-authors (2010) utilized published formulas for the Wet Bulb Globe Temperature (WBGT) in combination with global gridded climate data and concluded that estimated future increases of WBGT may create extreme heat exposure situations in large areas of the world.

Although global and national estimates of health effects due to climate change have been summarized, further studies are required to develop a better understanding of health risks across divergent geographical locations (Zhang, Bi, & Hiller, 2007). Public health researchers and practitioners are playing a lead role in this endeavor to develop estimates of interaction between exposure and susceptibility to health effects in identifying the most appropriate adaptation measures (Luber & Hess, 2007). For example, the elderly are thought to be particularly susceptible to heat stress, and mapping of the proportion of elderly has been used in adaptation planning (Minnesota Department of Health, 2013). In contrast, occupational risk factors have

FIGURE **1**

Heat-Related Deaths in Alabama Between 1994 and 2012



Data from Alabama Department of Public Health, 2005, 2010, and 2012b; and National Oceanic and Atmospheric Administration, 2012.

received limited attention in public health adaptation planning.

Alabama's high humidity and temperature extremes can lead to heat-related illnesses (HRI) and deaths (Alabama Department of Public Health [ADPH], 2012a). A study of temperature-related deaths in Alabama by Taylor and McGwin (2000) found that mortality rates for hyperthermia were higher in Alabama than nationally. The authors stated that rates among males were higher than those of females, with the highest rates found among African-American males. The cause of the higher rates among African-American males is not known, but the finding was consistent with nationwide studies (CDC, 2000). Risk factors include low socioeconomic status, alcohol consumption, certain drugs, underlying chronic disease, previous heat stroke, and physical exertion (Taylor & McGwin, 2000).

Mortality in the state of Alabama due to excessive heat include a high of 125 in 1980 and yearly deaths since 1994 are charted in Figure 1 (ADPH, 2005, 2010, 2012b; NOAA, 2012). Most of the victims during the 1980 heat wave were elderly shut-ins who lacked air conditioning. A less intense heat wave in August 2007 resulted in 13 fatalities, while the majority of those treated at hospitals were of working age (26–50) and were working outside when they experienced heat stress (Pence & Stefkovich, 2008), suggesting the demographics of heat-related deaths may be changing.

HRI and fatalities in Alabama were recently added to the list of notifiable diseases required to be reported to the health department (ADPH, 2012a). Of the 809 HRI in 2012, 347 were reported as work related (ADPH, 2012a). Other state surveillance programs have also suggested work-related HRI contributes significantly to the overall numbers of HRI (e.g., Florida Department of Health, 2012; North Carolina Public Health, 2012). Bonauto and co-authors (2007) used both International Statistical Classification of Diseases and Related Health Problems (ICD)-9 and American National Standards Institute (ANSI) Z16.2 codes with subsequent medical record review to identify 480 Washington State Fund workers' compensation claims for HRI over the 11-year time period of 1995–2005. North American Industry Classification System industries with the highest workers' compensation HRI average annual claims incidence rate were fire protection; roofing construction; and highway, bridge, and street construction. HRI claims were associated with high outdoor ambient temperatures, and medical risk factors for HRI were present in some cases. Risk factors for classical heat stroke include cardiovascular and respiratory disease, diabetes, obesity, and the use of medications that reduce sweating, impair thermoregulation, and weaken cardiovascular responses (Bonauto et al., 2007). The risk for developing exertional heat illness increases with body mass index (Donoghue & Bates, 2000; Gardner et al., 1996) and may be an important factor in determining occupational HRI.

This article maps occupational risks (as indicated by number of workers in high-risk occupations, based on physical exertion data) by county for the state of Alabama and identifies those counties with the highest proportion of at-risk workers per capita. This data should allow health agencies to target specific counties and industries for the dissemination of preventive care information, as well as identify likely future heat strain response priority locations.

Methods

To address occupation-specific vulnerabilities, metabolic equivalent (MET) values for Activities in American Time Use Survey (ATUS) data were obtained from the National Cancer Institute's Web site (National Cancer Institute, 2012a). These data are from a study by Tudor-Locke and co-authors (2009), who used the 2003 Bureau of Labor Statistics (BLS) ATUS, which contains "438 distinct primary activity variables that can be analyzed with regard to how time is spent by Americans." The Compendium of Physical Activities facilitates comparison of coded intensity levels across studies. Tudor-Locke and co-authors (2009) link compendium estimates of physical activity intensity (METs) with all activities reported in the 2003 ATUS. One MET is defined as "the energy to lie/sit quietly. It is equivalent

TABLE **1**

Summary of 2012 Alabama Heat-Related Deaths and Illnesses

Category	#
Heat-related deaths	6
Other	1
(Blank)	5
Heat-related illnesses	809
Athletic related	104
Other	358
Work related	347
Total	815

TABLE **2**

Activity Codes and Metabolic Equivalent (MET) Values Assigned to a Subset of Occupations

Management Occupation Title From 2002 Census Occupational Classification System	2002 Census Code	2002 SOC[a] Code	Assigned Activity Codes	Assigned MET Values
Fire fighters	3740	33-2011	12	5.0
Couriers and messengers	5510	43-5021	10	4.5
Agricultural inspectors	6010	45-2011	10	4.5
Logging workers	6130	45-4020	16	8.0
Brick masons, block masons, and stone masons	6220	47-2020	13	5.0

[a]SOC = Standard Occupational Classification Codes.

to a metabolic rate of consuming 3.5 mL O_2/kg/minute." The MET values in the resulting dataset range from 0.00 to 10.00. The higher the number, the more strenuous the task. MET values in the dataset range from a low value of 0.92 (sleeping) to a high value of 10.00 (playing rugby).

Occupation-specific MET-ATUS data were downloaded from the National Cancer Institute (2012b). MET values for occupations range from a low of 1.5, e.g., chief executives, to 8.0, e.g., logging workers. Census Occupation Classification codes for 2002 in the MET-ATUS data were matched to their corresponding 2002 Standard Occupational Classification Codes (SOC) by using 2002 Current Population Survey (CPS) Occupational Codes as a data crosswalk (U.S. Census Bureau, 2012).

Alabama employment data containing estimated employment for SOC codes were downloaded from the Alabama Department of Labor, summarized for 16 metropolitan statistical areas (MSAs) (Alabama Department of Labor, 2012a). Microsoft Access was used to join MET data for each MSA and SOC code.

Alabama HRI data were obtained from the Alabama Department of Public Health for reporting period June 29, 2012, through September 15, 2012, which included the following fields: type (HRI or heat-related death), facility county, age group (1–14, 15–24, 25–44, 45–59, or 60+), sex, contributing factor (athletic related, work related, or other), and entry timestamp. It should be noted that sex and contributing factor were not reported for five of the six heat-related death records.

TABLE **3**

Pearson Correlation Coefficients and *p*-Values for Work-Related Heat-Related Illnesses and Employment Rate in Various Metabolic Equivalent (MET) Categories and Obesity

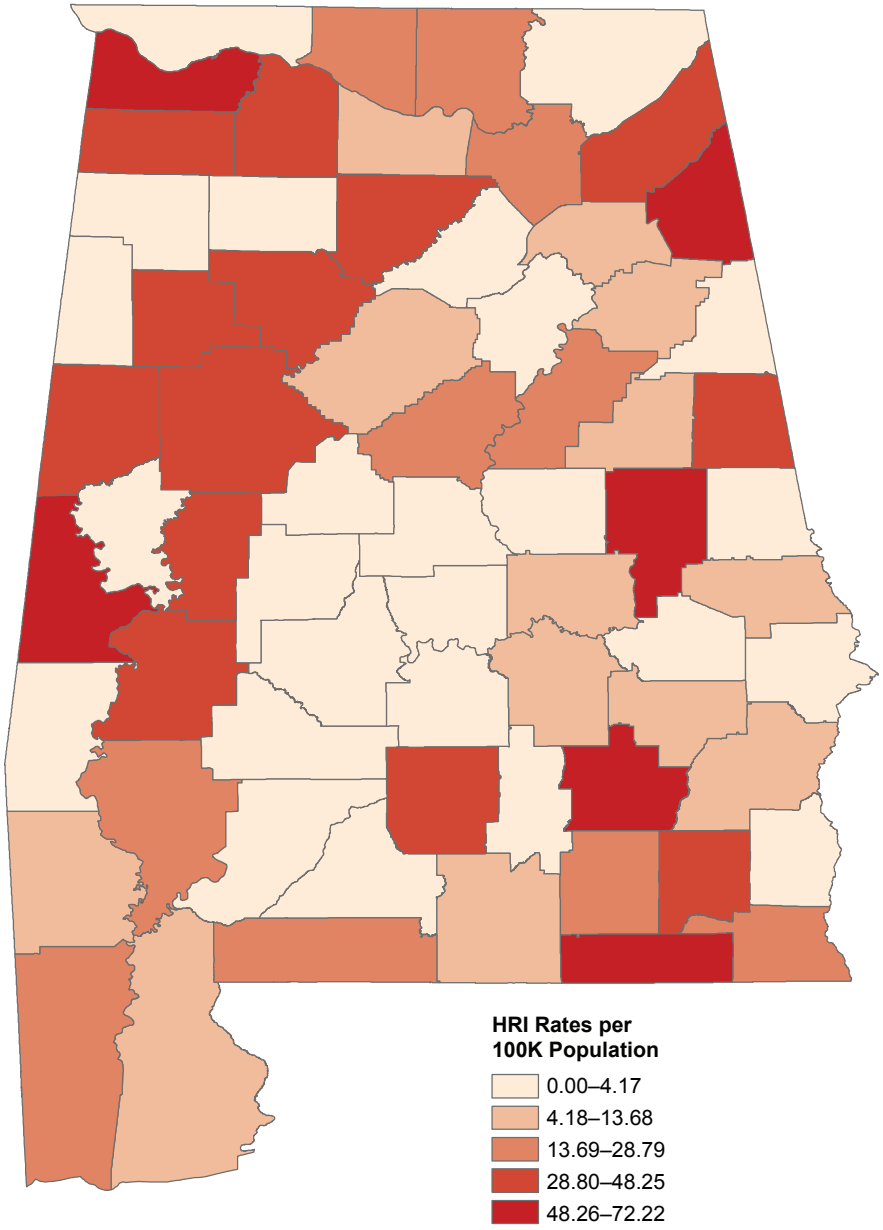
Category	Correlation Coefficient	*p*-Value
All METs	-.15	.59
MET <3.00	-.36	.18
MET 3.00–5.99	.45	.08
MET 6.00–10.00	-.17	.55
Outdoor METs	-.05	.87
Obesity	.29	.30

The Alabama Department of Public Health has mapped this data by state public health area and also has charted cases by date and age range. In terms of time trends, reported cases in 2012 reached an early high of more than 70 cases in early July and then trended downward with additional spikes above 30 cases in mid- and late July. The largest category for age was 25–44 (37%), followed by 45–59 (23%), 15–24 (20%), 60+ (17%), and 1–14 (3%) (ADPH, 2012b).

Weighted MET rates were calculated for each MSA as follows: first, occupational MET values were multiplied by estimated employment to obtain a weighted MET value for each occupation. These weighted MET occupation values were then summed for each MSA. To obtain the population in each MSA, average employment values were summed for each county in the MSA. Employment data, "Annual 2010 Selected Data Relative to Employment, Wages, & Benefit Payments," was downloaded from the Alabama Department of Labor (2012b). Finally, the weighted MET sum for each MSA was divided by its employment population to obtain a weighted MET rate. These operations were performed for (1) all MET values, (2) the average (per MSA) for all MET values, (3) MET values <3.00, (4) MET values 3.00–5.99, (5) MET values 6.00–10.00, and (6) MET values for out-

FIGURE **2**

Alabama County Heat-Related Illness (HRI) Rates per 100,000 Population



door occupations. These breaks correspond to the MET categories of sedentary and light (<3.00), moderate (3.00–5.99), and vigorous (≥6.00) by the National Cancer Institute (2012b).

Also, county obesity prevalence and leisure-time physical inactivity prevalence data were obtained from the CDC Diabetes Interactive Atlases (CDC, 2004, 2010). These values were summed for each MSA.

Finally, the ADPH-reported HRI incidents for each MSA were summed and divided by each MSA's population to obtain HRI rates per MSA. These rates were calculated for all reported HRIs as well as just those HRIs for which the contributing factor was work related. Once all data were formatted as rates per MSA, Pearson product-moment correlation coefficients and *p*-values were calculated between HRI (work-related HRI) and occupational MET categories and obesity in MATLAB R2013b using the corr function.

Results

Table 1 summarizes the 2012 HRI data analyzed. First, a possible connection between occupation, exertion, and HRI was investigated. Table 2 is a small subset of activity codes and their associated MET values, which were obtained after mapping MET-ATUS data CPS codes to their corresponding 2002 SOC codes.

Pearson correlation coefficients and *p*-values for work-related HRI with the estimated employment rates in various MET categories and obesity are reported in Table 3. Proportion of employees in the MET 3–5.99 category were marginally positively correlated to work-related HRI (p = .08). This MET category includes occupations with significant outdoor time such as fire fighters, groundskeepers, trash collectors, brick masons, sheet metal workers, plumbers, and electricians.

Utilizing ESRI ArcGIS 10.1, the reported cases of HRI by county were mapped. For each county, the report count was divided by the county population (Census 2010 estimates) and multiplied by 100,000 in order to obtain a report rate per 100,000 population. This is mapped in Figure 2 and helps visualize which counties are reporting higher HRI rates than one might expect based purely on population.

Finally, the weighted county MET employment for identified outdoor MET (OutMET) values were mapped. For each county, the sum of OutMET was divided by the county's average employment (Census 2010 estimates). These values are mapped in Figure 3.

