

JOURNAL OF

Environmental Health

fifteen dollars

Dedicated to the advancement of the environmental health professional

Volume 83, No. 8 April 2021

Occupational Health and Safety Issues Faced by Environmental Health Officers

EXPLORING EXPOSURES TO WORKPLACE HAZARDS



FOOD



INSPECTION & PERMITTING SOFTWARE

www.inspect2go.com/food
maryanne@inspect2go.com

Inspect2GO

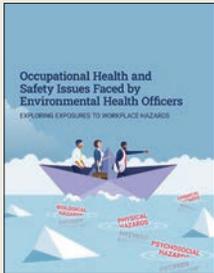
(949) 429 - 4620

Environmental Health

Dedicated to the advancement of the environmental health professional

Volume 83, No. 8 April 2021

ABOUT THE COVER



Environmental health officers are exposed to various physical, chemical, biological, and psychosocial hazards as frontline public health professionals. These exposures to workplace hazards,

however, can be overlooked. This month's cover article, "Occupational Health and Safety Issues Faced by Environmental Health Officers: A Perspective From Western Australia," surveyed environmental health officers about occupational health and safety hazard concerns in the workplace, job demands, workplace violence, and physical demands in the workplace. Environmental health officers perceive themselves as being at risk of exposure to a range of workplace hazards, with the ones of most concern being workplace stress; workplace violence; sharps injury; and slips, trips, and falls. This study provides useful preliminary information in understanding occupational health and safety issues in the environmental health profession. While more research is warranted, this study can help inform guidance and strategies to better protect environmental health professionals.

See page 20.

Cover image © iStockphoto: treety

ADVERTISERS INDEX

Accela	5
Bristol Bay Area Health Corporation.....	36
HealthSpace USA Inc.....	48
Inspect2GO Environmental Health Software.....	2
Ozark River Manufacturing Co.....	47

ADVANCEMENT OF THE SCIENCE

Evaluating the Impact of Food Safety Training: A Look at the Self-Analysis for Food Excellence Program	8
Special Report: <i>Cooking With Gas, Household Air Pollution, and Asthma: Little Recognized Risk for Children</i>	14

ADVANCEMENT OF THE PRACTICE

International Perspectives: <i>Occupational Health and Safety Issues Faced by Environmental Health Officers: A Perspective From Western Australian</i>	20
Building Capacity: <i>Building Capacity Through the Coronavirus Relief Fund</i>	30
Direct From CDC/Environmental Health Services: <i>Preventing Legionnaires' Disease: Frontline Tools for Environmental Health Practitioners</i>	32

ADVANCEMENT OF THE PRACTITIONER

EH Calendar	36
Resource Corner.....	37

YOUR ASSOCIATION

President's Message: <i>The Importance of Diversity, Equity, and Inclusion in Our Profession</i>	6
Special Listing	38
NEHA 2021 AEC Three-Part Virtual Series	40
People on the Move.....	42
NEHA News	44
DirecTalk: Musings From the 10th Floor: <i>Apricity</i>	46

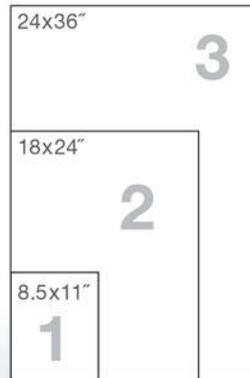


Showcase Environmental Health and All It Encompasses

For many years NEHA's *Journal of Environmental Health* has been adorned by visually stunning and creative covers portraying a wide variety of environmental health topics. You can now own these amazing cover images in poster size. Use the walls of your department and office to display to visitors, your boss and staff, and the public what environmental health encompasses and your pride in your profession.

For more information and to place your order:

- ➔ Go to neha.org/publications/journal-environmental-health
- ➔ Contact us at jeh@neha.org



- Three different sizes
- Laminated, high-quality prints
- Select covers from 2005 to the present

don't miss
in the next *Journal of Environmental Health*

- Evaluation of Electronic Health Records to Monitor Illness From Harmful Algal Bloom Exposure
- Health Risks Associated With the Use of Water Mist Systems as a Cooling Intervention in Public Places
- Use of an Environmental Swabbing Strategy to Support a Suspected Norovirus Outbreak Investigation at a Retail Food Establishment

Official Publication



Journal of Environmental Health
(ISSN 0022-0892)

Kristen Ruby-Cisneros, Managing Editor

Ellen Kuwana, MS, Copy Editor

Hughes design|communications, Design/Production

Cognition Studio, Cover Artwork

Soni Fink, Advertising

For advertising call 303.756.9090, ext. 314

Technical Editors

William A. Adler, MPH, RS

Retired (Minnesota Department of Health), Rochester, MN

Gary Erbeck, MPH

Retired (County of San Diego Department of Environmental Health), San Diego, CA

Thomas H. Hatfield, DrPH, REHS, DAAS
California State University, Northridge, CA

Dhitinut Ratnapradipa, PhD, MCHES
Creighton University, Omaha, NE

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 83, Number 8. Yearly subscription rates in U.S.: \$150 (electronic), \$160 (print), and \$185 (electronic and print). Yearly international subscription rates: \$150 (electronic), \$200 (print), and \$225 (electronic and print). Single copies: \$15, if available. Reprint and advertising rates available at www.neha.org/JEH. CPM Sales Agreement Number 40045946.

Claims must be filed within 30 days domestic, 90 days foreign, © Copyright 2021, National Environmental Health Association (no refunds). All rights reserved. Contents may be reproduced only with permission of the managing editor.

Opinions and conclusions expressed in articles, reviews, and other contributions are those of the authors only and do not reflect the policies or views of NEHA. NEHA and the *Journal of Environmental Health* are not liable or responsible for the accuracy of, or actions taken on the basis of, any information stated herein.

NEHA and the *Journal of Environmental Health* reserve the right to reject any advertising copy. Advertisers and their agencies will assume liability for the content of all advertisements printed and also assume responsibility for any claims arising therefrom against the publisher.

Full text of this journal is available 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 managing 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, managing 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.





Because environmental health **is always essential**

When disaster strikes, you are always there.
And when you need a solution to help keep your
public protected, Accela is always there too.

For 20 years, Accela has partnered with
environmental health departments to provide
the technology and information you need.

**User-friendly web applications, easy online
payments, and hassle-free virtual inspections**

– Accela has the tools you need to continue
business operations during challenging times,
which is as essential as ever.



Subscribe to Accela's Environmental
Health monthly newsletter to read the
latest news and insights on EH trends
and topics, such as leveraging the
Coronavirus Relief Fund (CRF) to help
fund your pandemic response.

Sign-up at <http://bit.ly/AccelaEH> or scan the code.

 **Accela**



▶ PRESIDENT'S MESSAGE



Sandra Long, REHS, RS

The Importance of Diversity, Equity, and Inclusion in Our Profession

I would like to start this column by acknowledging the members of the National Environmental Health Association (NEHA). Thank you for your continued membership. Throughout 2020, membership numbers remained strong at around 6,500, which is a testament to your dedication to the field of environmental health. In addition to the support of our members, we have been noticing a change in the membership that is significant.

Based on observations of the attendees at the NEHA Annual Educational Conference & Exhibition in 2019 (Nashville, Tennessee), 2018 (Anaheim, California), and 2017 (Grand Rapids, Michigan), we recognize that NEHA members come from a variety of backgrounds and ethnicities. We also recognize an increase in the number of women working in the environmental health profession. It is important that we celebrate our diversity, equity, and inclusiveness of the profession. As we look at some of the leaders and innovators of the profession, we acknowledge that the environmental health profession not only continues to evolve but also welcomes contributions from all disciplines of the profession without prejudice.

Many events in 2020 have reminded us that diversity, equity, and inclusion (DEI) are not just “nice” initiatives or boxes to be checked off on a “to-do list,” but rather, they are goals we should strive for. DEI is multifaceted and understanding how each element builds upon the other is important.

Diversity is the presence of differences, specifically differences in race, ethnicity, gender, gender identity, sexual orientation, age, and socioeconomic class, just to name a

We should strive to eliminate bias, practice inclusiveness, support diversity, and exert leadership.

few. Diversity allows for people from different backgrounds and varying experiences to provide new perspectives that contribute to developing and refining ideas and processes.

Equity is the act of ensuring impartiality, fairness, and equal possible outcomes for everyone. To ensure equal possible outcomes, equity requires that there be recognition of barriers and advantages. In this manner, these barriers and advantages can be addressed and overcome.

Inclusion ensures that people feel a sense of belonging, which means that everyone feels comfortable and supported when it comes to being authentically themselves. Inclusion is what maintains diversity. If a person does not feel included, they will leave.

DEI promotes diverse perspectives to be heard while valuing individual differences and promoting values that minimize bias. My hope is that all NEHA members feel heard and included, and are treated equitably.

More than ever right now, with significantly changing demographics, DEI should be practiced. As we look at our workplaces, coworkers, and communities, we should strive to eliminate bias, practice inclusiveness, support diversity, and exert leadership. DEI can be reflected in mission and vision statements and incorporated in strategic plans.

When it comes to DEI, it is important to practice basic courtesy and pay attention to how you embrace nondiscriminatory practices and policies. Everyone should feel safe to voice their concerns and opinions without criticism or discrimination, which are elements that divide and destroy. As leaders, we need to help create safe environments for ideas, opinions, and points of view to be heard, as well as foster collaboration. Differences allow for creative thought, new ideas, new strategies, and new processes to be developed.

NEHA is dedicated to DEI, which means we are dedicated to efforts to create a welcoming, equitable environment that allows people of different backgrounds to succeed. Organizations progress if DEI exists. NEHA's newest award, the Dr. Bailus Walker, Jr. Diversity and Inclusion Awareness Award, celebrates an individual or group who has made significant achievements in the development or enhancement of a diverse, inclusive, and competent environment. Dr. Walker was a long-time member and supporter of NEHA who wrote and spoke on public health, toxicology, and diversity in the field of environmental health.

Through my career I have experienced and witnessed the changes taking place in the environmental health profession. Without the diversity of creative minds, inclusion that

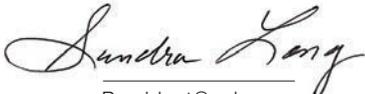
allows ideas to be expressed, and equity to be heard, so many of the processes and procedures we currently use—in food safety, emergency management, water, stormwater, public health, and other areas of environmental health—would not have progressed or changed.

Looking at DEI, I am proud and support all the women who have pursued environmental health as a career. Women are a growing part of all areas of the environmental health workforce, a workforce that has historically been mostly male.

As I close this column, I would like to put an “inclusion” thought in your mind. Please consider running for positions within the NEHA Board of Directors. Each August we begin the process of nominating members for open positions on the board. Members interested in participating on the board are encouraged to contact NEHA. My experience on the board has been a rewarding experience both professionally and personally. I have had the opportunity to represent members, participate in NEHA Hill Days in our

nation’s capital, and make contributions to the profession.

I leave you with the following quote from Pat Wadors, former head of human resources at LinkedIn: “When we listen and celebrate what is both common and different, we become a wiser, more inclusive, and better organization.”


President@neha.org

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 1 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 call NEHA at (303) 756-9090. You can also donate online at www.neha.org/about-neha/donate.

Thank you.

DELEGATE CLUB

(\$1–99)

Name in the Journal for 1 year.

Samuel M. Aboagye
Oyetunde Adukanle
Tunde M. Akinmoladun
Mary A. Allen
D.V. Asquith Reynolds
Steven K. Ault
Gary Baker
David Banaszynski
Gina Bare
Jeffrey Barosy
Edward Barragan
Marc E. Benchimol
Logan Blank
Sophia P. Boudinova
Danielle Bredehoeft
Freda W. Bredy
Deborah Carpenter
Kathy Cash
William D. Compton
Natasha Crawford
Lawrence Cyran
Daniel de la Rosa
Thomas P. Devlin
Concetta A. DiCenzo
Gery M. DuParc
Annette Eshelby
Wendy L. Fanassel
Anna Floyd
Debra Freeman
David P. Gilkey
Brittany Grace
Billy B. Green

Eric S. Hall
James Harber
Ken Hearst
Catherine Hefferin
Donna K. Heran
William Holland
Scott E. Holmes
Kjel Howard
Maria Huanosta
Anna-Marie Hyatt
Amiya Ivey
Katrina Keeling
Eric Klein
Adam Kramer
Maria G. Lara
Michael F. LaScuola
Philip Leger
Dion L. Lerman
Chanelle Lopez
James C. Mack
Patricia Mahoney
Jason W. Marion
Phillip Mathis
Ralph M. Matthews
Robert C. McIntire
Aruworay Memene
Patrick Moffett
Jose Montes
Derek Monthei
Shawnee Moore
Timothy J. Murphy
Nichole Nelson
Daniel B. Oether
Darvis W. Opp
Joe Otterbein

Kimberly Owens
Alexis Parale
Susan V. Parris
Michael A. Pascucilla
Munira Peermohamed
James E. Pierce
Michele Pineros
Laura A. Rabb
Raymond Ramdayal
Leejay Robles
Catherine Rockwell
Eldon C. Romney
Jonathan P. Rubingh
Joseph W. Russell
Ryan Schonewolf
Mario Seminara
Francis X. Sena
Zia Siddiqi
Dorothy A. Soranno
Elena K. Stephens
Martin J. Stephens
Dillion Streuber
M.L. Tanner
Tonia W. Taylor
Terry M. Trembly
Emilia A. Udofia
Ralph Utter
Kendra Vieira
Thomas A. Vyles
Phebe Wall
Marcel White
Dawn Whiting
Lisa Whitlock
Edward F. Wirtanen
Erika Woods

HONORARY MEMBERS CLUB

(\$100–499)

Letter from the NEHA president and name in the Journal for 1 year.

Robert Bialas
Nora K. Birch
Eric Bradley
Corwin D. Brown
D. Gary Brown
Michele R.R. DiMaggio
Tamara Dunams
Darryl J. Flaspahler
Gwendolyn R. Johnson
T. Stephen Jones
Sharon L. Kline
Adam E. London
Sandra Long
John A. Marcello
Wendell A. Moore
Priscilla Oliver
Larry A. Ramdin
Matthew Reighter
Michèle Samarya-Timm
William Scott
Jill M. Shugart
Jacqueline Taylor
Anthony Tworek
Linda Van Houten
Sandra Whitehead

21st CENTURY CLUB (\$500–999)

Name submitted in drawing for a free 1-year NEHA membership and name in the Journal for 1 year.

Amer El-Ahraf
Ned Therien
Leon F. Vinci

SUSTAINING MEMBERS CLUB

(\$1,000–2,499)

Name submitted in drawing for a free 2-year NEHA membership and name in the Journal for 1 year.

James J. Balsamo, Jr.
Brian K. Collins
Harry E. Grenawitzke
George A. Morris
Robert W. Powitz
Peter H. Sansone
Walter P. Saraniecki
Peter M. Schmitt
James M. Speckhart

AFFILIATES CLUB

(\$2,500–4,999)

Name submitted in drawing for a free AEC registration and name in the Journal for 1 year.

Robert W. Custard
David T. Dyjack

EXECUTIVE CLUB AND ABOVE

(>\$5,000)

Special invitation to the AEC President’s Reception and name in the Journal for 1 year.

Vincent J. Radke

Evaluating the Impact of Food Safety Training: A Look at the Self-Analysis for Food Excellence Program

Danny Ripley
Metro Public Health Department
of Nashville/Davidson County

Caleb Wiedeman, MPH
Craig Shepherd, MPH, REHS/RS, DAAS
Douglas J. Irving, MPH
Tennessee Department of Health

Abstract Understanding basic food safety is essential to preparing and serving safe food. The Self-Analysis for Food Excellence (SAFE) program was developed to promote food safety and improve restaurant sanitation scores in Nashville and Davidson County, Tennessee. SAFE is a food safety training program emphasizing high-risk food practices from receiving to service. The program was offered to restaurants that had performed poorly on routine food service inspections. Restaurant management and key personnel were encouraged to participate in SAFE.

To assess the effectiveness of SAFE, we compared participating restaurants to nonparticipating restaurants with similar food service inspection performance during 2009–2010 in Nashville and Davidson County. We evaluated and analyzed inspectional observations before and after SAFE training. While both groups improved their food safety inspection performance, no statistically significant differences regarding critical violations were noted between restaurants that participated in the SAFE program and restaurants that did not. This study, however, does not account for regulatory impact or other variables that could provide more clarity in the results of food safety training.

Introduction

According to the Centers for Disease Control and Prevention (CDC), every year foodborne pathogens infect 1 in 6 people in the U.S. and cause an estimated 3,000 deaths (Scallan et al., 2011). In addition, approximately 900 foodborne illness outbreaks are reported annually in the U.S. It is estimated that 60% of these outbreaks are associated with food prepared in a restaurant (Dewey-Mattia et al., 2017). Reducing foodborne illness by just 10% would prevent 5 million people in the U.S. from getting sick each year and result in significant healthcare cost savings, as food-

borne illness is estimated to cost \$15.6 billion each year (Centers for Disease Control and Prevention [CDC], 2020).

