JOURNAL OF

Environmental Health

twelve dollars

Dedicated to the advancement of the environmental health professional

Volume 77, No. 4 November 2014

POSTERS AS COMMUNICATION TOOLS

PROMOTING SAFE HYGIENE PRACTICES IN PUBLIC RESTROOMS

Published by the National Environmental Health Association

www.neha.org

UL PUTS SAFETY AT THE TOP OF THE FOOD CHAIN

Full Service Solution Provider for the Food Service Industry

UL Everclean

For more than a century UL has employed exacting scientific processes and the highest ethical principles to deliver trusted results. Today, we continue to focus on the next generation of food safety challenges and more, helping the food service industry and stakeholders achieve safer living and work environments.

Learn about our many food service and food safety resources below:

FOOD SERVICE EQUIPMENT
UL.COM/APPLIANCES

FOOD SAFETY & BRAND PROTECTION
UL.COM/FOOD

RETAIL FOOD SAFETY TRAINING
ULEDUNEERING.COM/FOODSAFETY

JOURNAL OF

Environmental Health

Dedicated to the advancement of the environmental health professional

Volume 77, No. 4 November 2014

ABOUT THE COVER

The authors of this month's cover feature, "Promoting Safe Hygiene Practices in Public Restrooms: A Pilot Study," wanted to determine the impact that hygiene posters placed in public restrooms had on toilet tissue disposal practices in rural New Mexico. One long-held hygiene norm in this area is to put used toilet tissue in a trash can instead of flushing it. When this practice occurs in public restrooms, it increases the potential for pathogen transmission. The authors found that putting posters such as the one shown on our cover in public restrooms led to a reduction in observations of toilet tissue on floors or in trash cans.

See page 8.

Cover photo © Cognition Studio; poster artwork provided by author

ADVERTISERS INDEX

ADVANCEMENT OF THE SCIENCE

ADVANCEMENT OF THE PRACTICE

ADVANCEMENT OF THE PRACTITIONER

YOUR ASSOCIATION

U.S. Postal Service Statement of Ownership

UNITED STATES POSTAL SERVICE® **Statement of Ownership, Management, and Circulation (All Periodicals Publications Except Requester Publications)**

1. Publication Title	2. Publication Number	3. Filing Date
Journal of Environmental Health	2 7 9 - 9 0 0	9/17/2014
4. Issue Frequency	5. Number of Issues Published Annually	6. Annual Subscription Price
Once per month except for two bi-monthly issues (January/February and July/August)	10 issues	$135.00

7. Complete Mailing Address of Known Office of Publication *(Not printer) (Street, city, county, state, and ZIP+4®)*
720 S. Colorado Blvd., Ste. 1000-N, Denver, CO 80246-1926
Contact Person: Kristen Ruby-Cisneros
Telephone *(Include area code)*: 303.756-9090, ext. 341

8. Complete Mailing Address of Headquarters or General Business Office of Publisher *(Not printer)*
National Environmental Health Association
720 S. Colorado Blvd., Ste. 1000-N, Denver, CO 80246-1926

9. Full Names and Complete Mailing Addresses of Publisher, Editor, and Managing Editor *(Do not leave blank)*
Publisher *(Name and complete mailing address)*
National Environmental Health Association
720 S. Colorado Blvd., Ste. 1000-N, Denver, CO 80246-1926

Editor *(Name and complete mailing address)*
Elizabeth Donoghue-Armstrong, Technical/Copy Editor, National Environmental Health Association
720 S. Colorado Blvd., Ste. 1000-N, Denver, CO 80246-1926

Managing Editor *(Name and complete mailing address)*
Kristen Ruby-Cisneros, Content Editor, National Environmental Health Association
720 S. Colorado Blvd., Ste. 1000-N, Denver, CO 80246-1926

10. Owner *(Do not leave blank. If the publication is owned by a corporation, give the name and address of the corporation immediately followed by the names and addresses of all stockholders owning or holding 1 percent or more of the total amount of stock. If not owned by a corporation, give the names and addresses of the individual owners. If owned by a partnership or other unincorporated firm, give its name and address as well as those of each individual owner. If the publication is published by a nonprofit organization, give its name and address.)*

Full Name	Complete Mailing Address
National Environmental Health Association	720 S. Colorado Blvd., Ste. 1000-N, Denver, CO 80246-1926

11. Known Bondholders, Mortgagees, and Other Security Holders Owning or Holding 1 Percent or More of Total Amount of Bonds, Mortgages, or Other Securities. If none, check box → ☑ None

Full Name	Complete Mailing Address

12. Tax Status *(For completion by nonprofit organizations authorized to mail at nonprofit rates) (Check one)*
The purpose, function, and nonprofit status of this organization and the exempt status for federal income tax purposes:
☑ Has Not Changed During Preceding 12 Months
☐ Has Changed During Preceding 12 Months *(Publisher must submit explanation of change with this statement)*

PS Form **3526**, July 2014 *(Page 1 of 4 (see instructions page 4))* PSN: 7530-01-000-9931 **PRIVACY NOTICE:** See our privacy policy on *www.usps.com*.

13. Publication Title: Journal of Environmental Health
14. Issue Date for Circulation Data Below: September 2014

15. **Extent and Nature of Circulation**

			Average No. Copies Each Issue During Preceding 12 Months	No. Copies of Single Issue Published Nearest to Filing Date
a. Total Number of Copies *(Net press run)*			5441	5650
b. Paid Circulation *(By Mail and Outside the Mail)*	(1)	Mailed Outside-County Paid Subscriptions Stated on PS Form 3541 (Include paid distribution above nominal rate, advertiser's proof copies, and exchange copies)	5126	5429
	(2)	Mailed In-County Paid Subscriptions Stated on PS Form 3541 *(Include paid distribution above nominal rate, advertiser's proof copies, and exchange copies)*	0	0
	(3)	Paid Distribution Outside the Mails Including Sales Through Dealers and Carriers, Street Vendors, Counter Sales, and Other Paid Distribution Outside USPS®	0	0
	(4)	Paid Distribution by Other Classes of Mail Through the USPS (e.g., First-Class Mail®)	0	0
c. Total Paid Distribution *[Sum of 15b (1), (2), (3), and (4)]*			5126	5429
d. Free or Nominal Rate Distribution *(By Mail and Outside the Mail)*	(1)	Free or Nominal Rate Outside-County Copies included on PS Form 3541	0	0
	(2)	Free or Nominal Rate In-County Copies Included on PS Form 3541	0	0
	(3)	Free or Nominal Rate Copies Mailed at Other Classes Through the USPS (e.g., First-Class Mail)	0	0
	(4)	Free or Nominal Rate Distribution Outside the Mail *(Carriers or other means)*	0	0
e. Total Free or Nominal Rate Distribution *(Sum of 15d (1), (2), (3) and (4))*			0	0
f. Total Distribution *(Sum of 15c and 15e)*			5126	5429
g. Copies not Distributed *(See Instructions to Publishers #4 (page #3))*			315	251
h. Total *(Sum of 15f and g)*			5441	5680
i. Percent Paid *(15c divided by 15f times 100)*			100%	100%

* If you are claiming electronic copies, go to line 16 on page 3. If you are not claiming electronic copies, skip to line 17 on page 3.

17. Publication of Statement of Owner
☑ If the publication is a general publication, publication of this statement is required. Will be printed in the November 2014 issue of this publication. ☐ Publication not required.

18. Signature and Title of Editor, Publisher, Business Manager, or O: Content Editor — Date: 9/17/2014

I certify that all information furnished on this form is true and complete. I understand that anyone who furnishes false or misleading information on this form or who omits material or information requested on the form may be subject to criminal sanctions (including fines and imprisonment) and/or civil sanctions (including civil penalties).

PS Form **3526**, July 2014 *(Page 2 of 4)*

don't miss

in the next *Journal of Environmental Health*

- Biomonitoring for Perfluorochemicals in a Minnesota Community
- Communicating About Biomonitoring and the Results of a Community-Based Project
- Consuming Untreated Water in Four Southwestern Alaska Native Communities
- The Environmental Health Workforce in the 21st Century
- Online prepublished article: Geostatistical Analysis of the Relationship Between Heavy Metals in Drinking Water and Cancer Incidence

Official Publication

NATIONAL ENVIRONMENTAL HEALTH ASSOCIATION

Journal of Environmental Health
(ISSN 0022-0892)

Kristen Ruby-Cisneros, Content Editor
Elizabeth Donoghue-Armstrong, PhD, Copy Editor
Hughes design|communications, Design/Production
Cognition Studio, Cover Artwork
Soni Fink, Advertising
For advertising call 303.756.9090, ext. 314

Published monthly (except bimonthly in January/February and July/August) by the National Environmental Health Association, 720 S. Colorado Blvd., Suite 1000-N, Denver, CO 80246-1926. Phone: (303) 756-9090; Fax: (303) 691-9490; Internet: www.neha.org. E-mail: kruby@neha.org. Volume 77, Number 4. Subscription rates in U.S.: $135 per year and $250 for two years. International subscription rates: $160 per year and $300 for two years (airmail postage included). Single copies: $12, if available. Reprint and advertising rates available at www.neha.org/JEH. CPM Sales Agreement Number 40045946.

Full text of this journal is available through Bigchalk.com at www.bigchalk.com and from ProQuest Information and Learning, (800) 521-0600, ext. 3781; (734) 973-7007; or www.proquest.com. The *Journal of Environmental Health* is indexed by Current Awareness in Biological Sciences, EBSCO, and Applied Science & Technology Index. It is abstracted by Wilson Applied Science & Technology Abstracts and EMBASE/Excerpta Medica.

All technical manuscripts submitted for publication are subject to peer review. Contact the content editor for Instructions for Authors, or visit www.neha.org/JEH.

To submit a manuscript, visit http://jeh.msubmit.net. Direct all questions to Kristen Ruby-Cisneros, content editor, kruby@neha.org.

Periodicals postage paid at Denver, Colorado, and additional mailing offices. POSTMASTER: Send address changes to *Journal of Environmental Health*, 720 S. Colorado Blvd., Suite 1000-N, Denver, CO 80246-1926.

Printed on recycled paper.

PRINTED WITH SOY INK

PRESIDENT'S MESSAGE

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

The Importance of Being Credentialed

Why do environmental health professionals strive to be Registered Environmental Health Specialists/Registered Sanitarians (REHS/RS)? Why do engineers want to be Professional Engineers (PE); dieticians want to be Registered Dieticians (RD); industrial hygienists want to be Certified Industrial Hygienists (CIH); and safety professionals want to be Certified Safety Professionals (CSP)? You can continue in this vein for numerous occupations in which a credential, certification, registration, or another designation allows the people on the street to know that you are a recognized expert in your profession. The credentialing process demands an extra measure of competence and dedication.

The original impetus behind the creation of NEHA was the desire by professionals of that day to establish a standard of excellence for this developing profession. This standard, which has come to be known as the REHS/RS credential, signifies that an environmental health professional has mastered a body of knowledge and has acquired sufficient experience to satisfactorily perform work responsibilities in the environmental health field. The pioneers of the association believed that such a credential was necessary if the environmental health field was to grow and take shape as a legitimate and widely respected profession. Furthermore in support of a credentialed profession, the American Academy of Sanitarians states that "the primary purpose of the Academy is to enhance professional recognition. Its aim is to improve environmental health within public health through certification."

These simple letters after your name indicate that you have reached the top of your profession.

Continued operation of a credentialing program increases coherence of the profession of environmental health and improves practice. These simple letters after your name indicate that you have reached the top of your profession and have shown you have the knowledge, skills, and experience to perform your job duties. A noncredentialed person does not have the same credibility.

How does being credentialed impact you as a professional with your employer, fellow employees, family, friends, and with the general public whom you serve? One impact is your ability to advance in your profession with your employer as they observe you working toward the REHS/RS designation, since registration is an indicator of your dedication to hard work, professionalism, and ethical practice. Your coworkers may be impacted in some way if you are an REHS/RS receiving promotions due to your REHS/RS designation.

Would you want to drive across a mile-long bridge if you discovered it was built without a Professional Engineer (PE) designing and inspecting the building of the bridge? You would not go to a medical doctor unless you saw some indication that he or she had a medical degree. You feel confident you can trust these individuals to perform their jobs with integrity and professionalism.

An environmental health professional performs numerous job functions that have an impact on everyone's health and lifestyle. Food inspections are one of the most common and most important duties performed by an environmental health professional. You would not eat at a restaurant if the inspection showed a low score based on roaches, low temperatures for hot foods, workers not washing their hands, or any of the other numerous items checked by that environmental health professional. Would you feel safer for your family if that environmental health professional had an REHS/RS after their name? I know I would because it indicates he or she has the education, skills, experience, and knowledge to conduct a very professional inspection of that restaurant.

Another important function of the environmental health professional is keeping our water safe. Waterborne diseases are endemic in many countries and pose a threat to millions of people every day. We are fortunate to have safe and well-inspected water supplies in the U.S. What separates many developed countries from undeveloped countries is the quality and safety of their air, food, and water

and the infrastructure that supports vital environmental health services.

REHS/RS professionals are global in their work and dozens of foreign countries have credentialing requirements similar to NEHA's requirements. Our Annual Educational Conference & Exhibition recently hosted the International Federation of Environmental Health's (IFEH's) biennial meeting. This organization is a federation of organizations that function in a similar manner to NEHA. IFEH member organizations represent dozens of different countries, languages, laws, rules, and regulations, but the common denominator for all of them is certification in the environmental health profession.

The state of Virginia recently decided to encourage their environmental health employees to obtain the REHS/RS credential by giving them a $1,500 cash bonus when they passed NEHA's REHS/RS exam and a $1,000 cash bonus when they recertified every two years. This was in lieu of requiring an REHS/RS to work in Virginia as an environmental health state, county, or city employee. The commonwealth of Kentucky has a law requiring the REHS/RS credential after two years of working in the state as an environmental health professional. At least 15 other states require an REHS/RS to practice in their state. Eighteen states want you to have the credential but do not require it to work as an environmental health professional. Seventeen states have no credentialing requirements or have shown little interest in having their environmental health employees obtain the REHS/RS.

NEHA's board of directors recently approved a policy position in support of the REHS/RS credential for environmental health professionals. This position is available for you to use and cite if faced with the issue of justifying that the REHS/RS credential is an important qualification for environmental health professionals. NEHA is strongly committed to a well-trained, educated, professional, and competent workforce and will be vocal in advocating these key workforce messages. You can read the policy position on page 62 as well as access it via NEHA's Web site at www.neha.org/pdf/positions/REHS-RS-Credential.pdf.

One additional benefit of being registered is that it ensures that an REHS/RS receives regular continuing education to ensure that they are maintaining and enhancing their knowledge within the environmental health field. For the environmental health professional it is an opportunity to attend state, regional, or national conferences to engage and network with colleagues while keeping current with environmental health issues. Reaching out to a fellow environmental health professional is much easier when a face is put to the name. In addition, you may make lifelong friends from attending these conferences.

I am very proud to be a member of the REHS/RS group—a group of great people who work every day to make everyone's life and environment safer and more enjoyable.

Are you not a member of the REHS/RS group and want to become one? Go to www.neha.org/credential/REHS.html for a candidate information brochure, eligibility requirements, exam and application information, and NEHA resources to help you prepare for the exam.

Dr Carolyn Harvey
carolyn.harvey@eku.edu

Promoting Safe Hygiene Practices in Public Restrooms: A Pilot Study

Cynthia Kratzke, PhD, CHES
Department of Public Health Sciences
New Mexico State University

Margaret Short, MA, Mdiv, DMin
Bruce San Filippo, MMM, MD
Memorial Medical Center

Abstract **The study described in this article examined the impact of hygiene posters in promoting safe hygiene practices for used toilet tissue disposal in public restrooms. Although the long-held hygiene norm in homes for the disposal of used toilet tissue in a container may occur in the rural U.S., it is critical in public environments to promote proper toilet tissue disposal in toilets to reduce potential transmission of bacteria and viruses. A control group time series design was used for observations of used toilet tissue disposal on the floor or in large trash cans in restrooms with and without signage for a two-week period. A significant decrease in observations was reported at intervention sites with posters (p = .025). No significant differences were reported at the control site. Posters were effective in motivating behavior change beyond hand hygiene. Further research may examine the impact of health posters in other environmental settings.**

Introduction

Safe hygiene practices are vital for infection control in community and health care settings to reduce the transmission of diseases and infections (Aiello, Coulborn, Perez, & Larson, 2008; World Health Organization, 2009). Primary prevention educational efforts suggest hand hygiene campaigns are effective precautions (Centers for Disease Control and Prevention [CDC], 2013; Davis, Fante, & Jacobi, 2013; Ford, Boyer, Menachemi, & Huerta, 2013; Mathai et al., 2010; White, Kolble, Carlson, & Lipson, 2005). Direct contact for transmission may include touching an infected person. Indirect contact for transmission may include touching contaminated surfaces or objects in environments and then touching the nose, eyes, or mouth (Otter, Yezli, Salkeld, & French, 2013).

Compelling evidence shows public restroom environments have a high frequency of contaminated surfaces or objects for the potential transmission of bacteria or viruses including antibiotic-resistant bacteria (Flores et al., 2011; Mkrtchyan, Russell, Wang, & Cutler, 2013; Zapka et al., 2011). The contaminated surfaces or objects may include sinks, faucets, floors, or bulk refillable soap dispensers (CDC, 2013; Flores et al., 2011; Mkrtchyan et al., 2013; Zapka et al., 2011). Public restroom floors particularly in toilet stalls may be used to place purses or dispose of used toilet tissue. The floors or toilet tissue placed on the floor may not be perceived as contaminated surfaces or objects. Moreover, the public and especially children may touch or pick up the used toilet tissue if they have low risk perception. A greater likelihood may exist in public restroom environments for contamination and transmission of bacteria or viruses with a high volume of people using the public restrooms. Thus, public awareness for a greater understanding of preventive measures for the disposal of toilet tissue in public restrooms is needed so community members take more precautions.

The promotion of safe hygiene practices in public restrooms is important for infection control yet it is not well discussed, recognized, or understood by the public. A public knowledge gap may exist about perceived contamination or transmission modes and risk (Burnett, Johnston, Kearney, Corlett, & MacGillivray, 2013). To close the knowledge gap, growing research brings attention to how farm worker safe field hygiene education overlaps with environmental factors (Park et al., 2013). Personal hygiene factors including how to use portable toilets or hand washing may be associated with reduced produce microbial contamination rates such as generic *E. coli* even at the preharvest level (Park et al., 2013). Beyond farm management, safe hygiene practices are slowly becoming recognized as important factors in public environmental settings. It is critical to provide community education for safe hygiene in public restroom use since it also has public health implications.

The educational strategy for toilet tissue disposal should include, but not be limited to, a full understanding of accepted home hygiene norms. In the rural U.S., U.S.-Mexico border, or other parts of the world, the long-held accepted hygiene norm of used toilet tissue disposal in containers by toilets may occur in homes (Phaswana-Mafuya & Shukla, 2005). The personal hygiene practice may be attributed to poor home plumbing or septic tank problems. Most public restrooms have adequate plumbing for flushing toilet tissue in the toilets. The hygiene practice may be continued in public restrooms as a perceived safe hygiene practice. The used toilet tissue may be placed on the floor by the toilet if no containers are in the public restroom toilet stalls. This understanding may have implications for the design of the hygiene education promoting disposal of used toilet tissue in public restroom environments.

Recent studies suggest health posters are simple and effective tools for health communication and behavior change prompts (Bass & Keathley, 2008; Davis et al., 2013; Schneider, Feufel, & Berkel, 2011). Health posters with persuasive messages as motivating factors may change the public's knowledge, attitudes, or health behaviors. Davis and co-authors (2013) found hand hygiene signs with positive messages were more effective than fear-arousing hand hygiene signs to promote hand hygiene compliance in public restrooms. Schneider and co-authors (2011) examined the impact of posters to promote colorectal cancer screenings. A 30% increase in sales of fecal occult blood test kits were reported at pharmacies displaying colorectal cancer screening posters with persuasive messages compared to pharmacies displaying no posters. Bass and Keathley (2008) found that a poster campaign was effective on campus to promote no drinking while driving. Nearly 67% of the students reported the alcohol awareness poster campaign as an effective strategy and 45% reported their intention to avoid drinking and driving.

The purpose of our study was to examine the impact of health posters to increase public awareness of the safe hygiene practice for disposal of used toilet tissue in public restrooms. Although previous studies suggest hand hygiene as effective education, no study to our knowledge examined safe hygiene education for toilet tissue disposal in public restrooms. The pilot study will add to the knowledge base of health communication and environmental health. This health concern may not be unique to one area in the U.S. Therefore, results from our study may be used to develop larger campaigns using posters to promote safe hygiene practice in public environments.

Methods

The long-held practice of placing used toilet tissue in a container was identified by the community members as a home hygiene norm in the rural region of southern New Mexico. An academic-community partnership was formed to address this public health concern. Community-based participatory research (CBPR) principles of sharing knowledge and building collaboration based on trust were used among partners for social change and improved health outcomes (Christopher, Watts, McCormick, & Young, 2008; Faridi, Grunbaum, Gray, Franks, & Simones, 2007). A control group time-series design was used to examine the impact of the posters to increase public awareness and behavior change for disposal of used toilet tissue in public restrooms. Approval to conduct the study was received from the university and medical center institutional review board.

We conducted the study in southern New Mexico, which covers a large geographical area with mostly rural populations. Fluid movement occurs at the U.S.-Mexico border crossings for health care, employment, or family visits (Bergmark, Barr, & Garcia, 2010; Reinger et al., 2012). Possible clashes of cultural norms or misperceptions of hygiene practice may occur (Bergmark et al., 2010). The border region also faces challenges with *colonias* that have limited infrastructure with no paved roads, limited potable water, and a lack of sewer systems. For example, Doña Ana County in New Mexico is a border county with 37 *colonias* (Doña Ana County, n.d.)

Setting

The men's and women's public restrooms in a health care facility were chosen as the pilot site since the facility had many public restrooms. Other community sites considered were public buildings, a large shopping store, schools, or restaurants. In the public facility, sites included three intervention sites (sites 1–3) for poster signage and the control site (site 4) for no poster signage. The restroom locations included were the lobby (site 1, four toilets in each restroom), women's health area (site 2, one toilet in each restroom), hallway (site 3, two toilets in each restroom), and cafeteria area hallway (site 4, one toilet in each restroom). Site 4 was used by the public and staff members since it was near the cafeteria. It was not possible to identify if restroom users were visitors or employees since tracking was not part of this study. Informal discussions with housekeeping, however, included the identification of the home hygiene norm for toilet paper disposal outside the toilet was practiced in the facility by some employees.

Data Collection

Graduate students from the master of public health program were recruited using flyers on campus and trained by the principal investigator for documentation of observations at the medical center. Students were selected to eliminate any potential bias in reporting results since most students were not from the region. An observation form was developed for daily documentation. The frequencies indicated only the toilet tissue disposal on the floor or in a trash bin in the public restrooms in each public restroom (yes/no). Recording observations (yes/no) was appropriate since some restrooms had more than one toilet. An incentive ($50 each day) was provided to students for their time. Seven trained students rotated their time with only one student present to conduct the observations.

Observations of the used toilet tissue in the trash can or on the floor in public restrooms took place during a two-week period in late 2010. The first one-week observation period was the baseline with no poster displays in all public restrooms. The second one-week observation period included poster displays in the intervention sites. The 8.5 x 11 inch laminated bilingual posters were mounted on the back of each stall door at a visible level or on the side wall in the men's and women's public restrooms in the intervention sites (Figure 1). The culturally sensitive posters were pretested in a focus group with community members prior to our study. No containers were located in the restroom stalls.

The observation times were determined by housekeeping-environmental services and scheduled between the first and second shift.

The process was coordinated between housekeeping staff members and students. The principal investigator observed the graduate students during their first observation in the facility. Any questions were answered to ensure inter-rater reliability agreement for observations. Observations occurred only when visitors were not in the restrooms to ensure privacy and anonymity. After the student's observation, the housekeeping staff member conducted an observation. High levels of agreement occurred (100%) among observers as an inter-rater reliability assessment. The restrooms were cleaned by housekeeping if toilet tissue was not disposed of properly. The observation forms were returned by the students daily to the researcher for daily documentation review.

Data Analysis

Descriptive statistics with frequency distributions and percentages were calculated and differences in observation weeks (baseline and poster display weeks) were examined using Chi-square tests. Fisher's exact Chi-square statistic was reported when appropriate. Statistical significance of this study was $p < .05$ and analysis was conducted using SPSS v. 20.

Results

Figure 2 shows the observation frequencies for the sites during the two-week period. In the intervention sites, the total number of observations decreased from 20 (48%) at baseline to 12 (29%) at measurement (posters). In the control site, the total number of observations decreased from eight (57%) at baseline to six (43%) at measurement (no posters). At the intervention sites, observations in the second week were significantly lower than observations in the first baseline week (χ^2 [1] = 5.05, p = .025). At the control site, no significant relationship was found (χ^2 [1] = .389, p = .627).

Discussion

The findings suggest that the impact of posters as communication tools to promote safe hygiene practices and influence behavior change was effective as supported in previous studies (Bass & Keathley, 2008; Davis et al., 2013; Schneider et al., 2011). Observations in the intervention sites with posters for disposal of used toilet tissue in the public restrooms were significantly lower than observations in the control site with no posters. Although the total number of observations was small, the results are encouraging. Our pilot study demonstrates the importance of evidence-based strategies in hygiene pilot studies to measure the impacts of health communication posters. Findings may be used to support poster messages in larger studies and health campaigns.

The findings also raise important questions for shifts in the U.S. demographic trends. A dramatic increase has occurred in Hispanic populations and other immigrants in many U.S. areas. Our study may help to determine possible hygiene norms in various environmental and cultural settings. This may warrant attention for future studies in larger cities. The findings also confirm the role of family members in teaching hygiene practices at home and in public settings. Discussions by public health professionals with communities about safe hygiene practices may help to minimize risks for infections and diseases and address any misconceptions.

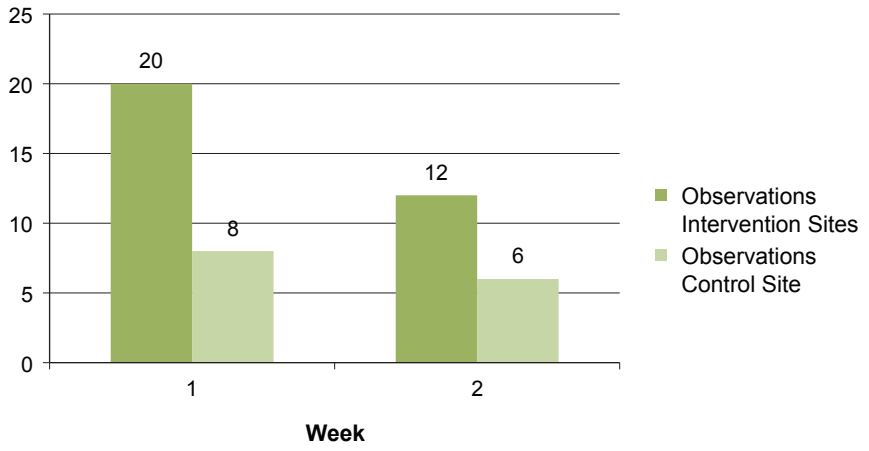
Another important contribution of our study is the reinforcement of the need to work with community members in different capacities. Our CBPR approach was action oriented and was built on the strengths of partners as in previous studies (Flores et al., 2010). The planned time commitment for partners, however, took longer and the time was extended four months to complete the pilot study. Findings further suggest the need to understand the complexity of health communication, culture, and literacy with community members. Low literacy and culturally appropriate material development must be considered in the design phase (Kreuter, Lukwago, Bucholtz, Clark, & Sanders-Thompson, 2003; Resnicow, Baranowski, Ahluwakia, & Braithwaite, 1999). The poster pictures were used for "tell-

FIGURE **1**

Health Poster

FIGURE **2**

Number of Observations at Intervention and Control Sites for Used Toilet Tissue Disposal in Public Restrooms During Week 1 and Week 2



ing the story" as a visual cue. Thus, costly mistakes in production of posters by not pretesting were avoided.