Discussion

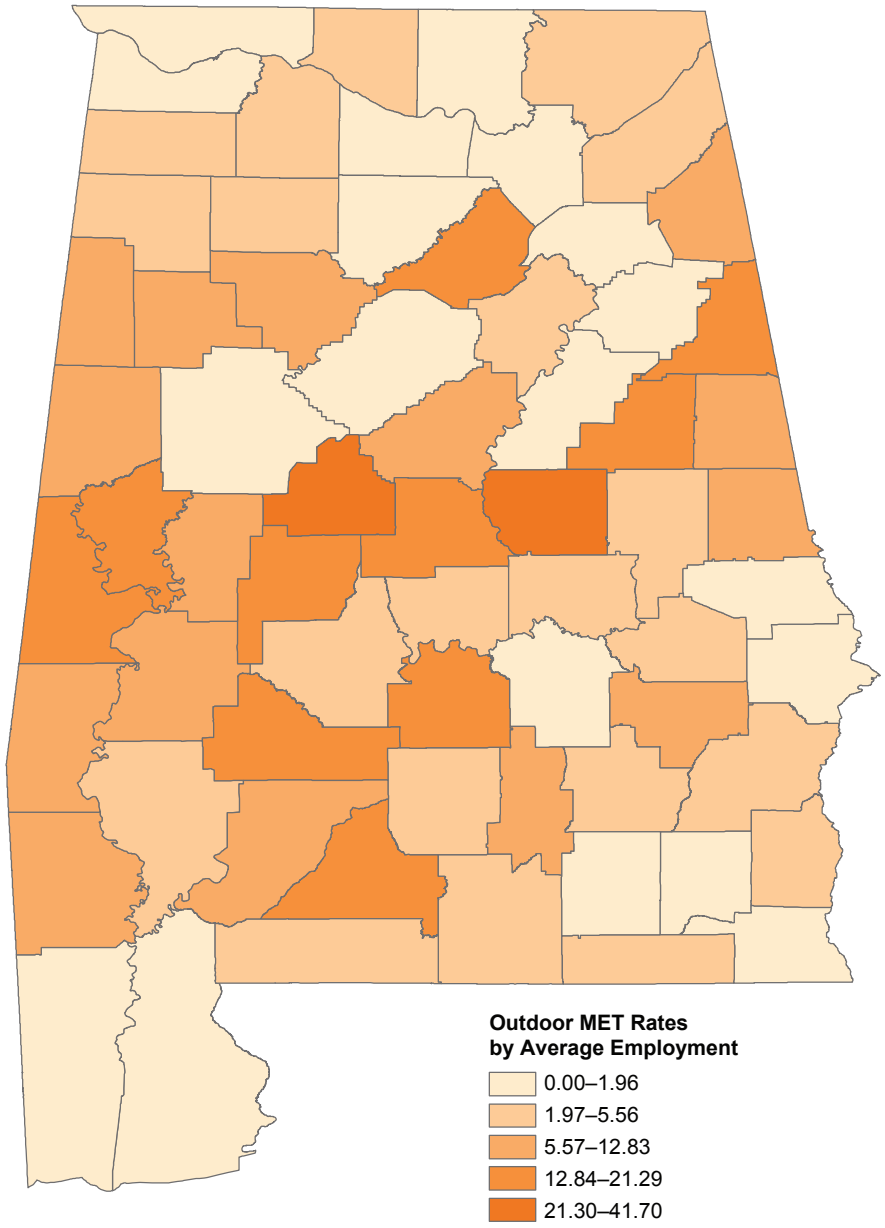
Limitations exist in the current application that may explain the lack of statistical significance in correlations between HRI and occupational MET categories and obesity. For example, although obesity is a known risk factor for HRI (Gardner et al., 1996), Alabama's most obese counties correspond to some of the state's most rural counties, falling within the Black Belt region (CDC,

2006b). Someone experiencing an HRI in one of these counties may receive medical treatment in another county; thus, the reporting county does not necessarily correspond to the county of residence.

Other factors likely contributing to poor correlations between the various MET data categorizations and HRI include both low HRI sample size, only one year of data, and employment data aggregation. Employment data had to be estimated for most counties by extrapolating values from multicounty (MSA-level) data, which leads to poor spatial resolution. Mapping vulnerability to extreme heat events by mapping occupation-related risk may aid in developing geographically specific prevention strategies for extreme heat events. Mapping allows us to identify areas of greater risk from factors like occupation and obesity, singly or in combination and to plan accordingly. Datasets that have been further disaggregated to the ZIP code or census tract level will increase the statistical power of future analysis of occupational risk factors and increase the utility of mapping for local level adaptation planning. Comparing predicted MET risks with actual reported HRI cases is important, as no clear correlation may exist between HRI risk and the number of employees working in vigorous or outdoor occupations (Table 4). A higher MET value for these occupations may be offset by appropriate clothing/gear, work-rest cycles, and acclimation. Additional research into specific occupation risk factors is warranted, along the lines of the state of Washington study by Bonauto and co-authors (2007), who found, for example, that roofing construction had one of the highest workers' compensation HRI average annual claims rates.

FIGURE **3**

Alabama Weighted Outdoor Metabolic Equivalent (MET) Rates by Average County Employment



Conclusion

County maps depicting HRI rates per capita and weighted MET rates depict areas of greater HRI incidence and potential occupational risk factors for HRI, respectively. Such maps may lead to improved public health strategies for health care professionals and emergency responders.

Additional promising future research avenues include the use of GIS tools to analyze both relatively static (demographic risk factors such as obesity and social vulnerability) and dynamic (environmental risk factors such as temperature and humidity) variables to the end that GIS may prove useful as a predictive tool by environmental and public health practitioners in order to prepare for heat-related emergencies.

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TABLE **4**

Master List of Outdoor Occupations

MET[a] Value	SOC[a] Code	SOC Title
8.0	45-4021	Fallers
8.0	45-4022	Logging equipment operators
8.0	45-4023	Log graders and scalers
8.0	45-4029	Logging workers, all other
7.5	47-2221	Structural iron and steel workers
7.5	53-7062	Laborers and freight, stock, and material movers, hand
7.5	53-7121	Tank car, truck, and ship loaders
6.0	47-2031	Carpenters
6.0	47-2061	Construction laborers
5.0	33-2011	Fire fighters
5.0	47-2021	Brickmasons and blockmasons
5.0	47-2051	Cement masons and concrete finishers
5.0	47-2071	Paving, surfacing, and tamping equipment operators
5.0	47-2081	Drywall and ceiling tile installers
5.0	47-2211	Sheet metal workers
5.0	47-3011	Helpers—brickmasons, blockmasons, stonemasons, and tile
5.0	47-3012	Helpers—carpenters
5.0	47-3013	Helpers—electricians
5.0	47-3014	Helpers—painters, paperhangers, plasterers, and stucco masons
5.0	47-3015	Helpers—pipelayers, plumbers, pipefitters, and steamfitters
5.0	47-3016	Helpers—roofers
5.0	47-3019	Helpers, construction trades, all other
5.0	47-5021	Earth drillers, except oil and gas
4.5	37-3011	Landscaping and groundskeeping workers
4.5	37-3012	Pesticide handlers, sprayers, and applicators, vegetation
4.5	37-3013	Tree trimmers and pruners
4.0	47-2132	Insulation workers, mechanical
4.0	47-2141	Painters, construction and maintenance
4.0	47-2151	Pipelayers
4.0	47-2152	Plumbers, pipefitters, and steamfitters
4.0	47-2171	Reinforcing iron and rebar workers
4.0	47-4031	Fence erectors
4.0	47-5011	Derrick operators, oil and gas
4.0	47-5012	Rotary drill operators, oil and gas
4.0	49-9021	Heating, air conditioning, and refrigeration mechanics and installers
4.0	51-2041	Structural metal fabricators and fitters
4.0	53-7081	Refuse and recyclable material collectors
3.5	47-2042	Floor layers, except carpet, wood, and hard tiles
3.5	47-2044	Tile and marble setters
3.5	47-2181	Roofers
3.5	47-4051	Highway maintenance workers
3.5	47-4071	Septic tank servicers and sewer pipe cleaners
3.5	47-5081	Helpers—extraction workers
3.0	43-5041	Meter readers, utilities
3.0	45-2092	Farmworkers and laborers, crop, nursery, and greenhouse
3.0	45-2093	Farmworkers, farm and ranch, and aquacultural animals
3.0	45-2099	Agricultural workers, all other
3.0	47-2111	Electricians
3.0	47-5041	Continuous mining machine operators
3.0	47-5042	Mine cutting and channeling machine operators
3.0	47-5049	Mining machine operators, all other
3.0	49-9051	Electrical power line installers and repairers
3.0	49-9052	Telecommunications line installers and repairers
3.0	53-5011	Sailors and marine oilers
2.5	17-1022	Surveyors
2.5	19-1032	Foresters
2.5	27-2022	Coaches and scouts
2.5	27-2023	Umpires, referees, and other sports officials
2.5	33-3041	Parking enforcement workers
2.5	47-2073	Operating engineers and other construction equipment operators
2.0	33-9091	Crossing guards
2.0	33-9092	Lifeguards, ski patrol, and other recreational protective service workers
1.5	53-7021	Crane and tower operators
1.5	53-7032	Excavating and loading machine and dragline operators

[a]MET = metabolic equivalent. SOC = Standard Occupational Classification Codes.

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Environmental Health Literacy in Support of Social Action: An Environmental Justice Perspective

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Abstract **Different demographic groups in the U.S. experience unequal exposures to environmental hazards, i.e., 56% of the population in neighborhoods containing commercial waste facilities are people of color, with the associated poverty rates in those communities being 50% higher than in neighborhoods without commercial waste facilities. Developing programs to educate communities about environmental hazards affecting their health and quality of life is an essential component for a community to understand their true risk. The study described in this article examined the risk of environmental hazards as perceived by public housing residents and assessed the residents' preference for educational programs on environmental hazards. Residents perceived their risk factors in a broad context and they included environmental health risks caused by pollutants along with physical safety concerns from crime and law enforcement interactions. The most trusted sources of information on environmental health include community organizations, trusted individuals in the community, and television programs. Recommendations for developing community-specific environmental health education programs include using sources of environmental health information that community members trust.**

Introduction

The unequal exposure to environmental hazards for residents in low-income and minority communities remains a major challenge to establishing safe and healthy communities. This is especially true for urban communities in the U.S. A national study examining environmental inequities found that almost one-third of low-income urban communities hosted hazardous waste facilities (Bullard, Mohai, Saha, & Wright, 2007). Another study concluded that families living in federally assisted public housing in metropolitan areas were at a greater risk for exposure to toxic releases of chemicals than more affluent communities (Cutter, Hodgson, & Dow, 2001). The vulnerability of these communities exacerbates environmental health disparities, thus leading to environmental injustice. Environmental injustice is the "unequal access to healthy and clean environments, including environmental amenities (Faber & Krieg, 2002)."

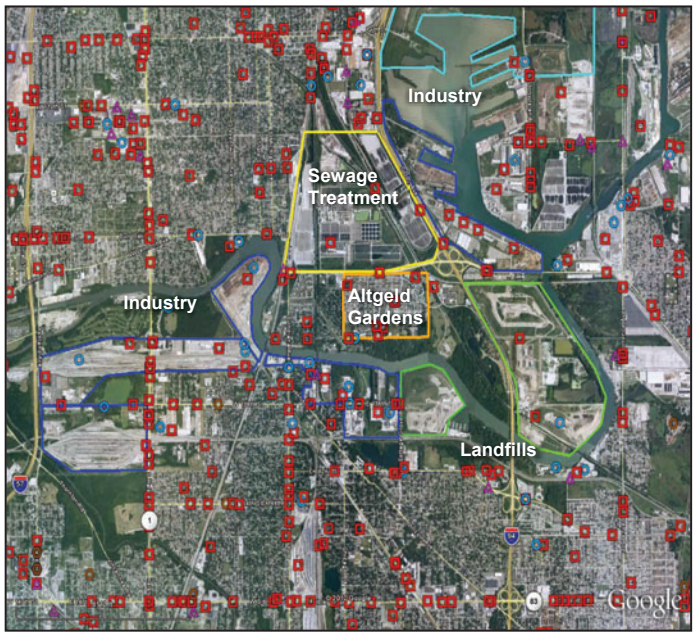
Effectively communicating environmental risks by using environmental health education can help protect communities disproportionately exposed to environmental hazards and address environmental injustice by increasing the awareness of hazardous exposures among community residents (Corburn, 2002; Hill, 2003; Sauvé & Godmaire, 2004). Environmental health education integrates components of environmental, health, and risk education and supports health promotion, behavior change, and social action (Hill, 2003; Sauvé & Godmaire, 2004). These education components are most effective when partnered with local knowledge (Corburn, 2002; Sauvé & Godmaire, 2004).

Environmental health education programs are of little value if they do not promote health literacy (an understanding of health-related issues) that helps communities make informed choices to reduce hazardous exposure. Health literacy supports individuals in making informed decisions that can reduce health risks and ultimately increase their quality of life (Zarcadoolas, Pleasant, & Greer, 2005). Incorporating environmental information with health concepts can assist communities in achieving environmental justice through scientific, environmental, and civic literacy (Zarcadoolas et al., 2005). Civic literacy facilitates community awareness of public issues, e.g., environmental health issues, and promotes active participation in local decision-making processes. Therefore, environmental health literacy is a tool that can assist communities in achieving their environmental justice objectives.

This article summarizes the findings from a research effort that engaged public housing residents with environmental justice concerns in a Chicago community. This research project provides information for guiding the

FIGURE **1**

Surrounding Community of Altgeld Gardens-Murray Homes



development of community-specific environmental health education materials. The aims of our study were to (1) understand community beliefs and knowledge of environmental health risks, (2) determine community levels of trust in federal/local agencies and community groups, and (3) identify strategies for mobilizing residents using environmental health messages and environmental health education programs.