Public health agencies across the U.S. incorporate regulatory food service inspections as a tool to help promote food safety. In addition, most public health agencies are tasked with providing food safety training—a widely recognized and significant component of a food protection program. According to CDC, food safety training is an integral part of public health strategy for communicating and promoting food safety (CDC, 2018).

In Tennessee, regulations for food service establishments are written and adopted into law by the Tennessee Department of Health and enforced throughout the state. All Tennessee Department of Health regions and the five contract counties, including Davidson County (Nashville), employ personnel to enforce food regulations within their respective jurisdictions.

At the time of this study, the population in Nashville and Davidson County was approximately 601,222 with >4,200 licensed food establishments. Additionally, food regulations were based on the 1976 Food and Drug Administration (FDA) *Food Code* model. These regulations did not require food safety training for restaurant staff or demonstration of knowledge by a designated person in charge. Recognizing this gap in regulations, the Metro Public Health Department of Nashville/Davidson County developed the Self-Analysis for Food Excellence (SAFE) program. Funding by the CDC Environmental Health Specialists Network (EHS-Net) cooperative agreement provided personnel to facilitate this program. EHS-Net is a network of environmental health specialists and epidemiologists focused on investigating environmental factors that contribute to foodborne illness. EHS-Net is a collaborative project of the CDC, FDA, U.S. Department of Agriculture, and state and local health departments.

Methods

The SAFE program consisted of classroom and field training provided to food establishments located within Nashville and Davidson County. All training emphasized risk factors for foodborne illness as defined by CDC (Olsen et al., 2000). These risk fac-

FIGURE 1

Retail Food Service Establishment Score Sheet With Critical Items and Misdemeanor Violations

*Critical Items Require Immediate Attention			**Identifies Misdemeanor Violations		
ITEM	DESCRIPTION	WT	ITEM	DESCRIPTION	WT
FOOD			SEWAGE		
*01	Source, sound condition, no spoilage	5	*28	Sewage and wastewater disposal	4
02	Original container, properly labeled	1	PLUMBING		
FOOD PROTECTION			TOILET AND HAND-WASHING FACILITIES		
*03	Potentially hazardous food meets temperature requirements during storage, preparation, service, transportation	5	29	Installed and maintained	1
*04	Facilities to maintain product temperature	4	*30	Cross-connection back siphonage, backflow	5
05	Thermometers provided and conspicuous	1	GARBAGE AND REFUSE DISPOSAL		
06	Potentially hazardous food properly thawed	2	INSECT, RODENT, ANIMAL CONTROL		
*07	Unwrapped potentially hazardous food not reserved, cross-contamination prevented: damage/detained food segregated	4	*31	Number, convenient, accessible, designed, installed	4
08	Food protection during storage, preparation, display service, transportation	2	32	Toilet rooms enclosed, self-closing doors, fixtures in good repair, clean, hand cleaner, sanitary towels, hand drying devices provided, proper waste receptacles	2
09	Handling of food (ice) minimized	2	FLOORS, WALLS, & CEILING		
10	In-use food (ice) dispensing utensils properly stored	1	33	Containers or receptacles, covered, adequate number, insect and rodent proof, frequency, clean	2
PERSONNEL			34	Outside storage areas enclosures properly constructed, clean, controlled incineration	1
*11	Personnel with infections restricted	5	FLOORS, WALLS, & CEILING		
*12	Hands washed and clean, good hygienic practices	5	*35	Presence of insects and rodents, outer openings protected, no birds, no turtles, no other animals	4
13	Clean clothes, hair restraints	1	FOOD EQUIPMENT AND UTENSILS		
14	Food (ice) contact surfaces designed, constructed, maintained, installed, located	2	36	Floors, constructed, drained, clean, good repair, covering, installation, dustless cleaning methods	1
15	Non-food (ice) contact surfaces designed, constructed, maintained, installed, located	1	37	Walls, ceiling, attached equipment, constructed, good repair, clean surfaces, dustless cleaning methods	1
16	Dishwashing facilities designed, constructed, maintained, installed, located, operated	2	LIGHTING		
17	Accurate thermometers, chemical test kits provided, gauge cock (1/4 in. IPS valve)	1	38	Lighting provided as required, fixtures shielded	1
18	Preflushed, scraped, soaked	1	VENTILATION		
19	Wash, rinse water clean, proper temperature	2	39	Rooms and equipment: vented as required	1
*20	Sanitization rinse clean, temperature, concentration, exposure time, equipment utensils sanitized	4	DRESSING ROOMS		
21	Wiping cloths clean, used, restricted	1	40	Rooms clean, lockers provided, facilities clean, located	1
22	Food contact surfaces of equipment and utensils clean, free of abrasives, detergents	2	OTHER OPERATIONS		
23	Nonfood contact surfaces of equipment and utensils clean	1	*41	Toxic items properly stored, labeled, used	5
24	Storage, handling of clean equipment and utensils	1	42	Premises maintained free of litter, unnecessary articles, cleaning maintenance equipment properly stored, authorized personnel	1
25	Single-service articles, storage, dispensing	1	43	Complete separation of living and sleeping quarters, laundry	1
26	No re-use of single service articles	2	44	Clean, soiled linen properly stored	1
WATER			ADMINISTRATION		
*27	Water source, safe, hot and cold under pressure	5	**45	Current permit posted	0
			**46	Most current inspection report available	0

tors included approved food sources, food temperature control, employee hygienic practices, ill employee exclusion, and cross-contamination prevention.

Classroom training was prescheduled once a month at the Nashville and Davidson County

Metro Public Health Department. Class was limited to a 2-hr duration and scheduled from 8:30–10:30 a.m. to facilitate participation. Participants were not limited to the number of classes they could attend. Monitoring and training documents, including temperature, hand

washing, and sanitizing logs, were provided to participants during SAFE classroom training. In addition, a reporting policy for ill workers and self-assessment worksheets were provided.

One field training exercise was scheduled within 2 weeks of SAFE classroom training at

each participating establishment. This training emphasized the identification, monitoring, and control of risk factors for foodborne illness. Both general and site-specific food safety opportunities were addressed. Reports from past inspections were reviewed with management and key personnel. Additionally, monitoring tools provided during classroom training were discussed during field training.

All training was conducted by the same environmental health specialist who was standardized according to the FDA Procedures for Standardization of Retail Food Safety Inspection Personnel (Food and Drug Administration, 2020). All SAFE training was provided free of charge to encourage participation.

Establishments that scored below 70 on a routine inspection during 2009 and 2010 were included in this study. Among these locations, two study groups were formed: establishments that participated in SAFE and establishments that did not. These study groups were compared based on three routine unannounced inspections occurring after the initial routine inspection that scored below 70. Data for the three subsequent inspections following SAFE training were collected during 2009–2012.

Unannounced inspections occurred in all permitted locations at least 2 times per calendar year. Inspection grading criteria were based on a 44-item inspection form created by the Tennessee Department of Health (Figure 1). The inspection form included 13 critical violations (CVs) and 31 non-critical violations, totaling 100 points. These violations were not weighted to how many times they occurred in a single inspection. Critical violations ranged from 4–5 points and non-critical violations were 1–2 points each. For study purposes, CVs were placed into two groups. Risk factor violations (RFVs) included violations 1, 3, 4, 11, 12, and 20. All other CVs included 7, 27, 28, 30, 31, 35, and 41.

Locations that scored below 70 were verbally encouraged to enroll in SAFE and were provided an official Repeat Critical Item Notice letter. This letter included verbiage strongly encouraging the restaurant’s management and key personnel to participate in SAFE training. Restaurants that did not voluntarily participate in SAFE could have been required to attend as a result of a department-mandated initiative.

Unannounced inspections conducted during the assessment phase were completed per

TABLE 1
Demographics of Self-Analysis for Food Excellence (SAFE) and Non-SAFE Restaurants

Demographic	SAFE Restaurants (n = 38) # (%)	Non-SAFE Restaurants (n = 160) # (%)
Menu type		
Asian	7 (18)	23 (14)
Indian	0	1 (1)
Italian	1 (3)	5 (3)
Mexican	8 (21)	16 (10)
Traditional American	22 (58)	106 (66)
Other	0	9 (6)
Ownership		
Chain	20 (53)	71 (44)
Nonchain	18 (47)	89 (56)
Process type		
Complex	37 (97)	115 (72)
Cook serve	1 (3)	27 (17)
Prep serve	0	18 (11)
Service type		
Buffet	6 (16)	11 (7)
Cafeteria	0	4 (2)
Quick serve/fast food	6 (16)	57 (36)
Sit-down	26 (68)	88 (55)

the health department’s routine protocols. Each participating location could have been inspected by different inspectors during the study period. During these inspections, for identified violations associated with foodborne illness, inspectors documented the violations and discussed them with the establishment’s management. These violations were not weighted to how many times they occurred in a single inspection (i.e., a violation would only be debited once against the overall inspection score) regardless of if multiple infractions of the same violation were observed. Additionally, the mean inspection scores and mean number of violations on each inspection were compared across both groups using Student’s *t*-test in SAS version 9.4. Violations not directly associated with established risk factors for foodborne illness were not individually evaluated in this study; however, these violations did influence inspection scores.

Results

During the period of 2009–2010, 13,622 routine inspections were conducted in approximately 3,400 restaurants. Out of these restaurants, 222 locations scored below 70 on an inspection. From the 222 restaurants, 48 enrolled in SAFE. Of those enrolled, 38 had complete data for the three following routine inspections; we used these for our data analysis. Of the 174 restaurants not enrolled in SAFE, 160 had complete data for the three subsequent routine inspections. Demographic data are shown for participating and nonparticipating SAFE restaurants in Table 1.

The menu types for SAFE and non-SAFE restaurants were mostly traditional American (58% and 66%, respectively). SAFE restaurants were more likely to have complex operations (97% versus 72%, $p \leq .001$) and less likely to be quick serve/fast food (16% versus 36%, $p = .02$). Both SAFE and non-SAFE restaurants had a higher percentage of

TABLE 2

Average Scores, Number of Risk Factor Violations (RFVs), and Number of Critical Violations (CVs) for Self-Analysis for Food Excellence (SAFE) and Non-SAFE Restaurants

Inspection Type	SAFE Restaurants (<i>n</i> = 38)			Non-SAFE Restaurants (<i>n</i> = 160)		
	Average Score	Average # of RFVs	Average # of CVs	Average Score	Average # of RFVs	Average # of CVs
Low scoring	63.00	2.18	4.61	63.13	2.04	4.73
1st scheduled	77.08	1.13	2.50	78.32	1.09	2.29
2nd scheduled	77.97	1.13	2.45	79.75	0.88	2.04
3rd scheduled	81.87	1.11	2.00	81.19	0.94	2.08

Note. There were no statistically significant differences among the data ($p > .05$).

sit-down service when compared with other service types. On average, all restaurants reported lower numbers of RFVs on their next regular inspection, whether participating in SAFE or not (Table 2). The mean inspection scores and mean number of RFVs found in the three inspections following the low scoring inspection were not significantly different statistically between SAFE and non-SAFE restaurants ($p > .05$). Additionally, the average number of CVs was not significantly different statistically between the two groups.

Discussion

Our study used convenience sampling from routine inspection reports for the assessment of a local food safety program. We learned that both groups improved following SAFE training. The lack of significant statistical difference in restaurant scores between SAFE and non-SAFE restaurants, however, suggests motivations beyond SAFE training might have improved performance. The impact of regulatory enforcement was not evaluated, but could explain similar changes among the SAFE and non-SAFE restaurants.

Furthermore, inspection data alone might not have provided an effective means for measuring the impact of SAFE. Variables such as sample size, employee turnover, individual food safety perceptions, knowledge gaps, inspector bias, and language barriers should be quantified and controlled for in future studies. Food safety training and knowledge among restaurant operators and staff can have a positive effect on the sani-

tary conditions of restaurants and offers the potential to reduce the incidence of foodborne illness (Cotterchio et al., 1998). Additionally, research shows that restaurants in which supervisors and food handlers had completed food handler education courses had better inspection scores than those without (Mathias et al., 1995).

Agencies provide food safety training to participants in an effort to improve their food safety understanding and encourage behavior change in kitchen environments. Measuring the success or impact of food safety training, though, is challenging. Studies indicate that education is important for food safety; however, food safety education alone is not enough to ensure behavior change. A number of factors can affect the ability to implement or adopt food safety education and create sustained behavioral changes (Green & Selman, 2005). Even when food workers demonstrate knowledge of safe food preparation practices, they do not always engage in those practices (Clayton & Griffith, 2002; Clayton et al., 2002; Howes et al., 1996; Manning & Snider, 1993). Therefore, evaluating the impact of food safety training within a controlled group of participants has proved challenging.

The impact of SAFE training during this study was measured by evaluating routine restaurant inspections. Improvements in inspection scores were seen within SAFE restaurants: average inspection scores improved by more than 20% and were maintained throughout the follow-up period. The average number of RFVs and total CVs by SAFE

restaurants dropped by nearly 50% and were maintained over the study period (Table 2).

At first glance, these improvements appear to suggest a positive impact on food safety resulting from SAFE participation. When comparing routine inspection results between SAFE and non-SAFE restaurants of equal inspection histories, no statistically significant differences were identified. Nearly identical reductions in average scores, RFVs, and total CVs were seen in both groups. These similarities in performance among SAFE and non-SAFE restaurants could support the importance of regulatory enforcement as an impetus to practice and behavior change.

Multiple limitations within the study could account for the similar performance of both restaurant groups. The study used a convenience sample that was limited to the records available at that time and complete inspection data were limited to only 38 of the 48 restaurants that participated in SAFE. In all, 10 locations were deemed ineligible due to missing inspection data ($n = 6$), ownership change/out of business ($n = 2$), or enrollment with a score ≥ 70 ($n = 2$). More robust data from a larger number of participants over a longer study period would have allowed for more power to detect differences between SAFE and non-SAFE restaurants.

Furthermore, we did not capture information regarding employee turnover during the study period. This information could have provided greater insight into each location's performance. The employee turnover rates for the restaurant and accommodations sector during this study period ranged from 56.6–61.0% (National Restaurant Association, 2015). A UK study found that many small- and medium-sized enterprises did not send staff to food hygiene courses due to the cost and high staff turnover (Yapp & Fairman, 2006). Employee turnover can negatively impact development and retention of strong food safety cultures within an establishment following food safety training interventions.

Individual motivation, knowledge, and language barriers were important variables that were not measured in this study. Some restaurant personnel were self-motivated to attend SAFE while others were not. We did not evaluate aptitude and language barriers. In addition, we did not measure food safety knowledge before and after the training. Providing pre- and post-exams might have allowed for

a better understanding of knowledge gaps, opportunities for training improvement, language barriers, and participant engagement. Additionally, assessing knowledge through surveys or assessments could have provided more insight into the long-term effectiveness of the training, as well as identified appropriate future training interventions. Understanding individual or group motivations could provide better insight into environmental antecedents (i.e., root causes of contributing factors to food safety hazards) such as economics, employee morale, regulatory influence, fear of litigation, and brand preservation.

Perhaps the most significant limitation to our study was the nuanced nature of the inspection process. Research suggests that both inspector and facility type can affect inspection scores (Lee et al., 2012). For future studies, it is recommended that establishment type (i.e., complexity of food preparation and style of food) and inspector bias be accounted for in the analysis. Also, the data collected were limited to normally scheduled inspections. Inspections occurred biannually during the study period and were estimated to be of a 1-hr duration, on average. An establishment open for 365 days/year, 8 hr/day would have only 0.068% of their operating

hours evaluated during an annual inspection cycle. Restaurants are dynamic in nature and the limited inspection time might not reflect normal day-to-day operations.

Finally, the number and severity of RFVs and CVs found during inspections were not individually weighted, which likely reduced the granularity of these violations as a measure of performance. For example, if one establishment had multiple food items out of temperature (Figure 1, Item 03) and another establishment had one food item out temperature, both would have received a single 5-point reduction. The evaluation of each individual infraction could have presented a more accurate description of food safety risk.

Equal regulatory enforcement protocols were applied to both study groups. The measured improvement experienced by both groups suggests that regulatory enforcement, including permit suspensions and closures, likely influenced the outcome of routine food safety inspections.

Conclusion

While both study groups improved their food safety inspection performance, no statistically significant differences regarding CVs were noted between SAFE and non-

SAFE restaurants. This lack of significant improvement in SAFE restaurants might not be representative of the true impact of food safety training. Instead, it might be an outcome of the study limitations. Findings from this study were based on inspection data alone. We did not evaluate variables associated with the establishments, employees, and inspectors, which might have provided an impact distinction between training and regulatory enforcement.

This study illustrates the limitations of using inspection data alone to evaluate food safety training. Additional training criteria should be considered to more effectively evaluate the impact of a food safety training program. 🍌

Acknowledgements: The authors would like to thank Drs. Timothy F Jones and John Dunn for their insight and direction in finalizing this article.

Corresponding Author: Danny Ripley, Environmental Health Specialist, Communicable and Environmental Diseases and Emergency Preparedness, Tennessee Department of Health, 710 James Robertson Parkway, Andrew Johnson Tower, 3rd Floor, Nashville, TN 37243 Email: danny.ripley@tn.gov.