The data suggest the poster's persuasive message was attractive and gained the public's attention. Influencing perceptions with motivating messages may change social norms and prompt action for behavior change (Davis et al., 2013). The message and wording broke the silence about this norm by providing the need for cognition as to "why" the behavior change was important. The wording on the final poster included, "Used toilet paper carries germs that can spread disease." Otherwise, the message may be perceived as a forceful message and challenge the long-held values, etiquette, and norms for hygiene practices.

Our study had a few limitations. Evaluating the impact of the posters was limited to a two-week period with three intervention sites and one control site in a public facility. The observation frequencies were counted only as observed or not observed (yes/no) and not the number of misplaced toilet tissues for disposal in each public restroom. A longer time period for more observations and more than one building to increase the sample size may provide different results. A potential diffusion effect was reduced by using the location of the cafeteria hallway restrooms on the ground floor as the control site. Visitors may use these restrooms without signage before or after walking to the cafeteria and not use other intervention sites. Finally, the study took place in southern New Mexico and the findings must be generalized with caution. Larger studies in other areas in the U.S. may determine if findings can be generalized.

Conclusion

Our study has made important contributions to the health education knowledge base for the use of health posters in environmental settings. The findings are promising for the use of posters in a campaign to influence public health awareness and promote health behavior changes. With field testing, the design process of health communication materials is critical before a health campaign implementation. Community members may provide valuable insights for the message wording and design. The findings may also influence policy changes on the organization, local, or regional level to include public display of posters promoting safe hygiene practices in public restroom settings. Further research can build on this study to assess the impact of the health posters in other environmental health settings.

Acknowledgements: This study was supported by funding from the College of Health and Social Services at New Mexico State University. The authors would like to thank Dr. Charles Gerba, professor, Departments of Microbiology and Immunology, and Soil, Water and Environmental Science, University of Arizona, who provided review of the initial manuscript.

Corresponding Author: Cynthia Kratzke, Assistant Professor, Department of Public Health Sciences, New Mexico State University, 1226 International Mall, Las Cruces, NM 88003. E-mail: ckratzke@nmsu.edu.

References

Aiello, A.E., Coulborn, R.M., Perez, M.A., & Larson, E.L. (2008). Effect of hand hygiene on infectious disease risk in the community setting: A meta-analysis. *American Journal of Public Health, 98*(8), 1372–1381.

Bass, M.A., & Keathley, R. (2008). Effectiveness of a social norms marketing campaign on a university campus. *American Journal of Health Studies, 23*(4), 173–178.

Bergmark, R., Barr, D., & Garcia, R. (2010). Mexican immigrants in the U.S. living far from the border may return to Mexico for health services. *Journal of Immigrant and Minority Health, 12*(4), 610–614.

Burnett, E., Johnston, B., Kearney, N., Corlett, J., & MacGillivray, S. (2013). Understanding factors that impact on public and patient's risk perceptions and responses toward *Clostridium difficile* and other health care–associated infections: A structured literature review. *American Journal of Infection Control, 41*(6), 542–548.

continued on page 12

References *continued from page 11*

Centers for Disease Control and Prevention. (2013). *Hand washing: Clean hands save lives*. Retrieved from http://www.cdc.gov/handwashing/

Christopher, S., Watts, V., McCormick, A.H., & Young, S. (2008). Building and maintaining trust in a community-based participatory research partnership. *American Journal of Public Health, 98*(8), 1398–1406.

Davis, O.L., Fante, R.M., & Jacobi, L.L. (2013). The effectiveness of sign prompts to increase hand washing behaviors in restrooms. *North American Journal of Psychology*, *15*(3), 565–576.

Doña Ana County. (n.d.). *Colonias initiative*. Retrieved from https://donaanacounty.org/health/supp_info_9

Faridi, Z., Grunbaum, J.A., Gray, B.S., Franks, A., & Simones, E. (2007). Community-based participatory research: Necessary next steps. *Preventing Chronic Disease*. Retrieved from http://www.cdc.gov/pcd/issues/2007/jul/06_0182.htm

Flores, G.E., Bates, S.T., Knights, D., Lauber, C.L., Stombaugh, J., Knight, R., & Fierer, N. (2011). Microbial biogeography of public restroom surfaces. *PloS ONE*, *6*(11), e28132.

Ford, E.W., Boyer, B.T., Menachemi, N., & Huerta, T.R. (2013). Increasing hand washing compliance with a simple visual cue. *American Journal of Public Health*, e1–e6.

Kreuter, M.W., Lukwago, S.N., Bucholtz, R.D., Clark, E.M., & Sanders-Thompson, V. (2003). Achieving cultural appropriateness in health promotion programs: Targeted and tailored approaches. *Health Education & Behavior, 30*(2), 133–146.

Mathai, E., Allegranzi, B., Seto, W.H., Chraïti, M.N., Sax, H., Larson, E., & Pittet D. (2010). Educating health care workers to optimal hand hygiene practices: Addressing the need. *Infection, 38*(5), 349–356.

Mkrtchyan, H.V., Russell, C.A., Wang, N., & Cutler, R.R. (2013). Could public restrooms be an environment for bacterial resistomes? *PloS ONE, 8*(1), e54223.

Otter, J.A., Yezli, S., Salkeld, J., & French, G.L. (2013). Evidence that contaminated surfaces contribute to the transmission of hospital pathogens and an overview of strategies to address contaminated surfaces in hospital settings. *American Journal of Infection Control, 41*(5 Suppl.), S6–S11.

Park, S., Navratil, S., Bauer, A., Srinath, I., Jun, M., Szonyi, B., Nightingale, K., Anciso, J., & Ivanek, R. (2013). Generic *E. coli* contamination of spinach at the preharvest stage: Effects of farm management and environmental factors. *Applied Environmental Microbiology, 79*(4), 474–487.

Phaswana-Mafuya, N., & Shukla, N. (2005). Factors that could motivate people to adopt safe hygienic practices in the Eastern Cape Province, South Africa. *African Health Sciences, 5*(1), 21–28.

Reininger, B.M., Barroso, C.S., Mitchell-Bennett, L., Chavez, M., Fernandez, M.E., Cantu, E., Smith, K.L., & Fisher-Hoch, S.P. (2012). Socioecological influences on health care access and navigation among persons of Mexican descent living on the U.S./Mexico border. *Journal of Immigrant and Minority Health, 16*(2), 218–228.

Resnicow, K., Baranowski, T., Ahluwakia, J.S., & Braithwaite, R. (1999). Cultural sensitivity in public health: Defined and demystified. *Ethnicity and Disease, 9*(1), 10–21.

Schneider, T.R., Feufel, M.A., & Berkel, J.H. (2011). Promoting colorectal cancer screening in public health outreach campaigns. *Human Factors, 53*(6), 637–646.

White, C., Kolble, R., Carlson, R., & Lipson, N. (2005). The impact of a health campaign on hand hygiene and upper respiratory illness among college students living in residence halls. *Journal of American College Health, 53*(4), 175–181.

World Health Organization. (2009). *WHO guidelines on hand hygiene in health care: A summary*. Retrieved from http://whqlibdoc.who.int/hq/2009/WHO_IER_PSP_2009.07_eng.pdf

Zapka, C.A., Campbell, E.J., Maxwell, S.L., Gerba, C.P., Dolan M.J., Arbogast, J.W., & Macinga, D.R. (2011). Bacterial hand contamination and transfer after use of contaminated bulk-soap-refillable dispensers. *Applied and Environmental Microbiology, 77*(9), 2898–2904.

Evaluation of Five Years of Nursing Home Inspection Forms: Structural and Hygiene-Related Violation Trends

Chris Avery, MS, REHS
Charles Humphrey, MS, PhD, REHS
Jo Anne Balany, MS, PhD, CIH
Environmental Health Sciences Program
East Carolina University

Abstract **Health inspections are performed at nursing homes to identify and reduce risk and to help maintain a safe environment for nursing home residents. The study described in this article aimed to identify the most frequent violations, types of violations (hygiene or structural), and repeat violations in nursing home facilities during health inspections; and to determine if the age of the facility influenced inspection scores. Nursing home health inspection forms (N = 131) completed between 2005 and 2011 in Pitt County, North Carolina, were analyzed. Results indicated that 60% of all violations were hygiene-related and could possibly be corrected without significant financial investments by management. Significant correlations occurred between the total number of violations and the facility age (p = .003) and between the number of repeat violations and total violations (p < .001). The average inspection score for nursing homes could be increased by more than three points if sanitation practices were improved.**

Introduction

Nursing homes are an important part of today's society because they provide shelter, health care, and a sense of community to over 1.5 million U.S. citizens (Smith et al., 2008). Most nursing home occupants are elderly or sick and are unable to fully provide for themselves (U.S. Department of Health and Human Services [HHS], 2013). In 2050, the number of Americans aged 65 and older is projected to be 88.5 million, more than double the current population (40.2 million) (HHS, 2010). One of every four persons who reaches the age of 65 can be expected to spend part of his or her life in a nursing home (American Medical Association, 1990). An estimated 15,000 nursing homes are currently operating in this country (American Health Care Association, 2011). Ninety percent of nursing home residents are over 65 years of age, and the mean age of residents is over 80 years (Smith et al., 2008). Nursing home residents must rely on nursing home staff and administration for their general welfare, which includes safe and sanitary living conditions. Without sanitary living conditions, elderly nursing home residents are more at risk for various acute illnesses such as pneumonia, urinary tract infections, cold, and flu (Yoshikawa, 2000). It has been noted that compared with other elderly adults, nursing home residents are often more frail, prone to multiple medical problems and symptoms, and are at a higher risk for adverse outcomes from acute illnesses (Hung, Liu, & Boockvar, 2010). More research is needed concerning sanitation conditions at nursing homes because in recent years, the acute illness of nursing home residents has increased (Smith et al., 2008).

The current nursing home inspection process emerged in the mid-1980s, as the U.S. Congress responded to reports of resident abuse and inadequate enforcement of the nursing home regulations. A report on nursing home quality by the Institute of Medicine (1986) found "serious, even shocking inadequacies" in the enforcement of the regulations. As a result of this report and the efforts of advocacy groups and professional organizations, Congress passed a major reform of nursing home regulation as part of the Omnibus Budget Reconciliation Act of 1987 (Institute of Medicine, 2013).

North Carolina nursing homes must be licensed and comply with state and local sanitation regulations (15A NCAC 18A .1300) that follow federal guidelines. Sanitation inspections are conducted by environmental health specialists (EHS) from local health departments in North Carolina to help ensure that nursing homes provide adequate, sanitary living conditions. Sanitation inspections are conducted at least once per year by EHS personnel. Inspection scoring is on a 10-point scale with 90–100 being an A, 80–89 being a B, and 70–79 being a C. During an inspection, EHS conduct a thorough review of the nursing home, documenting code violations and writing descriptive notes on an inspection form. Items are deducted full credit for repeat violations and half credit for nonrepeat violations. Full credit items can range from one to three points and one half credit can range from 0.5 to 1.5 depending on the violation. High-risk violations carry the larger point values and are associated with items such as hands properly

washed, vermin excluded, lavatories having mixing faucet with soap, water, and drying device, waste water and solid waste disposed properly, and food supply approved. EHS review the completed inspection reports with the nursing home manager. When a facility poses an imminent threat to health of residents, or the facility fails to maintain a minimum score of a C, the North Carolina state inspector is contacted by the county EHS for further review. Actions may include closure, suspension, or intent to suspend a facility. Nursing homes that have a history of serious problems may be inspected more frequently than once per year.

EHS are trained in risk-based inspection techniques. Recommendations are developed for long-term care infection control programs based on interpretation of currently available evidence (Smith et al., 2008). The recommendations cover the structure and function of the inspection control program, including surveillance, isolation precautions, outbreak control, resident care, and employee health (Smith et al., 2008).

Our study included a review and analysis of nursing home sanitation inspection reports conducted in Pitt County, North Carolina, over a five-year period (2005–2010). The objectives of our study were 1) to determine the most frequently reported violations, 2) to determine which violations (structural related vs. hygiene related) were most common, and 3) to determine if the nursing home sanitation scores were related to age of the nursing home facility.

The hypothesis of our study was that the majority of nursing home inspection report violations are related to structural problems that continually receive point deductions because structures deteriorate with age.

Materials and Methods

Nursing home inspection reports completed in Pitt County, North Carolina, between 2005 and 2010 were reviewed. The inspections were performed at 21 nursing homes by EHS with the Pitt County Health Department. The North Carolina state form for the inspection of hospitals, nursing homes, adult care homes, and other institutions was used during all inspections. The form has a total of 48 variables for multiple or single violations that can total 100 points and a comments section where inspectors can include notes specific to each violation. The forms are based on North Carolina General Statue 15A NCAC 18A.1300. Only paper inspection forms were evaluated to eliminate omission errors from computer-generated reports.

Pitt County nursing home inspection reports were analyzed for the frequency of violations, structural violations, hygiene-related violations, and sanitation scores. The violations and corresponding comments were reviewed on each inspection form. Reported violations were categorized into structural and hygiene-related violations. Structural violations were defined as facility changes that were needed to correct the issues through repair or replacement including replacing carpet, repairing walls, replacing furniture, or design issues. Hygiene-related violations were associated with cleaning, practice-related, or risk-based items that could contribute to illness, such as misuse of disinfectants, general cleanliness, improper hand-washing techniques, or poor food-handling procedures. Some violations were marked for both categories when the violation was for repair and cleanliness. The frequency of specific code violations over the five-year period was calculated for each nursing home. The total number of structural violations was compared to the total number of hygiene-related violations to determine which category was more common. When a nursing home had the same violation in sequence, it was recorded as a repeat violation.

The age and history of the facility were determined via interviews with current management. Nursing homes were assigned to age categories based on their age at the beginning of the study period (2005). The nursing homes were bracketed into three categories based on age to avoiding overlapping data into the different age categories as facilities became older during the five-year study period. The three age brackets included 0–14 years, 15–29 years, and 30–45 years. Six nursing homes were each in the 0–14 and 30–45 years age categories, and nine nursing homes were in the 15–29 year category. Spearman's rank correlation analysis for nursing home age, total violations, and repeat violations were performed using SPSS v. 19.

Results

Overall Trends

Twenty-one nursing homes and 131 corresponding inspection forms were evaluated over the five-year evaluation period. An average of 6.4 inspections occurred per facility, and the inspection rate was 1.29 inspections per year. The inspection frequency met the minimum of one inspection per year for the federal and state mandates. The average nursing home age in Pitt County was 25 years. A total of 525 violations were recorded for the five-year period. Three hundred ninety-seven (81%) were nonrepeat violations while 127 (19%) were repeat violations. The average number of repeat violations per facility was 6.0. The facility with the most repeat violations was 13 years old, with 13 violations over the five-year period. The average percentage of nursing homes marked for violations in this study (92.6%) was similar to the national average (91.9%) reported by the U.S. Department of Health and Human Services (2008). A significant correlation occurred between the age of the facility and total number of violations (p = .003), and between the number of total violations and repeat violations (p = .000).

Structural and Hygiene Violations

Two hundred ten structural violations were reported (40% of all violations) and 315 hygiene-related violations were reported (60% of all violations). The most frequent structural violation (n = 32) was "facilities conveniently located, clean, and in good repair" (Table 1). The age group of facilities that had the most structural violations was the 0–14 year category, followed by the 15–29, and 30–45 year categories (Table 1). The age group with the highest average rate of structural violations per nursing home was 0–14 years (2.6/yr.), followed by 30–45 years (2.1/yr.), and 15–29 years (1.5/yr.).

The most frequent hygiene-related violation (n = 37) was associated with "walls and ceilings cleanable, clean, and in good repair (Table 2)." Other common violations were clean floors, carpet, and walls; clean patient contact items; and clean furniture. The age group of facilities that had the most hygiene-related violations was the 15–29 year category, followed by the 30–45 and 0–14 year categories (Table 2). The age group with the highest average rate of hygiene-related violations per nursing home was 30–45 years (3.7/yr.), followed by 15–29 years (3/yr.) and 0–14 years (2.3/yr.). Hygiene-related violations accounted for 359.5 total points over the

course of 115 nursing home inspections, for an average of 3.1 points deducted per inspection. Approximately three hygiene-related violations occurred per inspection.

Discussion

The data did not show more structural than hygiene-related violations as hypothesized. More hygiene-related inspection items (31; 64.5% of total) occurred, however, than structural inspection items (17; 35.5% of total) on the inspection forms. Hygiene-related violations accounted for 60% while structural violations accounted for 40% of the violations reported. This should raise some concern because hygiene-related violations are usually a more significant health risk to patients than minor structural violations, and research has shown that people tend to change their routines under observation or overreport desired practices during such inspections (Biran et al., 2008). Despite any possible attempts to "deceive" nursing home inspectors, the results show that more hygiene-related violations were present than structural violations. An average of 3.1 points was deducted per inspection for hygiene-related violations in Pitt County nursing homes. Most of the hygiene-related violations reported in our study could be easily remedied by cleaning walls and surfaces with soap, water, and a U.S. Environmental Protection Agency–approved disinfectant that provides antimicrobial activity with minimal additional cost or work (Madeo, 2011).

The age bracket with the most violations over the five-year period was 15–29 years (204 violations), but this bracket also had the most nursing homes (nine). When evaluating the average violation rate for each category, the 15–29 year bracket had the lowest violation rate (4.5 violations/yr.), followed by the 0–14 bracket (4.9 violations/yr.), and the 30–46 year bracket (5.8 violations/yr.). Therefore, the oldest nursing home group did have the highest average violation rates, and a significant correlation occurred between the age of the facility and the number of total violations. The lowest violation rate, however, was for the middle bracket. This may be because those nursing homes were maintained and managed better.

Overall, hygiene-related violations were more common than structural violations. Hygiene-related violations are of importance because they can directly influence the health of nursing home residents. For example, Huang and Wu (2008) showed that the infection rate of nursing home residents was significantly decreased after nursing assistants implemented a hygiene program in Taiwan. Providing a health care environment that is aesthetically pleasing, clean, and microbiologically safe remains a key component to combating the spread of health care–associated infections (Madeo, 2011). Swanson and Jeanes (2011) stated that the key components of infection prevention and control that are common to all health care delivery include hygiene-related practices such as routine and proper hand washing, using personal protective equipment, sharps management, decontamination of equipment, identification of infection, surveillance, and education and training. Education is very important because research has shown that inconspicuous items such as laminated menus can harbor potentially pathogenic microorganisms, and thus should be sanitized frequently (Sirsat, Choi, & Neal, 2013). Nursing home assistants may not be aware of these potential hazards if they are not involved in the inspection process.

While EHS reviewed the nursing home inspection reports with the nursing home managers, it is unknown if the results were communicated from nursing home managers to the nursing assistants who provide most of the direct care to residents. If the inspection report information was not communicated to the nursing home staff and care providers, it is unlikely significant corrective changes would be made to improve sanitation and the inspection scores. Bowers and Becker (1992) found that rules and regulations relating to nursing home care were not communicated to the nursing assistants and suggest that nursing assistants need to be more involved in the development of the nursing home protocols. A study by Bowers and co-authors

TABLE **1**

Nursing Home Structural Violations by Facility Age

Items Inspected	Facility Age (yrs.)			Total
	0–14	15–29	30–46	
Floors easy to clean, no obstacles, drains where needed	2	2	2	6
Floors clean, carpet clean, dry, odor free	4	6	5	15
Walls and ceilings cleanable, clean, in good repair	11	8	11	30
Lighting at least 10 foot candles 30 inches above floor	3	1	1	5
Facilities conveniently located, clean, in good repair	13	11	8	32
Toilet rooms free of storage, hand wash signs posted	7	3	4	14
Hand sinks used only for intended purpose	0	0	2	2
Lavatories have mixing faucet or tempered water, soap, hand towel or drying device	2	3	2	7
Lavatory and bathing hot water between 100°F and 116°F	5	4	4	13
Water fountains clean, good repair, properly regulated	2	1	1	4
Ice protected, dispensed, equipment clean, in good repair	2	2	2	6
Vermin excluded	1	0	1	2
Adequate storage, area clean, items properly stored	4	9	5	18
Medication carts clean, sharps containers affixed, food and utensils handled properly	1	1	0	2
Furniture clean and in good repair, mattresses clean, dry, odor free	8	8	7	23
Patient contact items in good repair, properly stored, cleaned, and disinfected	9	9	8	26
Approved utensils and equipment, cleaned and sanitized	3	1	1	5
Total	77	69	64	210

TABLE **2**

Nursing Home Hygiene-Related Violations by Facility Age

Items Inspected	Facility Age (yrs.)			Total
	0–14	15–29	30–46	
Floors clean, carpet clean, dry, odor free	5	6	8	19
Walls and ceilings cleanable, clean, in good repair	8	12	17	37
Ambient air temperature 65°F to 85°F, equipment clean	1	2	2	5
No evidence of microbial growth	3	2	5	10
Indoor smoking limited to dedicated smoking rooms	0	0	0	0
Facilities conveniently located, clean, in good repair	9	11	9	29
Bedpans, urinals, bedside commodes, and emesis basins properly cleaned disinfected	8	11	8	27
Hand sinks used only for intended purpose	0	4	0	4
Lavatories have mixing faucet or tempered water, soap, hand towel or drying device	1	4	2	7
Disinfectant accessible, properly used	0	5	3	8
Approved water supply, no cross connections	0	1	0	1
Water fountains clean, good repair, properly regulated	0	8	2	10
Drinking utensils properly handled	1	8	2	11
Ice protected, dispensed, equipment clean, in good repair	1	6	5	12
Solid waste stored properly, areas clean, facilities for cleaning	1	0	1	2
Solid waste disposed of frequently, no insect breeding or nuisance	1	0	2	3
Medical wastes handled and disposed of properly	0	2	0	2
Vermin excluded	1	1	0	2
Approved pesticides properly stored and handled	1	1	0	2
Premises clean, no breeding places or rodent harborage	0	2	1	3
Adequate storage, area clean, items properly stored	4	4	7	15
Medication carts clean, sharps containers affixed, food and utensils handled properly	2	9	9	20
Feeding syringes and oral suction catheters handled properly, tube-feeding bags changed	0	0	1	1
Furniture clean and in good repair, mattresses clean, dry, odor free	3	9	8	20
Linen changed when soiled, soiled linen handled properly	0	9	4	13
Laundry area and equipment clean, linen disinfected, clean laundry stored and handled separately	11	5	5	21
Patient contact items in good repair, properly stored, cleaned, and disinfected	5	8	7	20
Approved utensils and equipment, cleaned and sanitized	0	1	1	2
Food brought by employees or visitors handled properly	2	1	0	3
Food protected, potentially hazardous food maintained at 45°F or 140°F, consumed or discarded in two hours	2	2	1	5
Hands properly washed or decontaminated	0	1	0	1
Total	70	135	110	315

(2003) indicated that many nursing assistants felt the administrators were dismissive when they discussed organization policies with them. Chung (2012) concludes that nursing assistants should be more involved in the inspection process to help reduce the chasm between administrators—"them"—and assistants—"us." Therefore, it may be beneficial for the staff to participate in the inspection review with the nursing home managers and EHS to ensure the messages are communicated to the assistants.

Pitt County EHS work in different territories of the county and are assigned nursing homes within their territory. It is possible that subjectivity played a role in the nursing home inspection process and grades. Each EHS, however, was authorized by the state of North Carolina pertaining to nursing home regulations and inspection protocols. Furthermore, Pitt County uses several quality control and quality assurance steps to ensure consistency among EHS, including regular "ride-along" exercises by the EHS supervisor with inspectors, departmental review of inspection grading sheets, the scheduling of routine staff meetings to discuss inspection report grading, and participation in professional development workshops.

Conclusion

Health inspections are important for nursing home residents because they aim to ensure a safe and healthy environment. Without sanitary living conditions, nursing home residences are more at risk for various acute illnesses such as pneumonia, urinary tract infections, cold, and flu. Data indicated a higher frequency of hygiene-related violations, which are relatively inexpensive for a facility to correct in comparison to structural defects. With improved sanitation practices, the mean nursing home inspection score could increase by more than three points. It is important for facilities to eliminate hygiene-related violations to lower nursing home residents' risk for acute illnesses.

Corresponding Author: Charles Humphrey, Assistant Professor, Environmental Health Sciences, East Carolina University, 3408 Carol Belk, Greenville, NC 27858.
E-mail: humphreyc@ecu.edu.

References on page 18

References *continued from page 17*

American Health Care Association. (2011). *Oscar data reports: Nursing facility total, average and median number of patients per facility, and ADL dependence*. Retrieved from http://www.ahcancal.org/research_data/oscar_data/Nursing%20Facility%20Operational%20Characteristics/OperationalCharacteristicsReport_Jun2011.pdf

American Medical Association. (1990). American Medical Association white paper on elderly health: Report of the council on scientific affairs. *Archives of Internal Medicine, 150*(12), 2459–2472.

Biran, A., Rabie, T., Schmidt, W., Juvekar, S., Hirve, S., & Curtis, V. (2008). Comparing the performance of indicators of handwashing practices in rural Indian households. *Tropical Medicine International Health, 13*(2), 278–285.

Bowers, B.J., & Becker, M. (1992). Nurse's aides in nursing homes: The relationship between organization and quality. *The Gerontologist, 32*(3), 360–366.

Bowers, B.J., Esmond, S., & Jacobson, N. (2003). Turnover reinterpreted: CNAs talk about why they leave. *Journal of Gerontological Nursing, 29*(3), 36–43.

Chung, G. (2012). Nursing assistant views on nursing home regulatory inspection: Knowledge and attitudes regarding the state nursing home survey. *Journal of Applied Gerontology, 31*(3), 336–353.

Huang, T.T., & Wu, S.C. (2008). Evaluation of a training programme on knowledge and compliance of nursing assistants' hand hygiene in nursing homes. *Journal of Hospital Infection, 68*(2), 164–170.

Hung, W.W., Liu, S., & Boockvar, K.S. (2010). A prospective study of symptoms, function, and medication use during acute illness in nursing home residents: Design, rationale, and cohort description. *BMC Geriatrics, 10*, 47.

Institute of Medicine. (1986). *Improving the quality of care in nursing homes*. Washington, DC: National Academies Press.

Institute of Medicine. (2013). *Actions taken as a result of the report "Improving the quality of care in nursing homes."* Retrieved from http://www.iom.edu/Reports/1986/Improving-the-Quality-of-Care-in-Nursing-Homes.aspx

Madeo, M. (2011). Cleaning the hospital environment—a focus on Difficil-S. *British Journal of Nursing, 20*(11), 688–693.

Sirsat, S.A., Choi, J.K., & Neal, J.A. (2013). Persistence of *Salmonella* and *E. coli* on the surface of restaurant menus. *Journal of Environmental Health, 75*(7), 8–14.

Smith, P.W., Bennett, G., Bradley, S., Drinka, P., Lautenbach, E., Marx, J., Mody, L., Nicolle, L., & Stevenson, K. (2008). Shea/apic guideline: Infection prevention and control in the long-term care facility. *Infection Control and Hospital Epidemiology, 29*(9), 785–814.

Swanson, J., & Jeanes, A. (2011). Infection control in the community: A pragmatic approach. *British Journal of Community Nursing, 16*(6), 282–288.

U.S. Department of Health and Human Services, Administration on Aging. (2010). *Aging statistics*. Retrieved from http://www.aoa.gov/AoARoot/Aging_Statistics/index.aspx

U.S. Department of Health and Human Services, Administration on Aging. (2013). *Aging into the 21st century, health, nursing home usage*. Retrieved from http://www.aoa.gov/AoARoot/Aging_Statistics/future_growth/aging21/health.aspx#Nursing

U.S. Department of Health and Human Services, Office of Inspector General. (2008). *Trends in nursing home deficiencies and complaints*. Retrieved from https://oig.hhs.gov/oei/reports/oei-02-08-00140.pdf

Yoshikawa, T.T. (2000). Epidemiology and unique aspects of aging and infectious diseases. *Clinical Infectious Diseases, 30*(6), 931–933.