Methods

Community of Interest

This research study focused on residents of Altgeld Gardens and Phillip Murray Homes (herein referred to as "Altgeld"), a predominantly African-American public housing development in the Calumet industrial region (Riverdale Community Area) in Southeast Chicago, Illinois. Altgeld was built on top of an abandoned waste site and dozens of heavy manufacturing facilities and closed/active landfills surround the development (Figure 1). The Chicago Metropolitan Water Reclamation District sludge beds lie just north of Altgeld, and to the east are former and existing steel plants and an automotive assembly plant, which in 2010 released over 250,000 pounds of toxic chemicals and generated over 645,000 pounds of waste (Bouman, 2001; Right-to-Know Network, n.d.).

Many Altgeld residents are worried about their air and drinking water quality and the impacts of those on the rising infant mortality rate (IMR) and asthma rate (C. Johnson, personal communication, February 15, 2013). In 2000–2002, Riverdale had the highest IMR and low birth weight rates in Chicago (Illinois Department of Public Health, n.d.). IMR and low birth weight are related to toxic environmental exposure, especially traffic pollution (Kaiser et al., 2004; Morello-Frosch, Jesdale, Sadd, & Pastor, 2010). In addition, Altgeld's residential isolation in an industrial zone is exacerbated by a lack of access to fresh and nutritious food, which is essential to overall health promotion and protection. Residents fish in area ponds and grow vegetables in the soil, which raises concerns given the fact that area soil and water contain pollution. The ingestion of fish and vegetables in contact with that pollution can increase the cumulative toxicity of these substances in individuals exposed to these pollutants (Fox, 2002). This is especially notable since an area containing electrical transformers on Altgeld's property had contaminated soil from polychlorinated biphenyls (Adams, 2000).

Despite the multiple environmental and social challenges the community faces, Altgeld has a rich history of social support systems and community activism. Many residents with job skills and experience started training classes to educate fellow residents in different vocational areas to increase their competitiveness for available employment opportunities. Several resources are also available within the community, including a community center, a public park center, a community health clinic, and a church. Residents have also been involved in community activism as evidenced by the resident-led environmental justice organization, People for Community Recovery (PCR), which has been active in the Chicago area for over 30 years (C. Johnson, personal communication, February 15, 2013).

Research Study Design

This research study was conducted by the University of Minnesota's School of Public Health (the primary author was the principal investigator of this study) in collaboration with PCR. The U.S. Environmental Protection Agency's (U.S. EPA's) Office of Research and Development provided expertise for the poststudy analysis of the data and results. The research protocol for our study was approved and monitored by the institutional review board of the University of Minnesota.

Six focus groups were conducted with 42 adult residents (residing two years or more in Altgeld) at convenient community locations. Residents were asked nine questions that focused on their understanding and perceptions of environmental hazards, government agencies and community groups, and ways to address environmental problems (Table 1). Discussions were audio recorded for transcription. All focus group participants completed a brief survey to collect additional information to supplement the discussions. Survey questions were adapted from previous questionnaires (Byrd, VanDerslice, & Peterson, 1997, 2001). Respondent validation surveys were administered to an additional 48 residents to corroborate focus group findings; these additional residents did not participate in the focus groups (Cho & Trent, 2006). All study participants were compensated for their time through monetary incentives.

Data Analysis

A professional transcriptionist company transcribed focus group audio recordings. Using QSR NVivo qualitative data management software version 2.0, transcripts were deductively categorized and predominant themes and subthemes were identified across focus groups and cross-checked with the respondent validation surveys (Miles & Huberman, 1994). Descriptive statistics were generated for focus group and respondent validation survey data using SAS software version 9.2. Bivariate analyses were performed to determine differences between focus group and respondent validation participants; the level of statistical significance selected was $p < .05$.

Results

Demographic Characteristics

Each of the 90 study participants (focus group: 42 members; respondent validation: 48) were African-Americans ranging in age from 18 to 64 years old (focus group: mean age 45 years and median age 49 years; respondent validation: mean age 44.9 years and median age 47 years; Table 2). Most study participants were female (focus group: 62%; respondent validation: 68%). Demographic characteristics for validation survey respondents did not differ significantly from focus group participants by age ($p = .88$), gender ($p = .54$), education ($p = .49$), work situation ($p = .09$), and current marital status ($p = .48$).

Community-Perceived Environmental Health Risks

In the focus group survey, crime, drugs, the dumping of hazardous waste, and landfills were seen as posing the greatest risks to the community. Environmental health risks were not limited to just physical risks, but also included social risks such as crime and police brutality. One focus group member stated, "The risks in our environment have a lot of different categories besides dealing with the pollution in the air, in the soil, in the water. It's a risk just walking to your house." Concerns were also raised about adverse health effects that could possibly be linked to local environmental pollution: "If you looked at all the people who have been living out here who are dying from cancer, that's not a coincidence." Table 3 provides a detailed list of perceived environmental health risks.

TABLE **1**

Focus Group Interview Questions/Comments

#	Question/Comment
1	What are environmental hazards?
2	What environmental health risks are present in your community?
3	How effective are government agencies in protecting your community's health?
4	How effective are environmental groups in protecting your community's health?
5	What do you do to protect your health from environmental health risks?
6	What should be done to address environmental problems in your community?
7	Describe how you can bring your community together to protect against environmental hazards.
8	Describe the type of information that would get your community to do something about environmental hazards.
9	Where would you like to get this information?

TABLE **2**

Participant Demographic Characteristics

	Focus Group % ($n = 42$)	Respondent Validation % ($n = 48$)
Gender		
Male	38	32
Female	62	68
Age		
Average, years	45.09	44.90
Median, years	49	47
Education		
High school graduate	48	36
Some college and beyond	31	30
Employment status		
Unemployed	36	30
Current marital status		
Married	12	16
Never been married	55	36

Community-Trusted Sources of Environmental Health Information

The majority of focus group participants reported getting "a fair amount" to "a lot" of information about the environment from PCR (67%) and television programs (60%). Approximately 45% of focus group participants reported that friends/relatives were their primary source of environmental information. Government agencies were not a major source of information, as only 41%, 36%, and 31% of focus group participants reported receiving at least "a fair amount" of information from the U.S. EPA, the Illinois Department of Public Health, and the Chicago Department of Public Health, respectively. Focus group participants believed they received the least amount of environmental information from private industry. When discussing local water testing, one focus group member stated, "I can see the water pollution people. They take a sample of the water. They're testing it to see how much pollution is in the water, but we don't get no information about it. We don't get no feedback on the results."

Community Trust in Government

Many focus group participants did not believe federal/local agencies were adequately protecting their health, nor did they trust gov-

TABLE **3**

Community-Specific Perceived Environmental Health Risks

Category	Specific Risks
Poor air quality	Outdoor: Near roadway pollutants (Interstate 94) Industrial emissions Odor (Metropolitan Water Reclamation)
	Indoor: Mold Environmental tobacco smoke Lead
Land contamination	Illegal dumping
	Landfills (Land & Lakes landfills, CID Landfills *Note*: CID Landfills are permitted to store commercial hazardous wastes and are governed by the Resource Conservation and Recovery Act [RCRA] of 1976, as amended)
	Polychlorinated biphenyl contamination
	Home gardens and soil contaminants
Environmentally related illnesses	Infant mortality
	Cancer
	Asthma
	Lupus
Poor water quality	Fish consumption advisories (Little Calumet River)
	Contaminated drinking water
	Sewage overflow

ernment agencies. One frustrated focus group participant stated, "We live in pollution… [A past elected official] let us be in this [word deleted]… We have a [word deleted] factory over here. They're building all around the hill and we're living around it. Our water… the smell… comes through the sewage system. I was standing one time by the drain, they sent it through there and I damn near fainted. That stuff will kill you and we stand around. They [elected officials] let them send it out at certain times. They send it out at night when we are asleep. Do you know they're killing us?" Similar statements were recurring throughout focus group discussions.

Community-Focused Environmental Health Messages

Most focus group participants indicated they received most of their environmental health information from the resident-led organization, PCR, and friends/relatives. Focus group discussions emphasized building on existing communication channels when relaying health messages. They recommended creating a residential network with respected residents from the neighborhood who have been trained in environmental health issues. Once trained, these residents would educate other residents on community-specific risks and mitigation strategies. One focus group participant suggested the creation of resident-led committees: "We need to form subgroups or subcommittees… and focus on certain areas where we want to gather information and become sort of experts… doing research." Focus group participants believed residents were the best source of information because they communicated in a language that was understandable and knew the best ways to engage other residents. In addition, residents would be more receptive to community members when discussing community concerns.

Discussion

Our study provides a clearer understanding of one community's perceptions of environmental health risks, trust level of agencies, and specific strategies to develop and disseminate environmental health messages. Focus group discussions, as corroborated by respondent validation surveys with additional study participants, identified several community-specific environmental health concerns. In general, friends/relatives were focus group participants' primary and trusted source of environmental information. These participants also did not trust federal/local agencies, nor did they feel these agencies were protecting their community's health. Suggestions for community-specific environmental health messages were provided and included utilizing community members to disseminate health information.

Focus group discussions in this study reflect the findings from similar studies that examined community perceptions of environmental health risks to inform health education programs (Corburn, 2002; Evans, Fullilove, Green, & Levison, 2002; Green, Fullilove, Evans, & Shepard, 2002; Taylor-Clark, Koh, & Viswanath, 2007). As with similar studies, participants had a broader definition of environmental health risks, which incorporated risks from the physical and social environments. This broader definition must be considered when designing programs and tailoring health messages, especially for low-income communities with environmental justice concerns, as the purpose for tailored messages is to inform, raise awareness, and encourage residents to work for environmental justice in their communities. Furthermore, engaging community members in the identification of risks can ensure that health messages are both culturally and socially appropriate. When considering the fact that nearly 45% of the focus group members self-report their health status as fair or poor, it is imperative that community residents be fully included in development of environmental health assessments and associated education and outreach programs.

Focus group participants also believed that many of their concerns were not being addressed by local agencies, and that local officials stand idly by while pollution is generated and released into their community. This observation is indicative of the belief by some participants that they have been abandoned and ignored by the different levels of government when it comes to their health and physical well-being. Participants also expressed a low level of trust in government agencies and did not believe they were receiving enough information. If these agencies were to communicate health messages, residents would have a difficult time believing them and might reject the health messages.

Some residents believe that their elected officials intentionally allow companies to poison their community. This level of distrust would make it difficult for any agency to effectively disseminate health information to residents.

While participants did not exhibit a great deal of trust towards agencies, they did cite PCR, the resident-led community organization, as a significant source of environmental health information. Participants stressed the importance of using local agencies, such as PCR, to communicate health messages because they have established trust relationships with community members. In addition, focus group participants identified friends and relatives as reliable sources of environmental health information. Several participants suggested creating a resident environmental health network. As residents, the trained advocates would be able to effectively engage other residents and to communicate with them in a socio-culturally appropriate way.

Utilizing a community health worker approach through a resident-focused network to communicate environmental health risks is a viable strategy to develop community-specific environmental health messages. Several studies have demonstrated the effectiveness of community health worker interventions in the reduction of environmental health risks, especially with low-income communities (Bryant-Stephens, Kurian, Guo, & Zhao, 2009; Krieger, Takaro, Song, & Weaver, 2005; Perez, Findley, Mejia, & Martinez, 2006). These interventions are especially effective at empowering communities to address social injustices, i.e., environmental injustice (Perez et al., 2006). Using a community-engaged research approach through the Centers for Disease Control and Prevention's Prevention Research Centers (PRCs) is another strategy to develop community-specific environmental health messages. Community-engaged research approaches can enhance trust between community members and academic institutions by incorporating community input to community-specific research efforts (Clinical and Translational Science Awards Community Engagement Key Function Committee, 2011). Research projects conducted at PRCs have improved health outcomes among low-income communities by tailoring interventions to meet community needs (Douyon, Chavez, Bunte, Horsburgh, & Strunin, 2010; Gustat, Rice, Parker, Becker, & Farley, 2012).

Conclusion

This research effort adds to existing evidence that low-income community members are interested in increasing their knowledge of the environmental risks and want to be actively involved in risk analysis and risk reduction efforts in their local area. The findings indicate that more applied research activity should be conducted using the results of our study. Follow-up research projects should be designed based on the outcome of this project and should focus on quantitative measures of the impact that increased health literacy can have on improved civic engagement (i.e., increased interaction with local political and industrial leaders on community issues), improved knowledge of environmental health risks, and improved community health outcomes (i.e., based on community-based and community-led health education programs). Resources should be directed towards an applied research effort working with a well-organized community partner like PCR to objectively measure the effect of improved awareness of environmental health risks.

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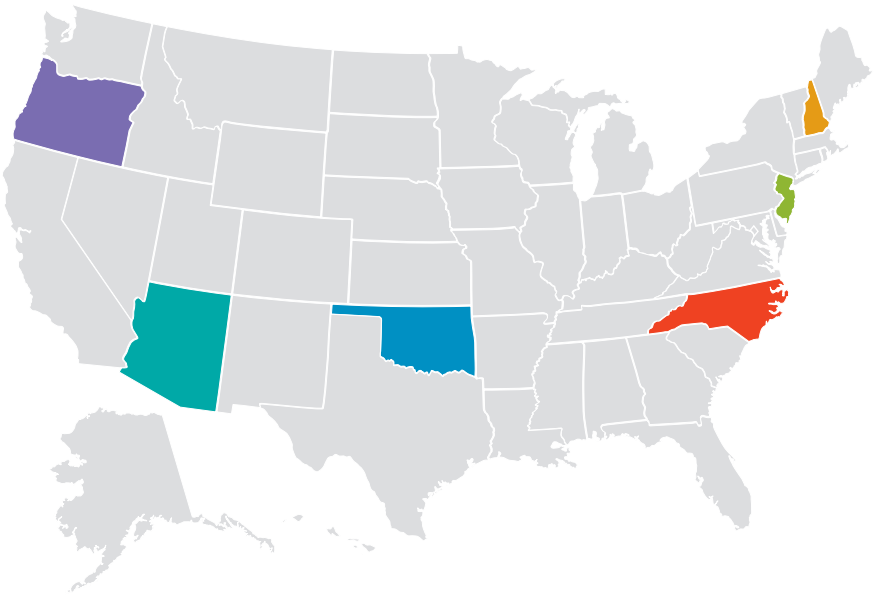
Did You Know?