References

Centers for Disease Control and Prevention. (2018). *National Public Health Performance Standards*. <https://www.cdc.gov/publichealthgateway/nphps/index.html>

Centers for Disease Control and Prevention. (2020). *CDC and food safety*. <https://www.cdc.gov/foodsafety/cdc-and-food-safety.html>

Clayton, D.A., & Griffith, C.J. (2002). Commercial food handlers' knowledge, attitudes and implementation of food hygiene practices [Poster abstract P192, p. 109]. *Journal of Food Protection*, 65(Suppl. A), 1–151. <https://doi.org/10.4315/0362-028X-65.sp1.1>

Clayton, D.A., Griffith, C.J., Price, P., & Peters, A.C. (2002). Food handlers' beliefs and self-reported practices. *International Journal of Environmental Health Research*, 12(1), 25–39. <https://doi.org/10.1080/09603120120110031>

Cotterchio, M., Gunn, J., Coffill, T., Tormey, P., & Barry, M.A. (1998). Effect of a manager training program on sanitary conditions in restaurants. *Public Health Reports*, 113(4), 353–358.

Dewey-Mattia, D., Manikonda, K., Chen, J., Kisselburgh, H., Pilewski, C., Sundararaman, P., & Crowe, S. (2017). *Surveillance for foodborne disease outbreaks—United States, 2015: Annual report*. Centers for Disease Control and Prevention.

Food and Drug Administration. (2020). *Standardization of retail food safety inspection personnel*. <https://www.fda.gov/food/retail-food-protection/standardization-retail-food-safety-inspection-personnel>

Green, L.R., & Selman, C. (2005). Factors impacting food workers' and managers' safe food preparation practices: A qualitative study. *Food Protection Trends*, 25(12), 981–990.

Howes, M., McEwen, S., Griffiths, M., & Harris, L. (1996). Food handler certification by home study: Measuring changes in knowledge and behavior. *Dairy, Food and Environmental Sanitation*, 16(11), 737–744.

Lee, J.-E., Nelson, D.C., & Almanza, B.A. (2012). Health inspection reports as predictors of specific training needs. *International Journal of Hospitality Management*, 31(2), 522–528. <https://doi.org/10.1016/j.ijhm.2011.07.010>

Manning, C.K., & Snider, O.S. (1993). Temporary public eating places: Food safety knowledge, attitudes and practices. *Journal of Environmental Health*, 56(1), 24–28. <https://www.jstor.org/stable/44534541>

References

Mathias, R.G., Sizto, R., Hazlewood, A., & Cocksedge, W. (1995). The effects of inspection frequency and food handler education on restaurant inspection violations. *Canadian Journal of Public Health*, 86(1), 46–50.

National Restaurant Association. (2015). *Hospitality employee turnover rose in 2014*.

Olsen, S.J., MacKinnon, L.C., Goulding, J.S., Bean, N.H., & Slutsker, L. (2000). Surveillance for foodborne-disease outbreaks—United States, 1993–1997. *Morbidity and Mortality Weekly Report, Surveillance Summary*, 49(1), 1–62.

Scallan, E., Hoekstra, R.M., Angulo, F.J., Tauxe, R.V., Widdowson, M., Roy, S.L., Jones, J.L., & Griffin, P.M. (2011). Foodborne illness acquired in the United States—Major pathogens. *Emerging Infectious Diseases*, 17(1), 7–15. <https://dx.doi.org/10.3201/eid1701.p11101>

Yapp, C., & Fairman, R. (2006). Factors affecting food safety compliance within small and medium-sized enterprises: Implications for regulatory and enforcement strategies. *Food Control*, 17(1), 42–51. <https://doi.org/10.1016/j.foodcont.2004.08.007>

Did You Know?

Members are extremely important to NEHA and its mission. NEHA's membership structure includes five different membership categories—Professional, Emerging Professional, Retired Professional, International, and Life. Environmental health professionals can benefit from NEHA membership at any career stage. NEHA membership provides credibility (credentials and leadership opportunities), learning (*Journal*, conferences, and continuing education), community (events, blogs, and webinars), and influence (advocacy and position papers). Learn more at www.neha.org/join.

CALLING ALL EH PROFESSIONALS!

EXPAND YOUR UNDERSTANDING
OF BUILT ENVIRONMENTS AND LAND REUSE!



NEHA, in partnership with the Agency for Toxic Substances and Disease Registry, is excited to announce the Environmental Health and Land Reuse Certificate Program! Join us for a comprehensive, online course exploring the environmental and health risks and social disparities associated with contaminated land properties, key players in land reuse planning and policy, and redevelopment techniques to improve community health.

- ◆ Earn an official NEHA certificate and become eligible for continuing education credits.
- ◆ Visit www.neha.org/ehlr to enroll.
- ◆ Take the next step to creating a lasting, positive environmental health impact on areas that need it most.

► SPECIAL REPORT

Cooking With Gas, Household Air Pollution, and Asthma: Little Recognized Risk for Children

Andee Krasner, MPH
Greater Boston Physicians
for Social Responsibility

T. Stephen Jones, MPH, MD
T. Stephen Jones
Public Health Consulting

Regina LaRocque, MPH, MD
Center for the Environment and Health,
Massachusetts General Hospital
Division of Infectious Diseases,
Massachusetts General Hospital
Harvard Medical School

Abstract Cooking with a gas stove releases combustion-generated nitrogen dioxide and other pollutants into household air. Both nitrogen dioxide in household air and cooking with gas are associated with increased risk and severity of childhood asthma. The impact on children can be substantial because at least one third of households in the U.S. cook with gas stoves, children spend most of their time indoors, indoor air is unregulated, and asthma is the most common chronic disease in children. The association between gas cooking stoves, household air pollution, and childhood asthma is not widely appreciated. We propose a public information campaign, public policies addressing household air pollution risks associated with cooking with gas, requirement of warning labels on gas cooking stoves, and further research on the efficacy of available interventions.

Introduction

Burning fossil fuels in vehicles, furnaces, electricity plants, and for other uses generates nitrogen dioxide, particulate matter, carbon monoxide, and other compounds that pollute the air people breathe, all of which contribute to poor health. Air pollution increases the risk of asthma, the most common childhood chronic disease across all socioeconomic classes and the most frequent cause of hospitalization among children (Zahran et al., 2018). The impact of combustion-generated outdoor air pollution on asthma and other health outcomes is recognized and subject to environmental regulation. The association of combustion-generated household air pollution and asthma is less well known and household air pollution is not regulated.

Cooking with gas stoves increases household air pollution, which is associated with

asthma and increased asthma severity. Household air pollution is a particular concern for children, who spend a majority of their time in homes and who are biologically more susceptible to air pollution because of higher breathing rates, developing lungs, and immature immune systems (Bateson & Schwartz, 2007). The aim of this special report is to discuss the health effects on children of cooking with gas and to discuss policy changes that could reduce the risk of asthma in children.

Methods

We searched PubMed in 2017 for articles including U.S. populations using the search term “gas stoves” with a human-only filter. Following our review, we searched for studies of the biological plausibility of nitrogen dioxide increasing the risk of respiratory illnesses in children, the health impacts of out-

door nitrogen dioxide, and interventions to reduce the harms of cooking with a gas stove. We informally asked health workers and others in Massachusetts if they knew about the association between cooking with a gas stove and childhood asthma.

Discussion

Household Air Pollution Worse Than Outdoor Air Pollution

Even in large cities, household air can be more polluted than outdoor air (U.S. Environmental Protection Agency [U.S. EPA], 2020a). Household air pollution is associated with asthma and increased asthma morbidity (Breyse et al., 2010). This association is particularly worrisome because according to the National Human Activity Pattern Survey, a probability-based telephone survey ($n = 9,386$) in the U.S., children spend approximately 65% of their time in homes and more than 80% of their time indoors (Klepeis et al., 2001).

Gas Cooking Stoves: Source of Household Air Pollution

Cooking with a gas stove is a significant source of household air pollutants. According to the U.S. Environmental Protection Agency (U.S. EPA), both unburned and burned gas release toxic chemicals into household air. These chemicals include nitrogen dioxide (NO_2), $\text{PM}_{2.5}$, carbon monoxide (CO), benzene, and formaldehyde (U.S. EPA, 1998), all of which are associated with serious human health effects (Table 1). The effect of exposure to these chemical pollutants on childhood respiratory illnesses is not well understood. Nitrogen dioxide is an established marker for

TABLE 1

U.S. Environmental Protection Agency (U.S. EPA) Listed Health Effects of Chemicals Emitted From Burned Natural Gas

Chemical Name	Health Effect
Nitrogen dioxide (U.S. EPA, 2016)	<ul style="list-style-type: none"> • Contributes to the development of asthma, aggravated asthma, and increases susceptibility to respiratory infections
PM _{2.5} (U.S. EPA, 2020b)	<ul style="list-style-type: none"> • Aggravates asthma, decreases lung function, and increases respiratory symptoms • Nonfatal heart attacks and irregular heartbeat • Premature death in people with heart or lung disease
Carbon monoxide (U.S. EPA, 2020c)	<ul style="list-style-type: none"> • Neurological effects including fatigue, impaired vision, reduced brain function, dizziness, confusion, nausea, and coma • Chest pain in people with heart disease • Death
Benzene (U.S. EPA, 2012)	<ul style="list-style-type: none"> • Neurological effects including drowsiness, dizziness, headaches, and unconsciousness • Aplastic anemia, excessive bleeding, and damage to the immune system • Leukemia
Formaldehyde (U.S. EPA, 2020d)	<ul style="list-style-type: none"> • Irritation of the skin, eyes, nose, and throat • Cancer

fossil fuel combustion-generated air pollution, including from natural gas (Jarvis et al., 2010).

Cooking With Gas Increases Household Nitrogen Dioxide Levels

Levels of NO₂ are significantly higher in homes with gas stoves than homes with electric stoves. U.S. EPA estimates that homes with gas cooking appliances have approximately 50% to >400% higher NO₂ levels than homes with electric cooking stoves (U.S. EPA, 2008). In a study of children with active asthma, NO₂ levels were measured in homes with electric and gas cooking stoves. The mean NO₂ levels were 8.6 ppb in homes with electric ranges and 3 times higher in homes with gas stoves (25.9 ppb) (Belanger et al., 2006).

A study of 1,400 homes in Albuquerque, New Mexico, analyzed the impact of housing characteristics, occupant behaviors, and weather on indoor NO₂ levels. Higher NO₂ levels in bedrooms were predominantly associated with the presence of gas cooking ranges with continuously burning pilot lights (10 ppb higher than gas cooking stoves without pilot lights), the use of the gas cooking stove for space heating, and fewer square feet of living space (Spengler et al., 1996).

A study of NO₂ levels in 352 homes in California found median kitchen NO₂ lev-

els were highest in homes with gas cooking stoves with pilot lights (gas stove with pilot, 22 ppb; gas without pilot, 15.4 ppb; and electric stoves, 6 ppb). Levels of NO₂ were higher in homes that cooked with gas ≥4 hr/week (gas >8 hr/week, 24 ppb; gas >4 hr/week, 19 ppb; gas <4 hr/week, 18 ppb; electric >8 hr/week, 6.5 ppb) and that reported not using over-the-stove exhaust fan hoods that vented outdoors, hereafter referred to as exhaust fans (gas stove with exhaust fan never used, 34 ppb; gas with exhaust fan used one half of the time, 22 ppb; gas with exhaust fan used most/all the time, 16 ppb; and electric, 6.6 ppb) (Mullen et al., 2016).

Nitrogen Dioxide May Cause Asthma and Aggravate Symptoms

Associations between higher outdoor NO₂ levels and increased risk of asthma are well established (Guarnieri & Balmes, 2014). In 2016, the U.S. EPA *Integrated Science Assessment for Oxides of Nitrogen* upgraded its assessment of the relationship of short periods of NO₂ exposure to aggravated respiratory diseases, particularly asthma, from “likely causal” to “causal,” and longer exposures to elevated levels of NO₂ to “likely causal” of respiratory effects, including asthma (U.S. EPA, 2016).

Indoor studies find associations between higher NO₂ levels and risk of asthma symptoms. A meta-analysis found that higher levels of household NO₂ were associated with a 15% (95% confidence interval [CI] [1.06, 1.25]) increased risk of current wheeze in children (Lin et al., 2013). A prospective study of 1,342 children with asthma between the ages of 5 and 10 years found that above a 6 ppb threshold, every 5 ppb increase in NO₂ levels was associated with a dose-dependent increase in risk of wheeze (1.49, 95% CI [1.09, 2.03]), night symptoms (1.52, 95% CI [1.16, 2.00]), and need for rescue medication (1.78, 95% CI [1.33, 2.38]) (Belanger et al., 2013). A prospective study of children ages 2–6 with asthma in Baltimore, Maryland, found each 20-ppb increase in NO₂ levels was associated with significant increases in risk of both cough (1.10, 95% CI [1.02, 1.18]) and nocturnal symptoms (1.09, 95% CI [1.02, 1.16]) (Hansel et al., 2008).

Cooking with gas is associated with increased risk of asthma. A meta-analysis showed that children living in a home with a gas cooking stove have a 42% increased risk of current asthma (95% CI [1.23, 1.64]) and a 24% increased lifetime risk of asthma (95% CI [1.04, 1.47]) (Lin et al., 2013).

Children's Exposure to Gas Cooking Stoves Is Substantial

Approximately one third of households in the U.S. cook with gas stoves, with regional variability (U.S. Census Bureau, 2011). A Lawrence Berkeley National Laboratory modeling study of homes in Southern California estimated that during winter, when ventilation in homes is lowest, 51–64% of homes using natural gas cooking stoves regularly experienced household NO₂ levels that exceeded health-based outdoor air standards (Logue et al., 2014). Current efforts to reduce energy consumption in homes and other buildings by reducing air flow into and out of buildings will increase household air pollution. A modeling study estimated that tightening building envelopes without repairing kitchen exhaust fans or eliminating gas stoves would lead to 20% more childhood asthma events (Fabian et al., 2014).

Exhaust Fans Can Decrease Household Nitrogen Dioxide Levels, With Limitations

Exhaust fans that are vented to the outdoors can reduce household air pollution. A study

of NO₂ levels in 352 homes in California found median NO₂ levels in the kitchen were significantly lower in homes where people reported cooking with gas and using exhaust fans all the time (16 ppb) compared with those who never used them (34 ppb) (Mullen et al., 2016). Many people, however, do not turn on exhaust fans when they cook with gas stoves. Respondents to a California web-based survey reported using exhaust fans only one third of the time when cooking dinner and less for other meals (Klug et al., 2011). Exhaust fans that do vent to the outdoors might not capture all the pollutants generated by gas cooking stoves. It depends, in part, on the amount of air the exhaust fan can capture and move to the outdoors (Singer et al., 2017). Exhaust fans that recirculate air inside the home and that are not vented to the outdoors remove very little NO₂ and other pollutants from household air.

Other Interventions That Can Reduce Household Nitrogen Dioxide Levels

A randomized study evaluating three interventions to lower household NO₂ levels in homes with gas cooking stoves found that replacing gas cooking stoves was the most effective way to lower household NO₂ levels. Median NO₂ levels were 42% lower when electric cooking stoves replaced gas cooking stoves and 27% lower when air purifiers with high-efficiency particulate air (HEPA) and activated carbon filters (hereafter referred to as air purifiers) were placed in the homes. Levels of NO₂ were not significantly lower in homes where new exhaust fans were installed over gas stoves (Paulin et al., 2014). It is not known why NO₂ levels were not reduced by the exhaust fans. Perhaps the fans were not turned on or the exhaust fans were used but did not expel enough of the NO₂ coming from the gas cooking stove. A study of commonly used exhaust fans in the U.S. found that exhaust fans captured <30% of the pollutants coming from the front stove burners (Delp & Singer, 2012).

Cooking With Gas Is an Unrecognized Risk

In Massachusetts, informal questioning of more than 100 parents, health professionals, staff of local health departments, and local boards of health, among others, found that most did not know about the association

TABLE 2

Recommendations to Families With Gas Cooking Stoves and Children With Asthma

Recommendation	Explanation
Reduce use of the gas stove	Use electric appliances instead of the gas stove. Alternative appliances include microwaves, toaster ovens, rice cookers, crockpots, and portable single electric induction burners.
Remove gas cooking stove-related pollution from household air	If there is an exhaust fan above the gas stove that pushes gas fumes out of the home, turn it on when cooking with the gas stove and consider leaving it on after turning the stove off. When possible, use the back burners because the exhaust hood captures more pollutants from back burners. If the gas stove does not have a working exhaust fan or the fan does not exhaust to the outdoors, use a HEPA air purifier with a carbon filter to remove pollution, or open a window.
Replace the gas cooking stove with an electric stove	Consider replacing the gas stove with an electric or electric induction stove.

between cooking with gas stoves, household air pollution, and increased risk of asthma among children living in the home (T.S. Jones, personal communication, April 30, 2019).

Implications for Public Health Practice

1. **Inform healthcare professionals, health departments, families, and others that gas cooking stoves are associated with childhood asthma.** The association between gas cooking stoves, household NO₂ levels, and childhood asthma is not widely known and has been insufficiently addressed in public policy. Information that cooking with gas is associated with increased asthma risk and severity should be widely disseminated to parents, healthcare professionals, public health staff, and government agencies that fund new housing, set safe housing standards, and inspect homes.