- ✓ 100% 'browser' web-based.
- ✓ Federal, state and local Environmental Health clients nation-wide.
- ✓ 2012 Crumbine Winner uses our full suite of EH applications.
- ✓ CDPmobile - the most intuitive form-filling data-capture interface imaginable on the market today for use on tablets.
- ✓ All development performed in U.S.
- ✓ Data centers are CDP owned and operated in the U.S.
- ✓ Fully-staffed software development and maintenance line of business providing architecture, requirements, system design, coding, testing, and implementation and support services.

- ✓ Portfolio includes 30 years of design, development and implementation of large scale workflow management, data collection, transaction processing and business intelligence solutions for use within the government health management environment.
- ✓ Specializing in redundant system componentry designed for high availability and supported by multiple, fully independent and redundant telecommunications links.
- ✓ Only Environmental Health Software vendor with experience/breadth of full suite of Public Health programs:
  - Clinic
  - WIC
  - WIC EBT
  - Public Financials

CDP's success is based on a fundamental set of beliefs: since our clients serve the public - we must uphold the highest level of support, value, and ethics. Evidence of this success can be found in our longevity of service, our reputation, and our references - none more valuable than our longstanding clients.

cdpehs.com
info@cdpehs.com
800.888.6035

Sanitation in Classroom and Food Preparation Areas in Child-Care Facilities in North Carolina and South Carolina

Kelly C. Wohlgenant
Sheryl C. Cates
RTI International

Angela Fraser
Clemson University

Benjamin Chapman
Lee-Ann Jaykus
North Carolina State University

Xi Chen
Clemson University

Abstract **Approximately 60% of U.S. children aged five and younger spend time in child-care settings. Such environments increase the risk of diarrheal disease, including diseases caused by enteric pathogens. To describe adherence to sanitation standards in classrooms and food preparation areas in child-care facilities, the authors conducted site visits in 40 North Carolina and South Carolina child-care facilities. Audits in up to two classrooms (rooms providing care for infants and toddlers) and the kitchen were performed using a form similar to a regulatory inspection form. Audit data were used to calculate indices to describe adherence to sanitation standards and were based on state environmental health regulations for child-care centers, the Food and Drug Administration's *Food Code 2009*, and guidance from food safety experts. Most facilities participating in the authors' study adhered to sanitation standards within the classroom; however, deficiencies with regard to sanitation in food preparation areas and refrigerator operating temperatures were noted. These results provide insight into possible risk factors for enteric disease transmission in child-care facilities.**

Introduction

Children five years of age and younger are at greater risk for foodborne illness because of their developing immune systems, among other factors (Koehler et al., 2006). One Texas study found that children aged zero to two years are 17 times more likely to develop foodborne illness than children who are three to five years (Sullivan, Woodward, Pickering, & DuPont, 1984). In addition to age, child-care attendance is a risk factor for contracting diarrheal disease. The association between child-care attendance and increased risk for diarrheal disease is well documented and, depending on the study, children cared for outside the home are 2.3 to 3.5 times more likely to experience diarrheal disease than those cared for in the home (Lu et al., 2004).

In the U.S., 60% of children under six years of age spend time in nonparental child care (National Center for Education Statistics, 2005). Among children who spend time in nonparental care, 36% are cared for in center-based facilities an average of 29 hours per week and 9% spend time in home-based facilities an average of 36 hours per week (Daniel J. Evans School of Public Affairs, 2006/2007). These types of environments can be reservoirs for pathogens associated with foodborne routes. Many child-care employees are inadequately trained in proper food safety and hygiene practices, and often only the director receives formal food safety training (Enke, Briley, Curtis, Greninger, & Staskel, 2007). Lack of appropriate personal hygiene practices is a well-documented mode of transmission for foodborne illness caused by *E. coli* O157:H7, rotaviruses, *Shigella*, and other pathogens (Heymann, 2004). Sullivan and co-authors (1984) reported that diapering and handling food by the same caregiver resulted in high rates of diarrhea among children in 736 licensed child-care facilities in Texas.

Our study was designed to examine the hygiene and sanitation practices of child-care workers to learn more about potential causes of pathogen dissemination in the child-care environment. Because the known transmission routes for diarrheal illnesses are through person-to-person contact, fomites, and ingestion of contaminated food, the project team used a combination of data collection approaches (Brady, 2005). Methods included surveys of child-care facility directors, direct observations of providers within the classrooms, microbial hand and surface sampling, and environmental kitchen and classroom audits. This article presents the results of the surveys of child-care facility directors and the kitchen and classroom audits.

Methods

The institutional review boards at Clemson University, North Carolina State University, and RTI International approved the study protocol and informed consent was obtained from all participants.

Recruitment

We used convenience sampling to recruit 40 licensed center and home-based child-care facilities in North and South Carolina. Inclusion criteria included the following: 1) facility must operate year round; 2) facility must not be a drop-in only facility; 3) facility must not provide services exclusively for a special population of children (e.g., services for only mentally

TABLE **1**

Calculation of Sanitation Indices

Kitchen Sanitation Index (Index Score 0–10)[a]
Food stored at least six inches off the floor
Food in closed containers or packages
Stove and refrigerator clean and in good repair
Proper dish washing set up[b]
Hand wash sink has soap
Hand wash sink has approved drying device
Workers wearing clean clothes during food preparation
Workers wearing hair restraints during food preparation
Workers wearing gloves during food preparation
Workers not wearing jewelry during food preparation
Classroom Sanitation Index (Index Score 0–8)[c,d,e]
Soft surface toys clean and in good condition
Trash cans clean
Non-diaper trash cans lined
Eating surfaces clean and in good repair
Floor areas where children play clean
Hand wash sink has warm water
Hand wash sink has soap
Hand wash sink has approved drying device

[a]The following items were omitted from the index because all observations were in compliance once missing and not applicable values were imputed: clean dishes and utensils stored at least six inches off the floor, work table clean and in good repair, and hand wash sink has warm water.

[b]Based on proper sink setup/sanitizer test kit available for facilities that washed dishes by hand or dish washing machine working.

[c]The following items were omitted from the index because all observations were in compliance once missing and not applicable values were imputed: child-care providers well groomed; child-care providers in good health; children's belongings in clean, dry place; hard-surface toys clean and in good repair; and changing pads or other changing surfaces clean and in good repair.

[d]Approximately 55% of home-based child-care facilities did not have a diaper trash can (e.g., soiled diapers were disposed of in a trash can outside the home); thus, the audit items related to the diaper trash can were excluded from the index.

[e]Sixty-seven percent or fewer classrooms had bedding, cribs, play mats, or high chairs; thus, these audit items were excluded from the index.

TABLE **2**

Characteristics of Child-Care Facilities

Characteristic	Centers (*n* = 27)	Homes (*n* = 8)	All Facilities (*N* = 35)[a]
Meal preparation			
Types of meals and snacks served to infants and toddlers[b]			
Meals/snacks sent in by child's parents	74.1%	25.0%	62.9%
Meals/snacks cooked and prepared by facility	48.1%	87.5%	57.1%
Meals/snacks purchased by facility from outside food service operation	33.3%	0.0%	25.7%
Meals/snacks in ready-to-eat, single-serving containers purchased and prepared by facility	14.8%	25.0%	17.1%
Other	14.8%	0.0%	11.4%
Average number of meals served	1.6	2.1	1.8
Average number of snacks served	1.7	1.4	1.6
Food preparer has food safety certification	42.9%	12.5%	34.5%
Employees			
Years experience as facility director			
Under 1 year	3.7%	0.0%	2.9%
1–5 years	22.2%	37.5%	25.7%
6–10 years	29.6%	25.0%	28.6%
11–15 years	18.5%	12.5%	17.1%
16 or more years	25.9%	12.5%	22.9%
No answer	0.0%	12.5%	2.9%
Mean number of employees			
Management	1.6	N/A	1.6
Child care providers	14.1	N/A	13.7
Food preparation employees who do not also provide child care	0.7	N/A	0.8
Other	0.5	N/A	0.5
Total	17.0	N/A	16.6
Average number of years of experience for all types of employees (%)			
1–5 years	0.0%	N/A	0.0%
6–10 years	37.0%	N/A	35.7%
11–15 years	44.4%	N/A	46.4%
16 or more years	11.1%	N/A	10.7%
No answer	7.4%	N/A	7.1%

continued on page 22

impaired or physically challenged children); 4) facility must provide care to children less than five years old; and 5) facility must serve lunch and snack to toddlers daily.

Study incentives were tailored to the needs of each state. North Carolina directors and their staff were offered free admission to a food safety training course, and South Carolina directors received several children's books. After on-site data collection, directors were contacted by phone for a follow-up interview and offered a $50 gift card for their participation.

Data Collection

Site visits were conducted from January 2010 to February 2011. Of the 40 licensed facilities visited, we excluded five from the analysis dataset because they only had preschool aged children (aged three to five) present the day of the site visit. Excluding these sites

allowed for consistency so that all data was from classrooms (infant, toddler, or combined infant/toddler) in which children were still in diapers, a factor that may increase the likelihood of pathogen transmission in child-care facilities (Arvelo et al., 2009).

The final sample size included 35 facilities—27 centers (77%) and 8 homes (23%). Fourteen of the facilities (40%) were located in North Carolina and 21 (60%) were located in South Carolina. Data were collected in two classrooms at 16 facilities; thus, the sample size for classroom-level data was 51 rooms. Data were also collected from the kitchens of 29 facilities. At the time of the site visit, the facility director completed a self-administered questionnaire to collect information on the characteristics of the facility and training. We conducted a follow-up survey from June to August 2011 with 27 of the child-care facility directors to collect additional information on the facilities' sanitation practices.

Audit Forms

The audit forms were designed to assess sanitary conditions of the facilities and were primarily based on North and South Carolina's environmental health regulations for child-care centers (North Carolina Department of Environment and Natural Resources, Office of Environmental Health Services, 2007; South Carolina Department of Social Services, 2006). For conflicting regulations, the audit item was based on guidance from food safety experts and the Food and Drug Administration (FDA) *Food Code 2009* (FDA, 2013). Separate audit forms for kitchens and classrooms were developed. Each form consisted of a checklist in which data collectors were instructed to check "Yes" for compliance, "No" for deviation, or "NA" for "Not applicable," with additional space provided for notes.

The kitchen audit form collected the following information: proper storage of dry food and dishes/utensils, cleanliness and condition of equipment, compliance with hand sink requirements (e.g., soap availability), worker hygiene (if handling food during audit), compliance with dishwashing requirements, whether food thermometer was present, and whether an employee had received food safety certification. The data collector recorded whether a thermometer was present in the refrigerator and measured the ambient refrigerator temperature using a metal-stem thermometer.

TABLE **2** *continued from page 21*

Characteristics of Child-Care Facilities

Characteristic	Centers (*n* = 27)	Homes (*n* = 8)	All Facilities (*N* = 35)
Facility Characteristics			
Type			
For profit (*n* = 21)	48.2%	100.0%	60.0%
Nonprofit (*n* = 11)	40.7%		31.4%
No answer (*n* = 3)	11.1%		8.6%
For profit–independently owned and operated	92.3%	100.0%	95.2%
For profit—chain	7.7%		4.8%
Nonprofit—Head Start[b]	18.2%		18.2%
Nonprofit—church sponsored[b]	54.6%		54.6%
Nonprofit—business/corporate sponsored[b]	9.1%		9.1%
Nonprofit—public school sponsored[b]	9.1%		9.1%
Nonprofit—other[b]	9.1%		9.1%
Participants in Child and Adult Care Food Program	37.0%	75.0%	45.7%
Accredited by National Association for the Education of Young Children[b]	11.1%	25.0%	14.3%
Mean number of children			
Infants (<12 months)	7.4	0.8	5.9
Toddlers (~12–23 months)	12.1	1.6	9.6
All children	82.9	6.5	64.9

[a]Note: For some characteristics, not all 35 facility directors responded to survey question. N/A = not applicable.
[b]Respondents could select multiple answers.

The classroom audit collected the following information: cleanliness and health of providers, health of children, cleanliness and condition of equipment and toys, compliance with trash can requirements for diaper and other trash cans, compliance with hand sink requirements, and cleanliness and condition of surfaces (diapering, eating, and floor areas). If the classroom had a refrigerator, the data collector recorded whether a thermometer was present and measured the ambient refrigerator temperature using a metal-stem thermometer. For audit items referring to a provider's or object's "cleanliness," the item was considered in compliance if it was free of visible dirt, soil, or debris.

Before full-scale data collection, the questionnaire and audit forms were pretested at five local child-care facilities (three centers and two homes) and minor changes were made.

Data Analysis

We computed proportions for categorical variables and means for continuous variables. We computed separate indices to provide an aggregate measure of the sanitation of the kitchen versus the classrooms (see Table 1). For each item included in the index, a value of 0 was assigned for noncompliant items, and a value of 1 was assigned for compliant items. For cases with missing or not applicable values, data were imputed based on the distribution for centers or homes (depending on facility type). An index score was calculated by summing across all items, and then a mean index was computed for all observations. If the value for any one item was equal to 1 or compliant for all observations, then the item was omitted from the index calculation because it would have no effect across groups. Also omitted from the index calculation were audit items for which 25% or more of the facilities did not have the item evaluated. Food preparation variables, including ambient temperatures collected from the kitchen and classroom refrigerators (if present), presence of a food thermometer in kitchen, and food safety certification were not included in the sanitation indices. Analyses were conducted using SAS v. 9.2.

TABLE **3**

Provision of Food Safety, Hygiene, and Sanitation Training and Written Policies and Procedures to Child-Care Facilities

Characteristic	Facility Type (%)		
	Centers (*n* = 27)	Homes (*n* = 8)	All Facilities (*N* = 35)[a]
Types of training provided to new employees[b]			
Safe food handling	70.4	87.5	74.3
Hygiene practices	81.5	50.0	74.3
Sanitation practices	92.6	62.5	85.7
Types of ongoing training provided[b]			
Safe food handling	51.9	87.5	60.0
Hygiene practices	77.8	50.0	71.4
Sanitation practices	85.2	50.0	77.1
Frequency of ongoing training provided			
At least monthly	14.8	0.0	11.4
At least quarterly	18.5	12.5	17.1
At least annually	51.9	50.0	51.4
Less than annually	0.0	25.0	5.7
Never	11.1	12.5	11.4
No answer	3.7	0.0	2.9
Facility has written policy or procedure[b]			
Hand washing	81.5	87.5	82.9
Food preparation	48.1	37.5	45.7
Diaper changing	88.9	87.5	88.6
Surface washing (method for disinfecting countertops, table tops, or other surfaces)	77.8	75.0	77.1
Removing, replacing, or covering shoes when entering rooms that infants use for play	18.5	0.0	14.3
Sick employees	74.1	62.5	71.4
Sick children	96.3	100.0	97.1

[a]For some characteristics, not all 35 facility directors responded to survey question.
[b]Respondents could select multiple answers.

Results

Results are shown for all facilities and by type of facility (center vs. home). Statistical testing of differences was not conducted for the two types of facilities because of the small sample size.

Facility Characteristics and Training

Table 2 provides the characteristics of the child-care facilities and Table 3 describes the facilities' food safety, hygiene, and sanitation training, and written policies and procedures. Although center-based facilities most often served food sent in by parents (74.1%), home-based facilities most often prepared meals for children (87.5%). Among both center and home-based facilities, an average of 1.8 meals and 1.6 snacks were served daily. New employee training in safe food handling, hygiene, or sanitation was provided by 91.4% or more of facilities. Most (88.6%) facilities also provided ongoing training, with 58.1% of these facilities providing such training annually. Most facilities had written sanitation and hygiene policies and procedures, but only 45.7% had written policies and procedures for food preparation.

Kitchen and Classroom Audits

Table 4 provides the results of the kitchen audits for facilities with separate food preparation areas (*N* = 29). Compliance was 90% or better for many items such as clean dishes and utensils stored at least six inches off the floor and work table clean and in good repair. Fewer than 17 facilities, however, were in compliance with the following items: food handlers wearing effective hair restraints, food handlers wearing gloves, sanitizer test kit available for facilities that wash dishes by hand, and a food thermometer available.

Table 5 provides the results of the classroom audits (*N* = 51). Compliance was 90% or better for many items such as children's belongings in clean dry place, hard-surface toys clean and in good repair, and changing pads or other changing surfaces clean and in good repair. Only 66.0% of 47 classrooms with diaper trash cans had trash cans with hands-free covers.

Follow-Up Survey

Table 6 provides the results of the follow-up survey on additional sanitation practices. Seventy percent of the facilities washed dishes, and of these, most sanitized dishes using a Steramine solution (36.8%) or chlorine solution (31.6%).

Sanitation Indices

The mean kitchen sanitation index (0 to 10) was 7.3 (standard deviation [*SD*] = 1.5) for all facilities, 7.9 (*SD* = 1.3) for centers, and 6.0 (*SD* = 1.1) for homes. The mean classroom sanitation index (0 to 8) was 7.7 (*SD* = 0.7) for all facilities, 7.8 (*SD* = 0.5) for centers, and 7.4 (*SD* = 1.4) for homes.

Food Preparation

For facilities with separate kitchens (*N* = 29), 47.6% of centers and 62.5% of homes had refrigerators with ambient temperatures >39°F. For classrooms with refrigerators used to store food and beverages for children (*N* = 29), 40.0% of centers and 75.0% of homes had refrigerators with ambient temperatures >39°F.

For facilities with separate kitchens, 41.4% did not have food thermometers available (33.3% of centers and 62.5% of homes), and only 34.5% of the facilities' workers had food safety certifications (42.9% of centers and 12.5% of homes).

Discussion

Among both center and home-based facilities with kitchens, excellent dry food storage practices, equipment sanitation practices, and adequate dish washing equipment

was observed. In the classrooms, providers appeared to be well groomed and in good health so as to minimize risk for spreading pathogens to children. Toys and equipment such as play mats, cribs, bedding, and high chairs appeared to be clean and in good repair, and hand washing stations were adequately stocked with soap, warm water, and an approved drying device as required by state regulations. Only 46 of 51 facilities had diaper trash cans in the classrooms; however, the majority of trash cans were in compliance, meaning they were clean, covered, and plastic lined.

Although we observed a number of audit items that suggest that child-care facilities follow safe sanitation practices, we also observed items that were not in compliance with state environmental health regulations or were not recommended best practices according to the FDA *Food Code 2009* (FDA, 2013). Facilities with separate kitchens could use improvement in several areas. First, only 23.5% of the workers in centers wore effective hair restraints. Although child-care facilities are not subject to the *Food Code* requirement to wear a hat or other type of hair covering such as a hair net, we used the *Food Code* because the North and South Carolina regulations for effective hair restraints differ.

Only 33.3% of workers at both center and home-based facilities were observed to wear single-use gloves while preparing food. This was not unexpected because workers in South Carolina are not required to wear gloves and workers in North Carolina are only required to wear gloves if nails are painted or artificial. Although gloves can be a physical barrier for pathogen transfer, some studies suggest that gloves may give food workers a false sense of security and even lessen hand washing frequency (Green et al., 2007; Todd, Michaels, Greig, Smith, & Bartleson, 2010). Thus, this finding may not be of particular concern.

Only 48% of facilities that washed dishes by hand had a sanitizer test kit. In lieu of the test kit requirement, the North and South Carolina inspection agencies allow immersion of dishes for at least one minute in clean hot water at a temperature of at least 170°F. The follow-up survey found that 7 of the 12 facilities that did not have test kits were not in compliance since they did not use the immersion method. Because only a subset of facilities participated in the follow-up survey, future research should investigate this finding.

TABLE **4**

Results for the Kitchen Audit

Item	% of Kitchens		
	Centers (n = 21)	Homes (n = 8)	All Facilities (N = 29)
Storage			
Dry food at least 6 inches off floor (n = 28)	90.0	100.0	92.9
Dry food in closed containers/packages	90.5	100.0	93.1
Clean dishes and utensils at least 6 inches off floor	100.0	100.0	100.0
Equipment clean and in good repair[a]			
Stove (n = 27)	100.0	75.0	92.6
Refrigerator (n = 28)	95.0	87.5	92.9
Work table (n = 29)	100.0	100.0	100.0
Hand sinks			
Warm water available	95.2	100.0	96.6
Soap available	85.7	87.5	86.2
Approved drying device	90.5	62.5	82.8
Workers[b]			
Wearing clean clothes	100.0	87.5	95.8
Wearing effective hair restraints[c]	23.5	100.0	16.7
Wearing gloves	47.1	0.0	33.3
Not wearing jewelry	82.4	71.4	79.2
Dishwashing			
Proper sink setup for facilities that wash dishes by hand (n = 23)	93.3	100.0	95.7
Dishwashing machine working (n = 9)	100.0	100.0	100.0
Refrigerator			
Thermometers in refrigerator	90.5	87.5	89.7
Ambient temperature of refrigerators was 39°F or below as measured by data collector	42.9	37.5	41.4
Measuring device			
Sanitizer test kit (n = 23)[d]	66.7	12.5	48.0
Food thermometer	66.7	37.5	58.6

[a]For kitchens with the equipment present: the number of kitchens audited with the item present is provided in the table.
[b]For kitchens with workers handling food during the audit (N = 24; n = 7 homes; n = 17 centers).
[c]Evaluated based on *Food Code 2009* recommendations.
[d]For facilities that washed dishes by hand.

Overall, center-based kitchens were in greater compliance with our audit form than were home-based kitchens as indicated by the sanitation index scores (7.9 centers vs. 6.0 homes). This finding is of particular concern given that a greater percentage of home-based facilities (87.5%) prepare meals and snacks for children than do center-based facilities (48.1%). These results and the fact that a smaller percentage of home-based child-care facility employees have received hygiene and sanitation training compared with employees of center-based facilities underscore the need for increased sanitation and hygiene training for employees of home-based facilities. Our study results suggest that education for home-based facilities should stress the importance of using disposable paper towels as opposed to wash cloths or dish towels to dry hands after hand washing.

Our study findings suggest that both center- and home-based facilities can improve their food preparation practices. Many facilities (41.4%) did not have a metal-stem food

TABLE **5**

Results for the Classroom Audit

Item	% of Rooms		
	Centers (*n* = 43)	Homes (*n* = 8)	All Facilities (*N* = 51)
Providers			
Child care providers well groomed	100.0	100.0	100.0
Child care providers in good health	100.0	100.0	100.0
Children			
Children in good health	86.0	100.0	88.2
Children's personal belongings in clean, dry place	100.0	100.0	100.0
Equipment/toys clean and in good condition[a]			
Bedding (*n* = 30)	88.5	50.0	83.8
Cribs (*n* = 34)	100.0	80.0	97.1
Play mats (*n* = 31)	92.0	83.3	90.3
Soft toys (*n* = 50)	97.7	100.0	98.0
Hard toys (*n* = 51)	100.0	100.0	100.0
High chairs (*n* = 24)	95.7	100.0	91.7
Trash cans[b]			
Trash cans clean (*n* = 50)	97.7	87.5	96.0
Diaper trash can plastic lined (*n* = 46)	95.2	50.0	91.3
All other trash cans plastic lined (*n* = 46)	94.9	100.0	95.7
Cover on diaper trash can (*n* = 47)	93.0	75.0	91.5
Hands-free cover on diaper trash can (*n* = 47)	67.4	50.0	66.0
Hand sinks			
Warm water available	95.3	100.0	96.1
Soap available	97.7	87.5	96.1
Approved drying device available	93.0	87.5	92.2
Surfaces[c]			
Changing pads/surfaces clean and in good repair (*n* = 49)	100.0	100.0	100.0
Eating surfaces clean and in good repair (*n* = 45)	100.0	87.5	97.8
Floor areas where children play clean (*n* = 51)	95.3	87.5	94.1
Refrigerator (*n* = 29)[d]			
Thermometers in refrigerator	76.0	75.0	75.9
Ambient temperature of refrigerators was 39ºF or below as measured by data collector	28.0	0.0	24.1

[a]For rooms with the item present. The number of rooms audited with the items is provided in the table.
[b]For rooms with trash cans. The number of rooms audited with trash cans is provided in the table.
[c]For rooms with the surface. The number of rooms audited with the surface is provided in the table.
[d]For rooms with refrigerators.

thermometer as required by state regulations to ensure that the internal temperature of cooked foods is correct. It is difficult to know the implication of this finding without knowing the exact types of foods served to children. Future research should examine the types of foods served in child-care settings; in particular, home-based facilities that are often not subject to regulations or routine inspection and, as suggested by our study, may often prepare more meals for children than center-based facilities.

Finally, although most facilities had appliance thermometers in kitchen refrigerators, only 41.4% had refrigerators with ambient temperatures of 39ºF or below as measured by a data collector. These results suggest that potentially hazardous foods were not likely remaining at 41ºF as recommended by the *Food Code*, posing a potential health risk to children. This was even more of a concern for classroom refrigerators used to store food and infant formula (75.9% of rooms had refrigerators at unsafe temperatures). Almansour and co-authors (2011) measured the temperature of sack lunches sent in by parents at child-care centers, some of which were stored in classroom refrigerators, and found that they were kept at unsafe temperatures.

Our study findings closely mimic what has been found when investigating consumer understanding of recommended refrigeration practices in which researchers found that many consumers are not aware of the recommended temperature for domestic refrigerators (Kosa, Cates, Karns, Godwin, & Chambers, 2007). A study of institutional food service settings in elementary schools found a slightly higher rate of compliance (71%) in elementary schools for keeping potentially hazardous foods at recommended holding temperatures (FDA, 2010).

Although only required by South Carolina's regulations, 34% of diaper trash cans did not have hands-free covers as recommended by the American Academy of Pediatrics guidelines (American Academy of Pediatrics, 2011). This recommendation is supported by a study conducted by Kotch and co-authors (2007) that showed that child-care centers that had specialized diaper-changing and other equipment including hands-free diaper trash receptacles had a significant reduction in the frequency of diarrheal illness among children. Therefore, child-care facilities can potentially improve sanitation by simply incorporating trash cans with hands-free covers.

It is important to consider the limitations of our study. First, the site visits were only conducted in 35 facilities in North and South Carolina that were recruited via convenience sampling. Thus, study findings are not generalizable to a larger population of child-care facilities. Additionally, site visits were not unannounced. Therefore, participants may not have behaved as they would normally—a bias known as the Hawthorne effect. Data were only collected during one point in time, so it is possible that observed practices are

not representative of the facilities' typical practices. Finally, although facilities showed compliance with some practices, and a relative lack of compliance with other practices, the public health significance of these findings is unknown because data on facility diarrheal rates was not collected.

Despite these limitations, our study has informed the development of educational materials for the training of child care workers (www.fightbac.org/campaigns/fightbac-goes-to-childcare).

Conclusion

Overall, child-care facilities audited in our study adhered to recommended sanitation practices in the classrooms, but improvements are needed with regard to sanitation practices in facility kitchens. This is especially true for home-based facilities where more meals are prepared for children than in center-based facilities, and, unlike center-based facilities, home-based facilities are not subject to regular environmental health inspections in many states. With regard to kitchen and classroom refrigerators, improvements are needed to ensure the temperature remains at 39°F or below. It is recommended that staff periodically check that refrigerator thermometers are calibrated properly and check the ambient temperatures of the refrigerators daily. Our study provided insight into the potential transmission modes for enteric pathogens in child-care facilities in North and South Carolina and identified how facilities can improve sanitation practices. Increased education for staff that is focused on the gaps identified can potentially prevent young children from contracting foodborne illness.

TABLE **6**

Results of the Follow-Up Survey

Item	% of Rooms		
	Centers (*n* = 24)	Homes (*n* = 3)	All Facilities (*N* = 27)
Wash dishes	66.7	100.0	70.4
If wash dishes, methods used for sanitizing dishes[a]			
Submerge dishes in a Steramine solution	43.8	0	36.8
Submerge dishes in hot water at least 170°F	12.5	0	10.5
Submerge dishes in a chlorine solution	37.5	0	31.6
Use a dishwashing machine (e.g., dishwasher) with a sanitizing cycle	6.3	33.3	10.5
Other method used to sanitize or clean dishes	18.8	100.0	31.6

[a]Respondents could select multiple answers.

Corresponding Author: Sheryl C. Cates, RTI International, 3040 Cornwallis Road, Research Triangle Park, NC 27709. E-mail: scc@rti.org.