The U.S. Environmental Protection Agency's Clean Power Plan (www2.epa.gov/carbon-pollution-standards/clean-power-plan-proposed-rule) will lower carbon emissions by 30% of 2005 pollution levels by the year 2030. While the limits on carbon pollution are firm, the plan gives energy providers choices in how to reach these goals, such as onsite efficiency improvements, investments in renewable energy, and low-cost energy efficiency measures.

ACROSS THE COUNTRY WHAT'S HAPPENING IN ENVIRONMENTAL HEALTH



Editor's Note: **This feature in the *Journal* is intended to provide readers with interesting and novel stories of environmental health being practiced across the country and to offer an avenue for story sharing and community building. It will be published in every other issue of the *Journal*. Do you have a story to share? Please contact Terry Osner at tosner@neha.org.**

ARIZONA

Solving the Origin of the 1918 Pandemic Flu Virus

University of Arizona Professor Michael Worobey's recently published study provides the most conclusive answers yet to two of the world's foremost biomedical mysteries of the past century: the origin of the 1918 pandemic flu virus and its unusual severity that resulted in a death toll of approximately 50 million people. Worobey and his colleagues developed an unprecedentedly accurate molecular clock approach and used it to reconstruct the origins of the 1918 pandemic H1N1 influenza A virus, the classic swine H1N1 influenza virus, and the post-pandemic seasonal H1N1 lineage that circulated from 1918 until 1957.

Surprisingly, they found no evidence for either of the prevailing hypotheses for the origin of the 1918 virus—that it jumped directly from birds or involved the swapping of genes between existing human and swine influenza strains. Instead, the researchers inferred that the pandemic virus arose shortly before 1918 upon the acquisition of genetic material from a bird flu virus by an already circulating human H1 virus, one that had likely entered the human population 10–15 years prior to 1918.

The study not only sheds light on the devastating 1918 pandemic, but also suggests that the types of flu viruses to which people were exposed during childhood may predict how susceptible they are to future strains, which could inform vaccination strategies and pandemic prevention and preparedness.

NEW HAMPSHIRE

Volunteer Lake Assessment

The state of New Hampshire lists 959 lakes in its "Official List of Public Waters." Assessing the water quality and watershed management of these lakes is a never-ending task. The Volunteer Lake Assessment Program (VLAP) plays a key role in this assessment process. Approximately 500 volunteers monitor over 170 lakes and conduct nearly 300 sampling events of those lakes. In addition, biologists conduct over 120 sampling events. Altogether, these volunteers sampled approximately 185 deep spots and 500 river/stream stations. In 2013, the VLAP generated over 14,000 individual samples, which represented a nearly 10% increase over the number of samples generated in the prior year.

Volunteers are encouraged to continue sampling on their own during the years in which their lake does not receive a biologist visit. Annual data collection is essential in establishing long-term water quality trends. These trends help determine whether water quality is getting better or worse and aid in watershed management decisions to protect and restore waters.

Source: http://des.nh.gov/organization/commissioner/pip/newsletters/en/documents/2014-jan-feb.pdf.

NEW JERSEY

PJs & PCBs

You've just purchased that book you've been dying to read (for those who still read books the old fashioned way!) and figure it's a great way to end the day. You put on your pajamas and get comfortable. What seems like an enjoyable evening could mean exposure to chemicals banned several decades ago. Lisa Rodenburg, associate professor of environmental chemistry at Rutgers University, is senior author of a new unpublished research study that found traces of polychlorinated biphenyls (PCBs)—banned 35 years ago in the U.S.—are leaching out of clothing and printed materials from around the world.

PCB-11 was detected in nearly all samples of paper products sold in 26 countries and clothing sold in the U.S. The findings reveal how the chemical, which is tied to yellow dyes, inks, and paints, is finding its way into people's blood, the air, and waterways. Since PCB-11 is an unintentional byproduct of pigment manufacturing, the levels found in consumer products are exempt from U.S. laws regulating PCBs. Rodenburg observed, "Even at the parts per billion levels, if you find it in almost everything you test, that means people are in almost constant contact."

Health effects of exposure to traces of PCB-11 have not been studied. But unlike the old PCBs, it doesn't accumulate in people or animals. The banned PCBs, which are so persistent they are still contaminating the environment, have been linked to reduced IQ levels, cancer, and suppressed immune systems.

NORTH CAROLINA

Soak Up the Sun for the Night

In one hour, the sun puts out enough energy to power every vehicle, factory, and device on the planet for an entire year. The problem is that solar panels typically harness the sun's energy and generate electricity during the day.

Now, researchers at the Energy Frontier Research Center at the University of North Carolina at Chapel Hill have devised a system that converts the sun's energy into hydrogen fuel, usable at any time! Researchers led by Tom Meyer use a dye-sensitized photoelectric cell to use the sun's energy to split water into its component parts. After the split, hydrogen is sequestered and stored, while releasing the byproduct, oxygen, into the air. Meyer's ingenious design uses two components—a molecule and a nanoparticle. The molecule absorbs sunlight and then kick starts the nanoparticle catalyst to rip electrons away from water. The nanoparticle is part of a film of nanoparticles that gathers and moves the electrons away to make the hydrogen fuel. The nanoparticle, coated atom-by-atom with a thin layer of titanium dioxide, helps bind the electrons.

Meyer's new system can turn the sun's energy into fuel while needing almost no external power to operate and releasing no greenhouse gases. What's more, the infrastructure to install these sunlight-to-fuel converters is imminent, based on existing technology.

Source: http://www.sciencedaily.com/releases/2014/01/140114114238.htm.

OKLAHOMA

Food Safety and Natural Disasters

Residents in Quapaw, Oklahoma, demonstrated their strength and generosity in the aftermath of the April 27 tornado that impacted the area. Many individuals and groups offered free food or food for sale for residents, responders, and relief workers. The Ottawa County Health Department (OCHD) notes that while the availability of these food options is helpful for workers and residents, it is important to remember that even in a natural disaster, food served to the public must be safe. Foodborne illnesses such as *E. coli, Salmonella*, and hepatitis A caused by improper food preparation and handling practices can be serious threats to rescue workers and shelter residents.

OCHD recommends food vendors serve items that do not require refrigeration and can be eaten without heating. Ready-to-eat foods are the best option when safe refrigeration and cooking are a problem. "Now is not the time to make a bad situation worse by offering food products to the public that may not be safe," said Maria Alexander, OCHD administrative director. OCHD emphasized that food handlers need to utilize good hygiene practices, wear gloves, and minimize food holding times. Other recommendations include protecting food from flying debris and insects, thawing and cooling food properly, cooking all food thoroughly and serving at correct temperatures, using clean utensils to handle cooked foods, and washing hands, dishes, and utensils used with water from a safe source.

Source: Oklahoma State Health Department, www.ok.gov.

OREGON

It's All On the Wrist

Over the past decade, beginning with Lance Armstrong's Livestrong bracelet, inexpensive colorful wristbands have promoted charities and other affiliations. Researchers at Oregon State University used a version of these wristbands as substance detectors in a recent study. Thirty volunteers wore orange and white Oregon State wristbands for 30 days. The bracelets were then tested for 1,200 substances. Forty-nine compounds were detected, including flame retardants, indoor pesticides such as pet flea medications, caffeine, nicotine, and various chemicals used in cosmetics and fragrances.

"We were surprised at the breadth of chemicals," said Kim Anderson, a professor and chemist who was senior author of the study published in *Environmental Science & Technology*. The bracelets provide an easier and cheaper way to measure individuals' chemical exposures. Silicone is porous and acts similarly to human cells, so once chemicals are absorbed by the wristband, "they don't want to go back to the water or the air," Anderson said. Anderson and colleagues have several other wristband projects underway in agricultural fields in Africa and Peru and hydraulic fracturing sites in the U.S.

DIRECT FROM CDC ENVIRONMENTAL HEALTH SERVICES BRANCH

Max A. Zarate-Bermudez, MSc, MPH, PhD

Contributions to Enhancing the Public Health Perspective on Onsite Wastewater Management

Editor's Note: NEHA strives to provide up-to-date and relevant information on environmental health and to build partnerships in the profession. In pursuit of these goals, we feature a column from the Environmental Health Services Branch (EHSB) of the Centers for Disease Control and Prevention (CDC) in every issue of the *Journal*.

In this column, EHSB and guest authors from across CDC will highlight a variety of concerns, opportunities, challenges, and successes that we all share in environmental public health. EHSB's objective is to strengthen the role of state, local, tribal, and national environmental health programs and professionals to anticipate, identify, and respond to adverse environmental exposures and the consequences of these exposures for human health.

The conclusions in this article are those of the author(s) and do not necessarily represent the views of CDC.

Dr. Max Zarate-Bermudez is an environmental epidemiologist who has worked with CDC's EHSB since 2008. Dr. Zarate-Bermudez serves as technical advisor in drinking and wastewater projects and inquiries.

Introduction

Onsite wastewater systems (onsite systems) treat and dispose of wastewater (effluent) near the point of generation (U.S. Environmental Protection Agency [U.S. EPA], 2002). Onsite systems are classified as septic or advanced systems. Septic systems may be conventional and enhanced treatment units or alternative onsite systems (New York State Department of Health, 2012; North Carolina Health and Human Services, 2013). Components of septic systems are the septic tank, distribution box, drain field, and soil. Wastewater flows by gravity or is pumped from the septic tank to the soil.

Enhanced treatment units control the wastewater flow to the drain field, while others may need an alternative drain field unit if the soil is unsuitable for effluent discharge or the water table is high. Wastewater treatment stages are defined as follows:

- Primary treatment is the removal of solids (those that float and those that settle).
- Secondary treatment is the removal of dissolved organic matter.
- Tertiary treatment is the removal of nutrients (nitrogen and phosphorus compounds).

Septic systems are designed to perform primary treatment (in the septic tank) and to some extent tertiary treatment (nitrate removal in suitable and aerated soils). Advanced onsite systems are designed to perform primary and secondary treatment. Most advanced onsite systems are small versions of conventional activated sludge systems that include an aerobic treatment unit.

Currently, most of the onsite systems operating in the U.S. are conventional septic systems. The U.S. Environmental Protection Agency (U.S. EPA) estimates that 25% of American households have an onsite system (U.S. EPA, 2013). Using the U.S. Census Bureau (2014) statistics for the period 2008–2012, an estimated 75.18 million people use onsite systems in the U.S. (28,806,700 households with 2.61 persons per household). Assuming that each person produces 50–80 gallons of wastewater per day, daily effluent discharges from onsite systems range from 4,000 to 6,000 million gallons. Also, the estimated rate of malfunctioning onsite systems is 10%–20% each year (U.S. EPA, 2013). Therefore, the lack of data on the quality of effluents discharged to the environment creates a public health concern.

Monitoring the Performance of Onsite Wastewater Systems

Because we lack data on the performance of onsite systems, the impact of effluents from these systems on the environment and human health has yet to be determined. Monitoring the performance of onsite systems and conducting epidemiologic studies in areas where these systems are prevalent have been recommended to determine the impact of onsite systems on the environment and human health (Zarate-Bermudez, 2009). Monitoring the performance of conventional onsite systems

is challenging, however, because their components are underground, which makes sampling difficult. The Center for Disease Control and Prevention's (CDC's) Environmental Health Services Branch sponsored a two-year collaborative study (2009–2011) to learn more about onsite systems' performance. Researchers from East Carolina University, North Carolina State University Extension Program, North Carolina Health and Human Services, and CDC collaborated in that study to determine the fate of contaminants from conventional onsite systems in a coastal setting of North Carolina. Although sampling was difficult, the sampling methodology designed and implemented in the study helped determine the fate of pollutants from the systems involved. This methodology can serve as the basis to develop programs for monitoring performance of onsite systems in similar coastal or other geographic settings. Study findings on the nitrogen fate (Humphrey et al., 2013) and the phosphorus fate (Humphrey, O'Driscoll, Deal, & Lindbo, 2014) were published. These publications include a description of the sampling methodology. Publications of findings on the microbial fate, the meteorological influences on nitrogen speciation, and the overall perspective of that study are pending.

Enhance the Public Health Perspective on Onsite Systems

Findings of the CDC-sponsored study can also help enhance the public health perspective on onsite systems. Onsite systems are not currently thought of as proven systems to protect public health, but they are designed to treat smaller wastewater flows at or near the point of generation, resulting in smaller environmental footprints (U.S. EPA, 2002). Due to the large number of onsite systems that currently discharge effluents of unknown quality into the subsurface, however, we still need to learn more about their performance. Thus, it is timely that stakeholders discuss onsite systems issues and plan viable interventions to enhance the management of these systems in the U.S.

Promising Aspects of Enhanced Onsite Wastewater Management

Discerning the extent to which onsite systems may impact the environment and human health remains a challenge, but learning more about their performance can enhance onsite wastewater management. Therefore, the following aspects of the CDC-sponsored study seem promising:

- Sampling methodology: The methodology designed for and implemented during the study may be the basis for developing programs to monitor onsite systems.
- Fate of pollutants in the environment and onsite rules: Study findings on the nitrogen fate may challenge existing required setback distances in coastal settings of North Carolina and other states.
- Building partnerships and local capacity: The partnerships developed during the study provide a model for building further partnerships and improving capacity in other localities.

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NATIONAL ENVIRONMENTAL HEALTH ASSOCIATION

DIRECT FROM CDC ENVIRONMENTAL PUBLIC HEALTH TRACKING NETWORK

Carrie Eggers, MPH

At Your Fingertips…

Editor's Note: As part of our continuing effort to highlight innovative approaches and tools to improve the health and environment of communities, the *Journal* is pleased to publish a bimonthly column from the Centers for Disease Control and Prevention's (CDC's) Environmental Public Health Tracking Network (Tracking Network). The Tracking Network is a system of integrated health, exposure, and hazard information and data from a variety of national, state, and city sources. The Tracking Network brings together data concerning health and environmental problems with the goal of providing information to help improve where we live, work, and play.