Healthcare professionals could ask families whose children have asthma what kind of stove is used for cooking and encourage families who cook with gas stoves to: reduce use, improve ventilation, and replace gas stoves with electric or electric induction stoves (Table 2). These interventions could include assessing the presence of gas cooking stoves as part of multi-trigger, multifaceted, home-based interventions for asthma recommended by the Community Preventive Services Task Force (Crocker et al., 2011).

2. **Healthcare organizations should invest in population health programs to prevent**

asthma and reduce asthma-related healthcare costs. Many families whose children have asthma have limited resources to address the multiple factors that contribute to their children's asthma, including gas cooking stoves. Healthcare organizations, including accountable care organizations, should implement population health policies to address the root causes of asthma, and thereby, reduce healthcare expenditures. As part of multifaceted, home-based interventions, these organizations could provide families with 1) electric induction burners to reduce the use of gas cooking stoves and 2) air purifiers to reduce household air pollution to improve health and reduce asthma-related healthcare expenditures.

3. **Government agencies that set safe home standards, plumbing standards, and inspect homes should review and revise existing standards and procedures to help reduce children's exposure to air pollution generated by gas cooking stoves.** State health departments issue safe housing standards. Staff from local health departments frequently inspect apartments and homes to ensure that residences meet existing safe housing standards. State plumbing boards issue codes for installation of gas appliances. These agencies should review and revise existing standards and procedures to help reduce children's exposure to air pollution generated by gas cooking stoves.

4. **Inform consumers that gas cooking stoves are associated with childhood asthma.**

Warning labels could be required on gas cooking stoves stating the stoves are associated with childhood asthma and should be used only with exhaust fans that vent to the outdoors and/or air purifiers.

5. **Further research.** Additional randomized trials to determine the impact of gas cooking stove interventions on asthma can help guide intervention implementation. The studies could evaluate the affect on childhood asthma of reducing gas stove use, using exhaust fans, using air purifiers, and replacing gas cooking stoves with electric or electric induction stoves.

Conclusion

Household air pollution is not monitored or regulated and is often overlooked as a pol-

lution exposure for children. Cooking with gas increases combustion-related household air pollutants, such as NO₂, and increases the risk of both childhood asthma and asthma severity. Cooking with gas has widespread potential impact on childhood health because 1) more than one third of homes in the U.S. cook with gas, 2) children are more susceptible to the effects of air pollution, and 3) children spend the majority of their time in homes.

Household air pollution generated by gas cooking stoves can be reduced by simple interventions: reducing the use of the stove, improving and using ventilation, and replacing the gas stove with an electric one. These interventions are likely to improve childhood health because exposure to gas cook-

ing stoves is common and asthma is the most common childhood disease in the U.S.

The risks of household air pollution and cooking with gas are not widely recognized and should be considered when developing policies for reducing children's exposure to air pollution. We recommend a public information campaign, warning labels on gas cooking stoves, population health policies addressing the risks of gas cooking stoves, and further research on the efficacy of interventions. 🌱

Corresponding Author: Andee Krasner, Program Manager, Climate and Health, Greater Boston Physicians for Social Responsibility, P.O. Box 470563, Brookline, MA 02447. Email: akrasner@gbpsr.org.

References

- Bateson, T.F., & Schwartz, J. (2007). Children's response to air pollutants. *Journal of Toxicology and Environmental Health, Part A*, 71(3), 238–243. <https://doi.org/10.1080/15287390701598234>
- Belanger, K., Gent, J.F., Triche, E.W., Bracken, M.B., & Leaderer, B.P. (2006). Association of indoor nitrogen dioxide exposure with respiratory symptoms in children with asthma. *American Journal of Respiratory and Critical Care Medicine*, 173(3), 297–303. <https://doi.org/10.1164/rccm.200408-1123OC>
- Belanger, K., Holford, T.R., Gent, J.F., Hill, M.E., Kezik, J.M., & Leaderer, B.P. (2013). Household levels of nitrogen dioxide and pediatric asthma severity. *Epidemiology*, 24(2), 320–330. <https://doi.org/10.1097/EDE.0b013e318280e2ac>
- Breyse, P.N., Diette, G.B., Matsui, E.C., Butz, A.M., Hansel, N.N., & McCormack, M.C. (2010). Indoor air pollution and asthma in children. *Proceedings of the American Thoracic Society*, 7(2), 102–106.
- Crocker, D.D., Kinyota, S., Dumitru, G.G., Ligon, C.B., Herman, E.J., Ferdinands, J.M., Hopkins, D.P., Lawrence, B.M., & Sipe, T.A. (2011). Effectiveness of home-based, multi-trigger, multicomponent interventions with an environmental focus for reducing asthma morbidity: A community guide systemic review. *American Journal of Preventive Medicine*, 41(2, Suppl. 1), S5–S32. <https://doi.org/10.1016/j.amepre.2011.05.012>
- Delp, W.W., & Singer, B.C. (2012). Performance assessment of U.S. residential cooking exhaust hoods. *Environmental Science & Technology*, 46(11), 6167–6173. <https://doi.org/10.1021/es3001079>
- Fabian, M.P., Adamkiewicz, G., Stout, N.K., Sandel, M., & Levy, J.I. (2014). A simulation model of building intervention impacts on indoor environmental quality, pediatric asthma, and costs. *The Journal of Allergy and Clinical Immunology*, 133(1), 77–84. <https://doi.org/10.1016/j.jaci.2013.06.003>
- Guarnieri, M., & Balmes, J.R. (2014). Outdoor air pollution and asthma. *Lancet*, 383(9928), 1581–1592. [https://doi.org/10.1016/S0140-6736\(14\)60617-6](https://doi.org/10.1016/S0140-6736(14)60617-6)
- Hansel, N.N., Breyse, P.N., McCormack, M.C., Matsui, E.C., Curtin-Brosnan, J., Williams, D.L., Moore, J.L., Cuhnan, J.L., & Diette, G.B. (2008). A longitudinal study of indoor nitrogen dioxide levels and respiratory symptoms in inner-city children with asthma. *Environmental Health Perspectives*, 116(10), 1428–1432. <https://doi.org/10.1289/ehp.11349>
- Jarvis, D.J., Adamkiewicz, G., Héroux, M.-E., Rapp, R., & Kelly, F.J. (2010). Nitrogen dioxide. In *WHO guidelines for indoor air quality: Selected pollutants* (pp. 201–287). World Health Organization Regional Office for Europe. <https://apps.who.int/iris/handle/10665/260127>
- Klepeis, N.E., Nelson, W.C., Ott, W.R., Robinson, J.P., Tsang, A.M., Switzer, P., Behar, J.V., Hern, S.C., & Engelmann, W.H. (2001). The National Human Activity Pattern Survey (NHAPS): A resource for assessing exposure to environmental pollutants. *Journal of Exposure Analysis & Environmental Epidemiology*, 11, 231–252. <https://doi.org/10.1038/sj.jea.7500165>
- Klug, V.L., Lobscheid, A.B., & Singer, B.C. (2011). *Cooking appliance use in California homes—Data collected from a web-based survey* [Technical report]. Lawrence Berkeley National Laboratory. <https://doi.org/10.2172/1050839>
- Lin, W., Brunekreef, B., & Gehring, U. (2013). Meta-analysis of the effects of indoor nitrogen dioxide and gas cooking on asthma and wheeze in children. *International Journal of Epidemiology*, 42(6), 1724–1737. <https://doi.org/10.1093/ije/dyt150>
- Logue, J.M., Klepeis, N.E., Lobscheid, A.B., & Singer, B.C. (2014). Pollutant exposures from natural gas cooking burners: A simu-

continued on page 18

References *continued from page 17*

- lation-based assessment for Southern California. *Environmental Health Perspectives*, 122(1), 43–50. <https://doi.org/10.1289/ehp.1306673>
- Mullen, N.A., Li, J., Russell, M.L., Spears, M., Less, B.D., & Singer, B.C. (2016). Results of the California Healthy Homes Indoor Air Quality Study of 2011–2013: Impact of natural gas appliances on air pollutant concentrations. *Indoor Air*, 26(2), 231–245. <https://doi.org/10.1111/ina.12190>
- Paulin, L.M., Diette, G.B., Scott, M., McCormack, M.C., Matsui, E.C., Curtin-Brosnan, J., Williams, D.L., Kidd-Taylor, A., Shea, M., Breyse, P.N., & Hansel, N.N. (2014). Home interventions are effective at decreasing indoor nitrogen dioxide concentrations. *Indoor Air*, 24(4), 416–424. <https://doi.org/10.1111/ina.12085>
- Singer, B.C., Pass, R.Z., Delp, W.W., Lorenzetti, D.M., & Madalena, R.L. (2017). Pollutant concentrations and emission rates from natural gas cooking burners without and with range hood exhaust in nine California homes. *Building and Environment*, 122, 215–229. <https://doi.org/10.1016/j.buildenv.2017.06.021>
- Spengler, J.D., Schwab, M., McDermott, A., Lambert, W.E., & Samet, J.M. (1996). *Nitrogen dioxide and respiratory illness in children. Part IV: Effects of housing and meteorologic factors on indoor nitrogen dioxide concentrations* (Research report 58). Health Effects Institute. <https://www.healtheffects.org/system/files/Research-Report-58-Part-4.pdf>
- U.S. Census Bureau. (2011). *American housing survey for the United States: 2009. Current housing reports* (Series H150/09). U.S. Government Printing Office. <https://www.census.gov/prod/2011pubs/h150-09.pdf>
- U.S. Environmental Protection Agency. (1998). 1.4 Natural gas combustion. In *Compilation of Air Pollutant Emissions Factors* (AP-42, 5th ed., Vol. 1). <https://www.epa.gov/air-emissions-factors-and-quantification/ap-42-fifth-edition-volume-i-chapter-1-external-0>
- U.S. Environmental Protection Agency. (2008). *Integrated Science Assessment (ISA) for oxides of nitrogen—Health criteria (Final report, Jul 2008)* (EPA/600/R-08/071). <https://cfpub.epa.gov/ncea/isa/recordisplay.cfm?deid=194645>
- U.S. Environmental Protection Agency. (2012). *Benzene: Hazard summary* (71-43-2). <https://www.epa.gov/sites/production/files/2016-09/documents/benzene.pdf>
- U.S. Environmental Protection Agency. (2016). *Integrated Science Assessment for oxides of nitrogen—Health criteria* (EPA/600/R-15/068). https://cfpub.epa.gov/si/si_public_file_download.cfm?p_download_id=526855&Lab=NCEA
- U.S. Environmental Protection Agency. (2020a). *The inside story: A guide to indoor air quality*. <https://www.epa.gov/indoor-air-quality-iaq/inside-story-guide-indoor-air-quality>
- U.S. Environmental Protection Agency. (2020b). *Particulate matter (PM) pollution: Health and environmental effects of particulate matter (PM)*. <https://www.epa.gov/pm-pollution/health-and-environmental-effects-particulate-matter-pm>
- U.S. Environmental Protection Agency. (2020c). *Carbon monoxide's impact on indoor air quality*. <https://www.epa.gov/indoor-air-quality-iaq/carbon-monoxides-impact-indoor-air-quality>
- U.S. Environmental Protection Agency. (2020d). *Facts about formaldehyde*. <https://www.epa.gov/formaldehyde/facts-about-formaldehyde>
- Zahrán, H.S., Bailey, C.M., Damon, S.A., Garbe, P.L., & Breyse, P.N. (2018). *Vital Signs: Asthma in children—United States, 2001–2016. Morbidity and Mortality Weekly Report*, 67(5), 149–155. <https://doi.org/10.15585/mmwr.mm6705e1>



CP-FS/CCFS

Join the growing ranks of professionals who have attained NEHA's most in-demand credentials in food safety. Whether your focus is retail food service or food manufacturing and processing, NEHA's Certified Professional—Food Safety (CP-FS) and Certified in Comprehensive Food Safety (CCFS) credentials demonstrate you went the extra mile to get specialized knowledge and training in food safety. Give yourself the edge that is quickly being recognized, required, and rewarded in the food industry.

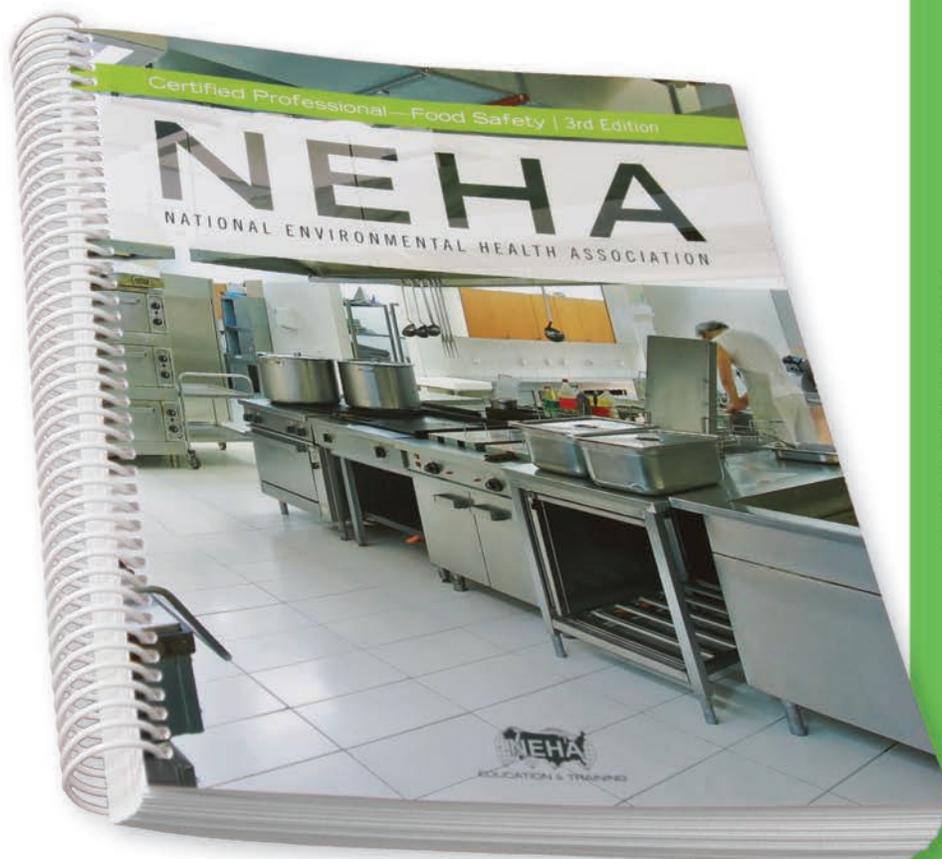
Learn more at neha.org/professional-development/credentials.



A credential today can improve all your tomorrows.



The go-to resource for students of food safety and industry professionals.



Hundreds of pages of new content to help candidates prepare for the current CP-FS exam

Updated to the 2013 *Food Code*

An integral part of Integrated Food Safety System (IFSS) body of knowledge

Includes new Food Safety Modernization Act (FSMA) requirements

Full-color photographs and illustrations throughout

Now available at NEHA's online bookstore.
neha.org/store

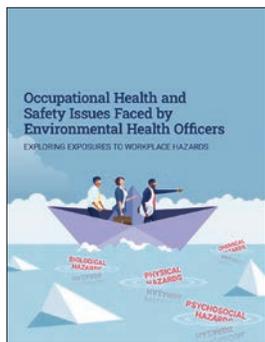
NEHA's ***Certified Professional—Food Safety*** manual was developed by experts from across the various food safety disciplines to help candidates prepare for the updated CP-FS credential examination. This 360-page manual contains science-based, in-depth information about:

- Causes and prevention of foodborne illness
- HACCP plans and active managerial control
- Cleaning and sanitizing
- Pest control
- Risk-based inspections
- Sampling food for laboratory analysis
- Food defense
- Responding to food emergencies and foodborne illness outbreaks
- Conducting facility plan reviews
- Legal aspects of food safety



EDUCATION & TRAINING

▶ INTERNATIONAL PERSPECTIVES



Occupational Health and Safety Issues Faced by Environmental Health Officers: A Perspective From Western Australian

Garry Dine, MSc
Sue Reed, MSc, MEngSc, PhD
Jacques Oosthuizen, MMedSci, PhD
*School of Medical and Health Sciences,
Edith Cowan University*

Abstract Environmental health officers (EHOs) are exposed to various physical, chemical, biological, and psychosocial hazards as frontline public health professionals. These exposures to workplace hazards, however, can be overlooked by EHOs. This study investigates occupational health and safety (OHS) issues faced by EHOs in Western Australia. We conducted an online questionnaire-based cross-sectional study. In total, 75 EHOs completed the survey. We analyzed differences in the general demographic profile, occupational profile, and OHS perception of participants. EHOs perceived themselves as being at risk of exposure to workplace stress; workplace violence; injury from sharps; and slips, trips and falls. Most participants also identified job demands, work-life balance, and biomechanical demands to be other important risks. This study provides useful preliminary information in understanding OHS issues in the environmental health profession.