References

Almansour, F.D., Sweitzer, S.J., Magness, A.A., Calloway, E.E., McAllaster, M.R., Roberts-Gray, C.R., Hoelscher, D.M., & Briley, M.E. (2011). Temperature of foods sent by parents of preschool-aged children. *Pediatrics, 128*(3), 519–523.

American Academy of Pediatrics. (2011). *Health promotion and protection. National health and safety performance standards: Guidelines for out-of-home child-care (3rd ed.)*. Retrieved from http://nrckids.org/CFOC3/PDFVersion/PDF_Color/CFOC3_ch3.pdf

Arvelo, W., Hinkle, C.J., Nguyen, T.A., Weiser, T., Steinmuller, N., Khan, F., Gladbach, S., Parsons, M., Jennings, D., Zhu, B.P., Mintz, E., & Bowen, A. (2009). Transmission risk factors and treatment of pediatric shigellosis during a large daycare center-associated outbreak of multidrug resistant *Shigella sonnei*: Implications for the management of shigellosis outbreaks among children. *The Pediatric Infectious Disease Journal, 28*(11), 976–980.

Brady, M.T. (2005). Infectious disease in pediatric out-of-home child-care. *American Journal of Infection Control, 33*(5), 276–285.

Daniel J. Evans School of Public Affairs, University of Washington. (2006/2007). *Fact sheet: Percent of all non-parental child-care hours by type of child-care*. Seattle: Author.

Enke, A.A., Briley, M.E., Curtis, S.R., Greninger, S.A., & Staskel, D.M. (2007). Quality management procedures influence the food safety practices of child-care centers. *Early Childhood Education Journal, 35*(1), 75–81.

Green, L.R., Radke, V., Manson, R., Bushnell, L., Reimann, D.W., Mack, J.C., Motsinger, M.D., Stigger, T., & Selman, C.A. (2007). Factors related to food worker hand hygiene practices. *Journal of Food Protection, 70*(3), 661–666.

Heymann, D.L. (2004). *Control of communicable diseases manual* (pp. 139, 161, 230, 225–226, 248, 250, 488–489, 514). Washington, DC: American Public Health Association.

Koehler, K.M., Lasky, T., Fein, S.B., Delong, S.M., Hawkins, M.A., Rabatsky-Ehr, T., Ray, S.M., Shiferaw, B., Swanson, E., & Vugia, D.J. (2006). Population-based incidence of infection with selected bacterial enteric pathogens in children younger than five years of age, 1996–1998. *The Pediatric Infectious Disease Journal, 25*(2), 129–134.

Kosa, K.M., Cates, S.C., Karns, K., Godwin, S.L., & Chambers, D. (2007). Consumer home refrigeration practices: Results of a web-based survey. *Journal of Food Protection, 70*(7), 1640–1649.

References

Kotch, J.B., Isbell, P., Weber, D.J., Nguyen, V., Savage, E., Gunn, E., Skinner, M., Fowlkes, S., Virk, J., & Allen, J. (2007). Hand-washing and diapering equipment reduces disease among children in out-of-home child-care centers. *Pediatrics, 120*(1), e29–36.

Lu, N., Samuels, M.E., Shi, L., Baker, S. L., Glover, S.H., & Sanders, J.M. (2004). Child day care risks of common infectious diseases revisited. *Child: Care, Health & Development, 30*(4), 361–368.

National Center for Education Statistics, U.S. Department of Education. (2005, November). *Child-care and early education arrangements of infants, toddlers, and preschoolers: 2001*. Retrieved from http://nces.ed.gov/pubs2006/2006039.pdf

North Carolina Department of Environment and Natural Resources, Office of Environmental Health Services. (2007). *North Carolina child care regulations* (15A NCAC 18A .2800, pp. 1–24). Retrieved from http://nrckids.org/index.cfm/resources/state-licensing-and-regulation-informationnorth-carolina-regulations/

South Carolina Department of Social Services. (2006). *Child-care licensing and regulatory services operating manual*. Retrieved from http://www.state.sc.us/dss/cdclrs/manual/index.html

Sullivan, P., Woodward, W.E., Pickering, L.K., & DuPont, H.L. (1984). Longitudinal study of occurrence of diarrheal disease in day care centers. *American Journal of Public Health, 74*(9), 987–991.

Todd, E.C., Michaels, B.S., Greig, J.D., Smith, D., & Bartleson, C.A. (2010). Outbreaks where food workers have been implicated in the spread of foodborne disease. Part 8. Gloves as barriers to prevent contamination of food by workers. *Journal of Food Protection, 73*(9), 1762–1773.

U.S. Food and Drug Administration. (2010). *FDA trend analysis report on the occurrence of foodborne illness risk factors in selected institutional foodservice, restaurant, and retail food store facility types (1998–2008)—Institutional food service*. Retrieved from http://www.fda.gov/Food/GuidanceRegulation/RetailFoodProtection/FoodborneIllnessRiskFactorReduction/ucm223293.htm

U.S. Food and Drug Administration. (2013). *FDA Food code 2009*. Retrieved from http://www.fda.gov/Food/GuidanceRegulation/RetailFoodProtection/FoodCode/UCM2019396.htm

INTERNATIONAL PERSPECTIVES

Exposure to Electric Power Generator Noise Among Small Scale Business Operators in Selected Communities in Ibadan, Nigeria

Although most of the information presented in the Journal refers to situations within the United States, environmental health and protection know no boundaries. The Journal periodically runs International Perspectives to ensure that issues relevant to our international membership, representing over 30 countries worldwide, are addressed. Our goal is to raise diverse issues of interest to all our readers, irrespective of origin.

Godson R.E.E. Ana
Yesufu A. Luqman
University of Ibadan

Derek G. Shendell, MPH, DEnv
Department of Environmental and Occupational Health
Rutgers School of Public Health

Eme T. Owoaje
University of Ibadan

Abstract **Inadequate and erratic power supplies mean small businesses use electric generators for alternative power. The authors' goal in the study described here was to assess noise from electric generators and impacts in the commercial areas of Agbowo and Ajibode in Ibadan, Nigeria. Noise levels (A-weighted decibels [dBA]) were measured over 12 weeks, three times a day, during the 2010 dry season using a sound level meter. A questionnaire was administered (515 respondents; 304 in Agbowo, 211 in Ajibode) and audiometric measurements were conducted on 40% of respondents. Mean noise levels varied by source (104 ± 7.7 dBA [diesel], 94.0 ± 6.3 dBA [petrol]) and were highest midday (90.6 ± 5.3 dBA [Agbowo], 70.9 ± 6.2 dBA [Ajibode]). Mean noise levels in Agbowo (78.5 ± 3.9 dBA) and Ajibode (65.7 ± 4.4 dBA) exceeded World Health Organization guidelines (65 dBA) for outdoor commercial environments. Working and living in Agbowo was significantly associated with current evidence of hearing impairment (odds ratio: 6.8, 95% confidence interval: 3.4–13.7). Reducing exposure to noise from electric power generators serving urban small businesses and homes is warranted.**

Introduction

An undesirable side effect of improperly planned industrialization is environmental pollution and consequent degradation of quality of life. One physical exposure agent, noise, has emerged as an urban environmental problem both at work and at school (Joshi, Devkota, Chamling, & Shrestha, 2003). Noise pollution is defined as audible unwanted sound posing a hazard (risk) to a person's heath and well-being, while environmental noise is any unwanted or harmful outdoor sound created by human activities detrimental to quality of life (Goines & Hagler, 2007). A difference exists between sound and noise; Walter (2001) concluded unwanted sounds are noise, and thus annoying and uncomfortable, while melodious sound is generally soothing and enjoyed. Faulkner (2002) stated most community environmental noise pollution comes from automobiles, trucks, airplanes, construction equipment, farm machines, some home appliances, shop tools, lawnmowers, and leaf blowers; guns, fire crackers, and some toys can also be noisy. Powell (2000) emphasized noise sources were domestic as well as industrial. Nevertheless, environmental noise pollution is, at present, of relatively lower policy importance in less developed countries (LDCs) like Nigeria where standards for monitoring pollution are not enforced or are nonexistent. This may be because many LDCs are encumbered with problems of poverty and disease while noise is less noticed.

Electricity, which is one of the benefits of industrialization, has become a major priority for most people in LDCs as they try to meet their domestic, commercial, and industrial needs. In Nigeria, most of the cities and towns are connected to the national power grid for electricity supply, which is used for domestic, commercial, and industrial purposes among other uses (Akande & Ologe, 2003). Unfortunately, supply and demand are not balanced; in general, electricity supplies in Nigeria have historically been limited, and thus the supply of electricity nationwide has been a persistent high-priority issue among the Nigerian population (Ibitoye & Adenikinju, 2007).

Due to the unavailability and unreliability of electricity in Nigeria, the use of electric power generators has become widespread

among small scale business operators as an alternative power source. These power-generating sets are usually located at close proximity to their workplace and produce noise at levels that potentially pose risks to human health, as well as incomplete combustion pollutants like carbon monoxide. Small scale business operators may not notice any change in their hearing abilities until a large threshold shift has occurred. According to Khopkar (2008), the principal aim of measuring noise levels is therefore to ascertain if the actual level is an acceptable sound level human ears can tolerate.

Noise has been recognized as a serious health problem in modern society (Muzet, 2002). Noise causes auditory and nonauditory effects depending on its intensity, according to the World Health Organization (WHO) (1999, 2001a). Nonauditory deleterious effects of noise include annoyance, loss of memory, and sleep disturbances (Stansfeld, Haines, & Brown, 2000). Noise with high intensity (loudness) can cause hearing impairment and tinnitus depending on the duration of exposure, while low intensity noise can cause indirect psychological and physiological effects.

The WHO permissible noise level guideline in an office environment is between 55 and 65 A-weighted decibels (dBA), while in outdoor commercial environments it is between 65 and 70 dBA (WHO, 2001a, 2001b). According to WHO, exposure for more than six hours a day to sound in excess of 85 dBA is potentially hazardous to health (WHO, 2001a). Burns (2001) described 0–90 dBA as the range of noise the human ear can tolerate, and above 50 dBA is thought to be hazardous to human health. Occupational noise is a widespread risk factor with a strong evidence base linking it to important health outcomes. For example, excessive exposure to noise, sometimes in excess of 95 dBA, has been associated with high prevalence (50%–80%) of hearing loss (Ologe, Akande, & Olajide, 2006). In research conducted in the construction industry, activities created noise levels ranging from 70 dBA to 140 dBA, including noise generated by air compressors, concrete mixers, scrappers, bulldozers, pavers, power sanders, generators, and rock drillers (School, 2005).

In LDCs like Nigeria, available limited evidence has suggested average noise levels are above occupational levels recommended in many industrialized nations (Suter, 2000; WHO, 2001a). The use of electric power generators by small scale business operators has potentially exposed workers and adjacent community residents to noise and health risks. Therefore, an initial cross-sectional assessment of the noise levels and auditory effects associated with the use of electrical power generators can help guide policy and focus future intervention research on this problem, given that industrial hygiene controls can be used to reduce exposure to noise at work (WHO, 2001a). Our cross-sectional study assessed environmental and community noise levels from electric power generators and potential auditory effects among small scale business operators at locations within two communities, the Agbowo and Ajibode business areas of Ibadan, Nigeria.

Materials and Methods

Our cross-sectional study was conducted in two communities, the Agbowo and Ajibode business areas, of Ibadan, Nigeria, after proper compulsory ethical review by the University of Ibadan and University College Hospital ethical review committee. Participants in these business locations were duly informed and consent was obtained. Our study also went through proper required institutional review board procedures at the College of Medicine, University of Ibadan, prior to its initiation.

Agbowo and Ajibode are both located in Ibadan, the capital of Oyo State in Nigeria. Ibadan, one of the largest metropolitan cities in West Africa, is a primarily indigenous city with millions of inhabitants, most of which are from the Yoruba ethnic group; other ethnic groups constitute smaller proportions of this urban population. The Agbowo business area is situated directly opposite the University of Ibadan and is a high commercial activity area encouraging small scale businesses. The Ajibode business area is also at close proximity to the University of Ibadan campus, but experiences relatively lower daily business activity. These two business areas were compared with each other; for this initial cross-sectional assessment with a convenience sample of volunteer participants, another community within the Ibadan urban area without small business/commercial electric generators but similar average and rush hour traffic was not selected.

The targeted study population included small business shops in Agbowo and Ajibode who had given informed consent to participate in the study. The sampling technique, i.e., maximized convenience sample, was employed to recruit consenting participants, i.e., operators above age 14. Our study had 515 participants from Agbowo (n = 304) and Ajibode (n = 211).

Two qualitative surveys were used. First, an observational checklist was used to collect data on environmental issues, focusing on electric power generator noise and other potential noise sources located outdoors and indoors. This technician walk-through type assessment contained items on generator position, use of personal protective equipment or devices, and the measured distance from a generator to user (worker). Information on the number of shops and workers was also obtained using this observational checklist. Second, the semistructured questionnaire elicited information on demographic characteristics and occupational history. Specifically, the validated questions, i.e., based on previously published human exposure assessment studies conducted in the U.S. and Europe, pertained to knowledge and perception of health hazards associated with noise exposure and nonauditory health problems experienced at work. In addition, due to the fact that outdoor sources of air and noise pollution are known to affect the indoor environment in urban and rural areas worldwide, and workers may spend some of their day indoors, shop dimensions of length, width, and sizes of doors and windows were determined and volumes computed. (These data/variables from study surveys were not reported here because carbon dioxide measures to estimate ventilation or air exchange rates were not realized.)

The electric-power-generator-produced noise levels were measured using a factory calibrated TECPEL model 330 series sound level meter (SLM), which was set at the slow response mode with dBA. The measurements were conducted three times a day on three weekdays each study week, and continuously during the 6:00 a.m.–8:00 a.m., 11:00 a.m.–1:00 p.m., and 4:00 p.m.–6:00 p.m. time periods; generators were confirmed to be operating during these three time periods. Measurements were obtained at three points outdoors (identified hereafter for con-

venience as L1, L2, and L3) within each of the surveyed business locations. These sampling points were each about 5 m from the generators. The noise level from each generator set was also obtained. We chose these points because, in general, typical workers spent time 2–5 m from the generators, and their work day was between 8:00 a.m. and 6:00 p.m.; we collected data on reported hours at work on an average of 4–6 hours daily. Data were recorded for each of the two business locations for 12 weeks over three months in the dry season of 2010.

Pure tone audiometry was also conducted during the time period of the field sampling with a total of 207 consenting questionnaire respondents (40.2% of 511), from either the Agbowo (n = 122, or 40.1% of 304) and Ajibode (n = 85, or 40.3% of 211) business districts. Specifically, an air conduction test was completed, and the pure tone average was calculated over frequencies of 500 Hz, 1,000 Hz, and 2,000 Hz. Available instrumentation did not go up to 4,000 Hz. As previously stated, this was a convenience sample; only two out of five consented and then completed both surveys and pure tone audiometry.

Data were entered into Microsoft Excel and then managed and analyzed using SPSS v. 15. Data were first analyzed using descriptive statistics. Then, for relative comparisons between two business areas in the targeted urban community of Ibadan, Nigeria, Chi-square, t-test, multivariate analysis of variance, and logistic regression analyses were conducted. Statistically significant results were determined to have a p-value of <.05.

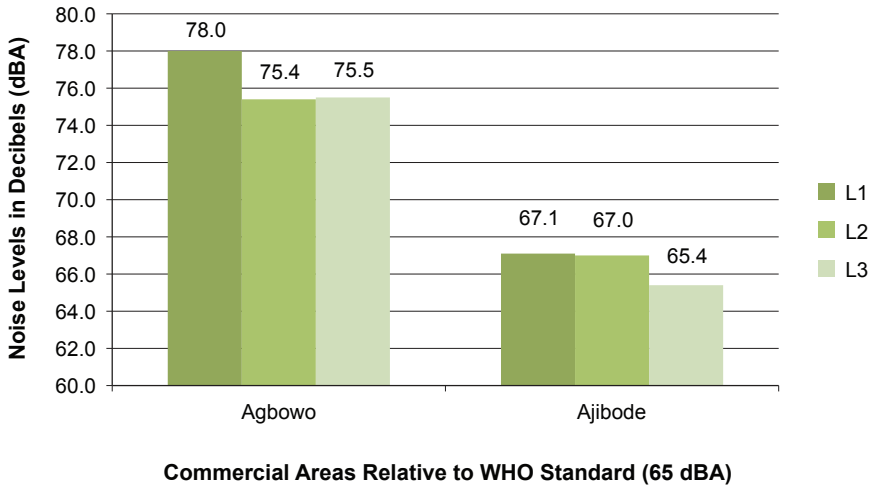
TABLE **1**

Occupational Characteristics of Respondents in the Two Selected Business Locations in Ibadan, Nigeria

Occupational Attribute	Category	Agbowo		Ajibode	
		#	%	#	%
Years at work	<1 year	16	5.3	11	5.2
	1–3 years	72	23.7	21	10.0
	4–8 years	216	71.1	179	84.8
Hours at work per day reported on average	<8 hours	34	11.2	39	18.5
	8 hours	84	27.6	55	26.1
	>8 hours	186	61.2	117	55.5

FIGURE **1**

Average Business Hour/Day Noise Level Indoors Across the Measurement Point



dBA = A-weighted decibels; WHO = World Health Organization.
Locations 1, 2, and 3 (L1, L2, L3) in comparison with the WHO guideline limit for office work (65 dBA) in the selected business locations in Ibadan, Nigeria.

Results

Status of Business Centers

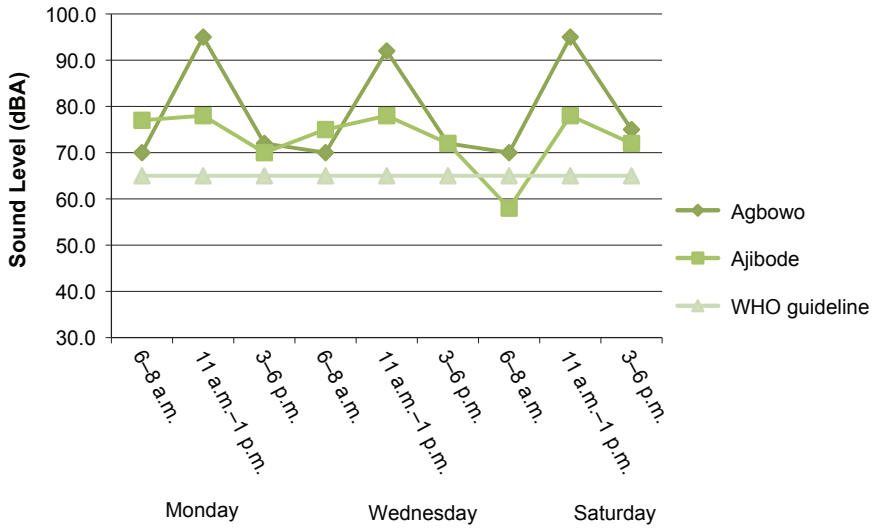
Selected general information, including some geographical and physical characteristics, was obtained about the study area business locations. Agbowo had more small business operators, represented by the number of shops and number of workers per shop (105 shops and on average 3.2 workers per shop [standard deviation {SD} = 0.3]), compared to Ajibode (71 shops and on average 2.9 workers per shop [SD = 0.9]). The majority of the shops studied were poorly constructed and were on the verge of collapsing due to leaking roofs and damp walls. Doors and windows were also absent in most shops. This scenario may increase exposure to noise from the generators and to other outdoor air pollutants (not measured in this study). Furthermore, shops appeared rowdy and congested due to their small sizes and relatively close proximity to primary roadways, particularly in Agbowo (range of distances from road to entrance of businesses: Agbowo: 1–12 m; Ajibode: 2–32 m).

Occupational Characteristics of Respondents (Table 1)

The mean age of respondents in Agbowo and Ajibode was 25.4±5.4 years and 24.8±5.8 years, respectively. Most respondents in Ajibode (179, 84.8%) and Agbowo (216, 71.1%) had spent 4–8 years in their present occupation; 72 (23.7%) and 21 (10.0%) in Agbowo and Ajibode, respectively, had spent 1–3 years in their present occupation, and a few respondents in Agbowo (16, 5.3%) and Ajibode (11, 5.2%) had spent less than one year in their present occupation. The majority of the respondents in Agbowo (186, 61.2%) spent more than eight hours at work; 84 (27.6%) and 34 (11.2%) spent eight hours and less than eight hours at

FIGURE **2**

Mean Outdoor Noise Levels Across Different Time Periods in Agbowo and Ajibode, Ibadan, Nigeria



dBA = A-weighted decibels; WHO = World Health Organization.
Compared to the WHO guideline for office work (65 dBA).

TABLE **3**

Correlation Analysis of Potential Relationships Between the Hearing Threshold at Different Noise Frequencies[a]

Frequency (Hz) of Noise During Pure Tone Audiometry (Air Conduction Test), Both Ears	Years at Work Reported
500	.369** (.000)
1000	.406** (.000)
1500	.363** (.000)
2000	.247** (.000)
3000	.202** (.000)
4000	.180** (.010)
6000	.176* (.011)
8000	.202** (.004)

[a]In Hz for both right and left ears, with respondent reported years at work in Agbowo and Ajibode, Ibadan, Nigeria.
*Correlation is significant at .05.
**Correlation is significant at $p < .01$.

TABLE **2**

Audiometric Status of Respondents at Agbowo and Ajibode*

Variable	Status	Agbowo *n* (%)	Ajibode *n* (%)	Total *N* (%)
Audiometry for both ears	Normal	30 (24.4)	55 (65.5)	85 (41.1)
	Impaired	93 (75.6)	29 (34.5)	122 (58.9)
Audiometry for right ear	Normal	24 (19.5)	53 (63.1)	77 (37.2)
	Impaired	99 (80.5)	31 (36.9)	130 (62.8)
Audiometry for left ear	Normal	47 (38.2)	56 (66.7)	103 (49.8)
	Impaired	76 (61.8)	28 (33.3)	104 (50.2)

*The *p*-value was <.05 in statistical analyses comparing results of audiometry—more were impaired than normal, by ear and for both ears—across the two studied business communities in urban areas of Ibadan, Nigeria.

work, respectively. In Ajibode, the majority (117, 55.5%) also spent more than eight hours at work, while 39 (18.5%) and 55 (26.1%) spent less than eight hours and eight hours at work, respectively.

Electric Power Generator Noise Levels at Agbowo and Ajibode

Figure 1 (indoors) and Figure 2 (outdoors) illustrates the noise levels recorded at different measurement points in each of the studied business area locations. The highest mean (± *SD*) noise level recorded outdoors for Agbowo, 95.2 ± 3.9 dBA, and for Ajibode, 80.3 ± 4.4 dBA, and the indoor noise levels recorded—although higher in Agbowo than in Ajibode—exceeded the WHO guideline for the office work environment. In Agbowo, the highest mean noise level recorded indoors at a study sampling location was 78.0 ± 3.9 dBA; in Ajibode, 67.1 ± 4.4 dBA. In addition, Agbowo had more diesel engines observed (35%) than at Ajibode (6%). The mean noise levels measured near engines were 104 ± 7.8 dBA (diesel) and 94.0 ± 6.3 dBA (petrol) when electric power generators were in operation during the study periods in Agbowo and Ajibode, respectively. In our study, the minimum dBA was 84.5 (near petrol-powered electric generator) and the maximum dBA was 121.0 (near diesel-powered electric generator). The difference in noise between study locations, i.e., Agbowo versus Ajibode, was statistically significant ($p < .05$).

Audiometric Status of Respondents

Tables 2 and 3 and Figure 3 (3a, right ear; 3b, left ear) detail audiometry results and associated statistical analyses. The proportion of those with some evidence of hearing impairment in Agbowo (75.6%) exceeded those in Ajibode (24.4%) for both ears, and the right ear alone. For the left ear, however, while the results for Agbowo were similar, the results for Ajibode were opposite, i.e., an approximately 2:1 ratio of normal versus impaired audiometry was observed. Statistically, differences existed between the two business areas

studied, for both ears and for single ears ($p < .05$). It is worth noting the majority of the respondents reported relative hearing difficulties at higher frequencies among those frequencies assessed (up to 2,000 Hz) in our study; correlation coefficients, while consistently statistically significant, were higher for 500 Hz–1,500 Hz and highest at 1,000 Hz.

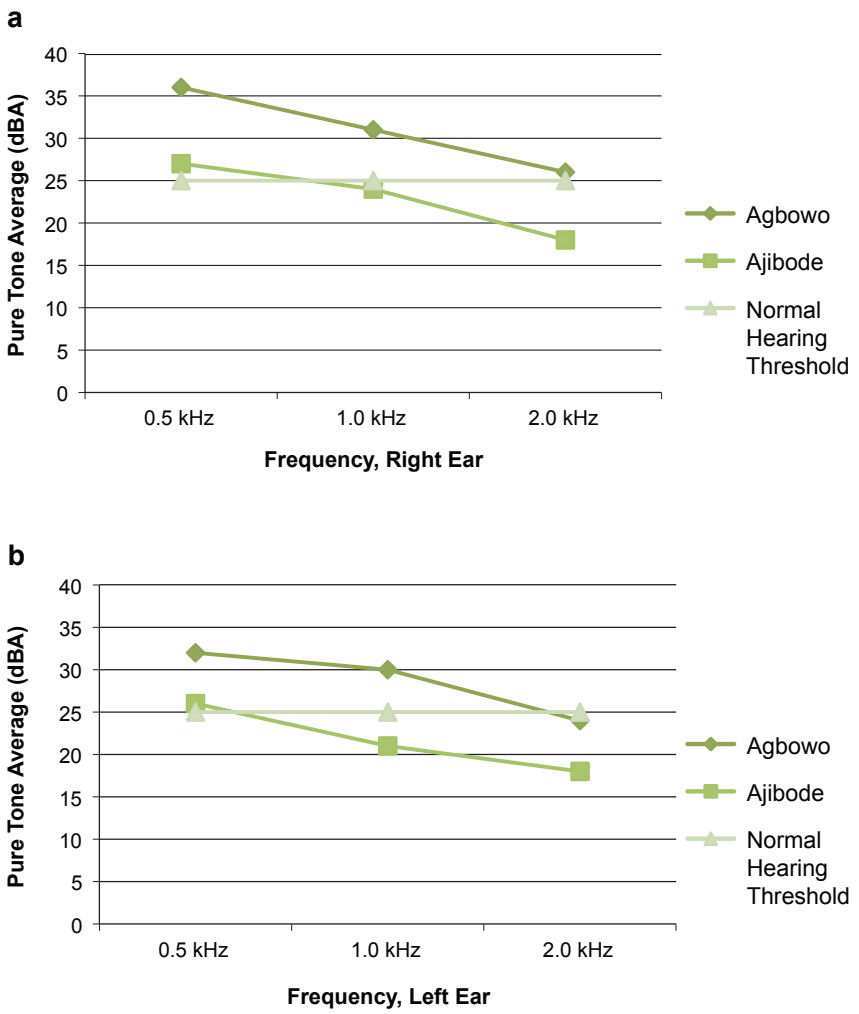
Discussion

The majority of the shops in the two business areas of Ibadan assessed in this initial cross-sectional study, as detailed in the Results section, had seemingly poor ventilation, with only the presence of single doors and an absence of windows and mechanical systems. The condition of the shops would most likely increase the indoor sound levels as suggested in our study, due to vibrations off of surfaces and equipment as reported in other research (Khopkar, 2008; Wilson, 1989). The electric power generators were observed to produce both sound and vibration. The on-site observations during our study also indicated that study respondents depended heavily on generators in Agbowo whereas in Ajibode, the relatively steadier supply of electricity reduced their relative dependence on supplemental generators. Traffic noise may have contributed more to the general environmental background noise in Ajibode; many shops in Ajibode were located along the road. As previously noted, Faulkner (2002) identified both automobiles and machines such as electric power generators as major sources of noise pollution in urban environments.