Environmental causes of chronic diseases are hard to identify. Measuring amounts of hazardous substances in our environment in a standard way, tracing the spread of these over time and area, seeing how they show up in human tissues, and understanding how they may cause illness is critical. The Tracking Network is a tool that can help connect these efforts. Through these columns, readers will learn about the program and the resources, tools, and information available from CDC's Tracking Network.

The conclusions of this article are those of the author(s) and do not necessarily represent the views of CDC.

As a public health informatics fellow in CDC's Environmental Health Tracking Branch within the National Center for Environmental Health, Carrie Eggers works on developing new content and enhanced functionality for the Tracking Network in collaboration with state and federal partners. Prior to joining CDC, Ms. Eggers was part of the Bureau of Epidemiology's Surveillance Systems Unit at the Florida Department of Health.

A group of blind men surrounds an elephant, and in an attempt to discern what the object is, each man reaches out and begins touching it. As each man feels a different part, he shares his observation. One man feels a leg and proclaims the pillar-like object to be a stout tree. Another one feels the trunk and declares the curved subject a snake. Still another touches an ear and pronounces the thing a fan. Although their observations are singularly plausible, it is only when all viewpoints are combined that the whole object becomes known as an elephant.

Although the tale may vary in its retelling, the message is clear. When separate information is shared and brought together, we are able to see a more complete picture.

Bringing varied and disparate information together to effect knowledge is a cornerstone of informatics. Public health informatics is the systematic application of knowledge about systems that capture, manage, analyze, and use information to improve population health. We use informatics to move from our current understanding to a more knowledgeable comprehension through acquiring and using information.

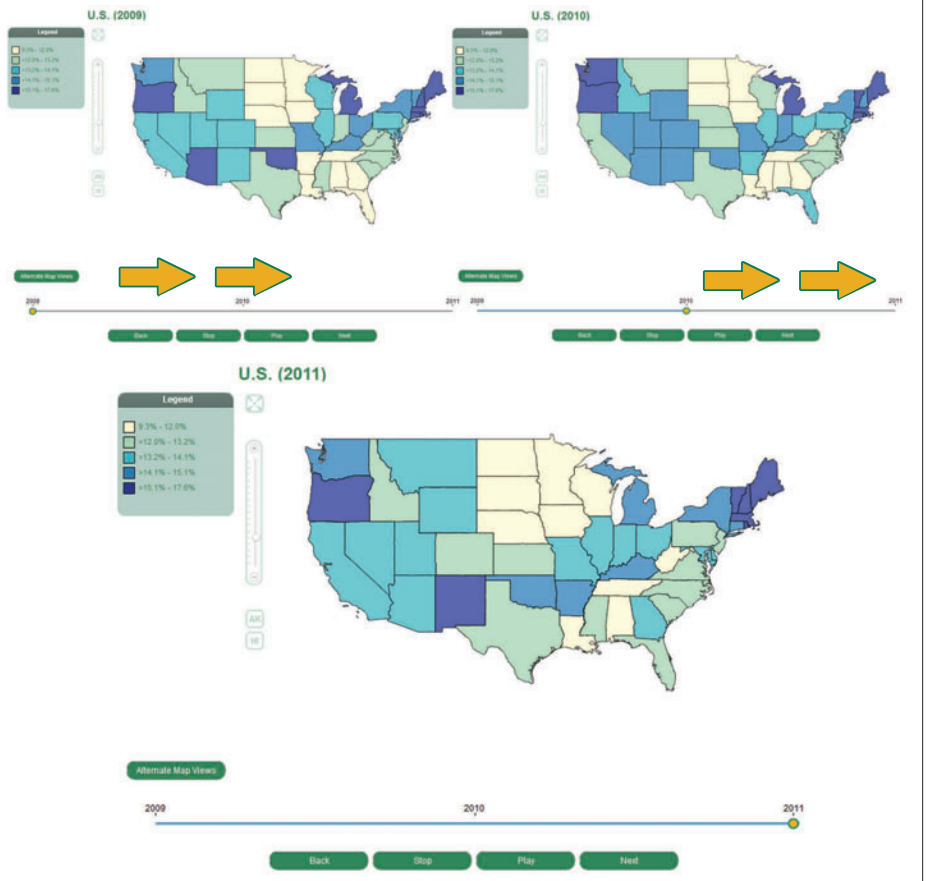
Where problems occur is at the gap between the present and future states, because we don't have the information we need or we can't use the information we do have. Information that can't be consumed, employed, and applied is ineffective.

The Environmental Public Health Tracking Program (Tracking Program) tries to make useful information available through a practical and engaging system. The Environmental Public Health Tracking Network (Tracking Network) is a web-based surveillance system for public health use that is constantly evolving. Environmental and health data are added several times per year, and the analysis and visualization tools are continually enhanced to improve utilization of the data and information available on the Tracking Network.

Since its launch in 2009, the Tracking Network has consistently added and enhanced functionalities. The most recent visualization additions include multiple chart types, animated slider maps, auto-conforming thumbnail maps, and demographic pop-ups on maps. These functional changes are designed

FIGURE **1**

Animated Slider Maps in Timeline View



with the end users in mind. They make data searching more intuitive and inviting and put useable information at your fingertips.

On the Tracking Network, you can search environmental and health outcome data, stratify and group the data based on geographic and demographic variables, and then automatically display the results in various maps, charts, or tables. Map displays are the most widely used functionality because of the location-focused nature of population health. Viewing data over time is particularly helpful when examining health conditions and considering trends. Animated slider maps in the timeline view make trends easy to see by dynamically displaying multiple maps (Figure 1).

You can search data in the Tracking Network by running a query based on a selected content area, geography and time elements, and optional age or gender breakdowns. The results of your query are automatically displayed on a large map, with alternate map views available, such as the timeline view.

The timeline view allows you to more easily see trends in data over time. In this view, you watch the dynamic map automatically change from year to year or manually drag the slider to go back and forth between years (Figure 1). For example, you select the asthma content area and would like to see the asthma prevalence among adults as a percentage of adults ever diagnosed with asthma throughout the entire nation for the years 2009–2011. The query displays the results as maps for each year with the option of choosing alternate map views such as the timeline view. After selecting this option, you can use controls below the main map to either manually or automatically alternate the display between 2009, 2010, and 2011 (Figure 1). While viewing the map in motion, you can zoom in or drag the map to highlight specific areas of interest. The timeline function gives you the power to view data over the years and actually see trends progressing or regressing, all at your fingertips.

Query results on maps can also be displayed in a tile view that shows the selected years of data in thumbnail maps, allowing you to see multiple years in one view. You can zoom into any area where you need to see more detail. With one click, you can rebuild all of the thumbnail maps to zoom in on the same area of interest as the main display map, which is a unique feature of this display (Figures 2a and 2b). The maps can also be linked so that all maps adjust when zooming in or out, allowing you to more easily compare data side by side. As shown in Figures 2a and 2b, you can visualize how the number of children tested for blood lead levels in Florida's Miami-Dade and Palm Beach counties has changed from 2008 to 2010. Once the query is run and the maps are created, you zoom in on southern Florida and are able to see all three years' maps in the same view at the same geographical level.

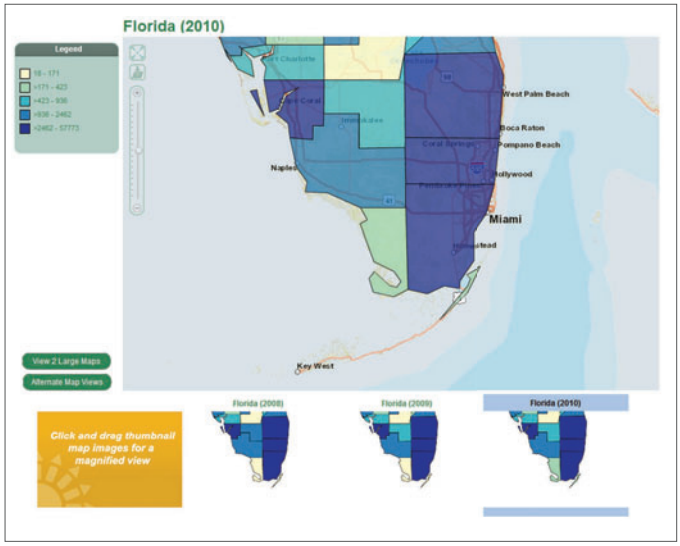
Another innovative feature recently added is U.S. Census demographic information in a map pop-up display (Figure 3). By double clicking on the state or county of interest, a window appears with a table and charts showing total population and population stratified by age group, race, ethnicity, and gender for that area. This quick view provides contextual information in an easy-to-read format, all at your fingertips.

These innovative visualization options also can be practically applied when using the Tracking Network's unique outdoor air health impact assessment estimates. In the outdoor air section of the network, you can find a mortality benefits assessment tool that estimates the number of deaths that could be prevented by lowering fine particulate matter ($PM_{2.5}$) levels. For instance, you can compare how many lives could potentially be saved from coronary artery disease if a 5%–25% reduction in $PM_{2.5}$ levels occurred. This interactive tool uses informatics technology to link air quality data and health data together to help identify areas where interventions to reduce air pollution could result in vital health improvements. Then you can use all of the interactive tools like slider maps, tile views, and more to visualize the impact of these estimates.

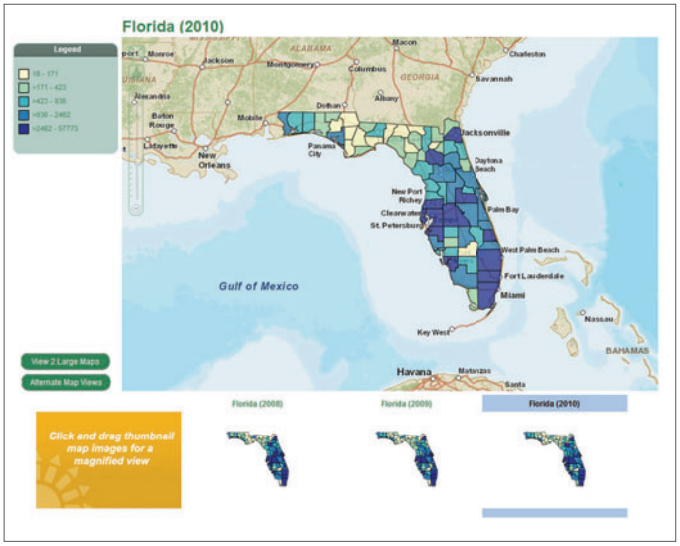
FIGURE **2**

County Level Thumbnail Maps

a.



b.



Making data available and useful is the driving principle of the Tracking Network. Listening to user comments has been an invaluable source of ideas for the previous enhancements and two new functionalities coming soon: multiple measure displays and improved info-by-location views.

Public health and environmental information and data should be simple to find and easy to use, all in one place. In the case of the blind men and the elephant, merging individual information in a meaningful way created awareness. In the case of environmental factors and effects on the public's health, combining data to inform and making it easily accessible at your fingertips provides the opportunity to generate enlightenment and helps us save lives and protect people.

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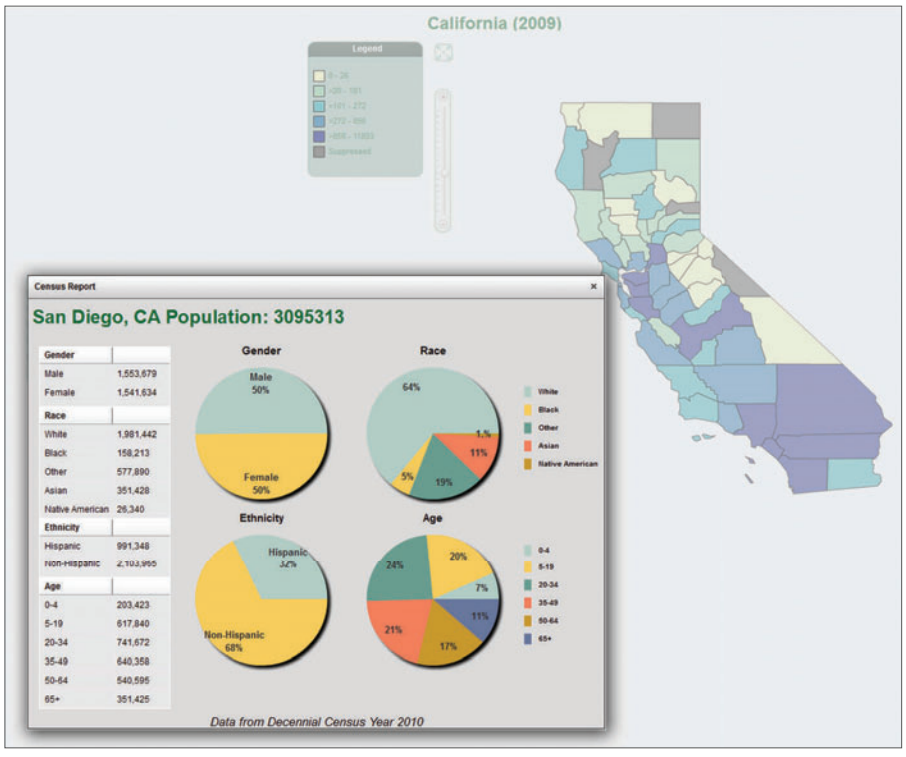
FIGURE **3**

County Demographics Pop-Up Display



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DEMYSTIFYING THE FUTURE

Thomas Frey

The Singularity and Our Collision Path With the Future

Editor's Note: Significant and fast-paced change is occurring across society in general and our profession in particular. The clearer our sense for the future is, the more able we are to both understand and take advantage of trends working their way through virtually every aspect of our lives today. To help us see what these trends are and where they appear to be taking us, NEHA has made arrangements to publish the critical thinking of the highly regarded futurist, Thomas Frey.

The opinions expressed in this column are solely that of the author and do not in any way reflect the policies and positions of NEHA and the *Journal of Environmental Health*.