Introduction

Environmental health officers (EHOs) are employed in multifaceted, diverse environments that present unique occupational health exposures. This study explores the occupational health and safety (OHS) issues faced by EHOs in Western Australia, with a focus on barriers and facilitators that influence safety behaviors and practices. In this study, we assess EHO awareness, perceptions, and levels of compliance to general OHS measures and precautions. The majority of EHOs in Western Australia are employed by local governments, with a focus on disease prevention in the form of consultation, investigation, education,

and regulatory enforcement. These functions expose EHOs to various physical, chemical, biological, and psychosocial hazards.

Environmental health (EH) is one of the oldest public health professions and arguably the bedrock of public health of the Western world; however, there is limited information about occupational health exposure for this professional group. In Australia, despite tremendous improvements in EH, the profession often is devalued (Whiley et al., 2019). We could not find specific research that clearly identifies and describes OHS issues experienced by EHOs. Safe Work Australia, the Australian government statutory body

responsible for national policy related to OHS and workers' compensation, does not have any data specific to EHOs.

Despite the lack of reliable scientific information about OHS in the EH profession, anecdotal evidence suggested that there are broad OHS issues within this sector. For example, verbal aggression, physical violence, and threat of violence are occasionally discussed among EHOs, but these issues are often normalized as being part of the job. As part of their compliance work, EHOs are involved in regulatory inspections, complaint investigations, and surveillance work that places them directly in contact with dissenting business owners, offenders, and irate individuals.

In June 2000, three government food inspectors were shot to death while inspecting a sausage factory in San Leandro, California (Glionna, 2000). In July 2001, an attack on an EHO in connection to a crackdown on illegal hawkers, slaughterhouses, and meat roasting factories was reported in Hong Kong (Lo, 2001). In Zambia, in May 2014, two EHOs working for a local council were attacked by food vendors ("Shebeen Dealers Attack," 2014). These examples highlight the potential for threats of violence in the EH profession. Furthermore, incidents of violence against EHOs are often underreported.

EHOs are subject to a wide variety of physical hazards due to the diverse range of industries they inspect and the multifaceted environments and situations they operate in. Protocols and legal requirements exist in Western Australia for the management of risks from exposure to physical hazards such as noise,

TABLE 1

Survey Themes and Data Collected

Theme	Data Collected
Demographics	Age, sex, level of education
Job descriptions	Employer, employment status, length of employment, supervisory role, job duties
Health and safety hazard concerns	Physical, chemical, psychosocial, and biological hazards; safety culture; work conditions; safety management; workplace bullying; workplace stress
Job demands	Job training, workload, support, job control, skill discretion, decision authority
Violence in the workplace	Physical violence, verbal abuse, workplace security, threats of violence
Physical and ergonomic demands	Physical demands, musculoskeletal demands, repetitive work
Personal protective equipment and clothing	Control measures provided at work, personal protective equipment training
Medical evaluation	Blood test, urine test, physical examination

heat, radiation, vibration, height, falls, electricity, machinery, etc.—but there are no data to indicate how these risks are managed. It is also important to note that EHOs often work in extreme weather conditions; for example, they play a key role on the ground in local government in the emergency recovery phase after bush fires, floods, and other local emergencies.

In their efforts to manage and assess the risk of different types of pollutants discharged into the environment, EHOs are subjected to different chemical hazards. These include contaminated water, air, land, and other materials of public health importance such as asbestos. In addition, the emergence and increase in clandestine drug laboratories are serious public health issues in Australia. Frontline public health professionals, such as EHOs, often find themselves directly involved in the management and remediation of these issues with limited guidance related to safe practices (Al-Obaidi & Fletcher, 2014). No literature was available on how EHOs are affected by biological agents in their line of work. This knowledge gap is particularly concerning given there currently is more emphasis for EH professionals to play an integral part in the management, response, and investigation of disease outbreaks, emerging communicable diseases, and biological hazards (Ratnapradipa, 2015).

As with other professions, there are barriers and facilitators that influence safety

behaviors and practices among EHOs. In order to comprehend OHS issues experienced by EHOs, it is important to recognize the underlying concepts within the professional culture that explicitly influence safety behaviors and practices. In a study conducted in a cohort of 18 EHOs working in the UK, it was suggested that EHO perceptions on workplace health improvement are not a priority and instead, the focus was on fulfilling their EH roles and that they were not overly concerned about work-related ill health (Reynolds & Wills, 2012). This study echoes anecdotal evidence that EHOs are more concerned about the safety and well-being of others than their own. This mindset of selfless commitment to protect others exceeds any kind of self-preservation behavior that is essential in the management of workplace risks. This altruistic mentality has also been observed in the nursing sector; for example, the “supernurse” culture has been identified as a barrier in addressing fatigue in hospital nurses (Steege & Rainbow, 2017).

EHOs have long been criticized for their narrow approach to public health, which is conservatively a protective and enforcement-based approach (Campbell et al., 2011; Reynolds & Wills, 2012). Reynolds and Wills (2012) suggested that EHOs regard themselves as enforcement officers when it comes to their understanding of OHS and do not feel conversant to address and promote the

broader determinants of health, especially the psychosocial elements. This assertion is reinforced by a Maguire (1997) qualitative study that assessed the attitudes and perceptions of EHOs toward people with mental illness in a region of the UK. The study showed that EHOs view their contribution as marginal when it comes to mental illness.

Our study attempts to identify and explore OHS hazards from the EHO perspective and experience to better understand the affect of occupational exposures on this profession. The fact that OHS issues in the EH profession are not frequently reported and have not been carefully studied strengthens the purpose for examining OHS practices in this sector. To our knowledge, there have not been any studies that investigate OHS issues faced by EHOs in Western Australia. This study aims to address this gap.

Methods

This questionnaire-based cross-sectional study used a modified version of the Employee Core Module from the National Exposures at Work Survey developed by the National Institute for Occupational Safety and Health (NIOSH) (Boiano & Hull, 2001). Participants were registered members of the Western Australia branch of Environmental Health Australia.

The original NIOSH survey instrument considers some aspects that were not relevant to the EH profession or the Australian context, and therefore, we slightly modified the questionnaire. The amended survey contained 34 questions, some of which had multiple parts, structured around 8 key themes (Table 1). The Edith Cowan University Human Research Ethics Committee (2019-00402-DINE) approved the research project proposal and survey instrument.

The survey link, using Qualtrics, and information letter were emailed to all registered Environmental Health Australia members who were registered as working in Western Australia and had an email address on file. Although it is not possible to know the exact number of potential participants who viewed the email invitation, it was sent to 348 members. In total, 75 EHOs responded to the survey, which is approximately 19% of the estimated 400 active EHOs working in local governments in Western Australia.

Participants were given 2 weeks to complete the survey. At the end of 2 weeks, a

follow-up email was sent with the survey link thanking those who had participated. Those who had not yet completed the survey were given 1 week more. The survey was estimated to take 15 min to complete. The data from Qualtrics were exported into Excel. Differences in the general demographic profile, occupational profile, and OHS issues of participants were analyzed. The Kruskal–Wallis test was used to identify significance differences between variables.

Results

Table 2 displays the demographic characteristics of the 75 survey participants. This included 36 (48%) who identified as male, 38 (51%) who identified as female, and 1 (1%) who preferred not to say. The age range of participants was 25–73 years, with the average age being 46.6 years. Male participants were older than female, with the male average age being 51.0 years and the female average age being 40.1 years. Approximately 90% of participants had completed a relevant bachelor’s degree or postgraduate qualification. The majority (55%) of the participants worked for a metropolitan local government and 39% worked for a country local government.

Participants were asked to specify their agreement with statements relating to the management of OHS in their workplace. Overall, most participants reported positively about their current organization’s OHS work arrangements (Table 3). There was, however, significant acknowledgement of exposure to dangerous or risky situations. For example, when asked if “People working at my workplace are frequently exposed to dangerous or risky situations,” 43% agreed or strongly agreed. For the statement, “I am often required to do a task that makes me feel like I might be at risk of getting hurt,” 35% agreed or strongly agreed.

On a risk scale of 1 to 5 (5 being a higher risk), participants were asked to estimate the level of risk from the OHS hazards item statements as related to their job (Table 4). Workplace stress appears to be a significant workplace issue among EHOs, with 25% of participants rating it as a level 3 risk, 33% as a level 4 risk, and 13% as a level 5 risk. On average, female EHOs rated workplace stress at a risk level of 3.42 and male EHOs rated workplace stress at a risk level of 3.08. The difference was not statistically significant ($p = .216$). Exposure to needlesticks and sharps injuries was rated as

TABLE 2

Demographic Characteristics of Environmental Health Officers (N = 75)

Demographic	# (%)
Sex	
Male	36 (48.0)
Female	38 (50.7)
Prefer not to say	1 (1.3)
Age (years)	
Average age (all participants)	46.6
Average age (male)	51.0
Average age (female)	40.1
Range	25.0–73.0
Education level	
TAFE associate diploma	4 (5.3)
TAFE advanced diploma	2 (2.7)
Bachelor’s degree	31 (41.3)
Postgraduate diploma/master’s degree	36 (48.0)
Doctoral degree	1 (1.3)
Other	1 (1.3)
Employment description	
Metropolitan local government	41 (54.7)
Country local government	29 (38.7)
Western Australia Department of Health	1 (1.3)
Other	4 (5.3)
TAFE = Technical and Further Education.	

an important hazard to EHOs, as was the risk of slips, trips and falls. A considerable proportion of participants indicated that they were concerned about infectious disease agents in their workplaces. Of the participants, 40% rated infectious disease agents at a level 3 risk and higher. The survey shows that female EHOs tended to have a higher risk perception than their male counterparts. The differences in how male and female EHOs perceived different OHS risks, however, were not statistically significant.

Figure 1 presents an overview of EHO responses related to the prevalence of violence in the workplace. For this theme of questions, EHOs were asked to report on their exposure to and witness of violence in their workplace in the past 12 months. Of the participants, 26% reported having witnessed

acts of violence ≥ 1 time against another person while at work in the past 12 months. Approximate one quarter (23.9%) indicated that they have been threatened with physical violence or with a weapon (e.g., gun, knife, club, sharp object) at least once while at work in the past 12 months. Most (75%) indicated that they have experienced verbal violence at least once in the past 12 months. On average, females perceived the risk of workplace violence higher (3.0) than males did (2.7). This difference, however, was not statically significant ($p = .369$). Approximately one third (31%) of participants had reported an incident of violence to their employer at their workplace at least once over the past 12 months. More than one third (34%) indicated that they have not been trained how to rec-

TABLE 3

Environmental Health Officer Level of Agreement and Disagreement Regarding Occupational Health and Safety Management Concern Statements by Sex (n = 74)

Statement	Male (n = 36)		Female (n = 38)	
	Agree/ Strongly Agree	Disagree/ Strongly Disagree	Agree/ Strongly Agree	Disagree/ Strongly Disagree
	# (%)	# (%)	# (%)	# (%)
The health and safety of workers is a major priority with top management at your workplace.	33 (91.7)	3 (8.3)	31 (81.6)	7 (18.4)
I feel safe from work-related injury or illness in my current work environment.	34 (94.4)	2 (5.6)	28 (77.8)	8 (22.2)
I usually have enough time to take safety precautions while completing my duties.	35 (97.2)	1 (2.3)	32 (84.2)	6 (15.8)
I feel free to express my concerns about health and safety conditions to management.	34 (94.4)	2 (5.6)	34 (89.5)	4 (10.5)
Proper personal protective equipment is made readily available by my employer.	35 (97.2)	1 (2.3)	36 (26.6)	2 (1.5)
I know how to reduce the risk of accidents and incidents in the workplace.	36 (100)	0	38 (100)	0
I am often required to do a task that makes me feel like I might be at risk of getting hurt.	11 (30.6)	25 (69.4)	14 (36.8)	24 (63.2)
People working at my workplace are frequently exposed to dangerous or risky situations.	13 (36.1)	23 (63.9)	19 (50.0)	19 (50.0)
Employees have sufficient access to workplace health and safety training programs.	30 (83.3)	6 (16.7)	32 (84.2)	6 (15.8)
The safety procedures and practices in this organization are useful and effective.	30 (83.3)	6 (16.7)	28 (77.8)	8 (22.2)
Managers and supervisors set proper examples by following safety rules and work practices.	31 (86.1)	5 (13.9)	32 (84.2)	6 (15.8)
I know how to use safety equipment and standard work procedures.	36 (100)	0	38 (100)	0
Work areas are periodically inspected to identify potential health and safety hazards.	28 (77.8)	8 (22.2)	29 (78.4)	8 (21.6)
Unsafe working conditions are corrected in a reasonable time period.	28 (77.8)	8 (22.2)	31 (81.6)	7 (18.4)
I have received adequate training from my current employer to recognize health and safety hazards in my job.	32 (88.9)	4 (11.1)	29 (76.3)	9 (23.7)
I have been trained by my current employer in how to recognize and deal with potential incidents of workplace violence.	26 (72.2)	10 (27.8)	23 (60.5)	15 (39.5)
I could talk to my employer if I had a problem with violence or aggression in my workplace.	33 (91.7)	3 (8.3)	36 (94.7)	2 (5.3)
My work area is adequately staffed.	24 (66.7)	12 (33.3)	23 (60.5)	15 (39.5)
I can report injuries to my manager without worrying about how it will affect my job.	34 (94.4)	2 (5.6)	37 (97.4)	1 (2.6)
I can report injuries to my manager without worrying about how it will affect my workplace safety record.	34 (94.4)	2 (5.6)	37 (97.4)	1 (2.6)

ognize and deal with potential incidents of workplace violence.

Most EHOs expressed general satisfaction with work conditions relative to their personal life. Of the participants, 63% agreed to

the statement, “After work I come home too tired to do some of the things I’d like to do.” When it comes to job demands, it appears that they were not entirely sure how job demands relate to their job. For example, for

the statement, “My job requires working very fast,” 46% of participants neither agreed nor disagreed, 14% disagreed, and 31% agreed. Similarly, EHO responses differed significantly for the statement, “I’m not asked to do

an excessive amount of work.” Specifically, 42% neither agreed nor disagreed, 21% disagreed, and 29% agreed. A majority of EHOs (69%) indicated that over the past few years their job had become more demanding. Of the participants, 36% disagreed or strongly disagreed that their work area was adequately staffed. Most responded positively about the level of support they received from their supervisors and the people they work with.

Table 4 presents the responses of the participants on item statements related to physical demands and ergonomic issues. It appears that most participants were not concerned about the level of physical demands associated with their current job. For the statement, “My job requires lots of physical effort,” about 87% disagreed or strongly disagreed. Most participants (94%) disagreed or strongly disagreed with the statement, “I am often required to move or lift very heavy loads.” Similarly, most (93%) disagreed or strongly disagreed with the statement, “My work requires rapid and continuous physical activity.” For the biomechanical demands, it appears that EHOs are not overly concerned about this issue. For the statement, “I am often required to work for long periods with my head or arms in physically awkward positions,” 96% of participants disagreed or strongly disagreed. A large proportion of respondents (70%), however, agreed or strongly agreed that their work involved a high degree of long sedentary periods at a computer.

Discussion

Overall, most participants reported positively about their current organization’s OHS work arrangements; however, 43% indicated that they are frequently exposed to dangerous or risky situations at their workplace and 35% indicated that they are often required to do tasks that makes them feel like they might be at risk of getting hurt. It was beyond the scope of this study to explore these risks in more depth. It can be argued, however, that exposure to risky situations is commonly associated with the itinerant nature of the EH profession and working in an ever-changing and high-paced environment. EHOs might not know what looms behind the next door they knock on or the next site they visit; therefore, the development of a specific OHS guideline for EHOs is necessary to address different work situations and environments. Local governments in Western Australia are required to provide

TABLE 4

Estimated Levels of Risk to Specific Hazards as Determined by Environmental Health Officers (N = 75)

Hazard	Level of Risk (%)					
	1	2	3	4	5	No Answer
Chemical agents (e.g., acids, caustics, solvents)	25.3	40.0	25.3	6.7	2.7	0
Ionizing radiation (e.g., X-rays, gamma rays)	73.3	22.7	2.7	0	1.3	0
Machine safety hazards (e.g., exposed moving parts)	33.3	37.3	22.7	4.0	2.7	
Nonionizing radiation (e.g., UV, microwaves, radio frequency, electromagnetic fields)	54.7	32.0	13.3	0	0	0
Infectious disease agents (e.g., <i>Mycobacterium tuberculosis</i> bacteria)	28.0	32.0	24.0	10.7	5.3	0
Bloodborne pathogens (e.g., HIV, hepatitis)	25.3	37.3	22.7	8.0	4.0	2.7
Latex allergens (e.g., from gloves)	38.7	32.0	21.3	6.7	1.3	0
Needlesticks and sharps injuries	17.3	20.0	41.3	14.7	6.7	0
Temperature extremes	14.7	32.0	26.7	17.3	8.0	1.3
Noise levels	21.3	32.0	32.0	12.0	2.7	0
Poor indoor air quality (e.g., molds, cigarette smoke, vehicle exhaust)	20.0	46.7	17.3	13.3	2.7	0
Workplace stress	5.3	22.7	25.3	33.3	13.3	0
Repetitive hand, wrist, arm, or shoulder motions	16.0	36.0	29.3	13.3	5.3	0
Slips, trips, and falls	10.7	32.0	32.0	24.0	1.3	0
Prolonged standing	37.3	41.3	21.3	0	0	0
Lifting/repositioning heavy objects	37.3	24.0	14.7	2.7	2.7	0
Violence at work (e.g., assaults, threats)	14.7	30.7	20.0	21.3	13.3	0
Acts of bioterrorism at work	57.3	36.0	1.3	2.7	1.3	1.3

1 = no risk, 5 = high risk.