The noise levels in Agbowo significantly exceeded measurements in Ajibode and were higher than the WHO guideline limit of 70 dBA for a commercial environment. The highest noise levels were observed at peak hours of 11:00 a.m.–1:00 p.m.; on-site observations suggested over 80% of the generators in Agbowo were in operation during this time frame. Onuu and Tawo (2006) conducted noise levels measurement in quarries and neighboring communities and reported noise from generators ranged 96–99 dBA. Similarly, Bisong and co-authors (2004) carried out a study on operators of grinding machines in Nigeria; mean noise levels were reported as 105 ± 9.3 dBA at grinding sites. These data were similar to mean noise levels measured from generators in Agbowo (104 dBA) in our study.

FIGURE **3**

Hearing Threshold on the Right Ear (a) and the Left Ear (b) for Respondents in Agbowo and Ajibode, Ibadan, Nigeria



Workers in our study were not observed to be using hearing protection devices (HPDs), which if worn could have reduced the intensity of sound permeating their ears. HPDs are recommended as alternate means of preventing noise induced hearing impairments (Workers' Compensation Board of British Columbia, 1996); several studies have supported this observation (Hétu & Fortin, 1995; Leinster, Baum, Tong, & Whitehead, 1994). Therefore, since none of the respondents used HPDs, they appeared to be at higher risk of developing hearing impairment. The impact of continuous exposure to elevated sound levels as recorded in our study can be substantial, with potential hearing impairment and non-auditory effects as well as potential financial implications, unless adequate control measures like sound attenuation techniques are implemented during the design and construction of power generators.

Hearing impairment evidence was observed among respondents in both business locations studied within this urban area of Nigeria, although more adversely affected study participants were in Agbowo. This may be attributed to the noise levels measured in this location in Ibadan. The first effects of expo-

sure to noise as excess sound are typically a threshold shift, as assessed by audiometry and defined as a change in hearing threshold of an average of 10 dBA or more at 2,000 Hz, 3,000 Hz, and 4,000 Hz in either ear (poorer hearing) (National Institute for Occupational Safety and Health [NIOSH], 1998). Furthermore, while noise-induced hearing loss (NIHL) occurred mostly at the higher frequency range of 3000–6000 Hz, NIHL was also reported at 2,000 Hz (NIOSH, 1998), the upper end of the frequency range assessed in our study given available resources/equipment in this LDC. Findings in our study were also consistent with work done by Ighoroje and co-authors (2004), who reported NIHL at higher frequencies among Nigerian traders, and by Ibhazehiebo and co-authors (2008), who conducted a study on the impact of noise on commercial motor bike riders and observed NIHL at higher frequencies.

In our cross-sectional study, correlations of duration of exposure with evidence or indicators of hearing loss at various assessed frequencies showed significant positive correlations from 500 Hz to 2,000 Hz. These data suggested duration of exposure to generator noise is important in understanding hearing impairment found among small business generator users, who typically work in small buildings relatively close to primary roads (which do contribute to ambient background noise). With time and further exposure, their hearing loss may likely worsen and potentially result in deafness. In a study on hearing acuity of grinding machine operators, Bisong and co-authors (2004) found significant positive correlations between duration of exposure to grinding machine noise and hearing impairment, although only at frequencies of 2,000 Hz and 4,000 Hz. This may be because electric power generators are in use for hours at a time, in comparison to operators of grinding machines who are exposed to increased noise levels intermittently when a customer is present.

Our study had limitations. Our initial study in an urban area of a LDC in West Africa was limited not only by its cross-sectional design and finite resources (e.g., number of participants able to complete audiometry, a potential source of selection bias), but also in that we did not have a longer follow-up period for the business operators. A prospective design would have involved a prework audiometric test and postwork audiometric test to better evaluate an association between occupational exposure to generator noise and hearing impairment as compared to exposure to other environmental noise, e.g., at home. Moreover, we did not include data from elsewhere in Ibadan, e.g., a comparison community with few or no small businesses using generators but still near primary roads.

Conclusion

This initial cross-sectional descriptive study suggested electric generator noise levels in the two targeted business areas of Ibadan, Nigeria, Agbowo and Ajibode, were significantly different and both higher than the WHO guideline permissible limit for office work environments. Audiometric tests suggested evidence of hearing impairment in both business locations, but at a higher proportion in Agbowo. Therefore, as LDCs like Nigeria struggle to achieve a steady power supply for growing and urbanizing populations, individuals must protect themselves from the harmful effect of continuous exposure to generator noise, particularly at small businesses adjacent to homes.

Our study also supports the recommendation of future longitudinal research, which would ensure concise follow-up of respondents before and after working with electrical power generators, and supports government agency collaboration with the private sector for provision of stable electricity supply and intensified efforts to ensure the creation, monitoring, and enforcement of environmental health policy on noise and combustion pollution from power generators running on petrol or diesel fuel.

Acknowledgements: The authors thank the operators of the business centers and shops visited in this study as well as the volunteer participants, and are also grateful to the master of public health students in environmental health at the College of Medicine, University of Ibadan, who participated as field assistants. A.E.M. Mapou and J. Melendez (Rutgers School of Public Health) are acknowledged for internal reviews of the draft manuscript. This project was completed during the masters of public health program of Y. Luqman. D. Shendell was supported and equipment used was purchased and brought by D. Shendell to the University of Ibadan for future use by funding from the Georgia State University International Strategic Initiative and the Atlantic Philanthropies-Bermuda/U.K. office, 2006–2008.

Corresponding Author: Derek G. Shendell, Associate Professor, Department of Environmental and Occupational Health, Rutgers School of Public Health, 683 Hoes Lane West, 3rd Floor SPH Building, Piscataway, NJ 08854. E-mail: shendedg@sph.rutgers.edu.

References

Akande, T.M., & Ologe, F.E. (2003). Noise induced hearing loss (NIHL) in the middle belt of Nigeria. *Postgraduate Doctor Africa, 25,* 81–82.

Bisong, A.S., Umana, N.A., Onoyom-ita, V., & Osim, E.E. (2004). Hearing acuity loss of operators of food grinding machines in Calabar, Nigeria. *Nigerian Journal of Physiological Sciences, 19*(1–2), 20–27.

Burns, W. (2001). *Noise and man*. London: J.B. Lippincott Press.

Faulkner, L.L. (2002). *Handbook of industrial noise control*. Norwalk, CT: Industrial Press.

Goines, L., & Hagler, L. (2007). Noise pollution: A modern plague. *Southern Medical Journal, 100*(3), 287–293.

Hétu, R., & Fortin, M. (1995). Potential risk of hearing damage associated with exposure to highly amplified music. *Journal of the American Academy of Audiology, 6*(5), 378–386.

continued on page 34

References *continued from page 33*

Ibhazehiebo, K., Ighoroje, A.D.A., Uche, O.K., Ogisi, F.O., & Iyawe, V.I. (2008). Impact of noise on hearing amongst commercial motor bike riders in Benin-City, Nigeria. *Journal of Medicine and Biomedical Research, 7*(1–2), 30–36.

Ibitoye, F.I., & Adenikinju, A. (2007). Future demand for electricity supply in Nigeria. *Journal of Applied Energy, 84*(5), 492–504.

Ighoroje, A.D.A., Marchie, C., & Nwobodo, E.D. (2004). Noise-induced as an occupational risk factor among Nigerian traders. *Nigerian Journal of Physiology Sciences, 19*(1–2), 14–19.

Joshi, S.K., Devkota, S., Chamling, S., & Shrestha, S. (2003). Environmental noise induced hearing loss in Nepal. *Kathmandu University Medical Journal, 1*(3), 177–183.

Khopkar, S.M. (2008). *Noise and vibrations*. London: Ellis Horwood.

Leinster, P., Baum, J., Tong, D., & Whitehead, C. (1994). Management and motivational factors in the control of noise induced hearing loss (NIHL). *Annals of Occupational Hygiene, 38*(5), 649–662.

Muzet, A. (2002). The need for a specific noise measurement for population exposed to aircraft noise during night time. *Noise Health, 4*(15), 61–64.

National Institute for Occupational Safety and Health. (1998). *Occupational noise exposure*. Cincinnati, OH: Author. Retrieved from http://www.cdc.gov/niosh/docs/98-126/

Ologe, F.E., Akande, T.M., & Olajide, T.G. (2006). Occupational noise exposure and sensorineural hearing loss among workers of a steel rolling mill. *European Archives of Otorhino-laryngology and Head and Neck, 263*(7), 618–621.

Onuu, M.U., & Tawo, A.N. (2006). Industrial noise studies in quarries and neighboring communities. *International Journal of Natural and Applied Sciences, 1*(1), 94–100.

Powell, R.F. (2000). *Noise in the military environment*. London: Brassy's Defence Publishers.

School, S.R. (2005). *Environmental protection*. London: Ellis Horwood.

Stansfeld, S., Haines, M., & Brown, B. (2000). Noise and health in the urban environment. *Reviews on Environmental Health, 15*(1–2), 43–82.

Suter, A. (2000). *Standards and regulations*. In E.H. Berger, L.H. Royster, J.D. Rozster, D.P. Driscoll, & M. Layne (Eds.), *The noise manual* (5th ed.). Fairfax, VA: American Industrial Hygiene Association.

Walter, A.A. (2001). *Noise and prices*. London: Oxford University Press.

Wilson, C.F. (1989). *Noise control*. Noida, Uttar Pradesh, India: Harper & Row.

Workers' Compensation Board of British Columbia. (1996). *Workers' compensation act*. Retrieved from http://www.bclaws.ca/Recon/document/ID/freeside/96492_00

World Health Organization. (1999). *Guidelines for community noise*. Geneva: Author. Retrieved from http://whqlibdoc.who.int/hq/1999/a68672.pdf

World Health Organization. (2001a). *Occupational exposure to noise: Evaluation, prevention, and control*. Geneva: Author. Retrieved from http://www.who.int/occupational_health/publications/occupnoise/en/

World Health Organization. (2001b). *Occupational and community noise* (Fact Sheet No. 258). Geneva: Author.

Thank You

for Supporting the NEHA/AAS Scholarship Fund

American Public University
Manassas, VA

Vickie L. Church
San Diego, CA

Bruce Clabaugh, RS
Greenwood Village, CO

Amer El-Ahraf
Huntington Beach, CA

Dion L. Lerman
Philadelphia, PA

Gloria T. Mackie
Pueblo, CO

COL Wendell A. Moore
Davidsonville, MD

George A. Morris, RS
Dousman, WI

Richard L. Roberts, MPH
Grover Beach, CA

Welford C. Roberts, PhD, RS, REHS, DAAS
South Riding, VA

Walter P. Saraniecki, MS, LDN, LEHP, REHS/RS
La Grange, IL

James M. Speckhart, MS
Norfolk, VA

Ned Therien
Olympia, WA

Clayton Tolson
Baltimore, MD

Dale H. Truesdell
Yakima, WA

Lisa A. Windross
Port Saint Lucie, FL

Did You Know?

Daylight Saving Time ends on November 2 and clocks will "fall" back an hour in most jurisdictions. In 2007, Daylight Saving Time was extended by four weeks. According to a 2008 U.S. Department of Energy study, these extra four weeks saved about 0.5% in total electricity per day. This adds up to an electricity savings of 1.3 billion kilowatt-hours—or the amount of electricity used by more than 100,000 households for an entire year.

BUILDING CAPACITY

Darryl Booth, MBA

An Introduction to Building Agency Capacity

Editor's Note: A need exists within environmental health agencies to increase their capacity to perform in an environment of diminishing resources. With limited resources and increasing demands, we need to seek new approaches to the business of environmental health.

Acutely aware of these challenges, NEHA has initiated a partnership with Decade Software Company called *Building Capacity*. *Building Capacity* is a joint effort to educate, reinforce, and build upon successes within the profession, using technology to improve efficiency and extend the impact of environmental health agencies.

The *Journal* is pleased to publish this bimonthly column from Decade Software Company that will provide readers with insight into the *Building Capacity* initiative, as well as be a conduit for fostering the capacity building of environmental health agencies across the country.

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

Darryl Booth is president of Decade Software Company and has been monitoring regulatory and data tracking needs of agencies across the U.S. for 18 years. He serves as technical advisor to NEHA's technology section, which includes computers, software, GIS, and management applications.

Consider for a moment your agency's mission. Say it out loud. Look it up or define it now if you're not certain. For many *Journal* readers, the mission is something such as, "...to protect, promote, and enhance the health and well-being of the public and the environment (Boulder County Environmental Health Division, Boulder, Colorado; http://tinyurl.com/bouldermission)."

Are you ever frustrated with the sense that doing your job—and doing it well—doesn't change the equation? Do worthy initiatives fall prey to the feeling that you can't make time to work on it, no matter its merit? How do you approach such challenges?

When I face a challenge at the office such as how to best hire and recruit, implement policy, or design a new service, I often look to successful organizations that have already innovated in those areas. Who hasn't been inspired by innovation and excellence in the wild? Where possible, I strive to apply those lessons; I rarely build from scratch what is already standing.

The Food and Drug Administration (FDA) *Food Code* comes to mind when I think of an imitable project. The *Food Code* package includes ordinance language, references, guidelines, forms, guides, and other aids. It's vetted by experts from the Conference for Food Protection; FDA; Centers for Disease Control and Prevention; and state, tribal, and local food safety experts.

Every state in the country has adopted the code in some form. I love this story; without this model, each jurisdiction risked consuming valuable resources to develop, defend, and maintain a regional food code. By embracing the FDA *Food Code*, these organizations have given themselves added capacity. New on the horizon, the Model Aquatic Health Code promises a similar benefit.

Leverage, strategy, and leadership are foundational components of *Building Capacity*, a NEHA initiative that promotes tactics for improved performance by highlighting fully developed ideas and materials that will allow you to build upon successes demonstrated by your peers. *Building Capacity* touches many parts of an organization and asks us to examine many facets of what we do daily. A fundamental aspect is how technology can help us accomplish our goals better and faster.

This regular *Journal* column is chartered to find and promote right-minded environmental health projects, largely with technical underpinnings, that your agency can consider and adopt. Often the column will include links to useful resources (e.g., templates, policies, instructions) to ease implementation. In other profiled projects, the column aims to alert readers to award-worthy projects.

Lest the reader assume I advocate for simply cloning existing projects, I want to underscore the obvious value of iterative innovation. That is, for every well-run project, I share an expectation of progress through innovation.

Future profiles include projects such as interagency data sharing, standardization among disparate computer systems, useful digital dashboards, GIS, data remediation, operational policy, social media, open data, mobile computing, customer service, and marketing/communications.

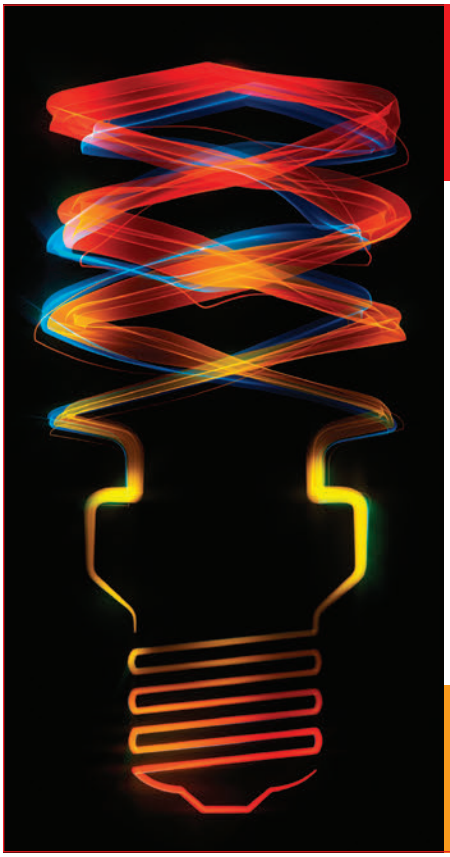
I welcome your feedback and suggestions.

Corresponding Author: Darryl Booth, President, Decade Software Company, 1195 W. Shaw, Fresno, CA 93711.
E-mail: darrylbooth@decadesoftware.com.

Did You Know?

The National Association of County and City Health Officials surveyed a nationally representative sample of local health departments (LHDs) in March and April 2012. The survey data indicates that environmental health revenue has decreased for a substantial amount of LHDs and significant cuts to the environmental health workforce and its services were made for budgetary reasons. Almost 30% of LHDs had a reduction in environmental health staff and over one-third reduced or eliminated at least one environmental health service. The full report can be found at www.naccho.org/topics/infrastructure/lhdbudget/upload/Research-Brief-Final.pdf.

Source: Li, J., & Eligers, A. (2014). Impact of budget cuts to environmental health services at local health departments: Key findings. J*ournal of Environmental Health, 76*(10), 38–40.



2015 Nelson E. Fabian Environmental Health Innovation Award

This award recognizes a NEHA member or organization for creating a new idea, practice, or product that has had a positive impact on environmental health and the quality of life. Innovative change that promotes or improves environmental health protection is the foundation of this award.

Named in honor of former NEHA Executive Director Nelson Fabian, this annual award recognizes those who have made an innovative contribution to the field, as well as encourages others to search for creative solutions. Take this opportunity to submit a nomination to highlight the innovations being put into practice in the field of environmental health!

Nominations are due in the NEHA office by March 16, 2015.

For more information, please visit **www.neha.org/about/awardinfo.html.** Nomination materials can be obtained by e-mailing Terry Osner at **tosner@neha.org**.

NATIONAL ENVIRONMENTAL HEALTH ASSOCIATION

DIRECT FROM ATSDR

Diane Jackson, PE

Lourdes (Luly) Rosales-Guevara, MD

Robert Blake, MPH, REHS

Environmental Odors Web Site: Providing Communities and Health Officials With the Tools to Address Odor Issues

Editor's Note: **As part of our continuing effort to highlight innovative approaches to improving the health and environment of communities, the *Journal* is pleased to publish a bimonthly column from the Agency for Toxic Substances and Disease Registry (ATSDR). ATSDR, based in Atlanta, Georgia, is a federal public health agency of the U.S. Department of Health and Human Services (HHS) and shares a common office of the Director with the National Center for Environmental Health at the Centers for Disease Control and Prevention (CDC). ATSDR serves the public by using the best science, taking responsive public health actions, and providing trusted health information to prevent harmful exposures and diseases related to toxic substances.**

The purpose of this column is to inform readers of ATSDR's activities and initiatives to better understand the relationship between exposure to hazardous substances in the environment and their impact on human health and how to protect public health. We believe that the column will provide a valuable resource to our readership by helping to make known the considerable resources and expertise that ATSDR has available to assist communities, states, and others to assure good environmental health practice for all is served.

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

Diane Jackson is an environmental health scientist with the Office of the Associate Director for Science in ATSDR's Division of Community Health Investigations. She has more than 30 years of experience with ATSDR and the U.S. Environmental Protection Agency in environmental emergency response and environmental health. Lourdes (Luly) Rosales-Guevara is a medical officer on ATSDR's Exposure Investigation Team. With ATSDR since 2002, she is a licensed physician trained in pediatrics with more than 26 years of clinical experience. Robert Blake is a health scientist with the Environmental Health Services Branch, Division of Emergency and Environmental Health Services at the National Center for Environmental Health. He has worked in environmental health at the county, state, and federal levels.

Environmental odor concerns are commonly reported to environmental health units at the local and state levels. Many U.S. Environmental Protection Agency program sites (Superfund and Resource Conservation and Recovery Act) and approximately 25% of Agency for Toxic Substances and Disease Registry (ATSDR) petition requests involve an odor concern component (e.g., industries, landfills, and confined animal feeding operations [CAFOs]). Increasing numbers of scientific studies are finding associations between environmental odors and health effects. Despite this need for information on environmental odors, no comprehensive electronic source or Web site existed that covered this topic and provided resources for the many parties that face environmental odor issues. Assessing the possible health impacts of odors is also complex. Even if the chemical or chemical mixture is identified, little to no regulations exist at the state and local levels. The lack of an effective odor response framework makes odor problems difficult to resolve.

In an effort to improve this situation, ATSDR collaborated with the National Center for Environmental Health at the Centers for Disease Control and Prevention to develop a comprehensive Web site that provides communities, health care providers, policy makers, health officials, municipalities, industries, and other stakeholders with actionable steps to deal with environmental odors in their communities.

Environmental odors can come from a variety of sources and affect communities across the nation. For example, animal activities may contribute to odors through manure or CAFOs; human activities can contribute to odors through compost and landfills; vehicles

FIGURE **1**

Screenshot of the Agency for Toxic Substances and Disease Registry Environmental Odors Web Site Home Page

FIGURE **2**

Screenshot of the "Getting Involved" Section of the Odors Web Site

can cause odors through diesel and exhaust; natural odors can be found with fires and stagnant ponds; and industries may contribute to odors during manufacturing, processing, waste treatment, and unplanned releases. The ATSDR odors Web site, located at www.atsdr.cdc.gov/odors/, addresses common questions about environmental odors and their effects on health and offers additional information about odors, including the following:

- approaches for reducing environmental odors in communities,
- steps for reporting environmental odor problems to state and local health departments,
- methods for conducting odor complaint investigations, and
- ways for involving community members and other stakeholders in odor management decisions.

In addition, regulatory approaches to odor and compliance and enforcement tools are available for communities and officials who seek long-term solutions to odor issues. A search tool on the home page of the Web site (Figure 1) helps users identify a particular odor or chemical simply by typing in information about the odor, such as a description of its smell.

The Web site also contains interactive PowerPoint presentations (under the "Getting Involved" section in Figure 2) that contain easy-to-understand information on symptoms related to odor exposure, odor controls, odor diaries (used to document information about environmental odors), and other related issues. While this information may be useful to groups such as health care providers and community residents, the Web site also provides a collection of resources for government agencies, officials, and industries. For example, the "Odor Investigations" page contains information on how to conduct an odor complaint investigation and identify a nuisance odor.

In 2015, ATSDR plans to add a new search tool containing typical odor-onset levels (odor thresholds), occupational limits, minimal risk levels, target organs, chemical uses, and industries commonly associated with certain chemicals. Additionally, information will be available on existing state and local regulations regarding odors.

To evaluate the utility of the Web site, ATSDR asked members of the National Association of County and City Health Officials' Environmental Health Committee, the Water Environment Research Foundation, the Association of State and Territorial Health Officials' State Environmental Health Directors Group, and officials with various state and local health departments for feedback. Overall, the reviewers found the Web site to be user friendly, logically organized, and a powerful resource for community advocacy, patient care, education, and policy decisions. Reviewers also cited the Web site as a useful tool for building trust by encouraging people with odor concerns to become involved in solving odor issues. Reviewers also shared useful comments to improve the Web site.

Issues surrounding environmental odors are multifaceted and can be difficult to address. The ATSDR Web site seeks to ease the challenges of the odor response process by providing information and ideas for addressing odors. We invite readers of this column to visit the Web site and to submit comments for further improvements.

Acknowledgement: Nirosha Perera contributed to this report.

Corresponding Author: Diane Jackson, Environmental Health Scientist, ATSDR, 4770 Buford Highway NE, Mailstop F-59, Atlanta, GA 30341. E-mail: dxj0@cdc.gov.

DIRECT FROM CDC ENVIRONMENTAL HEALTH SERVICES BRANCH

Chris S. Kochtitzky, MSP

Applying a General Best Practices Identification Framework to Environmental Health

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.

Chris Kochtitzky is the associate director for program development in CDC's Division of Emergency and Environmental Health Services. He is also an adjunct faculty member at Emory University's Rollins School of Public Health.

Environmental health is the second largest public health professional subdiscipline, therefore it has significant potential for impact (University of Michigan, 2013). Several realities have recently become firmly rooted at all levels: greater number of and more complicated demands; more constrained resources (human and fiscal); and increased calls to prove efficiency, efficacy, and impact. The following recent federal statements illustrate this point.

- The Office of Management and Budget issued guidance to agencies to "build on the President's vision for growth, opportunity, and national security by *reducing spending on lower priority programs in order to create room for effective investments in areas that remain critical* (White House Office of Management and Budget, 2014)."
- The National Prevention Council recommended that public health agencies and their partners "*identify and implement strategies that are proven to work and conduct research where evidence is lacking* (National Prevention Council, 2011)."

These statements underscore the need, where multiple options exist, to choose the one with the highest likelihood of producing the largest impact. Within environmental health programs it is critical to be able to demonstrate that current interventions have gone through periodic evaluations to determine that they continue to represent best practices with demonstrated success in the field.

Several sources are available for identifying interventions with a high evidence base, including the U.S. Taskforce for Community Preventive Services (www.thecommunityguide.org/) and the Cochrane Collaboration (www.cochrane.org). The challenge facing environmental health practitioners is what to do when multiple responses to a threat exist and no recommendation comes from the taskforce or similar sources. Centers for Disease Control and Prevention (CDC) staff confronted this challenge by creating a "Conceptual Framework for Planning and Improving Evidence-Based Practices (Spencer et al., 2013)."

The author and CDC colleagues conducted a literature review regarding best practices. We found that "best practice" and related terms do not refer to a static state but rather to *where on a continuum* a practice falls at a given time. We adopted the following definition of best practice: "a practice supported by a rigorous process of peer review and evaluation indicating effectiveness in improving health outcomes, generally demonstrated through systematic reviews." Supporting this definition, Rooney and co-authors (2014) have validated systematic reviews for environmental health.

The conceptual framework consists of two interrelated components: *public health impact* and *quality-of-evidence* (Figure 1). The impact component includes effectiveness, reach, feasibility, sustainability, and transferability (see Sidebar on page 41) The quality-of-evidence component includes four evidentiary levels: weak, moderate, strong, and rigorous (see Sidebar on page 42). At the intersection of the axes, a continuum of practice emerges.

FIGURE **1**

A Conceptual Framework for Planning and Improving Evidence-Based Practices

So, how might each of the framework's elements apply to environmental health?

Public Health Impact

- **Effectiveness**—Within the framework's definition of effectiveness, both *effect magnitude* and *equity* are key. Environmental health improvements (along with vaccination) have demonstrated significant results, receiving credit for much of the increase in U.S. longevity in the 20th century (Koplan & Fleming, 2000). Additionally, via environmental justice efforts, environmental health has demonstrated impact in the area of equity (Cook, 2008).
- **Reach**—Given the ubiquitous nature of the environment, the potential reach of environmental health interventions is often greater than others. Examples include the reach of smoke-free environments legislation (Tan & Glantz, 2012) and removal of lead from gasoline (Sexton, Needham, & Pirkle, 2004). In addition, compared to efforts to prevent transportation-related injuries through education, environmental interventions such as modifying road environments may have greater reach (Walsh, 2012).
- **Feasibility**—As to feasibility, because of its long practice history and related documented successes, environmental health has significant advantages in demonstrating and communicating feasibility (e.g., retail food inspections and food handler training: Campbell et al., 1998, and healthy housing: Jacobs et al., 2010).
- **Sustainability**—Sustainability may be environmental health's area of greatest advantage. Unlike educational interventions that

Elements of Public Health Impact and Examples of Questions to Consider Related to the Elements

Effectiveness: Extent to which the practice achieves the desired outcomes

1. What are the practice's desired outcomes?
2. How consistent is the evidence?
3. What is the magnitude of the effect, including efficiency or effectiveness or both, as appropriate?
4. What is the significance to public health, systems, or organizational outcomes?
5. What are the benefits or risks for adverse outcomes?
6. In considering benefits or risks for adverse outcomes, does the practice promote health equity?
7. To what extent does the practice achieve the desired outcomes?

Reach: Extent that the practice affects the intended and critical target population(s)

1. What is the practice's intended and critical target population (individuals, customers, staff, agency, and other target populations)?
2. What beneficiaries are affected?
3. What is the proportion of the eligible population affected by the practice?
4. How much of the population could ultimately be affected (potential reach)?
5. How representative are the groups that are currently affected compared with groups ultimately affected by the problem?
6. In considering representativeness, does the practice promote health equity?
7. To what extent does the practice affect the intended and critical target population(s)?

Feasibility: Extent to which the practice can be implemented

1. What are the barriers to implementing this practice?
2. What are the facilitators to implementing this practice?
3. What resources are necessary to fully implement the practice?
4. Does the practice streamline or add complexity to existing procedures or processes?
5. What is the cost-effectiveness and what are the available resources to implement the practice?

continued on page 42

Elements of Public Health Impact and Examples of Questions to Consider Related to the Elements

continued from page 41

Sustainability: Extent to which the practice can be maintained and achieve desired outcomes over time

1. How is the practice designed to integrate with existing programs or processes or both?
2. How is it designed to integrate with existing networks and partnerships?
3. What level of resources is required to sustain the practice over time?
4. What long-term effects or maintenance or improvement of effects over time can be achieved?
5. How has the practice been maintained to achieve its desired outcomes over time?