Thomas Frey is Google's top-rated futurist speaker and the executive director of the DaVinci Institute®. At the Institute, he has developed original research studies enabling him to speak on unusual topics, translating trends into unique opportunities. Frey is a powerful visionary who is revolutionizing our thinking about the future.

Google's Director of Engineering Ray Kurzweil has predicted that we will reach a technological singularity by 2045, and science fiction writer Vernor Vinge is betting on 2029, the 100th anniversary of the greatest stock market collapse in human history.

But where the 1929 crash catapulted us backwards into a more primitive form of human chaos, the singularity promises to catapult us forward into a future form of human enlightenment.

The person who coined the term "singularity" in this context was mathematician John von Neumann. In a 1958 interview, von Neumann described the "ever accelerating progress of technology and changes in the mode of human life, which gives the appearance of approaching some essential singularity in the history of the race beyond which human affairs, as we know them, cannot continue."

Since that first cryptic mention half a century ago, people like Vernor Vinge and Ray Kurzweil have begun focusing in on the exponential growth of artificial intelligence, as a Moore's Law type of advancement, until we develop super-intelligent entities with decision-making abilities far beyond our ability to understand them.

Cloaked in this air of malleable mystery, Hollywood has taken license to cast the singularity as everything from the ultimate boogeyman to the penultimate savior of humanity.

Adding to these prophecies are a number of fascinating trend lines that give credence to these predictions. In addition to our ever-growing awareness of the world around us brought on by social media and escalating rates of digital innovations, human intelligence shows a continued rise, every decade, since IQ tests were first invented in the 1930s, a phenomenon known as the Flynn Effect.

We all know intuitively that something is happening. IBM's Watson just beat the best of the best at their own game, Jeopardy. With computers beginning to generate their own algorithms, and more cameras adding eyes for the Internet to "see," amazing things are beginning to happen.

Tech writer Robert Cringely predicts, "A decade from now computer vision will be seeing things we can't even understand, like dogs sniffing cancer today."

So what happens when we lose our ability to understand what comes next?

The Failure of Artificial Intelligence

I've never liked the term "artificial intelligence (AI)."

Ever since it first became popular in the 1980s, its goal was to reverse engineer the thinking of experts and reduce their methodologies to a set of rules that could be performed far more efficiently by computers.

As a burgeoning area of science, AI sucked up hundreds of millions of dollars from investors around the world, before being declared an abysmal failure.

But even with this inauspicious beginning and prominent scientists attempting to drive a stake into its heart after every failure, AI is once again raising its ugly head, only this time bolstered by a far broader use of the term and riding the disruptive innovation bandwagon of big data.

Yes, I understand that machine intelligence can circumvent human fallibility issues, and

perform calculations a zillion times faster. But it is the yet-undefined quirkiness of human traits that give true intellect to human intelligence.

Since we live in a human-based world, ruled by human economics, machines are still subject to human limitations, foibles, and proclivities, at least for now.

The appeal of AI has not been in its ability to replace humans, but in its ability to supplement and bolster human capability.

Human Intelligence vs. Artificial Intelligence

A few years ago I was involved in a search engine–related start-up where we were studying the connection between a search phrase and the resulting Web site that the person was looking for.

In analyzing the path that began with the typing in of the search phrase, and watching the discernment process unfold, with inappropriate sites being discarded before a final destination was chosen, it became obvious that the search path was layered with huge amounts of valuable data that should be captured and dissected for later use.

The information fragments we were capturing were not merely data points along a line; we were capturing actual pieces of real human intelligence. Since real people were making the link between the search terms and the destination site, albeit a primitive association, it was indeed a useful form of human thinking.

Over time, a database with billions of human decisions like this could be developed into the principal engine for many future technologies.

On the Path to Superhuman Intelligence

If we take an MRI image of our brain, we can compare it to other similar brain images. By comparing human attributes tied to one brain scan to a similar list of traits and attributes from a second, we can begin to build a set of assumptions.

By pattern matching brains we can begin to see which brains have the propensity to excel at math, linguistics, gymnastics, or three-dimensional design.

As we move further up the food chain in computational power, speed, precision, and awareness, our pattern matching becomes exponentially more refined.

One example would be to uncover which people have some sort of deviant gene and are more likely to become criminals. But we'll not only be able to uncover those with criminal propensities, but we'll be able to zero in on those most likely to be repeat offenders.

Similarly, by comparing professional qualities, this type of pattern matching will be able to uncover those with plumbing skills, vs. those with mechanical engineering skills, vs. those with psychoanalytical skills.

Just as the "quantified self" is able to measure in precise ways the quality of all inputs and outputs of the human body, the "quantified brain" promises to accurately assess a person's thinking and reasoning ability though a myriad of micro brain analytical comparisons.

To be sure, this will not only be done with MRIs, but also countless forms of testing, imaging, and digitally dissecting the core reasoning and cognitive junctures of the greater human nervous system.

Out of a compendium filled with billions of scans will come a trillion assumptions that can be refined and improved over time.

The Ultimate Music Player Example

Perhaps the best way to explain the capturing of real human intelligence involves the music player of the future. Since music is a very integral part of our lives, we can all relate to the power of listening to the right song at just the right time. But, for each of us, the "right song" is a very different song.

So let's imagine a music player that only played the "right songs." One great song followed by another great song, followed by another.

The ultimate music player will do just this. It will be able to assess our mood, our likes and dislikes, whether we're doing something that requires us to be physically active or just sitting comfortably in a chair, and it will read our response to the music. The ultimate music player will measure our heartbeat, brainwaves, biorhythms, stress levels, circadian rhythms, and a few other sensory inputs that haven't been invented yet, and it will only serve up songs that our body has a positive reaction to.

This kind of technology will take our mind and mental clarity to a whole new level. It will energize us and at the same time, relax us. It will give us motivation, endurance, and determination. If done correctly, it will give us a reason to bound out of bed every morning to tackle a shining new day.

Macro Human Intelligence

Google's largest computer data centers are built around thousands and thousands of flawed machines that individually fail time and again. With systems for circumventing failures when they occur, the overall machine in its entirety is more than a little impressive.

People are very similar. We are all flawed individuals, mired in an ocean of personal chaos. But the same imperfections we see on the micro scale change dramatically when we transcend to look at humanity on a macro scale.

In much the same way that Google operates a massively complex machine by changing out individual units on the fly, we will eventually be able to create superhuman intelligence by connecting our own individually flawed brains with a massively coupled super brain.

Final Thoughts

Does a machine have a vested interest in improving the lot of other machines?

In the new television series "Almost Human," set in the year 2048, Dorian, the humanoid robot referred to in the show as a "synthetic," comes across another identical-looking synthetic that has not done well in his career, and he decides to come to the rescue.

Adding human-like emotion and sentiment to a machine makes for a good story line, but it's far too early to know if it will ever becomes a valid issue for us to deal with.

What's clear though is that we are just scratching the surface of knowing where all this is going. New forms of intelligence are continually being developed and we are baby stepping our way to worlds unknown.

As I've said before, seeing into the future is like walking through a dark forest with a flashlight that illuminates but a short distance ahead. Each step forward gives us a new perspective, adding light to what was previously dark. The people of tomorrow will simply need a better flashlight.

In the end, we create the future, and then the future creates us!

Interested in sharing your thoughts? Go to www.FuturistSpeaker.com.

Corresponding Author: Thomas Frey, Senior Futurist and Executive Director, DaVinci Institute®, 511 East South Boulder Road, Louisville, CO 80027.
E-mail: dr2tom@davinciinstitute.com.

CAREER **OPPORTUNITIES**

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Did You Know?

New studies show that e-cigarettes, marketed as safer than regular cigarettes, deliver a cocktail of toxic chemicals including carcinogens into the lungs. Using e-cigarettes may even make bacterial infections resistant to antibiotics, according to one study.

Source: Science News, www.sciencenews.org/article/health-risks-e-cigarettes-emerge

Now Available Wherever You Are!

Starting October 1, NEHA will offer new membership categories that also offer the option to receive an electronic version of the *Journal of Environmental Health (JEH).* Check it out!

- New feature: Download as a PDF for offline reading or printing
- Access web links and e-mail addresses found in articles, ads, and listings
- Read it on any computer or mobile device such as a tablet or smartphone
- Quickly find information using the search feature
- View video content
- Bookmark pages and articles for quick reference

As a NEHA member, you will receive the E-*Journal* in addition to the hard copy—absolutely free—for all issues of the *JEH* through September 2014 while your membership is active!

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NATIONAL ENVIRONMENTAL HEALTH ASSOCIATION

EH CALENDAR

UPCOMING NEHA CONFERENCES

July 7–10, 2014: NEHA's 78th Annual Educational Conference & Exhibition in Partnership with the International Federation of Environmental Health, The Cosmopolitan of Las Vegas, NV. For more information, visit www.neha2014aec.org.

July 13–15, 2015: NEHA's 79th Annual Educational Conference & Exhibition, Renaissance Orlando at SeaWorld, Orlando, FL.

NEHA AFFILIATE AND REGIONAL LISTINGS

Alaska

September 30–October 3, 2014: Annual Educational Conference, sponsored by the Alaska Environmental Health Association, BP Energy Center, Anchorage, AK. For more information, visit https://sites.google.com/site/aehatest/.

Colorado

September 24–26, 2014: Annual Education Conference & Exhibition, sponsored by the Colorado Environmental Health Association, Steamboat Grand, Steamboat Springs, CO. For more information, visit www.cehaweb.com/aec.html.

Florida

July 28–30, 2014: Annual Education Meeting, sponsored by the Florida Environmental Health Association, Florida Mall Hotel and Conference Center, Orlando, FL. For more information, visit www.feha.org.

Georgia

July 16–18, 2014: 68th Annual Interstate Environmental Health Seminar, hosted by the Georgia Environmental Health Association, Hyatt Regency, Savannah, GA. For more information, visit www.geha-online.org/Pages/Conference.htm.

Indiana

September 22–24, 2014: Fall Educational Conference, sponsored by the Indiana Environmental Health Association, Belterra Hotel and Conference Center, Florence, IN. For more information, visit www.iehaind.org.

Iowa

October 14–15, 2014: Fall Conference, sponsored by the Iowa Environmental Health Association, Best Western, Marshalltown, IA. For more information, visit www.ieha.net.

Minnesota

October 2, 2014: Fall Conference, sponsored by the Minnesota Environmental Health Association, Spicer, MN. For more information, visit www.mehaonline.org/events.

New Hampshire

September 3–4, 2014: 52nd Annual Yankee Conference on Environmental Health—Moving Forward by Building Partnerships, Radisson Manchester, NH. For more information, visit www.nhhealthofficers.org.

North Dakota

October 21–23, 2014: Fall Education Conference, sponsored by the North Dakota Environmental Health Association, Bismarck, ND. For more information, visit http://ndeha.org/wp/conferences.

Texas

October 7–10, 2014: 59th Annual Education Conference, sponsored by the Texas Environmental Health Association, Double Tree Hotel, Austin, TX. For more information, visit www.myteha.org/Annual_Education_Conference.

Wisconsin

September 24–25, 2014: Joint Educational Conference, hosted by the Wisconsin Environmental Health Association, Stoney Creek, Rothschild, WI. For more information, visit www.weha.net.

Wyoming

September 9–11, 2014: Annual Education Conference, sponsored by the Wyoming Environmental Health Association and the Wyoming Food Safety Coalition, The Peaks Conference Center, Lander, WY. For more information, visit www.wehaonline.net.

TOPICAL LISTINGS

Food Safety

September 9–11, 2014: FDA Pacific Region Retail Food Seminar, Phoenix, AZ. For more information, visit www.azeha.org/Conferences.html.

Recreational Waters

October 8–10, 2014: World Aquatic Health Conference, hosted by the National Swimming Pool Foundation, Portland, OR. For more information, visit www.thewahc.org.

Did You Know?

For those who couldn't make it to the NEHA 2014 AEC in Las Vegas, the Virtual AEC (www.neha2014aec.org/virtual-aec) lets you review educational content from the 2014 AEC to earn continuing education credits and stay connected to the latest issues and discussions.

RESOURCE CORNER

Resource Corner highlights different resources that NEHA has available to meet your education and training needs. These timely resources provide you with information and knowledge to advance your professional development. Visit NEHA's online Bookstore for additional information about these, and many other, pertinent resources!

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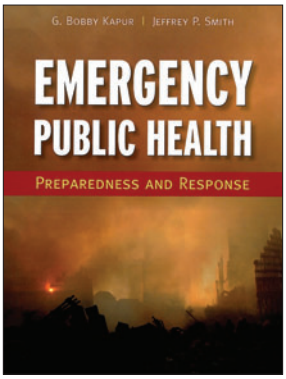
Emergency Public Health: Preparedness and Response

G. Bobby Kapur and Jeffrey P. Smith (2011)

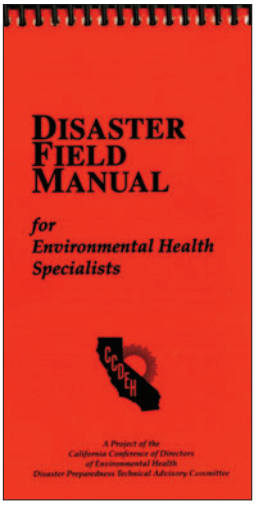


Emergency Public Health provides a unique and practical framework for disaster response planning at local, state, and national levels. This is the first book of its kind to systematically address the issues in a range of environmental public health emergencies brought on by natural calamity, terrorism, industrial accident, or infectious disease. It features historical perspectives on a public health crisis, an analysis of preparedness, and a practical, relevant case study on the emergency response. Study reference for NEHA's REHS/RS exam.