EHOs with a general OHS induction that covers issues such as how to report an incident, evacuation procedures, first aid, and the organization’s safety policy. There currently is no targeted OHS training or guidelines specific to the work environment for EHOs.

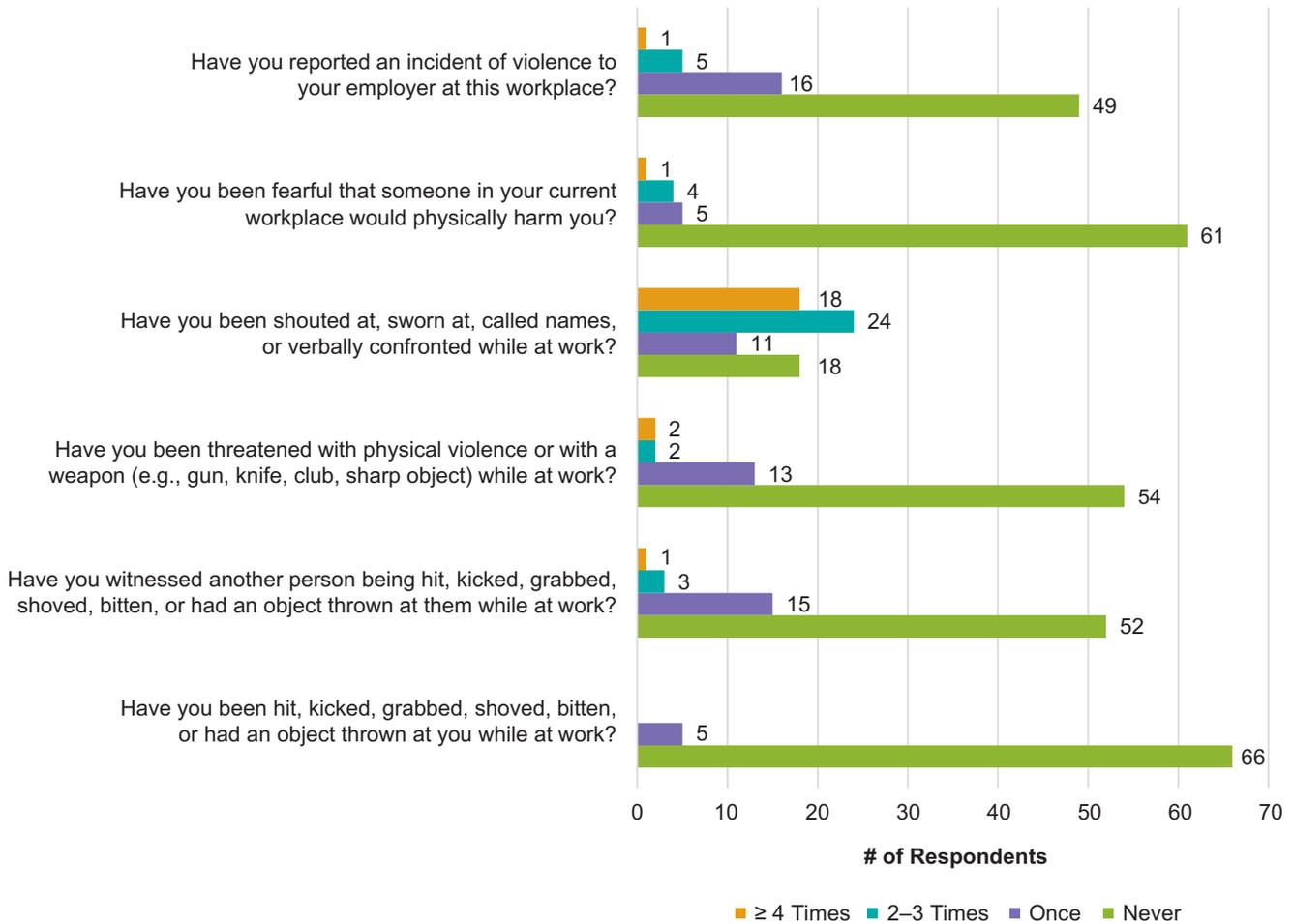
EHOs reported workplace stress as an important workplace issue. Although not statistically significant ($p = .216$), on average, female EHOs rated workplace stress at a risk level of 3.42, whereas male EHOs rated it at a risk level of 3.08. This observation is in line with other studies that have demonstrated a higher prevalence of workplace-related stress in female workers (Gyllensten & Palmer, 2005; Rivera-Torres et al., 2013), but the causes and factors that influ-

ence workplace stress in EHOs was beyond the scope of this study. Systematic observation of the data obtained in this survey, however, indicates that workplace stress is a tangible occupational risk among EHOs.

Our current study shows that most EHOs (69%) indicated that over the past few years their jobs have become more demanding, which has previously been reported as a known cause for workplace-related stress (Akbari et al., 2017). There is also evidence that job demand and resources have significantly affected employee well-being (Adil & Baig, 2018). Our survey revealed that 36% of participants disagreed or strongly disagreed that their work area is adequately staffed. Understaffing, heavy

FIGURE 1

Environmental Health Officer Workplace Exposure and Witness to Violence Over the Past 12 Months (n = 71)



workload, and other working conditions have been found to be the main sources of stress (Bhui et al., 2016). EH services are undervalued in Australian local governments. The absence of advocacy and an evidence-based approach to EH services appear to be a disadvantage in securing additional resources and staff.

Our survey shows that the prevalence of workplace violence among EHOs is frequent and widespread across local governments in Western Australia. The diverse work environments of EHOs make it incredibly challenging to implement effective preventive measures to mitigate the risk of workplace violence. Due to this impracticality, the violence associated with the EHO occupational setting is

somewhat normalized as part of the job and it appears that there is limited commitment to address the issue. A large proportion of participants (34%) indicated that they have not been trained by their current employer in how to recognize and deal with potential incidents of workplace violence. Additionally, the responses suggest that in spite of a relatively high prevalence of violence, the level of incident reporting is relatively low. The differences between the number of male and female EHOs in 1) the prevalence of violence experienced and 2) the tendency to report violence in the workplace were not statistically significant. Other studies have shown, however, that exposure to verbal abuse was

the most common form of violence (Lown & Setnik, 2018; Sun et al., 2017). Further study among EHOs is necessary to gain a fuller, countrywide understanding of workplace violence in Australia, as well as insight into coping mechanisms adopted by EHOs.

Improperly discarded sharps (e.g., needles, syringes) are a risk to the community and EHOs are tasked with the collection and disposal of these items when sharps are reported in public places. While there are procedures for safe retrieval and disposal of sharps, EHOs who participated in the survey reported a high risk perception of sharps. Data are unavailable on the prevalence of workplace injury from sharps in the EH pro-

fection. Proper reporting and further investigation in the broader EH occupation are necessary to determine whether the risk from sharps is significant for EHOs.

In relation to slips, trips, and falls, 56% of participants indicated that these types of incidents were a significant work-related risk. EHOs often walk on wet and slippery surfaces in kitchens, cool rooms, and other areas where foods are prepared and processed. EHOs often are required to perform specific tasks at a faster work pace due to time constraints or stringent protocols they have to follow when conducting specific tasks in problematic environments. An increase in walking pace usually increases the friction demand and risk of slip initiation; it has been established that slips are associated with friction demand characteristics that are affected by task factors such as working pace, turning, and load carrying (Chang et al., 2012, 2016).

The moderate quality of evidence in response to questions on biomechanical demands from this study is not enough to establish whether the risk of slip, trips, and falls is serious for EHOs. More dependable exposure measurement would improve the quality of evidence. Approximately one half of participants (48%) scored repetitive hand, wrist, arm, or shoulder motion as a relatively high-risk issue in their work. Almost 30% of the participants agreed or strongly agreed with the statement, "I am often required to squat or kneel to do my job," whereas 23% of participants agreed or strongly agreed with the statement "I am often required to bend or twist my wrists to do my job." Occupational squatting and kneeling are known to be risk factors for injuries or diseases of the knee (Ditchen et al., 2015; Klusmann et al., 2010).

Our survey highlighted that biological hazards are an important occupational risk among EHOs despite the introduction of a range of standard industry control measures. A significant proportion of participants estimated the risk to infectious agents to be relatively high. On a scale of 1 to 5, 40% rated it ≥ 3 . Data on the risk to biological agents in the EH profession are lacking. As fieldworkers, EHOs are exposed to various sources of biological hazards including humans, animals, insects, plants, bacteria, and viruses. These agents can cause a multitude of health issues including allergies and infections. Potential exposure to infectious agents has

been described among police officers, who can be exposed to infectious agents such as hepatitis viruses and HIV in their role as first responders (Jessop et al., 2014). Equally, as frontline public health professionals, EHOs could be exposed to infectious agents when they responded to various public health-related emergencies in their communities.

The recent and ongoing COVID-19 pandemic is one example of how EHOs can be exposed to infectious disease. While much has been said about the risk of COVID-19 to frontline healthcare workers (Karlsson & Fraenkel, 2020; Nguyen et al., 2020; Shaukat et al., 2020; Sheraton et al., 2020; Shreffler et al., 2020), nothing has been reported about EHOs who have continued to implement EH standards during the pandemic. The pandemic has been challenging for EHOs who must continue to provide successful EH services in potentially high-risk environments and, at the same time, maintain personal responsibilities for their families, colleagues, and themselves.

In Western Australia, EHOs were required to strengthen the level of EH services and maintain a high level of oversight to manage the new and changed health risks associated directly with COVID-19 and the introduction of the government restrictions on businesses and communities. In Queensland, for example, the Public Health Act was amended to include certain offenses for failing to comply with directions designed to contain the spread of COVID-19 (Queensland Government, 2020). EHOs in local governments were given special powers to ensure compliance with public health direction related to particular industries including food businesses and personal appearance services. Our survey was conducted in August 2019 prior to COVID-19, so the potential impact of COVID-19 as a psychological and physical risk to EHOs was not assessed.

Differences in how male and female EHOs perceived different OHS risks were not statistically significant. A study with a larger sample group is necessary to determine if there is a significant difference between male and female EHOs toward potential OHS risks. Studies have shown that women tend to have a higher risk perception and commitment to safety than men do (De Sio et al., 2017; Finucane et al., 2000; Harris et al., 2006; Li et al., 2018; Susanto et al., 2018). In comparison, acceptance and normalization of occupational risks by male workers is well established (Stergiou-

Kita et al., 2015). The concept of masculinities has been proved to be an influencing factor of how workplace risks are perceived by men (Johnston & McIvor, 2004). To prove their worth, male workers are known to not report workplace complaints (Breslin et al., 2007) and accept risk as an inevitable part of their work (Knudsen & Gron, 2010).

Limitations

As this study is based on a self-administered questionnaire, we were not able to clarify issues that might crop up in the minds of the participants. This study did not examine the causes and impacts of OHS hazards. As with any survey, there is always the element of self-reporting bias. Two types of self-reporting bias could have occurred in this survey. The first, social desirability bias, might have occurred because 50% of participants held a supervisory position, which could have generated bias in their responses on management of OHS and supervisor support of employees (Althubaiti, 2016). The second, recall bias, relates to participants being asked to report on events or situations that took place within the last 12 months (Althubaiti, 2016).

Conclusion

This study provides useful preliminary information in understanding OHS issues in the EH profession. EHOs perceived themselves as being at risk of exposure to a range of workplace hazards, with the ones of most concern being workplace stress; workplace violence; sharps injury; and slips, trips, and falls. Job demands, work-life balance, and biomechanical demands were also identified by most participants as being important risks. While this study has its limitations, these findings can be useful in the development of OHS policy and implementation in EH practices and can be used as the basis for a much larger in-depth study to explore some of the issues identified here. Further research using a relevant study design (e.g., focus groups, face-to-face interviews) is necessary to explore potential barriers and perceptions affecting OHS management among EHOs. 🐼

Corresponding Author: Garry Dine, School of Medical and Health Sciences, Edith Cowan University, 270 Joondalup Drive, Joondalup, Western Australia, 6027, Australia. Email: gdine@our.ecu.edu.au.

References

- Adil, M.S., & Baig, M. (2018). Impact of job demands-resources model on burnout and employee's well-being: Evidence from the pharmaceutical organisations of Karachi. *IIMB Management Review*, 30(2), 119–133. <https://doi.org/10.1016/j.iimb.2018.01.004>
- Akbari, J., Akbari, R., Shakerian, M., & Mahaki, B. (2017). Job demand-control and job stress at work: A cross-sectional study among prison staff. *Journal of Education and Health Promotion*, 6(1), 15. https://doi.org/10.4103/jehp.jehp_68_14
- Al-Obaidi, T.A., & Fletcher, S.M. (2014). Management of clandestine drug laboratories: Need for evidence-based environmental health policies. *Environmental Health and Preventive Medicine*, 19, 1–11. <https://doi.org/10.1007/s12199-013-0360-8>
- Althubaiti, A. (2016). Information bias in health research: Definition, pitfalls, and adjustment methods. *Journal of Multidisciplinary Healthcare*, 9, 211–217. <https://doi.org/10.2147/jmdh.S104807>
- Bhui, K., Dinos, S., Galant-Miecznikowska, M., de Jongh, B., & Stansfeld, S. (2016). Perceptions of work stress causes and effective interventions in employees working in public, private and non-governmental organisations: A qualitative study. *BJPsych Bulletin*, 40(6), 318–325. <https://doi.org/10.1192/pb.bp.115.050823>
- Boiano, J.M., & Hull, R.D. (2001). Development of a National Occupational Exposure Survey and Database associated with NIOSH hazard surveillance initiatives. *Applied Occupational and Environmental Hygiene*, 16(2), 128–134. <https://doi.org/10.1080/104732201460217>
- Breslin, F.C., Polzer, J., MacEachen, E., Morrongiello, B., & Shannon, H. (2007). Workplace injury or “part of the job”? Towards a gendered understanding of injuries and complaints among young workers. *Social Science & Medicine*, 64(4), 782–793. <https://doi.org/10.1016/j.socscimed.2006.10.024>
- Campbell, A.C., Foggin, T.M., Elliott, C.T., & Kosatsky, T. (2011). Health promotion as practiced by public health inspectors: The BC experience. *Canadian Journal of Public Health*, 102(6), 432–436. <https://doi.org/10.1007/BF03404194>
- Chang, W.-R., Leclercq, S., Lockhart, T.E., & Haslam, R. (2016). State of science: Occupational slips, trips and falls on the same level. *Ergonomics*, 59(7), 861–883. <https://doi.org/10.1080/00140139.2016.1157214>
- Chang, W.-R., Matz, S., & Chang, C.-C. (2012). Stochastic distribution of the required coefficient of friction for level walking—An in-depth study. *Ergonomics*, 55(8), 937–945. <https://doi.org/10.1080/00140139.2012.683880>
- De Sio, S., Cedrone, F., Sanità, D., Ricci, P., Corbosiero, P., Di Traglia, M., Greco, E., & Stansfeld, S. (2017). Quality of life in workers and stress: Gender differences in exposure to psychosocial risks and perceived well-being. *BioMed Research International*, 2017, Article 7340781. <https://doi.org/10.1155/2017/7340781>
- Ditchen, D.M., Ellegast, R.P., Gawliczek, T., Hartmann, B., & Rieger, M.A. (2015). Occupational kneeling and squatting: Development and validation of an assessment method combining measurements and diaries. *International Archives of Occupational and Environmental Health*, 88(2), 153–165. <https://doi.org/10.1007/s00420-014-0946-5>
- Finucane, M.L., Slovic, P., Mertz, C.K., Flynn, J., & Satterfield, T.A. (2000). Gender, race, and perceived risk: The ‘white male’ effect. *Health, Risk & Society*, 2(2), 159–172. <https://doi.org/10.1080/713670162>
- Glionna, J.M. (2000, June 23). Sausage plant owner held in 3 slayings. *Los Angeles Times*. <https://www.latimes.com/archives/la-xpm-2000-jun-23-mn-44050-story.html>
- Gyllensten, K., & Palmer, S. (2005). The role of gender in workplace stress: A critical literature review. *Health Education Journal*, 64(3), 271–288. <https://doi.org/10.1177/001789690506400307>
- Harris, C.R., Jenkins, M., & Glaser, D. (2006). Gender differences in risk assessment: Why do women take fewer risks than men? *Judgment and Decision Making*, 1(1), 48–63. <http://journal.sjdm.org/jdm06016.pdf>
- Jessop, A.B., Del Buono, F., Solomon, G., Mullen-Fortino, M., & Rogers, J.M. (2014). Police exposure to infectious agents: An audit of protective policies. *Occupational Medicine*, 64(7), 546–548. <https://doi.org/10.1093/occmed/kqu112>
- Johnston, R., & McIvor, A. (2004). Dangerous work, hard men and broken bodies: Masculinity in the Clydeside Heavy Industries, c. 1930–1970s. *Labour History Review*, 69(2), 135–151. <https://doi.org/10.3828/lhr.69.2.135>
- Karlsson, U., & Fraenkel, C.-J. (2020). COVID-19: Risks to healthcare workers and their families [Editorial]. *BMJ*, 371, m3944. <https://doi.org/10.1136/bmj.m3944>
- Klussmann, A., Gebhardt, H., Nübling, M., Liebers, F., Quirós Perea, E., Cordier, W., von Engelhardt, L.V., Schubert, M., Dávid, A., Bouillon, B., & Rieger, M.A. (2010). Individual and occupational risk factors for knee osteoarthritis: Results of a case-control study in Germany. *Arthritis Research & Therapy*, 12(3), Article R88. <https://doi.org/10.1186/ar3015>
- Knudsen, F., & Gron, S. (2010). Making sense of fishermen's risk perception. *Policy and Practice in Health and Safety*, 8(2), 77–94. <https://doi.org/10.1080/14774003.2010.11667749>
- Li, J.Q., Wiersma, J.W.F., & Rahman, M.B. (2018, April 30). *Do women and men have different perceptions on hazards in the workplace?* [Conference paper]. Symposium Proceeding on Safety in Garment Industry, Five Years After Rana Plaza. Dhaka, Bangladesh. <https://jidpus.buet.ac.bd/resources/img/conference-symposium/Proceedings-2018.pdf>
- Lo, C. (2001, July 19). Top health inspector badly hurt in attack. *South China Morning Post*. <https://www.scmp.com/article/352804/top-health-inspector-badly-hurt-attack>
- Lown, B.A., & Setnik, G.S. (2018). Utilizing compassion and collaboration to reduce violence in healthcare settings. *Israel Journal of Health Policy Research*, 7(1), 39. <https://doi.org/10.1186/s13584-018-0234-z>