Transferability: Extent to which the practice can be applied to or adapted for various contexts

1. How has the practice been replicated in similar contexts, and did it achieve its intended outcomes?
2. Was adaptation required in different contexts?
3. How has the practice been adapted?
4. What is the impact of varying political, organizational, geographic, social, and economic climates?
5. Has the practice been proven to be effective in different settings?
6. To what extent has the practice been applied to or adapted for a variety of contexts?

must be repeated to maintain efficacy, environmental interventions—whether removing a hazard or modifying the environment to create facilitators/protections for health—are often more sustainable.

- **Transferability**—Because many of the most well-studied and deployed areas of environmental health represent policies (restaurant inspection) or environmental engineering standards (water purification, transportation engineering) their transferability is easier.

Quality of Evidence

The quality of evidence in areas of significant environmental health involvement (e.g., surveillance [Charreire et al., 2014], food safety [Campbell et al., 1998], indoor air quality [Tan & Glantz, 2012], and built environments [Taskforce for Community Preventive Services, 2014a]) has improved greatly. More practice areas have access to research that falls in the categories of rigorous or strong. And in areas with moderate or weak evidence, environmental health practitioners can learn from past successes within the discipline to improve the evidence base. One example is the Taskforce for Community Preventive Services's recommendation for home-based multi-trigger, multicomponent environmental interventions (2014b). Building on successes like these, it seems very possible for environmental health practice to move rapidly along the continuum towards best practice.

Definitions and Examples Related to Levels of the Evidence Quality Supporting Public Health Practices

Level of Evidence	Definitions and Examples
Weak	Field-based summaries or evaluations in progress that have plausible impact (e.g., abstracts, book chapters without peer review, demonstration projects lacking appropriate evaluation)
Moderate	Intervention evaluations without peer review of practice or publication that have evidence of impact (e.g., case studies with appropriate evaluation, evaluation reports, peer-reviewed abstracts and presentations)
Strong	Case-control or cohort analytic studies; peer-reviewed journal publications; published reports from consensus panels such as the Advisory Committee on Immunization Practices (e.g., nonsystematic review of published intervention evaluations with peer review of practices that have evidence of impact)
Rigorous	Intervention evaluations or studies with systematic review that have evidence of impact (e.g., meta-analyses, Guide to Community Preventive Services)

Conclusion

We developed the framework to begin a dialogue and to encourage further evaluation of current and emerging practices in every public health discipline. It is our hope that the ongoing dialogue will increase our collective efficiency and efficacy, ensure the public's confidence in their public health investments, and improve our collective ability to predict and respond to new challenges. It is my individual hope that environmental health practitioners will not only engage others, but will lead the way in pursuing the very best practices possible in all our activities.

Corresponding Author: Chris Kochtitzky, Associate Director for Program Development, Division of Emergency & Environmental Health Services, National Center for Environmental Health, CDC, 4770 Buford Highway NE, Mailstop F-58, Atlanta, GA 30341-3717. E-mail: csk3@cdc.gov.

References

Campbell, M.E., Gardner, C.E., Dwyer, J.J., Isaacs, S.M., Krueger, P.D., & Ying, J.Y. (1998). Effectiveness of public health interventions in food safety: A systematic review. *Canadian Journal of Public Health, 89*(3), 197–202.

Charreire, H., Mackenbach, J.D., Ouasti, M., Lakerveld, J., Compernolle, S., Ben-Rebah, M., McKee, M., Brug, J., Rutter, H., & Oppert, J.-M. (2014). Using remote sensing to define environmental characteristics related to physical activity and dietary behaviors: A systematic review (the SPOTLIGHT project). *Health & Place, 25*, 1–9.

Cook, W.K. (2008). Integrating research and action: A systematic review of community-based participatory research to address health disparities in environmental and occupational health in the USA. *Journal of Epidemiology and Community Health, 62*(8), 668–676.

Jacobs, D.E., Brown, M.J., Baeder, A., Sucosky, M.S., Margolis, S., Hershovitz, J., Kolb, L., & Morley, R.L. (2010). A systematic review of housing interventions and health: Introduction, methods, and summary findings. *Journal of Public Health Management and Practice, 16*(5), S5–S10.

Koplan, J.P., & Fleming, D.W. (2000). Current and future public health challenges. *Journal of the American Medical Association, 284*(13), 1696–1698.

National Prevention Council. (2011). *National prevention strategy.* Washington, DC: U.S. Department of Health and Human Services, Office of the Surgeon General. Retrieved from http://www.surgeongeneral.gov/initiatives/prevention/strategy/

Rooney, A.A., Boyles, A.L., Wolfe, M.S., Bucher, J.R., & Thayer, K.A. (2014). Systematic review and evidence integration for literature-based environmental health science assessments. *Environmental Health Perspectives* (online). Retrieved from http://ehp.niehs.nih.gov/wp-content/uploads/advpub/2014/4/ehp.1307972.pdf

Sexton, K., Needham, L.L., & Pirkle, J.L. (2004). Human biomonitoring of environmental chemicals. *American Scientist, 92*(1), 38–45.

Spencer, L.M., Schooley, M.W., Anderson, L.A., Kochtitzky, C.S., DeGroff, A.S., Devlin, H.M., & Mercer, S.L. (2013). Seeking best practices: A conceptual framework for planning and improving evidence-based practices. *Preventing Chronic Disease* (online). Retrieved from http://www.cdc.gov/pcd/issues/2013/13_0186.htm

Tan, C.E., & Glantz, S.A. (2012). Association between smoke-free legislation and hospitalizations for cardiac, cerebrovascular, and respiratory diseases: A meta-analysis. *Circulation, 126*(18), 2177–2183.

Taskforce for Community Preventive Services. (2014a). *Environmental and policy approaches: Street-scale urban design and land use policies.* Retrieved from http://www.thecommunityguide.org/pa/environmental-policy/streetscale.html

Taskforce for Community Preventive Services. (2014b). *Asthma control: Home-based multi-trigger, multicomponent interventions.* Retrieved from http://www.thecommunityguide.org/asthma/multicomponent.html

University of Michigan, Center of Excellence in Public Health Workforce Studies. (2013). *Public health workforce enumeration, 2012.* Ann Arbor, MI: University of Michigan. Retrieved from http://www.phf.org/resourcestools/Documents/UM_CEPHS_Enumeration2012_Revised_July_2013.pdf

Walsh, R. (2012). *Local policies and practices that support safe pedestrian environments.* Retrieved from http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_syn_436.pdf

White House Office of Management and Budget (2014). *Fiscal year 2016 budget guidance* (OMB Memo M-14-07). Retrieved from http://www.whitehouse.gov/sites/default/files/omb/memoranda/2014/m-14-07.pdf

DEMYSTIFYING THE FUTURE

Thomas Frey

"Situational Futuring" and 44 Mind-Stretching Scenarios to Learn How to Use It: The Second 22

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.

Last issue's column introduced the concept of situational futuring. To refresh your memory, situational futuring begins with a central idea that grows into a series of rippling thoughts, issues, and questions expanding in every direction. The process begins with an initial scenario and asks some of the standard who-what-when-where-how-and-why questions. Probing deeper, questions formulated around things like timing, monetary implications, disruptive effects, symbiotic partners, who-wins-who-loses, wild cards, policy changes, and strange bedfellows will help expand your thinking even further.

Unlike the study of macro or megatrends, situational futuring is a microfuturing process that begins with a single invention, tiny idea, or what-if condition and expands from there. This column provides a list of the second 22 examples and some final thoughts.

44 Examples of Situational Futuring: The Second 22

23. **Hyper-Individualized Medicine:** Professor Lee Cronin at the University of Glasgow believes we will soon be using 3D printers to replace traditional pharmaceuticals with hyper-individualized medicines that are printed specifically for the person at the time they ordered them. What are the likely health and business implications from this kind of technology?
24. **Crypto Currencies:** Bitcoin is the first crypto currency to make major inroads as an alternative to national currencies. What will be the first major banking system to accept deposits either from bitcoin or some other crypto currency?
25. **Atmospheric Water Harvesters:** Several new technologies have been developed to extract moisture directly from the air. These have become known as atmospheric water harvesters. How long will it be before we see the first city to harvest 100% of its water supply from the atmosphere?
26. **Ultra-High-Speed Transportation System:** Today's high speed trains max out around 300 mph. Vacuum tube transportation systems like the one being proposed by ET3 (www.et3.com), however, have the potential to exceed 4,000 mph. Once implemented, how will a technology like this affect the airline industry?
27. **Genetically Engineered Athletes:** Will genetically engineered designer babies, often referred to as super babies, grow up to become super humans? Will the prospects of creating bigger, faster, stronger humans change the rules for professional sports?
28. **Mass Energy Storage:** We are now entering the early growth stages of what will surely become a huge global indutstry—energy storage. In what year will we see the first mass energy storage system capable of storing enough energy to power a city of one million people for over a month? How will that impact the price of power?
29. **Large-Scale 3D Printing:** In April, the Chinese company WinSun Decoration Design Engineering created the first 3D printed house. They not only printed a

house, they completed 10 houses in a single day using a massive printer that was 490 feet long, 33 feet wide, and 20 feet deep. How long before this same technology can be used to 3D print much larger items such as ships, stadiums, aircraft, and even floating islands?

30. **Water Bullets:** Nonlethal weapons employ many different technologies, but using water bullets could be the easiest to use and also the least dangerous. Are water bullets a likely candidate for nonlethal weapon technology, and how long before police forces are equipped to use them?
31. **Crowdsourced Court System:** If a court system were developed using crowdsourcing to form its jury decisions, what things would have to change in our current justice system? Would this be a fairer kind of justice and who would be the early adopters?
32. **Instant Sleep:** The workaholic's dream. People who need to finish an important project but are feeling exhausted would simply walk into the instant-sleep chamber, and voilà! In a few seconds they would walk back out, fully rejuvenated and raring to go. Is this possible?
33. **Global Language Archive:** Over the next century nearly half of the roughly 7,000 languages spoken on Earth will disappear, as young people abandon native tongues in favor of English, Mandarin, or Spanish. Do we have a moral obligation to begin archiving our languages in a central repository as a way to preserve our cultures, and in many ways, our humanity?
34. **Legalized Marijuana Movement:** Tracking very similarly to the end of prohibition in 1929, the legalization of recreational marijuana in Colorado and Washington is paving the way for other states and counties to follow suit. How long before marijuana is as prevalent as alcohol in nightclubs around the U.S. and around the world?
35. **Perpetual Self-Filling Canteen:** In a world where people continually die from lack of hydration, one of the most-needed devices is a handheld canteen that is constantly extracting moisture from the air. What are some of the ways a technology like this can be used and how large of market could a technology like this create?
36. **Downloadable Personalities:** If you had the ability to create a new "personality" for your conversational computer, with some new personality-builder software, what features would you want it to have? Who are some of today's best known celebrities who would likely show up as downloadable personalities for your computer, car, or robot? How would this affect your relationship with your machines as well as other people?
37. **Nano-Netting:** Using super strong fibers so small that they are invisible to the human eye, nano-netting will provide a fibrous support structure that is visually nonintrusive but capable of keeping out insects, birds, and other unwanted animals. But this technology will also enable objects to be suspended in air with seemingly invisible support. Invisible fences, invisible screens, invisible cars and windmills will all be possible. What kind of market will there be for invisible netting like this?
38. **Electron-Based Information Storage:** Yes, Moore's Law is still in effect, but we are still a long ways from using electrons as the basis for our storage medium. How long will it be before this happens and how will achieving this milestone for ultra-tiny storage particles change the tech industry?
39. **Seed Capitalists:** In the startup business world a huge gulf exists between initial concept and fundable prototypes. This dearth of funding options will require an entirely new profession. How will the introduction of seed capitalists, who specialize in high-risk early stage startups, change the entrepreneurial landscape?
40. **Avatar Relationship Managers:** As the foibles of humanity enter the realm of autonomous, freethinking avatars, people will find it necessary to both manage and limit the often dangerous relationships that our avatars get us into. Will this be a near-term problem?
41. **Anomaly Zero:** The medical problems most people have can be traced to changes in a single cell. Anomaly Zero is the first detectable sign that something is wrong. We may not be able to spot a change in a single cell, but can get far closer than what we detect today. So how can we use our pursuit of Anomaly Zero to intervene before major damage begins?
42. **Robotic Earthworms:** The most valuable land on the planet will soon be the landfills because that is where we have buried our most valuable natural resources. In the future, robotic earthworms will be used to silently mine the landfills and replace whatever is extracted with high-grade soil.
43. **Movable Holes:** If you drill a hole in the wrong place, will it someday be possible to simply move the hole? Will this type of technology ever be practical? If so, how will movable holes be advertised and sold?
44. **Flashdark:** As a device that works the opposite of a flashlight, the "flashdark" can be used to shine "darkness" onto any surface. So if you're getting too much sun on the beach, shining darkness on yourself becomes an easy solution. Does the invention of the "flashdark" violate our current laws of physics? Even so, is it still a viable technology?

Final Thoughts

How much power and influence do predictions have? Do predictions sometimes influence an event to happen? Are some more of a self-fulfilling prophecy than a prediction?

The answer depends on many factors. Who is making the prediction, how credible are they, how many people are actually paying attention to it, and are other factors involved that we may not be aware of?

As with most predictions, some of the ones above are far more likely than others. But the true value in this kind of list comes from giving serious consideration to each one of them and reaching your own conclusions. And situational futuring is a fascinating tool that can help you do exactly that.

In this context predictions become an important tool, even when they are wrong.

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**

Food Safety Inspector

UL Everclean Services is the leader in the restaurant inspections market. We offer opportunities throughout the country. We currently have openings for professionals to conduct Q.A. audits of restaurants.

Past or current food safety inspecting is required.

U.S. Listings
Alaska
Baltimore, MD
Billings, MT
Birmingham, AL
Bismarck, ND
Boise, ID
Buffalo, NY
Butte, MT
Chattanooga, TN
Cleveland, OH
Grand Junction, CO
Hartford, CT
Indianapolis, IN
Jackson, MS
Kansas City, KS
Little Rock, AR
McAllen, TX
Milwaukee, WI
Minneapolis, MN
New Orleans, LA
Oklahoma City, OK
Owatonna, MN
Pittsburgh, PA
Pocatello, ID
Princeton, WV
Roanoke, VA
Rochester, NY
San Jose, CA
Shreveport, LA
Spearfish, SD
St. Louis, MO
St. Paul, MN
Syracuse, NY
Tampa, FL
Tulsa, OK
Washington, DC
Yuma, AZ

Canada Listings
Edmonton, AB
Kamloops, BC
Mississauga, ON
Ontario
Ottawa, ON

Interested applicants can send their resume to: Bill Flynn at Fax: 818-865-0465. E-mail: Bill.Flynn@ul.com.

Find a Job | Fill a Job

Where the "best of the best" consult...

NEHA's Career Center

First job listing **FREE** for city, county, and state health departments with a NEHA member, and for Educational and Sustaining members.

For more information, please visit neha.org/job_center.html

NEHA SABBATICAL EXCHANGE PROGRAM TO ENGLAND OR CANADA

NEHA offers wide-ranging opportunities for professional growth and the exchange of valuable information on the international level through its longtime Sabbatical Exchange Program.

The sabbatical may be taken in England, in cooperation with the Chartered Institute of Environmental Health, or in Canada, in cooperation with the Canadian Institute of Public Health Inspectors. The sabbatical can be from two to four weeks, as determined by the recipient. If selected, the sabbatical ambassador receives up to **$4,000** as a stipend, depending on the length of the sabbatical, and up to $1,000 for roundtrip transportation.

The application deadline is March 2, 2015.

Winners will be announced at the NEHA 2015 Annual Educational Conference (AEC) & Exhibition in Orlando, Florida, in July 2015. Recipients will complete the sabbatical between August 1, 2015, and June 1, 2016. The sabbatical ambassador will give a required report of their experience at the 2016 AEC in San Antonio, Texas.

For more information, contact Terry Osner at tosner@neha.org.

To access the online application, visit www.neha.org/about/awardinfo.html.

Students Don't Miss This Opportunity!

Applications for the 2015 National Environmental Health Association/American Academy of Sanitarians (NEHA/AAS) Scholarship Program are now available. Last year, $4,000 was awarded to two students who demonstrated the highest levels of achievement in their respective environmental public health degree programs. If you would like an application or information about the NEHA/AAS Scholarship, do one of the following before the deadline:

Visit

www.neha.org/scholarship/scholarship.html.

Application and qualification information is available to download from NEHA's scholarship Web page.

Contact

Cindy Dimmitt
with a request for
an application and information.
E-mail: cdimmitt@neha.org
Phone: 303.756.9090, ext. 300
Write: NEHA/AAS Scholarship
720 S. Colorado Blvd.,
Ste.1000-N
Denver, CO 80246-1926

Deadline: February 1, 2015

EH CALENDAR

UPCOMING NEHA CONFERENCE

July 13–15, 2015: NEHA's 79th Annual Educational Conference & Exhibition, Renaissance Orlando at SeaWorld, Orlando, FL. For more information, visit www.neha2015aec.org.

NEHA AFFILIATE AND REGIONAL LISTINGS

California
April 13–16, 2015: Annual Educational Symposium, hosted by the California Environmental Health Association, San Diego, CA. For more information, visit www.ceha.org.

Michigan
March 17–20, 2015: Annual Educational Conference, hosted by the Michigan Environmental Health Association, Traverse City, MI. For more information, visit www.meha.net.

Ohio
April 22–24, 2015: Annual Education Conference, hosted by the Ohio Environmental Health Association, Dublin, OH. For more information, visit www.ohioeha.org.

Texas
December 3–5, 2014: Annual Educational Conference, hosted by the South Texas Chapter of the Texas Environmental Health Association, South Padre Island, TX. For more information, visit www.facebook.com/TEHASTC.

TOPICAL LISTINGS

Food Safety
December 4–5, 2014: Consumer Food Safety Education Conference, hosted by the Partnership for Food Safety Education, Arlington, VA. For more information, visit www.teamfoodsafety.org/2014.

2015 Educational Contribution Award

This award was established to recognize NEHA members, teams, or organizations for an outstanding educational contribution within the field of environmental health. This award provides a pathway for the sharing of creative methods and tools to educate one another and the public about environmental health principles and practices. Don't miss this opportunity to submit a nomination to highlight the great works of your colleagues!

Nominations are due in the NEHA office by March 16, 2015.

For more information, please visit **www.neha.org/about/awardinfo.html**.
Nomination materials can be obtained by e-mailing Terry Osner at **tosner@neha.org**.

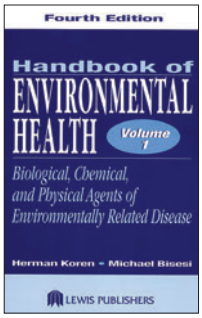
RESOURCE CORNER

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!

NEHA BOOKSTORE
www.neha.org/store

Handbook of Environmental Health, Volume 1: Pollutant Interactions With Air, Water, and Soil (Fourth Edition)

Herman Koren and Michael Bisesi (2003)

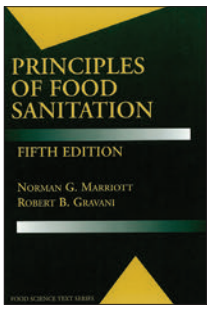


A must-have for the reference library of anyone with environmental health concerns, this book focuses on factors that are generally associated with the internal environment. It is written by experts in the field and co-published with the National Environmental Health Association. A variety of environmental issues are covered, such as food safety, food technology, insect and rodent control, indoor air quality, hospital environment, home environment, injury control, pesticides, industrial hygiene, instrumentation, and much more. Environmental issues, energy, practical microbiology and chemistry, risk assessment, emerging infectious diseases, laws, toxicology, epidemiology, human physiology, and the effects of the environment on humans are also covered. Study reference for NEHA's REHS/RS exam.

790 pages / Hardback / Catalog #215A
Member: $195 / Nonmember: $215

Principles of Food Sanitation (Fifth Edition)

Norman G. Marriott and Robert B. Gravani (2006)

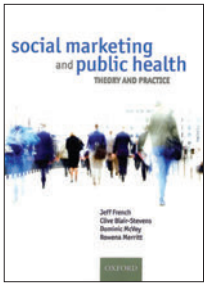


This book provides sanitation information needed to ensure hygienic practices and safe food for food industry and regulatory professionals. It addresses the principles related to contamination, cleaning compounds, sanitizing, and cleaning equipment. It also presents specific directions for applying these concepts to attain hygienic conditions in food processing or preparation operations. The book includes chapters that address biosecurity and allergens as they relate to food sanitation, as well as updated chapters on the fundamentals of food sanitation, contamination sources and hygiene, HACCP, cleaning and sanitizing equipment, and waste handling disposal. Study reference for NEHA's REHS/RS and CP-FS exams.

413 pages / Hardback / Catalog #126
Member: $84 / Nonmember: $89

Social Marketing and Public Health: Theory and Practice

Jeff French, Clive Blair-Stevens, Dominic McVey, and Rowena Merritt (2010)

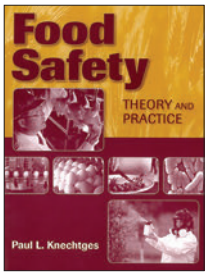


Social marketing is the application of tools and principles for the design, implementation, and evaluation of health and social behavior change programs. Social marketing is increasingly recognized as a valuable tool within public health, where it can improve health. This book sets out new thinking on social marketing within a strategic as well as operational context. It adopts a whole-system ecological approach drawing on the latest international learning and thinking. It covers both theory and practical step-by-step planning, enhanced by case examples that illustrate the benefits and challenges involved in applying social marketing. It will appeal to a broad policy, academic, and practitioner readership, from public sector and business backgrounds, including those working in policy, public and environmental health, health promotion, public sector management, nursing, medicine, allied health, communications, and marketing.

349 pages / Paperback / Catalog #1118
Member: $67 / Nonmember: $72

Food Safety: Theory and Practice

Paul L. Knechtges (2012)



Authored by a NEHA member! Written from a "farm-to-fork" perspective, this book provides a comprehensive overview of food safety and discusses the biological, chemical, and physical agents of foodborne diseases. Topics covered include risk and hazard analysis of goods; the prevention of foodborne illnesses and diseases; safety management of the food supply; food safety laws, regulations, enforcement, and responsibilities; and the pivotal role of food sanitation/safety inspectors. Early chapters introduce readers to the history and fundamental principles of food safety. Later chapters provide an overview of the risk and hazard analysis of different foods and the important advances in technology that have become indispensable in controlling hazards in the modern food industry.

460 pages / Paperback / Catalog #1120
Member: $78 / Nonmember: $83

SUPPORT THE NEHA ENDOWMENT FOUNDATION

The NEHA Endowment Foundation was established to enable NEHA to do more for the environmental health profession than its annual budget might allow. Special projects and programs supported by the foundation will be carried out for the sole purpose of advancing the profession and its practitioners.

Individuals who have contributed to the foundation are listed below by club category. These listings are based on what people have actually donated to the foundation—not what they have pledged. Names will be published under the appropriate category for one year; additional contributions will move individuals to a different category in the following year(s). For each of the categories, there are a number of ways NEHA recognizes and thanks contributors to the foundation. If you are interested in contributing to the Endowment Foundation, please fill out the pledge card or call NEHA at 303.756.9090.

Thank you.

DELEGATE CLUB ($25–$99)

Name in the Journal *for one year and endowment pin.*

Freda W. Bredy
Alexandria, VA

HONORARY MEMBERS CLUB ($100–$499)

Letter from the NEHA president, name in the Journal *for one year, and endowment pin.*

Michele R. DiMaggio
Martinez, CA

B. Robert Rothenhoefer, RS, REHS, CP-FS
Falls Church, VA

James M. Speckhart, MS
Norfolk, VA

21st CENTURY CLUB ($500–$999)

Name in AEC program book, name submitted in drawing for a free one-year NEHA membership, name in the Journal *for one year, and endowment pin.*

Bette J. Packer
Ham Lake, MN

Peter M. Schmitt
Shakopee, MN

Dr. Bailus Walker, Jr.
Arlington, VA

SUSTAINING MEMBERS CLUB ($1,000–$2,499)

Name in AEC program book, name submitted in drawing for a free two-year NEHA membership, name in the Journal *for one year, and endowment pin.*

James J. Balsamo, Jr., MS, MPH, MHA, RS, CP-FS
Metairie, LA

George A. Morris, RS
Dousman, WI

Welford C. Roberts, PhD, RS, REHS, DAAS
South Riding, VA

Walter P. Saraniecki, MS, LDN, LEHP, REHS/RS
La Grange, IL

AFFILIATES CLUB ($2,500–$4,999)

Name in AEC program book, name submitted in drawing for a free AEC registration, name in the Journal *for one year, and endowment pin.*

EXECUTIVE CLUB AND ABOVE ($5,000–$100,000)

Name in AEC program book, special invitation to the AEC President's Reception, name in the Journal *for one year, and endowment pin.*

NEHA ENDOWMENT FOUNDATION PLEDGE CARD

I pledge to be a NEHA Endowment Foundation Contributor in the following category:

❍ Delegate Club ($25)
❍ Honorary Members Club ($100)
❍ 21st Century Club ($500)
❍ Sustaining Members Club ($1,000)
❍ Affiliates Club ($2,500)
❍ Executive Club ($5,000)
❍ President's Club ($10,000)
❍ Endowment Trustee Society ($25,000)
❍ Visionary Society ($50,000)
❍ Futurists Society ($100,000)
❍ **You have my permission to disclose the fact and amount (by category) of my contribution and pledge.**

I plan to make annual contributions to attain the club level of _____ over the next _____ years.

Signature _____ Print Name _____

Organization _____ Phone _____

Street Address _____ City _____ State _____ Zip _____

❍ Enclosed is my check in the amount of $_____ payable to **NEHA Endowment Foundation**.