568 pages / Paperback / Catalog #1121
Member: $96 / Nonmember: $101

Disaster Field Manual for Environmental Health Specialists

California Association of Environmental Health Administrators (2012)

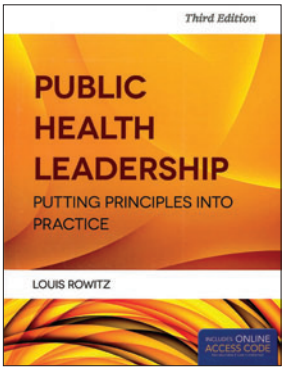


This manual serves as a useful field guide for environmental health professionals following a major disaster. It provides an excellent overview of key response and recovery options to be considered as prompt and informed decisions are made to protect the public's health and safety. Some of the topics covered as they relate to disasters include water, food, liquid waste/sewage, solid waste disposal, housing/mass care shelters, vector control, hazardous materials, medical waste, and responding to a radiological incident. The manual is made of water-resistant paper and is small enough to fit in your pocket, making it useful in the field. Study reference for NEHA's REHS/RS exam.

224 pages / Spiral-Bound Hardback / Catalog #535
Member: $37 / Nonmember: $45

Public Health Leadership: Putting Principles into Practice (Third Edition)

Louis Rowitz (2014)

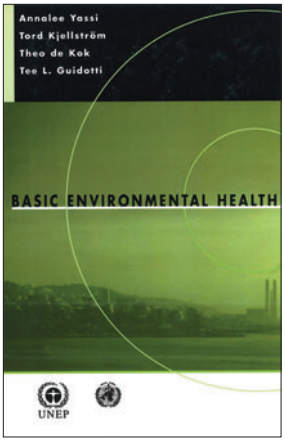


New edition! The importance of leadership in public health has steadily increased over the last 20 years. This text has become a standard reference for future and practicing public health leaders. The new third edition is an exhaustive revision that includes extensive coverage of the leadership skills and tools that are critical to managing public health emergencies. In five parts, it explores the basic theories and principles of leadership and describes how they may be applied in the public health setting. Leadership skills and competencies, as well as methods for measuring and evaluating leaders, are thoroughly covered. The book includes an online access code to the companion Web site. It also offers updated exercises and case studies throughout and new chapters on building infrastructure, accreditation, and the global public health leader.

738 pages / Paperback / Catalog #931
Member: $93 / Nonmember: $99

Basic Environmental Health

Annalee Yassi, Tord Kjellstrom, Theo de Kok, and Tee L. Guidotti (2001)



Recently added! This comprehensive interdisciplinary text draws from the social sciences, the natural sciences, and the health sciences to introduce readers to the principles and methods of environmental health. It offers an overview of the basic sciences needed to understand environmental health hazards, including toxicology, microbiology, health physics, injury analysis, and relevant psychosocial concepts. It also presents a basic approach to risk assessment and risk management. The text aims to enhance knowledge, skills, and attitudes in environmental health. Study reference for NEHA's REHS/RS exam.

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JEH QUIZ

FEATURED ARTICLE QUIZ #1

Norovirus Outbreak at a Wildland Fire Base Camp Ignites Investigation of Restaurant Inspection Policies

Available to those holding an Individual NEHA membership only, the *JEH* Quiz, offered six times per calendar year through the *Journal of Environmental Health,* is a convenient tool for self-assessment and an easily accessible means to accumulate continuing-education (CE) credits toward maintaining your NEHA credentials.

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Quiz Registration

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Home phone

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E-mail

→ Quiz deadline: October 1, 2014

1. During 2008, norovirus was the most common cause of confirmed single-etiology foodborne disease outbreaks in the U.S.
   a. True.
   b. False.
2. In the U.S., noroviruses cause an estimated __ million illnesses annually.
   a. two
   b. 12
   c. 21
   d. 46
3. Transmission of noroviruses occurs
   a. directly through the fecal-oral route.
   b. indirectly through contact with contaminated fomites or environmental surfaces.
   c. by ingestion of contaminated food or water.
   d. through ingestion of aerosolized particles of vomit.
   e. via all of the above.
4. Standards instituted by federal, state, and local regulatory and public health agencies to control the incidence of norovirus and other pathogen-associated foodborne illnesses associated with food establishments include
   a. facility construction.
   b. employee health practices.
   c. employee food safety practices.
   d. all of the above.
   e. b and c.
5. Definitive information about dinner location on September 1, 2011, was obtained for __ of the resource groups at the fire camp.
   a. 66%
   b. 70%
   c. 76%
   d. 80%
6. Among the resource groups who ate at Restaurant A, __ were categorized as ill.
   a. 76%
   b. 79%
   c. 84%
   d. 89%
7. Deficiencies noted during the unscheduled inspection as a result of the outbreak included
   a. improper sanitation of food contact surfaces.
   b. bare-hand contact with ready-to-eat foods.
   c. incorrect hot-holding temperatures.
   d. all of the above.
   e. a and b.
8. The median incubation period calculated for this outbreak was __ hours.
   a. 21
   b. 24
   c. 31
   d. 55
9. The overall attack proportion among all responders was about __ .
   a. 4%
   b. 11%
   c. 24%
   d. 27%
10. Of the 47 cases for which time of onset was known, __ were considered secondary cases.
    a. 11%
    b. 8%
    c. 5%
    d. 2%
11. Epidemiologic investigation of the outbreak implicated a restaurant and portable toilets as the sources.
    a. True.
    b. False.
12. Of the 18 states surveyed, __ indicated that no state rule or policy existed about the requirement for conducting postopening food establishment inspections.
    a. 5%
    b. 18%
    c. 28%
    d. 72%

JEH Quiz #5 Answers
March 2014

1. a	4. d	7. a	10. b
2. c	5. b	8. c	11. c
3. b	6. b	9. a	12. b

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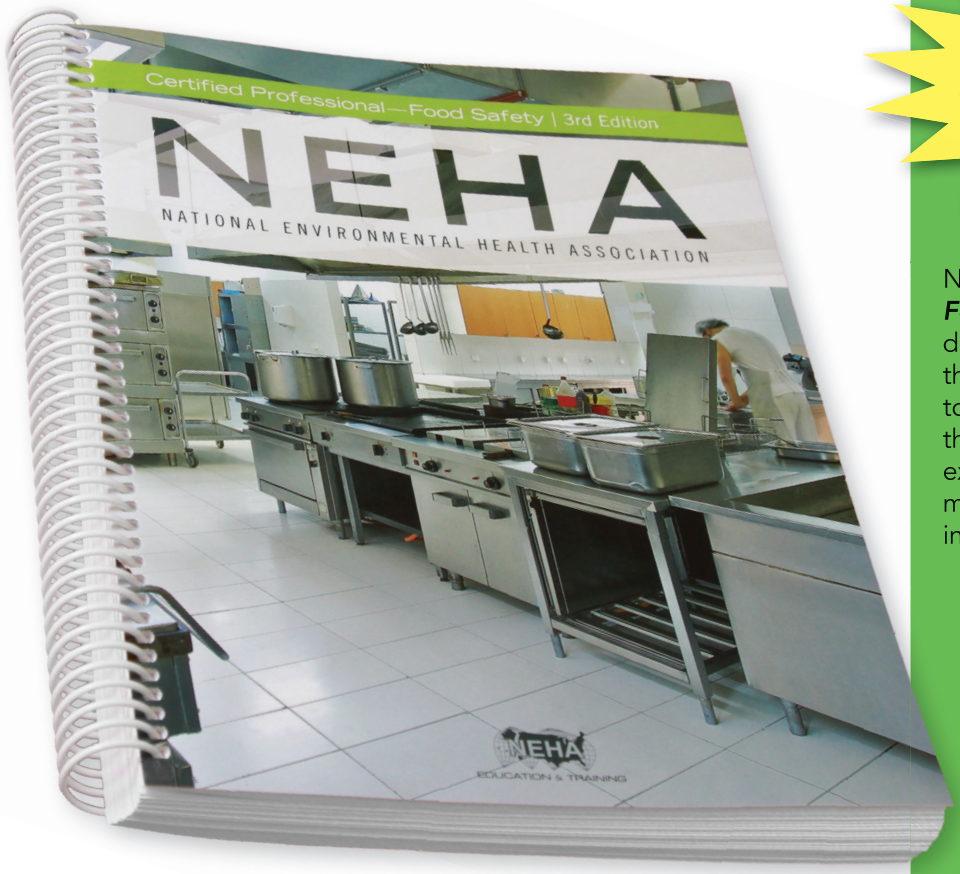

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- Food defense
- Responding to food emergencies and foodborne illness outbreaks
- Conducting facility plan reviews
- Legal aspects of food safety

NEHA
EDUCATION & TRAINING

Corresponding Author and Subject Index

Code	Corresponding Author/Title	Volume/Issue	Keyword 1	Keyword 2	Keyword 3	Keyword 4	Keyword 5
1	**Mubashir Ahmed, MBBS, MSc, et al.** Correlation of Arsenic Exposure Through Drinking Groundwater and Urinary Arsenic Excretion Among Adults in Pakistan	76.6 Jan/Feb 2014 Pages: 48–54	Drinking Water	Hazardous Materials/Toxic Substances	International	Risk Assessment	
2	**Aziz Amoozegar, PhD, et al.** Transport of *E. coli* in a Sandy Soil as Impacted by Depth to Water Table	76.6 Jan/Feb 2014 Pages: 92–100	Wastewater	Water Pollution Control/Water Quality			
3	**Ayana R. Anderson, MPH, et al.** The Distribution and Public Health Consequences of Releases of Chemicals Intended for Pool Use in 17 States, 2001–2009	76.9 May 2014 Pages: 10–15	Hazardous Materials/Toxic Substances	Pools/Spas	Public Health/ Safety	Recreational Environmental Health	
4	**Perekibina A. Bariweni, PhD, et al.** Assessment of Nonzoonotic Soil-Transmitted Helminth Levels in Soils in Yenagoa Metropolis, Niger Delta	76.6 Jan/Feb 2014 Pages: 108–112	Epidemiology	International	Public Health/ Safety	Recreational Environmental Health	
5	**Jane A. Gwira Baumblatt, MD, et al.** An Outbreak of Bed Bug Infestation in an Office Building	76.8 April 2014 Pages: 16–18	Epidemiology	Occupational Health/Safety	Vector Control		
6	**Michael Anthony Cappello, MPH, PhD, REHS, et al.** Radon-Contaminated Drinking Water From Private Wells: An Environmental Health Assessment Examining a Rural Colorado Mountain Community's Exposure	76.4 Nov 2013 Pages: 18–24	Drinking Water	Epidemiology	Public Health/ Safety	Radiation/Radon	Water Pollution Control/Water Quality
7	**Jinkyung Choi, PhD, et al.** A Strategic Cleaning Assessment Program: Menu Cleanliness at Restaurants	76.10 June 2014 Pages: 18–24	Education/ Training	Food	Public Health/ Safety	Risk Assessment	
8	**Maggie L. Clark, PhD, et al.** Asthma Prevalence and Risk Factor Assessment of an Underserved and Primarily Latino Child Population in Colorado	76.6 Jan/Feb 2014 Pages: 8–16	Ambient Air	Children's Environmental Health	Environmental Justice	Risk Assessment	
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PEOPLE ON THE MOVE

People on the Move is designed to keep NEHA members informed about what their peers in environmental health are up to. If you or someone you know has received a promotion, changed careers, or earned a special recognition in the profession, please notify Kristen Ruby at kruby@neha.org. It is NEHA's pleasure to announce our reader's achievements and new directions of fellow members. This feature will run only when we have material to print—so be sure to send in your announcements!

CAPT Mark Miller Retires

After a remarkable 26-year career with the U.S. Public Health Service, CAPT Mark Miller, MPH, RS, retired from the Centers for Disease Control and Prevention's (CDC's) Environmental Health Services Branch on June 1, 2014. Over this time period CAPT Miller has continuously provided extraordinary leadership and made significant contributions to the environmental health profession, especially in the field of emergency preparedness. In 2007, NEHA listed him as one of the nation's top 15 leaders in the field of environmental health.

During this career, CAPT Miller served at three federal agencies: Indian Health Service (IHS), Agency for Toxic Substances and Disease Registry (ATSDR), and CDC. The impact of his efforts to prepare the nation's environmental health workforce to respond to disasters and emergencies is unprecedented and is renowned throughout the U.S. and internationally.

One of the major accomplishments of his career was the development of the Environmental Health Training in Emergency Response (EHTER) course. EHTER was the first comprehensive course designed to provide environmental health professionals with the necessary knowledge and skills to address the environmental health impacts of disasters and emergencies. Through partnerships with NEHA, IHS, CDC University, numerous states, and several international environmental health associations, EHTER has been offered to over 5,400 state and local environmental health professionals throughout the U.S., as well as in Jamaica, Australia, Indonesia, and Malaysia. CAPT Miller's remarkable work in developing and promoting EHTER has led to a dramatic increase in the emergency response readiness capabilities of environmental health professions throughout the U.S and abroad.

CAPT Miller and coworker Martin Kalis were the first recipients of NEHA's Educational Contribution Award in 2013 for their work on the EHTER course. This award was established by NEHA's board of directors to recognize outstanding contributions within the field of environmental health and provide a pathway to share creative educational methods and tools used across the country and the world.

CAPT Miller has also done significant work with tribal groups concerning environmental public health issues. He was able to bring his expertise to underserved populations and assist in developing programs to address issues such as motor vehicle death rates, an outbreak of hantavirus, and Rocky Mountain spotted fever prevention.

Furthermore, he has lent his knowledge and expertise in contributing to the development of several CDC publications such as *The CDC Drinking Water Advisory Communication Toolbox*, *CDC Emergency Water Supply Planning Guide for Hospitals and Healthcare Facilities*, and *Protecting Public Health During Drought Conditions—A Guide for Public Health Professionals*.

CAPT Mark Miller accepts NEHA's newly created Educational Contribution Award at the 2013 AEC in Washington, DC, on behalf of his colleague Martin Kalis and himself.

These are just a few examples of the accomplishments and honors CAPT Miller has achieved over his 26-year career. It would be impossible to chronicle all of his contributions to the environmental health field but it is profoundly clear that his leadership and dedication have resulted in an amazing and positive impact to the environmental health profession and the health of the nation.