continued on page 28

References *continued from page 27*

- Maguire, K. (1997). A qualitative study of attitudes and perceptions of environmental health officers towards people with mental illness in a region of the UK. *International Journal of Environmental Health Research*, 7(3), 203–214. <https://doi.org/10.1080/09603129773841>
- Nguyen, L.H., Drew, D.A., Graham, M.S., Joshi, A.D., Guo, C.-G., Ma, W., Mehta, R.S., Warner, E.T., Sikavi, D.R., Lo, C.-H., Kwon, S., Song, M., Mucci, L.A., Stampfer, M.J., Willett, W.C., Eliassen, A.H., Hart, J.E., Chavarro, J.E., Rich-Edwards, J.W., . . . Chan, A.T. (2020). Risk of COVID-19 among front-line health-care workers and the general community: A prospective cohort study. *The Lancet Public Health*, 5(9), e475–e483. [https://doi.org/10.1016/s2468-2667\(20\)30164-x](https://doi.org/10.1016/s2468-2667(20)30164-x)
- Queensland Government. (2020). *COVID-19 enforcement framework for local government: Food businesses and beauty therapy*. https://www.health.qld.gov.au/_data/assets/pdf_file/0027/986040/Enforcement-Framework-for-local-government-authorized-persons.pdf
- Ratnapradipa, K. (2015). 2014 Ebola outbreak: Implications for environmental health practice. *Journal of Environmental Health*, 78(4), 18–21.
- Reynolds, J., & Wills, J. (2012). Workplace health improvement: Perspectives of environmental health officers. *Occupational Medicine*, 62(1), 17–22. <https://doi.org/10.1093/occmed/kqr134>
- Rivera-Torres, P., Araque-Padilla, R.A., & Montero-Simó, M.J. (2013). Job stress across gender: The importance of emotional and intellectual demands and social support in women. *International Journal of Environmental Research and Public Health*, 10(1), 375–389. <https://doi.org/10.3390/ijerph10010375>
- Shaukat, N., Ali, D.M., & Razzak, J. (2020). Physical and mental health impacts of COVID-19 on healthcare workers: A scoping review. *International Journal of Emergency Medicine*, 13(1), 40. <https://doi.org/10.1186/s12245-020-00299-5>
- Shebeen dealers attack Council health inspectors in Livingstone. (2014, May 23). *Lusaka Times*. <https://www.lusakatimes.com/2014/05/23/shebeen-dealers-attack-council-health-inspectors-livingstone/>
- Sheraton, M., Deo, N., Dutt, T., Surani, S., Hall-Flavin, D., & Kashyap, R. (2020). Psychological effects of the COVID 19 pandemic on healthcare workers globally: A systematic review. *Psychiatry Research*, 292, Article 113360. <https://doi.org/10.1016/j.psychres.2020.113360>
- Shreffler, J., Petrey, J., & Huecker, M. (2020). The impact of COVID-19 on healthcare worker wellness: A scoping review. *Western Journal of Emergency Medicine*, 21(5), 1059–1066. <https://doi.org/10.5811/westjem.2020.7.48684>
- Steege, L.M., & Rainbow, J.G. (2017). Fatigue in hospital nurses—‘Supernurse’ culture is a barrier to addressing problems: A qualitative interview study. *International Journal of Nursing Studies*, 67, 20–28. <https://doi.org/10.1016/j.ijnurstu.2016.11.014>
- Stergiou-Kita, M., Mansfield, E., Bezo, R., Colantonio, A., Garritano, E., Lafrance, M., Lewko, J., Mantis, S., Moody, J., Power, N., Theberge, N., Westwood, E., & Travers, K. (2015). Danger zone: Men, masculinity and occupational health and safety in high risk occupations. *Safety Science*, 80, 213–220. <https://doi.org/10.1016/j.ssci.2015.07.029>
- Sun, T., Gao, L., Li, F., Shi, Y., Xie, F., Wang, J., Wang, S., Zhang, S., Liu, W., Duan, X., Liu, X., Zhang, Z., Li, L., & Fan, L. (2017). Workplace violence, psychological stress, sleep quality and subjective health in Chinese doctors: A large cross-sectional study. *BMJ Open*, 7(12), e017182. <https://doi.org/10.1136/bmjopen-2017-017182>
- Susanto, N., Nugroho W.P.S., & Rizkiyah, E. (2018). Evaluating risk perception based on gender differences for mountaineering activity. *E3S Web of Conferences*, 31, Article 09028. <https://doi.org/10.1051/e3sconf/20183109028>
- Whiley, H., Willis, E., Smith, J., & Ross, K. (2019). Environmental health in Australia: Overlooked and underrated. *Journal of Public Health*, 41(3), 470–475. <https://doi.org/10.1093/pubmed/fdy156>

Did You Know?

National Public Health Week (NPHW) is April 5–11. This year’s theme is “Building Bridges to Better Health.” During this week, the American Public Health Association (APHA) brings together communities across the U.S. to recognize the contributions of public health and highlight issues that are important to improving our nation’s health. For over 25 years, APHA has served as the organizer of NPHW, developing a national campaign to educate the public, policy makers, and practitioners about issues related to each year’s theme. APHA creates new materials each year that can be used during and after the observance to raise awareness about public health and prevention. Learn more at www.nphw.org.



FOOD HANDLER CERTIFICATE PROGRAMS

- ▶ Updated to the 2017 FDA Food Code
- ▶ Textbook and self-paced online learning versions
- ▶ ANSI accredited

Order today at www.neha.org/handler
For more information contact nehatraining@neha.org
or call **303.802.2147**

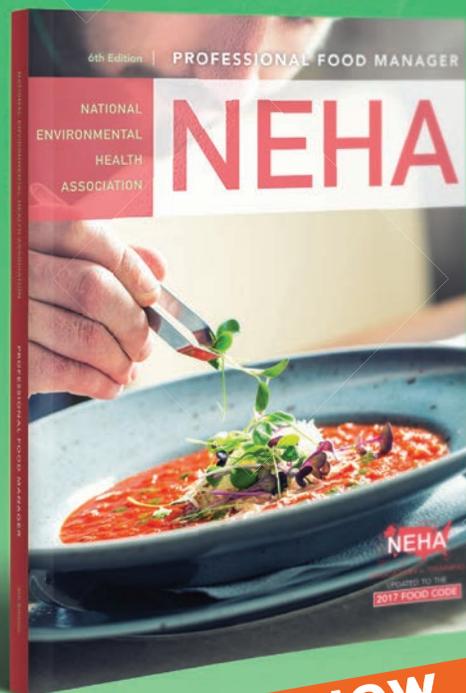


Updated to the 2017 FDA Food Code

NEHA PROFESSIONAL FOOD MANAGER 6TH EDITION

- ◆ Edited for clarity, improved learning, and retention
- ◆ Content aligns with American Culinary Federation Education Foundation competencies
- ◆ Prepares candidates for CFP-approved food manager exams (e.g., Prometric, National Registry, ServSafe, etc.)
- ◆ Discounts for bulk orders and NEHA Food Safety Instructors

Professional Food Manager Online Course is also available
To order books or find out more about becoming a NEHA food safety instructor, call **303.802.2147** or visit neha.org



**NOW
AVAILABLE
IN SPANISH!**

► BUILDING CAPACITY



Darryl Booth, MBA

Building Capacity Through the Coronavirus Relief Fund

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, the National Environmental Health Association (NEHA) has initiated a partnership with Accela called Building Capacity—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 column from Accela 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 the general manager of environmental health at Accela and has been monitoring regulatory and data tracking needs of agencies across the U.S. for almost 20 years. He serves as technical advisor to NEHA's informatics and technology section.

The Coronavirus Aid, Relief, and Economic Security Act of 2020 authorized \$2 trillion to battle COVID-19 and its economic impacts. Within the law, the Coronavirus Relief Fund (CRF) authorized \$150 billion earmarked for state and local governments. Departments of environmental health might be well-suited to utilize a portion of this fund in very strategic ways, perhaps in ways not previously considered.

The \$150 billion earmarked for state and local governments was rapidly injected into a whirlwind of distribution formulae and disparate request processes, all with extremely limited visibility. Said another way, it can be a

challenge to determine the status of the fund in many regions.

At its foundation, the practical need for massive appropriations is apparent and urgent, especially to those in the service of public health—an intensely local matter. But too, Congress intended the fund to accommodate many varied necessities.

As the last calendar year closed and the original December 30, 2020, deadline loomed large, Congress extended the program through December 31, 2021. The president signed the omnibus bill (H.R. 133) into law on December 27, 2020. Notably, Congress did not increase the fund. Most agree that

there are substantial unspent or unreported funds, at least in certain regions.

Important facts to know:

1. The U.S. Department of the Treasury disbursed funds directly to states, counties, and cities with populations >500,000, as well as to certain tribal governments.
2. Regionally, states and counties were encouraged to “pass down” funds to municipalities (e.g., those with populations <500,000) within their boundaries.
3. The funds may be used to reimburse for expenditures related to the public health emergency and not budgeted for prior to March 27, 2020.

Congress made spending rules vague on purpose. The U.S. Department of Treasury has published guidance for the CRF program in the January 15, 2021, *Federal Register* (see sidebar). We can appreciate, though, that the intent of Congress was to enable states, cities, and counties to execute against regional priorities.

Let's add that the intent of Congress is undermined if the funds are never spent. Unspent funds do not aid in COVID-19 response. Unspent funds do not stimulate the economy.

Environmental health departments could still utilize these funds if applied to the pandemic response. Beyond the more obvious direct public health needs, other projects can fit, too. For example, closing (or downsizing) your customer counter by moving plan review, applications, consulting, and payments to the internet reduces virus exposure and risk. Enabling inspectors to do more remotely (e.g., through virtual inspections) eliminates contact. Often overlooked, department payroll (including overtime) for environmental health

employees substantially involved in these and other COVID-19 response projects is also reimbursable by the fund.

What we know today:

- It is challenging to determine the remaining funds available and the local processes to access it. You must contact the grant, budget, or finance office of your jurisdiction and ask.
- The CRF can pay for software licenses and implementation and configuration services, as well as the payroll and overtime for involved department staff. The software licenses can extend for 12 months (i.e., beyond the deadline), but services (e.g., configuration, data conversion, report writing) should be completed prior to the December 31, 2021, deadline. If services are not completed, you can expect only a partial or proportional reimbursement.
- Some jurisdictions told us that they balance and reallocate expenses to the fund, where the rules allow it, near the end of the reporting period. For example, an environmental health inspector might be assigned to coronavirus education or enforcement, thus making their salary and overtime eligible. That example uses the CRF to free up traditional budgets.

Therefore, I advise environmental health directors and their IT leaders to plan with intent to access all the resources available. Through your local inquiries, identify the status of the CRF in your state, county, or city. Health districts can also be funded. Finally, isolate the processes and approvals that would be needed. If the path is clear, revisit your backlog of projects and find those that meet the definitions above. You could potentially have a way to fund some projects in whole or part.

Remember that projects involving payroll and overtime, as well as most professional services, have a diminishing horizon. That is, the number of pay periods or work products that can be delivered by December 31, 2021, is impacted by the start date of your project. So, delays can diminish the potential.

We also note that President Biden, just prior to the inauguration, committed to a follow-on relief and stimulus package, which promises to include more funding for cities and counties. As of press time, the Biden Administration is still meeting with lawmakers, cabinet secretaries, and industry leaders to gain support for a \$1.9 trillion stimulus package to be voted on in mid-March 2021. If the CRF is not accessible to you at this time, there could be a new program available in the future. We sug-

Additional Resources

- **Eligible Units of Local Government:** <https://home.treasury.gov/system/files/136/Eligible-Units.pdf>
- **Eligibility of Local Governments:** <https://home.treasury.gov/system/files/136/Census-Data-and-Methodology-Final.pdf>
- **Payments to States and Eligible Units of Local Government:** <https://home.treasury.gov/system/files/136/Payments-to-States-and-Units-of-Local-Government.pdf>
- **Federal Register: Coronavirus Relief Fund Program Guidance:** https://home.treasury.gov/system/files/136/CRF-Guidance-Federal-Register_2021-00827.pdf

gest maintaining a list of those project priorities and keeping them “shovel-ready.” 🛠️

Acknowledgement: Additional research for this column was conducted by Jason Christensen.

Corresponding Author: Darryl Booth, General Manager, Environmental Health, Accela, 2633 Camino Ramon #500, San Ramon, CA 94583. Email: dbooth@accela.com.



ENVIRONMENTAL HEALTH

It's a tough job.
That's why you love it.

Join the only community of people as dedicated as you are about protecting human health and the environment.

Begin connecting today through NEHA membership.

neha.org/join

▶ DIRECT FROM CDC ENVIRONMENTAL HEALTH SERVICES



Benjamin Clopper, MPH



CDR Jasen Kunz, MPH



Elizabeth Hannapel, MPH

Preventing Legionnaires' Disease: Frontline Tools for Environmental Health Practitioners

Editor's Note: The National Environmental Health Association (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, NEHA features this column on environmental health services from the Centers for Disease Control and Prevention (CDC) in every issue of the *Journal*.

In these columns, authors from CDC's Water, Food, and Environmental Health Services Branch, as well as guest authors, will share insights and information about environmental health programs, trends, issues, and resources. The conclusions in these columns are those of the author(s) and do not necessarily represent the official position of CDC.

Benjamin Clopper is a fellow with the Oak Ridge Institute for Science and Education (ORISE). CDR Jasen Kunz is an environmental health subject matter expert for Legionnaires' disease at CDC's National Center for Environmental Health and the Water, Food, and Environmental Health Services Branch. Elizabeth Hannapel is an epidemiologist and Legionnaires' disease subject matter expert at CDC's Division of Bacterial Disease within the National Center for Immunization and Respiratory Diseases.

Environmental health practitioners play a critical role in the prevention, identification, and mitigation of Legionnaires' disease outbreaks (Kunz & Cooley, 2016). Over the last 20 years, Legionnaires' disease outbreaks have increased significantly and the Centers for Disease Control and Prevention (CDC) continues to learn about the disease and how to prevent it (Association of State and Territorial Health Officials, 2019; CDC, 2019). For example, CDC investigations show almost all (9 in 10) Legionnaires' disease outbreaks were caused by problems preventable with more effective building water management. Water management programs have become an important industry standard and are

now required in healthcare facilities nationwide (Centers for Medicare & Medicaid Services, 2018; Veterans Health Administration, 2014).

Updated Guidance on Preventing *Legionella* in Water Systems and Devices

ASHRAE recently released expanded and updated guidelines (Guideline 12-2020) to help prevent Legionnaires' disease (ASHRAE, 2020). These guidelines support water management programs and significantly expand previous guidance.

The ASHRAE Guideline 12-2020:

- provides design, operation, and control parameters for various devices and systems,

such as decorative fountains, hot tubs, cooling towers, and potable water systems;

- includes considerations for when *Legionella* testing is appropriate;
- reviews recent and evolving *Legionella* testing methods; and
- suggests response activities according to routine *Legionella* testing results.

New Toolkit for Controlling *Legionella* in Common Sources of Exposure From the Centers for Disease Control and Prevention

CDC created a series of six easy-to-use content modules to summarize the updated guidance. This toolkit aims to help environmental health practitioners, building owners and operators, and facility engineers:

- evaluate hazardous conditions quickly,
- implement *Legionella* control measures,
- strengthen water management programs, and
- support environmental assessments during public health investigations.