❍ Please bill my: MasterCard/Visa Card #_____ Exp. Date _____

Signature _____

MAIL TO: NEHA, 720 S. Colorado Blvd., Suite 1000-N, Denver, CO 80246, or FAX to: 303.691.9490. 1411JEHEND

SPECIAL NEHA MEMBERS

Sustaining Members

Advanced Drainage Systems
www.ads-pipe.com

Advanced Fresh Concepts Corp.
www.afcsushi.com

AIB International
www.aibonline.org

Albuquerque Environmental Health Department
www.cabq.gov/environmentalhealth

Allegheny County Health Department
www.county.allegheny.pa.us

American Academy of Sanitarians (AAS)
Gary P. Noonan
www.sanitarians.org

American Chemistry Council
www.americanchemistry.com

Anua
www.anua-us.com

Ashland-Boyd County Health
hollyj.west@ky.gov

Association of Environmental Health Academic Programs
www.aehap.org

ATSDR/DCHI
www.atsdr.cdc.gov/hac

Camelot International Health Organization
www.camelot.gr

CDP, Inc.
www.cdpehs.com

City of Bloomington
www.ci.bloomington.mn.us

City of Fall River Health & Human Services
(508) 324-2410

City of Houston Environmental Health
www.houstontx.gov/health/Environmental

City of Milwaukee Health Department, Consumer Environmental Health
http://city.milwaukee.gov/Health

City of San Diego Environmental Services Department
www.sandiego.gov/environmental-services

City of St. Louis Department of Health
www.stlouis-mo.gov/government/departments/health

Coconino County Public Health
www.coconino.az.gov

Colorado Department of Public Health and Environment, Division of Environmental Health, Delegated Programs Unit
Therese Pilonetti
therese.pilonetti@state.co.us

Decade Software Company, LLC
Darryl Booth
www.decadesoftware.com

DEH Child Care
www.denvergov.org/DEH

DeltaTrak, Inc.
Vallierie Cureton
www.deltatrak.com

Digital Health Department, Inc.
www.dhdinspections.com

Diversey, Inc.
Steve Hails
www.diversey.com

DuPage County Health Department
www.dupagehealth.org

Eastern Idaho Public Health District
www.phd7.idaho.gov

Ecobeco
www.ecobeco.com

Ecolab
robert.casey@ecolab.com
www.ecolab.com

EcoSure
charlesa.arnold@ecolab.com

Elite Food Safety Training
www.elitefoodsafety.com

English Sewage Disposal, Inc.
(756) 358-4771

Florida Department of Health
www.doh.state.fl.us

Gila River Indian Community, Environmental Health Services
www.gilariver.org

GLO GERM/Food Safety First
Joe D. Kingsley
www.glogerm.com

HealthSpace USA Inc.
Joseph Willmott
www.healthspace.com

Industrial Test Systems, Inc.
www.sensafe.com

Inspect2Go
www.inspect2go.com

InspekPro LLC
www.inspekpro.com

International Association of Plumbing and Mechanical Officials
www.iapmo.org

Jefferson County Health Department (Missouri)
Joe Hainline
www.jeffcohealth.org

Jefferson County Public Health (Colorado)
csanders@jeffco.us
http://jeffco.us/health

Kansas Department of Health & Environmental
jrhoads@kdheks.gov

LaMotte Company
www.lamotte.com

Linn County Public Health
health@linncounty.org

Maricopa County Environmental Services
jkolman@mail.maricopa.gov

Mars Air Doors
www.marsair.com

Merced County Public Health, Division of Environmental Health
rrowe@co.merced.ca.us

Mesothelioma Lawyer Center
www.mesotheliomalawyercenter.org

Mid-Iowa Community Action
www.micaonline.org

Mid-Ohio Valley Health Department
tim.l.miller@wv.gov
www.movhd.com

Mitchell Humphrey
www.mitchellhumphrey.com

Mycometer
www.mycometer.com

National Environmental Health Science and Protection Accreditation Council
www.ehacoffice.org

National Registry of Food Safety Professionals
Lawrence Lynch
www.nrfsp.com

National Restaurant Association
www.restaurant.org

National Swimming Pool Foundation
Michelle Kavanaugh
www.nspf.org

Neogen Corporation
www.neogen.com

New York City Department of Health & Mental Hygiene
www.nyc.gov/health

North Bay Parry Sound District Health Unit
www.healthunit.biz

Nova Scotia Department of Agriculture
www.gov.ns.ca

NSF International
Stan Hazan
www.nsf.org

Omaha Healthy Kids Alliance
www.omahahealthykids.org

Oneida Indian Tribe of Wisconsin
www.oneidanation.org

Orkin
Zia Siddiqi
www.orkincommercial.com

Ozark River Hygienic Hand-Wash Station
www.ozarkriver.com

PerkinElmer, Inc.
www.perkinelmer.com

Polk County Public Works
www.polkcountyiowa.gov/publicworks

Presby Environmental, Inc.
www.presbyenvironmental.com

Prometric
www.prometric.com

Racine City Department of Health
www.cityofracine.org/Health.aspx

Remco Products
www.remcoproducts.com

Sacramento County Environmental Management Department
www.emd.saccounty.net

San Jamar
www.sanjamar.com

Seattle & King County Public Health
Michelle Pederson
michelle.pederson@kingcounty.gov

Shat-R-Shield Inc.
Anita Yost
www.shat-r-shield.com

Skillsoft
www.skillsoft.com

Sneezeguard Solutions Inc.
Bill Pfeifer
www.sneezeguard-solutions.com

Sonoma County Permit and Resource Management Department, Wells and Septic Section
www.sonoma-county.org/prmd

Starbucks Coffee Company
www.starbucks.com

Stater Brothers Market
www.staterbros.com

StateFoodSafety.com
www.StateFoodSafety.com

Sweeps Software, Inc.
Kevin Thrasher
www.sweepssoftware.com

Taylor Technologies, Inc.
www.taylortechnologies.com

Texas Roadhouse
www.texasroadhouse.com

The Steritech Group, Inc.
www.steritech.com

Tri-County Health Department
www.tchd.org

Underwriters Laboratories, Inc.
Gus Schaeffer
www.ul.com

Waco-McLennan County Public Health District
davidl@ci.waco.tx.us

Washington County Environmental Health (Oregon)
environmentalhealth@co.washington.or.us
www.co.washington.or.us/HHS/EnvironmentalHealth

Waukesha County Public Health Division
sward@waukeshacounty.gov
www.oeo.wv.gov

Winn-Dixie Stores, Inc.
www.winn-dixie.com

Educational Institution Members

American Public University
Tatiana Sehring
www.StudyatAPU.com/NEHA

Colorado State University, Department of Environmental/Radiological Health
www.colostate.edu

East Tennessee State University, DEH
Phillip Scheuerman
www.etsu.edu

Eastern Kentucky University
worley.johnson@eku.edu
http://eh.eku.edu

Georgia State University
Christine Stauber
cstauber@gsu.edu

Michigan State University, Online Master of Science in Food Safety
www.online.foodsafety.msu.edu

Ponce School of Medicine, Public Health Program
www.psm.edu/php

The University of Findlay
www.findlay.edu/sciences/environmental-ma

University of Illinois Springfield
Sharron LaFollette
www.uis.edu/publichealth

University of Wisconsin–Stout, College of Science, Technology, Engineering, and Mathematics
www.uwstout.edu

SPECIAL **LISTING**

The board of directors includes NEHA's nationally elected officers and regional vice presidents. Affiliate presidents (or appointed representatives) comprise the Affiliate Presidents Council. Technical advisors, the executive director, and all past presidents of the association are ex-officio council members. This list is current as of press time.

Adam London, RS, MPA
Second Vice President

National Officers

President—Carolyn Hester Harvey, PhD, CIH, RS, DAAS, CHMM, Professor, Director of MPH Program, Department of Environmental Health, Eastern Kentucky University, Dizney 220, 521 Lancaster Avenue, Richmond, KY 40475.
Phone: (859) 622-6342
carolyn.harvey@eku.edu

President Elect—Bob Custard, REHS, CP-FS, 29 Hammond Drive, Lovettsville, VA 20180. Phone: (571) 221-7086
BobCustard@comcast.net

First Vice President—David E. Riggs, REHS/RS, MS, 2535 Hickory Avenue, Longview, WA 98632. Phone: (360) 430-0241
davideriggs@comcast.net

Second Vice President—Adam London, RS, MPA, Environmental Health Director, Kent County Health Department, 700 Fuller NE, Grand Rapids, MI 49503.
Phone: (616) 632-7266
adam.london@kentcountymi.gov

Immediate Past President—Alicia Enriquez Collins, REHS
enriqueza@comcast.net

Regional Vice Presidents

Region 1—Ned Therien, MPH,
Olympia, WA.
nedinoly@juno.com
Alaska, Idaho, Oregon, and Washington.
Term expires 2017.

Region 2—Marcy A. Barnett, MA, MS, REHS, Emergency Preparedness Liaison, California Department of Public Health, Center for Environmental Health, Sacramento, CA. Phone: (916) 449-5686
marcy.barnett@cdph.ca.gov
Arizona, California, Hawaii, and Nevada.
Term expires 2015.

Region 3—Roy Kroeger, REHS,
Environmental Health Supervisor, Cheyenne/Laramie County Health Department, 100 Central Avenue, Cheyenne, WY 82008.
Phone: (307) 633-4090
roykehs@laramiecounty.com
Colorado, Montana, Utah, Wyoming, and members residing outside of the U.S. (except members of the U.S. armed forces).
Term expires 2015.

Region 4—Keith Johnson, RS, Administrator, Custer Health, 210 2nd Avenue NW, Mandan, ND 58554.
Phone: (701) 667-3370
keith.johnson@custerhealth.com
Iowa, Minnesota, Nebraska, North Dakota, South Dakota, and Wisconsin.
Term expires 2016.

Region 5—Sandra Long, REHS, RS, Inspection Services Supervisor, City of Plano Health Department, 1520 K Avenue, Suite 210, Plano, TX 75074. Phone: (972) 941-7143 ext. 5282; Cell: (214) 500-8884
sandral@plano.gov
Arkansas, Kansas, Louisiana, Missouri, New Mexico, Oklahoma, and Texas.
Term expires 2017.

Region 6—Lynne Madison, RS,
Environmental Health Division Director, Western UP Health Department, 540 Depot Street, Hancock, MI 49930.
Phone: (906) 482-7382, ext. 107
lmadison@hline.org
Illinois, Indiana, Kentucky, Michigan, and Ohio. Term expires 2016.

Region 7—Tim Hatch, MPA, REHS,
Environmental Programs, Planning, and Logistics Director, Center for Emergency Preparedness, Alabama Department of Public Health, 201 Monroe Street, Suite 1310, Montgomery, AL 36104.
Phone: (334) 206-7935
tim.hatch@adph.state.al.us
Alabama, Florida, Georgia, Mississippi, North Carolina, South Carolina, and Tennessee. Term expires 2017.

Region 8—LCDR James Speckhart, MS, USPHS, Health and Safety Officer, FDA, CDRH-Health and Safety Office, WO62 G103, 10903 New Hampshire Avenue, Silver Spring, MD 20993. Phone: (301) 796-3366
jamesmspeckhart@gmail.com
Delaware, Maryland, Pennsylvania, Virginia, Washington, DC, West Virginia, and members of the U.S. armed forces residing outside of the U.S. Term expires 2015.

Region 9—Edward L. Briggs, MPH, MS, REHS, Director of Health, Town of Ridgefield Department of Health, 66 Prospect Street, Ridgefield, CT 06877.
Phone: (203) 431-2745
eb.health@ridgefieldct.org
Connecticut, Maine, Massachusetts, New Hampshire, New Jersey, New York, Rhode Island, and Vermont. Term expires 2016.

Affiliate Presidents

Alabama—Haskey Bryant, MPH, MPA, Environmental Health Specialist, Jefferson County Dept. of Health, Birmingham, AL.
haskey.bryant@jcdh.org

Alaska—Ryan Autenrieth, REHS, Environmental Health Officer, Yukon-Kuskokwim Health Corporation, Bethel, AK.
aeha.net@gmail.com

Arizona—Shikha Gupta, Environmental Operations Program Supervisor, Maricopa County, Phoenix, AZ.
sgupta@mail.maricopa.gov

Arkansas—Jeff Jackson, Camden, AR.
jeff.jackson@arkansas.gov

California—Sarah Crossman, REHS, Environmental Health Specialist IV, Riverside County Dept. of Environmental Health, Riverside, CA.
president@ceha.org

Colorado—Mindi Ramig, Environmental Health Supervisor, Jefferson County Public Health, Golden, CO.
mramig@jeffco.us

Connecticut—Marco Palmeri, RS, Chief Sanitarian, Plainville-Southington Regional Health District, Plainville, CT.
health@plainville-ct.gov

Florida—Jill Wallace, Winter Haven, FL.
kninetrainer@aol.com

Georgia—Chris Rustin, MS, DrPH, REHS, Environmental Health Section Director, Georgia Dept. of Public Health, Atlanta, GA.
chris.rustin@dph.ga.gov

Hawaii—John Nakashima, Sanitarian IV, Food Safety Education Program, Hawaii Dept. of Health, Hilo, HI.
john.nakashima@doh.hawaii.gov

Idaho—Patrick Guzzle, MA, MPH, REHS, Food Protection Program Manager, Idaho Dept. of Health and Welfare, Boise, ID.
guzzlep@dhw.idaho.gov

Illinois—Adam Dotson, MPA, LEHP, Community Development Director, City of Oak Forest, Oak Forest, IL.
adotson@oak-forest.org

Indiana—Michael Mettler, Indiana State Dept. of Health, Indianapolis, IN.
mmettler@isdh.in.gov

Iowa—Sandy Heinen, Environmental Health Officer, Black Hawk County Health Dept., Waterloo, IA.
sheinen@co.black-hawk.ia.us

Jamaica—Steve Morris, Chief Public Health Inspector, Ministry of Health, St. Catherine, Jamaica.
president@japhi.org.jm

Kansas—Bronson Farmer, RS, HHS, Salina-Saline County Health Dept., Salina, KS.
farmerduo@hotmail.com

Kentucky—Leslie Cobb, Technical Consultant, Kentucky Food Safety Branch, Frankfort, KY.
leslie.cobb@ky.gov

Louisiana—John Koury, MS, COO, KourCo Enivironmental Services, Inc., Lafayette, LA.
jkoury@kourco.com

Maryland—James Lewis, Westminster, MD.
jlewis@mde.state.md.us

Massachusetts—Alan D. Perry, REHS/RS, Attleboro Health Dept., Attleboro, MA.
president@maeha.org

Michigan—Carolyn Kreiger, REHS, Environmental Quality Analyst, Michigan Dept. of Environmental Quality, Kalamazoo, MI.
chobbs@meha.net

Minnesota—Jim Topie, REHS, Planner Principal, Minnesota Dept. of Health, Duluth, MN.
james.topie@state.mn.us

Mississippi—Queen Swayze, Food Program Specialist, Mississippi State Dept. of Health, Jackson, MS.
elizabeth.swayze@msdh.state.ms.us

Missouri—Paul Taylor, Environmental Representative, St. Louis County Health Dept., St. Louis, MO.
ptaylor@stlouisco.com

Montana—Laurel Riek, RS, Program Manager, Lewis & Clark City/County Health Dept., Helena, MT.
lriek@lccountymt.gov

National Capitol Area—Shannon McKeon, Environmental Health Specialist, Fairfax, VA.
smckeon@ncaeha.com

Nebraska—Kathy King, Environmental Health Specialist II, Lincoln-Lancaster Health Dept., Lincoln, NE.
kking@lincoln.ne.gov

Nevada—Tamara Giannini, Environmental Health Supervisor, Southern Nevada Health District, Las Vegas, NV.
giannini@snhdmail.org

New Jersey—Robert Uhrik, REHS, South Brunswick Township Health Dept., Monmouth Junction, NJ.
ruhrik@sbtnj.net

New Mexico—Michael Broussard, CP-FS, Program Specialist, NMED, Santa Fe, NM.
michael.broussard@state.nm.us

New York—Contact Region 9 Vice President Edward L. Briggs.
eb.health@ridgefieldct.org

North Carolina—Jesse Dail, Environmental Health Specialist, Morehead City, NC.
jessed@carteretcountygov.org

North Dakota—Jane Kangas, Environmental Scientist II, North Dakota Dept. of Health, Fargo, ND.
jkangas@nd.gov

Northern New England Environmental Health Association—Co-president Brian Lockard, Health Officer, Town of Salem Health Dept., Salem, NH.
blockard@ci.salem.nh.us
Co-president Thomas Sloan, RS, Agricultural Specialist, New Hampshire Dept. of Agriculture, Concord, NH.
tsloan@agr.state.nh.us

Ohio—Eric J. Zgodzinski, MPH, RS, CPH, Director of Community and Environmental Health, Toledo-Lucas County Health Dept., Toledo, OH.
zgodzinski@co.lucas.oh.us

Oklahoma—Matthew Brosh, RPES, Public Health Specialist, Oklahoma City-County Health Dept., Oklahoma City, OK.
matt_brosh@occhd.org

Oregon—Delbert Bell, Klamath Falls, OR. Dbell541@charter.net

Past Presidents—Brian Collins, MS, REHS, DAAS, Director of Environmental Health (ret)

Pennsylvania—TBD

Rhode Island—Dottie LeBeau, CP-FS, Food Safety Consultant and Educator, Dottie LeBeau Group, Hope, RI. deejaylebeau@verizon.net

Saudi Arabia—Zubair M. Azizkhan, Environmental Scientist, Saudi Arabian Oil Company, Saudi Arabia. Zubair.azizkhan@aramco.com.sa

South Carolina—Trey Reed, Regional Environmental Health Director, South Carolina Dept. of Health and Environmental Control, Aiken, SC. reedhm@dhec.sc.gov

South Dakota—John Osburn, Pierre, SD. john.osburn@state.sd.us

Tennessee—David Garner, Nashville, TN. david.garner@tnenvironmentalhealth.org

Texas—Cindy Corley, REHS, CP-FS, Environmental Health Manager, City of Garland Health Dept., Garland, TX. ccorley@garlandtx.gov

Uniformed Services—Joseph Hout, Environmental Science Officer, The Uniformed Services University of the Health Sciences, Bethesda, MD. joseph.hout@usuhs.edu

Utah—Ronald Lund, Salt Lake County Health Dept., Murray, UT. rlund@slco.org

Virginia—Christopher Gordon, Executive Advisor-Public Health, Virginia Dept. of Health, Richmond, VA. christopher.gordon@vdh.virginia.gov

Washington—Michael Baker, MS, PhD, Dept. of Environmental Health Director, Whitman County Public Health, Pullman, WA. michael.baker@whitmancounty.net

West Virginia—Elizabeth Green, Parkersburg, WV. elizabeth.s.green@wv.gov

Wisconsin—Laura Temke, REHS, CP-FS, HHS, Environmentalist, City of West Allis Health Dept., West Allis, WI. ltemke@westalliswi.gov

Wyoming—Tiffany Gaertner, REHS, CP-FS, EHS II, Cheyenne-Laramie County Health Dept., Cheyenne, WY. tgaertner@laramiecounty.com

NEHA Historian

Dick Pantages, NEHA Past President, Fremont, CA. dickpantages@comcast.net

Technical Advisors

Air Quality—Scott E. Holmes, REHS, MS, Environmental Public Health Manager, Lincoln-Lancaster County Health Dept., Lincoln, NE. sholmes@lincoln.ne.gov

Aquatic Venues/Recreational Health—Tracynda Davis, MPH, Environmental Health Consultant, Colorado Springs, CO. tracynda@gmail.com

Aquatic Venues/Recreational Health—Colleen Maitoza, REHS, Supervising Environmental Specialist, Environmental Management Dept., County of Sacramento, Mather, CA. maitozac@saccounty.net

Children's Environmental Health—M.L. Tanner, HHS, Environmental Health Manager III, Bureau of Environmental Health Services, Division of Food Protection and Rabies Prevention, South Carolina Dept. of Health and Environmental Control, Columbia, SC. tannerml@dhec.sc.gov

Drinking Water/Environmental Water Quality—Sharon Smith, RS, West Central Region Supervisor, Minnesota Dept. of Health, Fergus Falls, MN. sharon.l.smith@state.mn.us

Emergency Preparedness and Response—Martin A. Kalis, Public Health Advisor, CDC/NCEH/DEEHS/EHSB, Atlanta, GA. mkalis@cdc.gov

Emergency Preparedness and Response—Vince Radke, MPH, REHS, CP-FS, DAAS, Sanitarian, CDC/NCEH/DEEHS/EHSB, Atlanta, GA. vradke@cdc.gov

Emerging Pathogens—Lois Maisel, RN, CP-FS, Environmental Health Specialist II, Fairfax County Health Dept., Fairfax, VA. lois.maisel@fairfaxcounty.gov

Environmental Justice—Welford C. Roberts, PhD, DAAS, RS/REHS, Subject Matter Expert, Office of the Air Force Surgeon General, ERP International, LLC., South Riding, VA. welford@erols.com

Food (including Safety and Defense)—Eric Bradley, MPH, REHS/RS, CP-FS, Environmental Health Specialist, Scott County Health Dept., Davenport, IA. Eric.Bradley@scottcountyiowa.com

Food (including Safety and Defense)—John A. Marcello, REHS, CP-FS, Pacific Regional Food Specialist, FDA, Tempe, AZ. john.marcello@fda.hhs.gov

General Environmental Health—Ron de Burger, Retired Director, Toronto Public Health, Toronto, ON, Canada. rdeburger@gmail.com

General Environmental Health—Eric Pessell, REHS, Environmental Health Division Director, Kent County Health Dept., Grand Rapids, MI. eric.pessell@kentcountymi.gov

Global Climate Change and Health—Steve Konkel, PhD, MCP, AICP, FRIPH, Associate Professor, Environmental Health Sciences, University of Alaska Anchorage, Anchorage, AK. steven.konkel@uaa.alaska.edu

Hazardous Materials/Toxic Substances—Priscilla Oliver, PhD, Life Scientist/Program Manager, U.S. EPA, Atlanta, GA. POliverMSM@aol.com

Healthy Homes and Healthy Communities—Sandra Whitehead, MPA, Environmental Public Health Planner, Division of Environmental Health, Florida Dept. of Health, Tallahassee, FL. Sandra_Whitehead@doh.state.fl.us

Injury Prevention—CAPT Alan J. Dellapenna, Jr., RS, MPH, DAAS, Historian, Indian Health Service, Rockville, MD. alan.dellapenna@gmail.com

Institutions/Schools—TBD

International—Sylvanus Thompson, PhD, CPHI(C), Associate Director, Toronto Public Health, Toronto, ON, Canada. sthomps@toronto.ca

Land Use Planning/Design—Felix I. Zemel, MCP, MPH, RS, DAAS, Health Agent/Administrator, Cohasset Board of Health, Cohasset, MA. felix.zemel@gmail.com

Legal—Doug Farquhar, JD, Program Director, National Conference of State Legislatures, Denver, CO. doug.farquhar@ncsl.org

Mentorship—Sheila D. Pressley, DrPH, REHS/RS, Associate Professor, Eastern Kentucky University, Richmond, KY. sheila.pressley@eku.edu

Mentorship—Marie Woodin, REHS, Deputy Division Chief, Sacramento County Environmental Management Dept., Sacramento, CA. WoodinM@saccounty.net

Occupational Health/Safety—D. Gary Brown, DrPH, CIH, RS, DAAS, Professor, Eastern Kentucky University, Richmond, KY. gary.brown@eku.edu

Radiation/Radon—TBD

Risk Assessment—TBD

Sustainability—Tom R. Gonzales, MPH, REHS, Environmental Health Director, El Paso County Public Health, Colorado Springs, CO. tomgonzales@elpasoco.com

Technology (including Computers, Software, GIS, and Management Applications)—Darryl Booth, MBA, President, Decade Software Company, Fresno, CA. darrylbooth@decadesoftware.com

Vector Control—Zia Siddiqi, PhD, BCE, Director of Quality Systems, Orkin, Inc., Atlanta, GA. zsiddiqi@rollins.com

Wastewater—Craig Gilbertson, RS, Environmental Planner, TrackAssist-Online, Walker, MN. cgilbertson@yaharasoftware.com

Workforce Development, Management, and Leadership—CAPT Michael E. Herring, REHS, MPH, Senior Environmental Health Scientist/Training and Technical Assistance Team Leader, CDC, Atlanta, GA. mherring@cdc.gov

Workforce Development, Management, and Leadership—George Nakamura, MPA, REHS/RS, DAAS, President/CEO, Nakamura Leasing, Sunnyvale, CA. gmlnaka@comcast.net

NEHA Staff: (303) 756-9090

Rance Baker, Program Administrator, NEHA Entrepreneurial Zone (EZ), ext. 306, rbaker@neha.org

Trisha Bramwell, Customer & Member Services Specialist, ext. 336, tbramwell@neha.org

Laura Brister, Customer & Member Services Specialist, AEC Registration Coordinator, ext. 309, lbrister@neha.org

Patricia Churpakovich, Credentialing Coordinator, ext. 317, pchurpakovich@neha.org

Ginny Coyle, Grants/Projects Specialist, Research and Development (R&D), ext. 346, gcoyle@neha.org

Jill Cruickshank, Chief Operating Officer (COO), ext. 342, jcruickshank@neha.org

Vanessa DeArman, Project Coordinator, R&D, ext. 311, vdearman@neha.org

Cindy Dimmitt, Receptionist, Customer & Member Services Specialist, ext. 300, cdimmitt@neha.org

Elizabeth Donoghue-Armstrong, Copy Editor, *Journal of Environmental Health,* nehasmtp@gmail.com

Eric Fife, Learning Content Producer, NEHA EZ, ext. 344, efife@neha.org

Soni Fink, Strategic Sales Coordinator, ext. 314, sfink@neha.org

Michael Gallagher, IFSS Logistics and Training Coordinator, NEHA EZ, ext. 343, mgallagher@neha.org

TJay Gerber, Credentialing Specialist, ext. 328, tgerber@neha.org

Dawn Jordan, Customer Service Manager, Office Coordinator, HR and IT Liaison, ext. 312, djordan@neha.org

Erik Kosnar, Learning Content Production Assistant, NEHA EZ, ext. 318, ekosnar@neha.org

Elizabeth Landeen, Assistant Manager, R&D, (702) 802-3924, elandeen@neha.org

Matt Lieber, Marketing and Communications Assistant, ext. 338, mlieber@neha.org

Larry Marcum, Managing Director, R&D and Government Affairs, ext. 307, lmarcum@neha.org

Marissa Mills, Project Assistant, R&D, ext. 304, mmills@neha.org

Eileen Neison, Credential Department Customer Service Representative, ext. 310, eneison@neha.org

Carol Newlin, Credentialing Specialist, ext. 337, cnewlin@neha.org

Terry Osner, Administrative Coordinator, ext. 302, tosner@neha.org

Barry Porter, Financial Coordinator, ext. 308, bporter@neha.org

Kristen Ruby-Cisneros, Content Editor, *Journal of Environmental Health*, ext. 341, kruby@neha.org

Michael Salgado, Assistant Manager, NEHA EZ, ext. 315, msalgado@neha.org

Jill Schnipke, Education Coordinator, ext. 313, jschnipke@neha.org

Joshua Schrader, Sales & Training Support, NEHA EZ, ext. 340, jschrader@neha.org

Clare Sinacori, Marketing and Communications Manager, ext. 319, csinacori@neha.org

Christl Tate, Project Coordinator, R&D, ext. 305, ctate@neha.org

To update information, contact Terry Osner at tosner@neha.org.

NEHA **NEWS**

NEHA Staff Profiles

As part of tradition, NEHA features new staff members in the *Journal* around the time of their one-year anniversary. These profiles give you an opportunity to get to know the NEHA staff better and to learn more about the great programs and activities going on in your association.

Clare Sinacori

It is no wonder given my Italian heritage that my initial career choice involved food.

My undergraduate degree in nutrition and registered dietitian credential gave me a taste for working in a variety of food settings, starting in a boutique New York public relations firm working for food clients such as Mazola Corn Oil, Weight Watchers, and Sweet 'n Low. From there my love of the outdoors and a healthy lifestyle brought me to Colorado, and I continued working as a dietitian in hospital food service and community nutrition counseling. Along the way, I realized that I preferred communicating with and impacting the masses as I had in my first PR job, so I obtained my master's degree in integrated marketing communications while working full time.

Since then I've held marketing and communications positions at The Quizno's Corporation and Wild Oats Community Markets, providing marketing and public relations support and opening stores across the country. My altruistic spirit prevailed and I decided to give nonprofits a try, accepting a position at the National MS Society, Colorado Chapter as their communications manager. A small but mighty team of us succeeded in hosting a number of fundraising walks, bike rides, luncheons, and dinners—two of which raised $1 million each.

Most recently I had the pleasure of working for the State of Colorado's Department of Natural Resources. For close to a decade, I served as the State Parks' spokesperson, public relations liaison, marketing professional, advertising media buyer, Web site guru, e-mail campaign crafter, news release writer, social media maven, and event planner.

In my current role as NEHA's marketing and communications manager, I'm able to apply my natural resources, health, and philanthropic experiences in one place. I love to learn so I have been busy delving into understanding all the credentials we offer, the resources we provide, and being part of the trainings and education such as NEHA's Annual Educational Conference & Exhibition. Like many of you, I pine for the day when NEHA will have a new Web site! I can assure you it is on our list of top priorities and is a passion of mine. I'm a marketing technology evangelist, as I've seen dramatic results when great people—like my coworkers here—have the right tools and a clear path forward. I'd like to get to know more of you, individually and collectively, so that we can serve you better and be your first choice among association memberships.

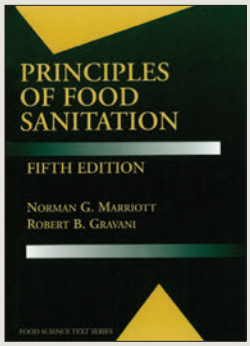
When I'm not at NEHA I enjoy traveling, cooking (of course!), and spending time with my daughter and my dog, both of whom are willing participants in my continued outdoor adventures of all varieties and in all seasons.