NEHA was fortunate to partner with CDC and offer the EHTER course in person and through its e-Learning Web site. "As I think about the work NEHA has done to respond to some of the most pressing training needs in environmental health practice—from emergency response to vector control and emerging pathogens to safe drinking water—Mark Miller has played a key and essential role in that process. Many of the training programs, educational materials, online education, and technical assistance guidance that are in widespread use are a direct result of Mark's work. He is a consummate professional whose commitment to environmental health will be long remembered and much appreciated," stated Larry Marcum, NEHA's managing director of research and development and government affairs.

A retirement celebration was held for CAPT Miller on May 21 at CDC's Chamblee campus. Coworkers, colleagues, and family came together to recognize his extraordinary career and dedication. Following retirement, CAPT Miller will return to the Oklahoma City area to enjoy being near family and will continue to serve as a member of the environmental health workforce. NEHA congratulates Mark on this milestone event and thanks him for his immeasurable contribution to the profession! We wish him the best of luck in future endeavors.

Editor's Note: We would like to acknowledge CDC's Maggie Byrne, LCDR Justin Gerding, CAPT Mike Herring, and LCDR Joe Laco for their contribution in providing text and information for this piece. Thank you!

A Tribute to Our 2013–2014 Peer Reviewers

The *Journal of Environmental Health* thanks and honors the individuals listed below whose contributions as peer reviewers are paramount to the *Journal's* efforts to advance, advise, educate, and promote environmental health professionals. Their bounty of knowledge and experience is unsurpassed; their accomplishments and reputations in the field well respected. We sincerely appreciate their hard work and their devotion to the environmental health profession.

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Thank you.

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Colorado Department of Public Health and Environment, Division of Environmental Health, Delegated Programs Unit
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EcoSure
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Elite Food Safety Training
www.elitefoodsafety.com

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(756) 358-4771

Erie County Department of Health
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Gila River Indian Community, Environmental Health Services
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Jefferson County Public Health (Colorado)
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Maricopa County Environmental Services
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Mars Air Doors
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Mid-Iowa Community Action
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Nova Scotia Department of Agriculture
www.gov.ns.ca

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www.nsf.org

Omaha Healthy Kids Alliance
www.omahahealthykids.org

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www.oneidanation.org

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www.orkincommercial.com

Ozark River Hygienic Hand-Wash Station
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PerkinElmer, Inc.
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Pinnacle Health Childhood Lead Poisoning Prevention Program
www.pinnaclehealth.org/Conditions-Treatments/Services/Children-s-Health/Services/Childhood-Lead-Poisoning-Prevention-Program.aspx

Prometric
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Racine City Department of Health
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www.emd.saccounty.net

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www.staterbros.com

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www.texasroadhouse.com

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NEHA **NEWS**

Interview With A Top Expert on Spice and Its Health Risks

NEHA Past President Alicia Enriquez Collins recently interviewed Dr. Michael Schwartz of the Centers for Disease Control and Prevention (CDC) to bring attention to a new designer drug being used as an alternative to marijuana. It is known as K2 or Spice. This drug has been gaining prominence and can cause serious health effects.

Dr. Michael Schwartz is an emergency physician and medical toxicologist at CDC's National Center for Environmental Health. Dr. Schwartz has been involved in the public health investigation of two Spice outbreaks and numerous cases of toxicity associated with Spice use since the designer drug epidemic began in 2009–2010. He has collaborated with the Drug Enforcement Administration (DEA) on the temporary scheduling of synthetic cannabinoids based on clinical adverse event and outbreak reports; he has presented nationally on the public health threat from synthetic cannabinoids.

What is "K2" or "Spice" and how is it used?
K2 and Spice refer to a new type of designer drug of abuse currently in widespread use in the U.S. and Europe. K2 and Spice are the brand names of two early formulations of "herbal" incense being smoked by users as an alternative to marijuana. Spice, K2, and other brands contain one or more synthetic cannabinoid compounds, which were originally developed by research chemists to facilitate study of cannabinoid receptor pharmacology. Synthetic cannabinoids are typically dissolved in a solvent, applied to dried plant material, and smoked out of a bong, bowl, or as a joint. Products are packaged with intentionally benign labels such as "not for human consumption" or "incense," but health professionals and legal authorities report that these products are smoked like marijuana. More than 30 synthetic cannabinoids are available, and the particular synthetic cannabinoids used in any one brand of Spice or K2 can vary. Often more than one synthetic cannabinoid is present in a product. No regulation of the manufacture of synthetic cannabinoid products exists and little is known about quality control processes used by makers of the drugs. In several recent outbreaks, synthetic cannabinoid–containing products have been linked to adverse health effects.

Are you seeing this more commonly used in certain states? If so, where are you seeing Spice commonly used?
To date, published reports of outbreaks have been associated with investigations in specific states. It is important to remember, however, that the use of synthetic cannabinoid–containing compounds is widespread. In 2013, CDC and collaborators reported on a nationwide outbreak of acute kidney injury (AKI) associated with one synthetic cannabinoid, XLR-11. Our investigation identified 16 cases, and other investigators in Alabama and Oregon identified clusters of AKI associated with use of synthetic cannabinoids in general, and particularly XLR-11.

In 2013–2014, CDC investigated outbreaks of delirium and psychosis in Georgia and Colorado associated with a newer cannabinoid, ADB-PINACA. Surveillance by the nations' poison control centers and reports of emergency room visits resulting from synthetic cannabinoid use show that adverse health effects are occurring frequently across the country.

What is the primary demographic for this compound?
Synthetic cannabinoid–containing products may appeal to younger, first-time users of drugs. Synthetic cannabinoid products also may be viewed as a "safe" alternative to marijuana, and their availability in convenience stores and smoke shops may convey a false air of legitimacy. A review of emergency department visits for synthetic cannabinoids use in 2010 by the Substance Abuse and Mental Health Services Administration found that 75% of users were 12 to 29 years old, and 33% of visits for synthetic cannabinoid intoxication were in the 12- to 17-year-old age group. A University of Michigan "Monitoring the Future" survey found that 11.4% of high school seniors in the U.S. had used Spice at least once within the past 12 months.

Please tell us about the acute and the chronic health risks to an individual using this drug.
Because widespread use of synthetic cannabinoids is relatively recent, we have no data on chronic health risks. Synthetic cannabinoids are active at the cannabinoid receptors CB1 and CB2, but toxicity also could result from a synthetic cannabinoid metabolite, from the solvent used to generate the potpourri, or from a toxic herb or plant to which the synthetic cannabinoid is applied.

In terms of acute effects, users may experience rapid heart rate, increased blood pressure and temperature, vomiting, and agitation. Reports of more severe effects include psychotic behavior and seizures. Some deaths have been reported; one report has been published (http://www.cdc.gov/mmwr/preview/mmwrhtml/mm6206a1.htm). The drug is readily available to the public, and the chemicals used to make different Spice preparations change so rapidly that investigators have not completely determined the mechanisms of adverse health effects associated with one compound before it is replaced by another. It is possible that we will see additional outbreaks of unusual toxicities not related to CB1 or CB2 receptor physiology.

As we strive to bring awareness to this crisis, what message would you like to convey to NEHA members?
These designer drugs are not a substitute for marijuana and are not a "safe" alternative to marijuana. Synthetic cannabinoid preparations can have unpredictable and unexpected side effects that can cause serious injury and even death. NEHA members should be aware of the public health threat posed by synthetic cannabinoids and work to educate their communities about the dangers of using these drugs.

NEHA NEWS

The following sources of information, outbreak reports, and resources for testing are available.

Centers for Disease Control and Prevention. (2013). Acute kidney injury associated with synthetic cannabinoid use—multiple states, 2012. *Morbidity and Mortality Weekly Report, 62*(6), 93–98.

Centers for Disease Control and Prevention. (2013). Notes from the field: Severe illness associated with synthetic cannabinoid use—Brunswick, Georgia, 2013. *Morbidity and Mortality Weekly Report, 62*(46), 939.

Johnston, L.D., O'Malley, P.M., Bachman, J.G., & Schulenberg, J.E. (2012). *Monitoring the future national results on adolescent drug use: Overview of key findings, 2011*. Ann Arbor, MI: Institute for Social Research, University of Michigan.

Office of Diversion Control. (2014). *Spice/K2 cannabinoids*. Retrieved from http://www.deadiversion.usdoj.gov/drug_chem_info/spice/

Office of National Drug Control Policy. (2012). *Fact sheet: Synthetic drugs (a.k.a. K2, Spice, bath salts, etc.)*. Retrieved from http://www.whitehouse.gov/ondcp/ondcp-fact-sheets/synthetic-drugs-k2-spice-bath-salts

Substance Abuse and Mental Health Services Administration, Center for Behavioral Health Statistics and Quality. (2012). *The DAWN report: Drug-related emergency department visits involving synthetic cannabinoids*. Retrieved from http://www.samhsa.gov/data/2k12/DAWN105/SR105-synthetic-marijuana.pdf

Did You Know?

Beginning October 1, NEHA will offer exciting new membership choices that allow you to pick the best option to meet your needs. Stay tuned for details or visit www.neha.org/membership for more information.

neha.org

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- Continuing Education
- NEHA Food Safety Training
- Awards & Sabbaticals
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Information and opportunities abound behind the research and development (R&D) button on NEHA's homepage. Visit neha.org/research to obtain the latest on the following NEHA federally funded programs, many of which include free or low-cost training and educational opportunities:

- Biology and Control of Vectors and Public Health Pests Program
- Environmental Public Health Tracking Program
- Epi-Ready Team Training Program
- Food-Safe Schools Program
- Industry-Foodborne Illness Investigation Training and Recall Response (I-FIIT-RR) Program
- Land Use Planning and Design Program
- Onsite Wastewater Treatment Systems Program
- Radon/Indoor Air Quality Program
- Workforce Development Program

79th NEHA AEC

National Environmental Health Association (NEHA)
79th Annual Educational Conference (AEC) & Exhibition

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JULY 13-15, 2015

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NATIONAL ENVIRONMENTAL HEALTH ASSOCIATION

NEHA 2015 AEC
CALL FOR ABSTRACTS

The National Environmental Health Association presents its 79th Annual Educational Conference & Exhibition in Orlando, FL, July 13-15, 2015.

The NEHA AEC is designed to train, educate, and advance people who have an interest or career in environmental health and protection, as well as to bring people together to build a professional network of environmental health colleagues, exchange information, and discover new and practical solutions to environmental health issues.

AEC Format

Directed and sequenced programming will be presented in simultaneous training and educational tracks. NEHA is seeking abstracts that bring to a national and international audience the latest advances in environmental health, as well as unique responses to environmental health and protection problems. Practical applications in both the public and private sectors should be emphasized along with the latest in proven emerging technologies.

NEHA offers two different types of training and educational sessions at the AEC—Lectures and Learning Labs. For Lectures, applications for single or multiple speaker presentations that are educational in nature are being accepted. However, presentations that are more interactive will be given first consideration. For Learning Labs, NEHA is accepting applications for hands-on demonstrations, tabletop exercises, poster presentations, drop-in learning labs, roundtable discussions, and other types of interactive and innovative presentation formats that will help train the attendees.

Ensuring Attendees a Return on Investment

Additionally, the NEHA AEC is being rationalized according to return on investment (ROI) principles. Emphasis will be given to those abstracts that have the potential to impart knowledge to attendees, which enables them to make cost effective program improvements in their workplaces as a result of what they learn by attending the event, and thereby helping to pay for the investment made for their attendance to the NEHA AEC.

Submission Process

Individuals and groups involved in all aspects of environmental health and public health are strongly encouraged to participate in this Call for Abstracts. Please visit neha.org for information about the abstract submission process.

NATIONAL ENVIRONMENTAL HEALTH ASSOCIATION

ENVIRONMENTAL HEALTH
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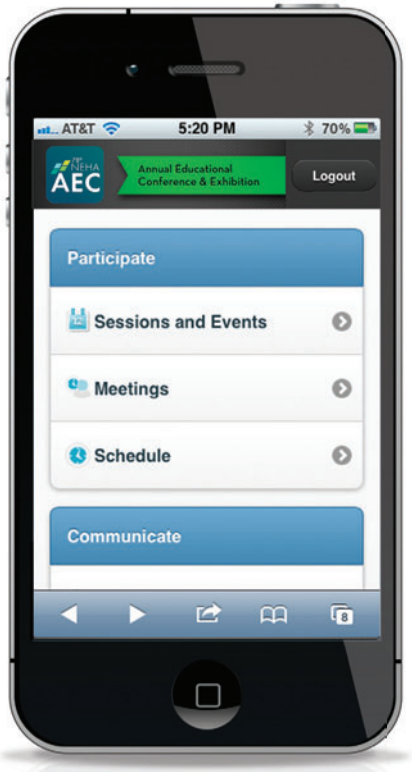
Virtual AEC: Continuing Education Resource
from the NEHA 2014 AEC

78th NEHA AEC



Though the NEHA 2014 AEC has ended, you can still access valuable educational content from this event using the Virtual AEC. The Virtual AEC provides you with:

- An archive of over 30 educational sessions that were recorded at the 2014 AEC and can be viewed on demand
- Access to speaker presentations, handouts, and other materials
- The opportunity to earn continuing education credits
- A way to connect to a professional network of environmental health professionals, speakers, and exhibitors that attended the AEC

Whether or not you attended the NEHA 2014 AEC in Las Vegas, the Virtual AEC serves as an important resource for you to review valuable educational content over and over again, and to continue networking and conversing with other professionals!

Visit neha2014aec.org for more information.

What is Capacity Building?

It's about time.®

NEHA identified the need to help health agencies increase their capacity to perform in an environment of diminishing resources. Their study recognized that, while new EH regulations and program areas are constantly being added, staffing levels are contracting. The burden of Federal and State reporting mandates overwhelm resources.

As your national organization, NEHA selected a technology partner to advance this initiative. *Building Capacity* is a partnership designed to help professionals confront the changing demands of environmental health across the nation.

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Key focus areas include—

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