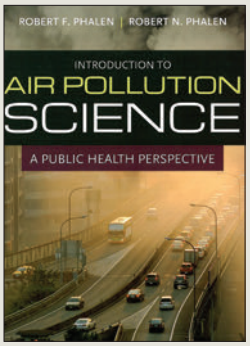
Did You Know?

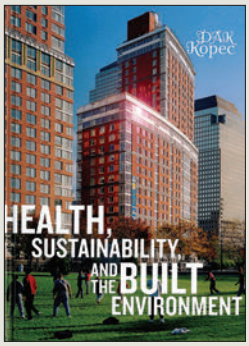
As a NEHA member, you have the power to determine how you would like to receive the *Journal of Environmental Health*—be it as a hard copy, in electronic format, or both.

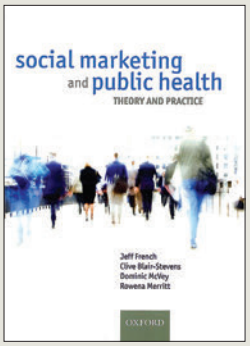
Do you prefer receiving the *Journal* electronically as the E-*Journal* rather than the hard copy?

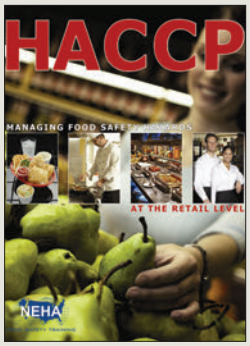
If you would like to continue to receive the E-*Journal* delivery, you can **opt out of the hard copy** and receive *only* the E-*Journal*. Beginning November 2014, members who would like to get **both** the E-*Journal* and a hard copy of the *Journal* can do so by subscribing to the E-*Journal* for $15 until your membership renewal. As part of NEHA's new membership options, at the time of membership renewal NEHA members will then choose an option that either includes the E-*Journal* delivery or the E-*Journal* and hard copy *Journal* delivery. Visit www.neha.org/member/join.html or contact staff@neha.org for details.

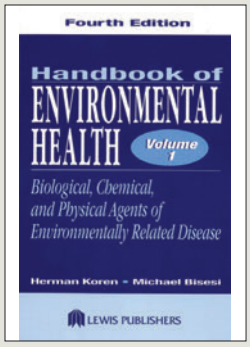


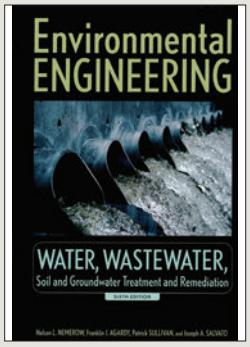


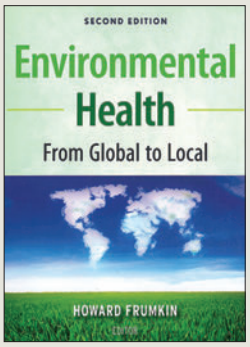


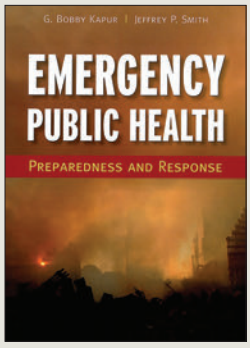


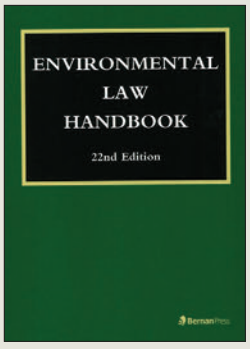


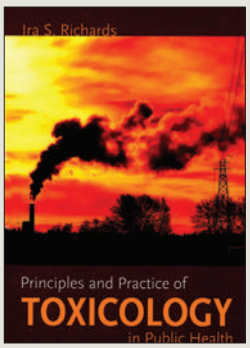


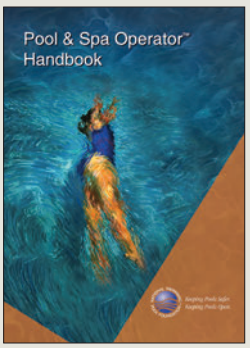


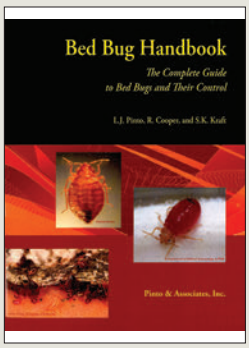


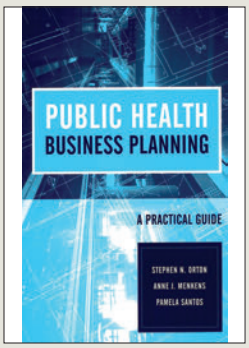


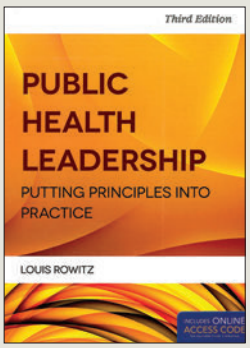












NEHA BOOKSTORE
www.neha.org/store

Choose from the most complete library of environmental health resources available—more than 150 texts, as well as recent *Journal of Environmental Health (JEH)* articles and E-*Journal* issues. NEHA's Bookstore allows you to search for resources by topic and gives you the opportunity to peruse resource descriptions and table of contents.

- AEC & Exhibition
- Air Quality
- All-Hazards Preparedness
- Clearance Books
- Credential Study References
- Epidemiology
- Food Safety and Protection
- Food Safety Training Resources
- General Environmental Health
- Hazardous Materials
- *JEH* Articles and E-*Journal* Issues
- NEHA Merchandise
- Occupational Health
- Sustainability
- Swimming Pools/Spas
- Toxicology
- Vector Control
- Water Quality
- Workforce Development

Purchase online or call

www.neha.org/store 303.756.9090

NATIONAL ENVIRONMENTAL HEALTH ASSOCIATION

A Tribute

to Our 25-Year Members

The National Environmental Health Association (NEHA) thanks and honors the individuals listed below who have been members of the association for 25 years or longer. NEHA sincerely appreciates their commitment to the association and to the environmental health profession.

a

James M. Abbott, RS
Warren Abrahams, REHS, MSPH
Patrick T. Accardi
Karen L. Ahrendt, RS
Anthony C. Aiken
Herbert Anderson, RS
Kevin F. Anderson
Peter R. Andrews
Louis E. Anello
Ronald M. Aquino
Bennett H. Armstrong, RS
Thomas W. Ashton, CPSS, REHS

b

Corey Bain
Jeffrey L. Bain
Dale A. Baker
Denis L. Baker
Gary Baker
Ned E. Baker, RS
James J. Balsamo, Jr., MS, MPH, MHA, RS, CP-FS
John M. Barry, PhD
Myron Bateman
Dale M. Bates, REHS
Davies H. Batterton
Vance E. Baucom
Sidney G. Becnel, RS
Frank L. Bedey, RS
Delbert Bell
John E. Benko
Anthony E. Bennett
Steve L. Berry, REHS, DAAS
Jackie L. Bethel, RS
Chirag H. Bhatt
Michael E. Bish
Robert P. Bishop
James J. Blaha, MS
Rob Blake, MPH, REHS
Lee A. Bland
James D. Blaylock, REHS
Arthur W. Bloom
Dean Bodager, RS, DAAS, MPA
Patrick O. Bohan, MSEH, MS, PhD, RS
David W. Boone, REHS
John N. Bowers
Robert T. Bowland
James H. Bowles
David C. Breeding, PhD
Kevin P. Breen, MPH
Robert E. Brewster, RS, LEHP, MPA
Edward L. Briggs, REHS
Corwin D. Brown
Robert C. Brown
Thomas N. Brudnicki, REHS/RS
Albert H. Brunwasser
Jackson C. Burgess
Thomas J. Butts, MSc, REHS, RHSP

c

John T. Callen, RS
Dennis P. Campbell, RS, REHS
Dorothy A. Campbell, RS
Jennifer R. Campbell
Robert J. Canning, RS
Thomas G. Carbone, RS
Deborah A. Caronna
John W. Carr
Harold D. Carrasquillo
Enid L. Carruth
Karen A. Casale, REHS
James L. Casaus, REHS
Charles Catlin, RS
Ofelia C. Cavazos-Edmondson
Paula J. Champagne
Robin L. Chapell
Jeffrey A. Church
Vickie L. Church, MPA, REHS
Bruce Clabaugh, RS
Richard F. Clapp, RS
Kenneth A. Clare
Nancy M. Clark, REHS
Richard W. Clark, REHS
Wayne N. Clark
John W. Clayton, RS
Gordon Clemans
C. Dee Clingman
L. Darrell Cochran
Rodney L. Coker, RS
Troy Cole, RS
Dora M. Coleman
Gary E. Coleman, RS, DAAS, CP-FS
Gordon C. Coleman
Holly H. Coleman, MS, REHS
Brian Collins, MS, REHS, DAAS
Daniel E. Collins
Gary A. Collins
Richard F. Collins, MSEH, RS, DAAS
William D. Compton, REHS
David R. Conrad, RS
Kenneth L. Conright, REHS
Murray Cooper
Ralls M. Coston
Laurie A. Cotulla, RS
Stanley R. Cowan
Wayne T. Craney
Alan M. Croft, REHS
Kathi L. Crump
Catherine W. Cummings, REHS
Joseph Ferrell Curlee, Jr., MEd
Robert W. Custard, REHS/RS, CP-FS

d

John J. D'Agnese
Ralph J. D'Aries
Brian C. Dalshaug, REHS/RS
John H. Dame, REHS
Richard A. Daugherty
Trenton G. Davis
Daniel De La Rosa
Edward A. Deep, RS
Joseph Del Ferro, RS
Alan J. Dellapenna
James E. Devore, REHS
Patricia Diamond
James D. Dingman, REHS
Michael J. Diskin
Frank T. Dono
Henry A. Drake, RS
Vicki L. Drake
Bernard Alan Dreher
Thomas S. Dunlop, MPH, REHS
Richard W. Durrett, MPH, PhD, RS

e

Diane R. Eastman
Douglas J. Ebelherr
Fred Einerman, RS
Amer El-Ahraf
Brian P. Emanuel
William B. Emminger, Jr.
Russell E. Enscore
Christopher C. Etcheson, RS
Bruce M. Etchison, RS
Diane L. Evans

f

Wendy L. Fanaselle, MS, DAAS
Donald T. Fanning
John W. Fee, III, RS
Sheila P. Ferrell, RS
Frank S. Ferro, RS, CP-FS
Albert L. Fishback, RS
Michael D. Flanagan, REHS
Raymond E. Ford
Morris V. Forsting, REHS/RS
Alain J. Fortier, CHMM, REHS
Thomas M. Frank, HO
Norman Franks, RS
Gary Fraser
Anthony Fraundorf
Allen J. Frechette, RS
Peggy D. French, RS
Ronald Froehlich, RS
Gerald C. Fuhrmann, RS

g

Frank A. Gabrian
Jeanne M. Galloway, REHS/RS, CP-FS
Eugene K. Garland
Galen W. Garst, Jr., MS
G. David Ghesquiere
Craig D. Gilbertson, RS
Ginger L. Gist, PhD
Scott R. Golberg
Scott M. Golden, RS, MSEH
Francis J. Goldsmith, RS
Maurice Goldstein, RS
Eugene T. Goode
Larry J. Gordon, MS, MPH, DHL
Charles R. Gossett, RS
Carolyn J. Gray, RS
Harry E. Grenawitzke, Jr., RS, MPH, DAAS
Karen A. Griffith, REHS
Ron L. Grimes, RS, MPH, DAAS
Steven F. Grover, REHS
Paul E. Guenther, REHS/RS
Maryanne Guichard
John G. Gurrisi
John J. Guzewich, MPH

h

Gary R. Hague
Michael G. Halko, MS, RS, DAAS
Earl E. Hallberg, Jr., RS
John M. Halliwill, REHS
Marlena M. Hamann, MS, REHS
Michael C. Hanika
Daniel M. Harper, Sr.
Barry S. Hartfield
Mark A. Harvley
Jack B. Hatlen, MS
Cheryl Hawkins
Anne R. Hawkins-Badge
Cathy S. Hayden
William H. Hayes, Jr., LEHP
Robert S. Hays, REHS
Gregory M. Heck
Cory D. Hedman
Chris R. Helgesen
Wendy W. Henderson, RS, REHS
William Michael Henderson
Charles W. Henry, Jr., RS
Donna K. Heran, REHS
Robert E. Herr
Michael E. Herring
Peter Heywood
Gary M. Hickman
Charles L. Higgins, REHS
Thomas A. Hill, RS
John E. Hiramoto, REHS
Kirk B. Hodges, RS
Kenneth W. Hohe, MSEH
James A. Holley
Scott E. Holmes
Randall C. Holveck, RS
Tim Honadel
Donald M. Horning, REHS/RS
Chsun-Yi Hsu
Joseph L. Hughart
Paul L. Hutcheon, REHS

i

William A. Iannucci, PhD, RS, DAAS
Nancy Ellis Ice, RS

j

William Jacovina
Conrad A. Janus, RS
Fred D. Jeffers, REHS/RS
David G. Jefferson, REHS
Terri J. Jenkins-McLean
Glenn B. Joesten, RS
Donald A. Johnson
Keith M. Johnson
Bruce A. Jones, RS
Horace E. Jones, Jr., REHS
Kimball E. Jones
Lisa M. Jones, RS

k

Brian P. Kaiser, CSP, CHMM, RPIH
Samuel R. Kalafat
Richard Kebabjian
Frank E. Kellogg, RS, MPH
William M. Kelly
Harvey D. Kern, MS, REHS
Patricia A. Kerst, REHS
Michael J. Kirby
David C. Klusman
Alan D. Knapp, RS
David A. Knauf
Paul L. Knechtges, REHS
Phillip B. Kneler, REHS
Mel Knight, REHS
Christopher J. Knuth
Theodore J. Koenig
Peter J. Kolodziej, RS
Herman Koren, REHS, MPH, HSD
Jerry E. Kral, RS
Daniel J. Kramer
Melvin N. Kramer, MPH, PhD, REHS/RS
Keith L. Krinn, MA, RS, DAAS
Dennis K. Kroll
Bruce E. Kummer
Cynthia C. Kunkel, RS
George A. Kupfer, RS, DAAS

l

James P. LaFleur, REHS/RS(E), CP-FS(E)
L. Charles Landman, Jr., RS
Bruce K. Lane
Jonathan Langer, RS
Jim Langevin, RS
Roland Everett Langford, PhD
Oren L. Larson
John H. Laubach, RS
H. Harold Lehman
Dody E. LeSueur, RS
Michael A. Letry
Stephanie J. Levell
Allan R. Levesque, RQAP-GLP, REHS
Paul M. Lewis
Richard L. Licari, RS
Frank S. Lisella
David L. Litke, RS
Patricia A. Livingston
Robert M. Livingston, RS
Percell Locklear
Gus T. Lopez
Thomas I. Lovey, REHS
Cherié L. Lowry, RS
David F. Ludwig, MPH, REHS, RS, CPM
John M. Lunter
Ross D. Lytle, RS, MS

m

Scott L. Maass
Arthur N. Mabbett
Gloria T. Mackie
Kathleen MacVarish, RS/REHS
Abraham M. Maekele
Kathleen A. Mallet, CQA
Patrick J. Maloney, RS, CHO, MPAH
Steven Richard Maness, RS
Richard D. Manney, REHS/RS
Boyd T. Marsh, RS
Kevin A. Marshall
Elizabeth K. Martin
Glenn L. Martin
Joseph H. Martin, RS
Anthony J. Matarazzo
Isao Matoi, RS
Collis G. Mayfield
Ann Mayo
Paul A. Mazzuchelli, REHS/RS
Richard McCutcheon
Harold C. McDowell, REHS
Anne Marie H. McKenzie
Scott A. McKenzie, MPA, REHS
David H. McMahon
David Z. McSwane, HSD
Christopher T. Melchert
Stephen L. Melega
Raymond P. Merry, REHS
Mark Meske, RS
Nancy M. Meyer-Emerick, RS, PhD
Colette A. Michaletz
Edward Michalewicz
William R. Milardo, Jr.
David L. Miles
John M. Milgrim, REHS
Deborah A. Miller
Wesley Mills
Donna Z. Miorandi
Peter M. Mirandi, RS, MPH
Richard W. Mitzelfelt
John S. Moody, RS
Robert E. Moore, MPH
Wendell A. Moore, RS, REHS, DAAS
Michael C. Morehouse, RS
Monroe T. Morgan, MSPH, DrPH
John E. Morrell, PhD, REHS/RS, CHO
George A. Morris, RS
Milton A. Morris, REHS, CP-FS, DAAS
Clifford L. Moseley, CIH, REHS
Gene L. Mossing
Russ A. Mull
Brian Murphy, DrPH, REHS
Bruce Murphy
Timothy J. Murphy, PhD, REHS, DAAS
Mary L. Myszka, RS

n

George M. Nakamura
Evelyn D. Neavear
Robert R. Nelson, PhD
Edison E. Newman, RS
Gary P. Noonan, REHS
John P. Nordin, RS
John G. Norris, RS
Naphtali O. Nyagwachi
Eric R. Nystuen

o

Stewart B. Oakes, CEHT
Robert L. Odette, REHS/RS, MSPH
Rudolph E. Ollanketo

continued on page 60

continued from page 59

Gerald V. Olson, RS
MaryAnn Orapello
Carl S. Osaki
Michael J. Ostasz, RS
Ronald J. Osterholm
Charles S. Otto, MPA, RS, CP-FS
Anthony Ovesney, Jr.

p

Bette J. Packer, REHS
Marco Palmeri, RS
Richard A. Pantages
Joseph Michael Parker, REHS
Dan L. Partridge, RS, MPH
Mary B. Passaglia, LEHP, REHS
Clark A. Pearson, REHS/RS, CP-FS
Ann M. Peden
Gregory C. Peters, MHS, REHS
Rick Petersen, RS
Mark D. Petrillo
James Michael Phillips
Douglas C. Pickup, CIH, REHS
James E. Pierce, REHS
Richard E. Pierce
Harvey Pine
Michael R. Plemons, RS
Mickey Plymale, RS
Wayne A. Potter, REHS
Robert W. Powitz, PhD, MPH, RS, CP-FS
Lewis J. Pozzebon
Gale Prince
Theodore E. Pumo, Jr., LEHP

r

Laura A. Rabb, REHS, CIH
Vincent J. Radke
Aminda Ramig
Edward H. Rau, RS, MS, CHSP
Richard L. Ray
Preston R. Rea, RS
Thomas A. Reardon
Kent A. Rees, RS
Roger T. Reid
Michael L. Reiss, MPH, REHS/RS
Scott Mather Reynolds
Michael U. Rhodes, MS, REHS
Leonard F. Rice, RS
David E. Riggs, REHS/RS
Richard H. Rinaldi
Pat A. Risa, RS
Janet E. Rittenhouse, RS
Marsha A. Robbins, RS, EHS, CP-FS
Reed S. Roberts
Richard L. Roberts, MPH
Welford C. Roberts
Perry L. Robinson, RS, REHS
Adam R. Rocke
Connie Rocke, REHS
Dwight E. Roepenack, LEHP
David J. Rogers, REHS
Eldon C. Romney, REHS
Stanley I. Rooker, RS/REHS
Paul Rosile, MPH, RS
Gary R. Rothbarth, REHS
Eduardo R. Rubic
R. Jeanne Rucker, REHS
Douglas L. Ryan, REHS

s

Dennis A. Salmen, REHS
Richard Sanchez
Paul R. Sandoval, REHS
Dennis V. SanFilippo, RS
Peter H. Sansone, RS
Wade D. Saucier, RS, CHO, REHS/RS
Eldon P. Savage, MPH, PhD
Paul J. Scaglione
Sue Scheurer
John E. Schillinger
Vickie Sue Schleuning
Peter M. Schmitt
Garry M. Schneider
Tommye Schneider, RS
James W. Schothorst
Julia H. Schott
Ellen M. Schroth, RS
Lucy S. Schrum
Frank S. Sedzielarz, RS
Richard D. Setty, RS
Thomas B. Sexton, Jr.
Ginger L. Shaffer
Jon R. Shannon
Brian P. Sheehan, MPH, LEHP, RS
Charles Shepherd, III, RS
Richard A. Sherman
John H. Shrader, REHS/RS, CP-FS
David P. Shuemaker
Loren W. Sibilla, REHS/RS(E), MPH
Gary Skillett
Aubrey C. Smelley, MSEH
Doug R. Smith
Jeffrey J. Smith, RS
Sharon L. Smith
Richard K. Snaman, Jr., REHS/RS, CP-FS
Stanley J. Sosnicki
Will Spates
Vincent A. Spencer
Steven D. Spurlock, RS
Philip D. St. Onge
Carl W. Stein
Grace E. Steinke, RS
Todd M. Stephens, REHS/RS
John A. Steward, REHS, MPH
Steven Stiefel
Howard M. Stiver, MPH
Jeffrey T. Stout, RS
Dan C. Strausbaugh
Allen J. Stroh
Laura Studevant, RS
Neil R. Swanson, RS
Mark D. Swartz

t

Stephen R. Tackitt, RS, MPH, DAAS
Craig P. Taft
Ryan Talken
Kenneth Tannen, RS
David C. Taylor, BCE
John V. Teyhen, MPH, REHS
Colin K. Thacker, RS(E)
Dennis Thayer, RS
Peter D. Thornton, MPH, RS
Richard J. Thoune, RS, MS, MPH
John G. Todd, DrPH, RS
Leroy E. Todd
Steven E. Tome, REHS/RS
Donald T. Torres, RS
Tara N. Tradd
Charles Treser
Dale H. Treusdell, RS
Earl E. Tuntland
Brian Turner
Douglas E. Turner, REHS

u

Cynthia L. Ulch, RS
Gerald T. Ulleberg, REHS

v

Robert Vaccarella, RS
Lawrence G. Van Dyck
Steve Van Stockum
A.F. VanNostrand
Laura L. Vasile, MPH, RS
Edwin Vazquez, REHS
Leon F. Vinci, DHA, RS
Janice Viola
Daniel R. Voss

w

Ronnie L. Waggoner
Bailus Walker, Jr.
Jerry D. Walker
Michael G. Wallingford, REHS
Robert E. Walters
Steven Joseph Ward
Thomas R. Ward
Michael D. Warren, RS
Robert B. Washam, RS, MPH
Rebecca M. Webb
Norman L. Weiss
Michael M. Welch
Susan L. Welch, CIH, CSP, RS
Daniel M. Wellington, REHS, CP-FS
April L. Wendling, MPA, MS, RS
Betty L. Wernette-Babian, RS
Ted R. Westmeier, RS
Richard H. Whelan
James F. White, RS
James M. White, Jr., RS/REHS
Chris J. Wiant, PhD
Christopher E. Wicker
Jeffrey P. Widmeyer
Stephen P. Wiener, RS
Douglas A. Wigle, Jr.
James R. Wiles, RS
Donald B. Williams, Jr.
Keith M. Willingham, RS
Bruce W. Wilson, REHS
Edward F. Wirtanen
Linden E. Witherell, PE
Dana Wiyninger, REHS
John D. Wollstein, RS
Wayne E. Wood, RS
John A. Wozniak, Jr., REHS

y

Larry D. Yates, REHS
Herbert C. Yeaman, Jr.
C.L. Young, MEd
George G. Young, REHS
Melinda A. Young
Webster Young, Jr.

z

Brian J. Zamora
Richard L. Zipin
Patrick Zurick

79th NEHA

AEC

ANNUAL EDUCATIONAL CONFERENCE & EXHIBITION

SAVE THE DATES

JULY 13-15, 2015

RENAISSANCE ORLANDO *at* SEAWORLD

Call for Abstracts

OPENS IN OCTOBER

neha2015aec.org/call-abstracts

Help Create the 2015 AEC!

View the abstract submission guide and submit your abstracts for lectures, learning labs, and posters.

Deadline for abstract submission is October 28, 2014.

Sign up for our AEC email alerts at ***neha2015aec.org****!*

@nehaorg

NATIONAL ENVIRONMENTAL HEALTH ASSOCIATION

National Environmental Health Association Position to Support the Registered Environmental Health Specialist/Registered Sanitarian Credential for Environmental Health Professionals

The National Environmental Health Association (NEHA) represents more than 5,000 environmental health professionals throughout the United States and around the world. NEHA is the profession's strongest advocate for excellence in the practice of environmental health. NEHA's mission is the advancement of the environmental health professional and it serves to provide quality training, continuing education, and credentials to its members and environmental health professionals.

Environmental health programs carried out by Registered Environmental Health Specialists (REHS) and Registered Sanitarians (RS), as well as other credentialed personnel, serve to prevent illness, injury, and death. Additionally, credentialed personnel within these programs work to improve the quality of life in local communities and to prepare their communities to respond to and recover from disasters including terrorism events, acts of nature, and pandemics.

Data concerning the environmental health workforce strongly point to two key reasons that professional credentialing is important. First, obtaining a professional credential assures that an individual has obtained and can demonstrate core competencies that are relevant to providing communities with high quality environmental health services. Second, the process by which an individual becomes certified also ensures that the individual is current with contemporary standards within the profession and is utilizing best practice models consistent with current research and science.

NEHA asserts that employing credentialed REHS and RS staff working in well managed and effective programs results in an overall economic gain for the community based on disease prevention, extended lives, enhanced productivity, and reduced lost time from work. There is an added community benefit that comes with better rates of retention within environmental health programs as the workforce achieves the greater professionalism that comes with certification through a nationally recognized credential like the REHS/RS.

Most localities depend on a small cadre of environmental health professionals to protect their communities from disease and environmental hazards. Hiring and retaining REHS and RS credentialed professionals is the most viable way to ensure quality and capacity in environmental health.

NEHA takes the position that

- health is the basis of every community's prosperity;
- providing safe food, safe drinking water, clean air, safe sewage disposal, emergency response, and healthy living and workplace environments are basic necessities for communities;
- assuring a healthy living environment requires a workforce of well-trained and technically competent credentialed environmental health specialists and sanitarians; and
- environmental health agencies and industry partners must attract and retain credentialed and trained environmental health professionals to provide capacity and quality in environmental health programs in order to protect the health of our communities.

Think you're connected to your workday world?

It's about time.®

Our flagship EnvisionConnect Product Suite plugs you in with more information, in more ways, than standalone solutions. That's because it's process-engineered to work the way you do.

Make the digital connection between EnvisionConnect and…

- Enterprise accounting systems such as Oracle® Financials, Munis, and others
- Time tracking systems such as Kronos® and SAP HCM/HR
- Online and lockbox payment services
- Local and regional GIS
- State-mandated reporting
- Federally-mandated data flows to SDWIS and others
- Public-facing services such as Yelp LIVES, mobile apps, and online restaurant inspection reports

Get the facts.

Call or visit us online to learn more about the *connect* in EnvisionConnect.

800.233.9847 | www.decadesoftware.com

All trade names are property of their respective owners.

DECADE® software company

Trusted to do more.®

Do you know...

IF ...you are collecting all your inspection and permit fees?

...you are getting the most out of your human resources?

...you are under or over staffed?

...inspections can be automatically scheduled based on risk, location or inspector?

...you can answer media enquires in a timely manner?

...you can publish inspection results to the web?

...too much time is consumed manually sending out correspondence, notifications, permits and invoices?

...you can monitor effectively inspection frequency, targets and schedules?

...your high risk facilities are inspected regularly?

...critical violations are being followed up in a timely manner?

...inspections are overdue?

...you can easily report fee revenue to a central accounting system?

...revenue is generated by program, location or fee category?

...programs are having any impact?

...you can do better?

IF there are too many IFs in your program...

...there is one integrated package that will keep you in the "know."

HealthSpace's EnviroIntel Manager pays for itself many times over by saving time and effort while improving efficiency.

HealthSpace has been helping over 100 health departments manage information and systems for more than a decade. HealthSpace has retained every customer and never failed to successfully deploy a system.

Call for a demo today

1-866-860-4224

HEALTHSPACE

HARMONIZED INTELLIGENCE

www.healthspace.com

IBM Premier Business Partner