The toolkit's six content modules (Figure 1) summarize Guideline 12-2020 updates across common sources of *Legionella* exposure: potable water systems, cooling towers, hot tubs, decorative fountains, and other devices. Each content module includes essential information from Guideline 12-2020 regarding the design, operation, maintenance, and controls specific to the corresponding source of exposure. Module recommendations are anchored to four key factors that affect the ability of *Legionella* to grow in water: sediment and biofilm, temperature, water age, and disinfectant residuals. The importance of these four factors is highlighted in a quick-reference table of *Legionella* control measures for each respective device or system

FIGURE 1

Content Modules From the Centers for Disease Control and Prevention for the ASHRAE Guideline 12-2020



Potable Water Systems



Cooling Towers



Hot Tubs



Decorative Fountains



Other Devices



Testing

TABLE 1

Legionella Control Measures for Hot Tubs and Whirlpool Spas

Water Parameter	Control Measure	Recommendation*		
Sediment and biofilm	Cleaning frequency	Vigorously scrub all surfaces each time tub is drained.		
Temperature	Control limits	Hot tubs operate within <i>Legionella's</i> favorable growth range (77–113 °F). Additional measures are required to control <i>Legionella</i> . Water should not exceed 104 °F for health and safety reasons.		
Age	Bather load, frequency of use	Water replacement frequency (days) = (spa volume/3)/average number of users per day**		
Disinfectant residual	Control limits	pH: 7.2–7.8**	Free chlorine: 3–10 ppm**	Bromine: 4–8 ppm**

*See the Managing *Legionella* Risk in Display Hot Tubs section for recommendations to control *Legionella* in display-only hot tubs at www.cdc.gov/legionella/wmp/control-toolkit/hot-tubs.html.

**Recommendation based on guidance from the Centers for Disease Control and Prevention's Model Aquatic Health Code (www.cdc.gov/mahc/editions/current.html).

(Table 1). One additional module describes considerations if *Legionella* testing is conducted for routine purposes, such as water management program validation. The testing module contains practical information such as values for performance indicators and a multifactorial approach to understanding test results.

Updated *Legionella* Environmental Assessment Form for Building Water Systems From the Centers for Disease Control and Prevention

CDC has also updated the *Legionella* Environmental Assessment Form (LEAF) based on

Snapshot of Legionnaires' Disease (LD)

- LD is caused by inhalation of aerosols that contain *Legionella* bacteria.
- Nearly 1 in 10 cases is fatal (Shah et al., 2019).
- The Centers for Disease Control and Protection (CDC) reported 9,933 cases in 2018—an increase of almost 900% since 2000 (CDC, 2019).
- Of all waterborne outbreaks reported through CDC's National Outbreak Reporting System in 2017, 61% implicated *Legionella* bacteria (CDC, 2018).

field experience during outbreak responses and to better align with Guideline 12-2020. Public health officials can use LEAF to gain a thorough understanding of a facility's water systems and assist facility management with using environmental control measures to minimize the risk of Legionnaires' disease. It can also be used along with epidemiologic information to determine whether to conduct *Legionella* environmental sampling and to develop a sampling plan.

A key revision to LEAF includes an expanded cooling tower appendix refined over the course of multiple CDC-led field investigations. During an outbreak involving cooling towers, rapid identification and environmental assessment are essential to limit the number of people exposed. The updated LEAF supports CDC procedures developed in 2019 for identifying cooling towers during an outbreak investigation (Figure 2).

By sharing knowledge and developing easy-to-use resources, CDC hopes to empower local communities to prevent outbreaks of Legionnaires' disease. Explore CDC's free *Legionella* resources at www.cdc.gov/legionella/health-depts/environmental-inv-resources.html. 🐼

Corresponding Author: Benjamin Clopper, Oak Ridge Institute for Science and Education, Division of Environmental Health Science and Practice, National Center for Environmental Health, Centers for Disease Control and Prevention, 4770 Buford Highway, Mailstop S106-5, Atlanta, GA, 30341. Email: oyx5@cdc.gov.

References

ASHRAE. (2020). *Guideline 12-2020—Minimizing the risk of legionellosis associated with building water systems.*

Association of State and Territorial Health Officials. (2019). *Understanding Legionnaires' disease outbreak response gaps and resource needs: Results from a survey of state and territorial health agencies.* <https://www.astho.org/Programs/Environmental-Health/Documents/Legionnaires-Disease-Outbreak-Response-Gap-and-Resource-Needs/>

Centers for Disease Control and Prevention. (2018). *National Outbreak Reporting System (NORS): NORS dashboard.* <https://wwwn.cdc.gov/norsdashboard/>

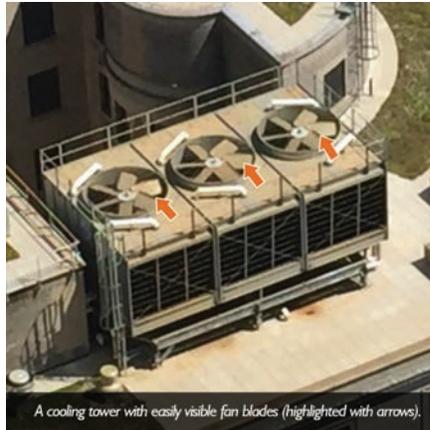
Centers for Disease Control and Prevention. (2019). *National Notifiable Diseases Surveillance System (NNDSS): Notifiable infectious diseases and conditions data tables.* <https://wwwn.cdc.gov/nndss/infectious-tables.html>

Centers for Medicare & Medicaid Services. (2018). *Requirement to reduce Legionella risk in healthcare facility water systems to prevent cases and outbreaks of Legionnaires' disease (LD).* <https://www.cms.gov/Medicare/Provider-Enrollment-and-Certification/SurveyCertificationGenInfo/Policy-and-Memos-to-States-and-Regions-Items/Survey-And-Cert-Letter-17-30->

Kunz, J.M. & Cooley, L.A. (2016). Preventing Legionnaires' disease: Environmental health expertise is key. *Journal of Environ-*

FIGURE 2

Identifying Cooling Towers Using Aerial and Satellite Imagery



Cooling towers can cause outbreaks of Legionnaires' disease when they are not adequately maintained. The Centers for Disease Control and Prevention has tools for scanning aerial or satellite images to rapidly identify cooling towers.
Source: www.cdc.gov/legionella/health-depts/environmental-inv-resources/id-cooling-towers.html

mental Health, 79(1), 24-26. <https://www.cdc.gov/nceh/ehs/docs/jeh/2016/july-aug-legion.pdf>

Shah, P., Barskey, A., Binder, A., Edens, C., Lee, S., Smith, J., Schrag, S., Whitney, C., Cooley, L., & Division of Bacterial Diseases, National Center for Immunization and Respiratory Diseases. (2019). *Legionnaires' disease surveillance summary report, United States, 2014–2015.* Centers for

Disease Control and Prevention. <https://www.cdc.gov/legionella/health-depts/surv-reporting/2014-15-surv-report-508.pdf>

Veterans Health Administration. (2014, August 13). *Prevention of healthcare-associated Legionella disease and scald injury from potable water distribution systems (VHA Directive 1061).* https://www.va.gov/vhapublications/ViewPublication.asp?pub_ID=9181



REHS/RS

Choosing a career that protects the basic necessities like food, water, and air for people in your communities already proves that you have dedication. Now, take the next step and open new doors with the Registered Environmental Health Specialist/Registered Sanitarian (REHS/RS) credential from NEHA. It is the gold standard in environmental health and shows your commitment to excellence—to yourself and the communities you serve.

Find out if you are eligible to apply at neha.org/rehs.



A credential today can improve all your tomorrows.



2021 Walter F. Snyder Award

Call for Nominations Nomination deadline is May 15, 2021

Given in honor of NSF International's cofounder and first executive director, the Walter F. Snyder Award recognizes outstanding leadership in public health and environmental health protection. The annual award is presented jointly by NSF International and the National Environmental Health Association.

Nominations for the 2021 *Walter F. Snyder Award* are being accepted for environmental health professionals achieving peer recognition for:

- outstanding accomplishments in environmental and public health protection,
- notable contributions to protection of environment and quality of life,
- demonstrated capacity to work with all interests in solving environmental health challenges,
- participation in development and use of voluntary consensus standards for public health and safety, and
- leadership in securing action on behalf of environmental and public health goals.

Past recipients of the *Walter F. Snyder Award* include:

2020 - Joseph Cotruvo
2019 - LCDR Katie Bante
2018 - Brian Zamora
2017 - CAPT Wendy Fanaselle
2016 - Steve Tackitt
2015 - Ron Grimes
2014 - Priscilla Oliver
2013 - Vincent J. Radke
2012 - Harry E. Grenawitzke
2011 - Gary P. Noonan

2010 - James Balsamo, Jr.
2009 - Terrance B. Gratton
2008 - CAPT Craig A. Shepherd
2007 - Wilfried Kreisel
2006 - Arthur L. Banks
2005 - John B. Conway
2004 - Peter D. Thornton
2002 - Gayle J. Smith
2001 - Robert W. Powitz
2000 - Friedrich K. Kaferstein

1999 - Khalil H. Mancy
1998 - Chris J. Wiant
1997 - J. Roy Hickman
1996 - Robert M. Brown
1995 - Leonard F. Rice
1994 - Nelson E. Fabian
1993 - Amer El-Ahraf
1992 - Robert Galvan
1991 - Trenton G. Davis
1990 - Harvey F. Collins

1989 - Boyd T. Marsh
1988 - Mark D. Hollis
1987 - George A. Kupfer
1986 - Albert H. Brunwasser
1985 - William G. Walter
1984 - William Nix Anderson
1983 - John R. Bagby, Jr.
1982 - Emil T. Chanlett
1981 - Charles H. Gillham

1980 - Ray B. Watts
1979 - John G. Todd
1978 - Larry J. Gordon
1977 - Charles C. Johnson, Jr.
1975 - Charles L. Senn
1974 - James J. Jump
1973 - William A. Broadway
1972 - Ralph C. Pickard
1971 - Callis A. Atkins

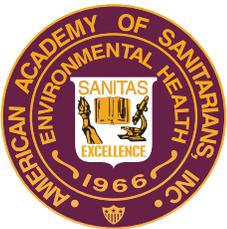
The 2021 Walter F. Snyder Award will be presented at the NEHA 2021 Annual Educational Conference & Exhibition Three-Part Virtual Series.



For more information or to download nomination forms, please visit www.nsf.org or www.neha.org or contact Stan Hazan at NSF at (734) 769-5105 or hazan@nsf.org.



DAVIS CALVIN WAGNER SANITARIAN AWARD



The American Academy of Sanitarians (AAS) announces the annual Davis Calvin Wagner Sanitarian Award. The award consists of an individual plaque and a perpetual plaque that is displayed in NEHA's office lobby.

Nominations for this award are open to all AAS diplomates who:

1. Exhibit resourcefulness and dedication in promoting the improvement of the public's health through the application of environmental and public health practices.
2. Demonstrate professionalism, administrative and technical skills, and competence in applying such skills to raise the level of environmental health.
3. Continue to improve through involvement in continuing education type programs to keep abreast of new developments in environmental and public health.
4. Are of such excellence to merit AAS recognition.

NOMINATIONS MUST BE RECEIVED BY APRIL 15, 2021.

Nomination packages should be emailed to **Dr. Robert W. Powitz at powitz@sanitarian.com.**
Files should be in Word or PDF format.

For more information about the award nomination, eligibility, and the evaluation process, as well as previous recipients of the award, please visit www.sanitarians.org/awards.

EH CALENDAR

UPCOMING NATIONAL ENVIRONMENTAL HEALTH ASSOCIATION (NEHA) CONFERENCE

April 20–21, June 1–2, and July 14–15, 2021: NEHA 2021 Annual Educational Conference & Exhibition Three-Part Virtual Series, www.neha.org/aec

NEHA AFFILIATE AND REGIONAL LISTINGS

California

April 8–May 6, 2021: 2021 California Conference of Directors of Environmental Health (CCDEH) Training Series (Virtual), CCDEH and the California Environmental Health Association, www.ccdeh.org

Iowa

April 5–9, 2021: Public Health Conference of Iowa—Public Health in Action: Taking on a Pandemic, Health Equity, Natural Disasters, and More! (Virtual), www.ieha.net/event-4026991

Missouri

August 10–13, 2021: Annual Educational Conference, Missouri Environmental Health Association, Springfield, MO, <https://mehamo.org>

Nevada

May 4–5, 2021: NvEHA/NFSTF Joint Virtual Conference: Evolutions in Environmental Health, Nevada Environmental Health Association (NvEHA) and the Nevada Food Safety Task Force (NFSTF), www.nveha.org

Utah

May 5–7, 2021: Spring Conference, Utah Environmental Health Association, Kanab, UT, www.ueha.org/events.html

Washington

May 6–8, 2021: 67th Annual Educational Conference (Virtual), Washington State Environmental Health Association, www.wseha.org/2021-aec

TOPICAL LISTINGS

Water Quality

August 2021 (Dates TBA): *Legionella* Conference: Prevention of Disease and Injury From Waterborne Pathogens in Health Care (Virtual), NSF Health Sciences and NEHA, www.legionellaconference.org 🦋



Bristol Bay Area Health Corporation

We're Hiring

Environmental Health Manager

A Full-time Environmental Health Manager is needed in Rural Alaska. The Bristol Bay Area Health Corporation is located in Dillingham, Alaska on the shores of Bristol Bay, the salmon capitol of the world. The 40,000-mile region of Bristol Bay includes rich and vibrant cultures of Alaska Native People and an abundance of beautiful scenery, wildlife, and fishing opportunities. The position plans, develops, administers, and evaluates programs designed to identify, prevent, and/or eliminate environmental and injury hazards.

For more information, please visit our website
www.bbahc.org

Find a Job Fill a Job

Where the
“best of the best” consult...

NEHA's Career Center

First job listing **FREE**
for state, tribal, local, and
territorial health departments
with a NEHA member.

For more information, please
visit neha.org/careers.

RESOURCE CORNER

Resource Corner highlights different resources the National Environmental Health Association (NEHA) has available to meet your education and training needs. These 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!



Certified Professional–Food Safety Manual (3rd Edition)

National Environmental Health Association (2014)



The Certified Professional–Food Safety (CP-FS) credential is well respected throughout the environmental health and food safety field. This manual has been developed by experts from across the various food safety disciplines to help candidates prepare for the National Environmental Health Association's (NEHA) CP-FS exam. This book contains science-based, in-depth information about causes and prevention

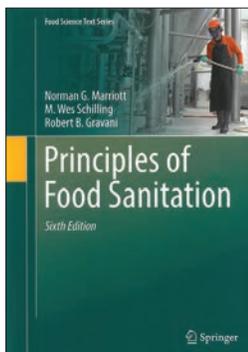
of foodborne illness, HACCP plans and active managerial control, cleaning and sanitizing, conducting facility plan reviews, pest control, risk-based inspections, sampling food for laboratory analysis, food defense, responding to food emergencies and foodborne illness outbreaks, and legal aspects of food safety.

358 pages / Spiral-bound paperback

Member: \$179 / Nonmember: \$209

Principles of Food Sanitation (6th Edition)

Norman G. Marriott, M. Wes Schilling, and Robert B. Gravani (2018)



Now in its 6th edition, this highly acclaimed book provides sanitation information needed to ensure hygienic practices and safe food for food industry professionals and students. It addresses the principles related to contamination, cleaning compounds, sanitizers, and cleaning equipment. It also presents specific directions for applying these concepts to attain hygienic conditions in food processing or preparation operations. The new

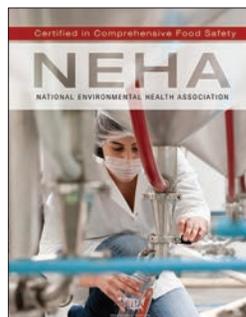
edition includes updated chapters on the fundamentals of food sanitation, as well as new information on contamination sources and hygiene, HACCP, waste handling disposal, biosecurity, allergens, quality assurance, pest control, and sanitation management principles. Study reference for NEHA's Registered Environmental Health Specialist/Registered Sanitarian and Certified Professional–Food Safety credential exams.

437 pages / Hardback

Member: \$84 / Nonmember: \$89

Certified in Comprehensive Food Safety Manual

National Environmental Health Association (2014)



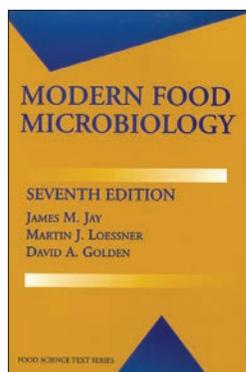
The Food Safety Modernization Act has recast the food safety landscape, including the role of the food safety professional. To position this field for the future, NEHA is proud to offer the Certified in Comprehensive Food Safety (CCFS) credential. CCFS is a mid-level credential for food safety professionals that demonstrates expertise in how to ensure food is safe for consumers throughout the manufacturing and processing environment. It can be utilized by anyone wanting to continue a growth path in the food safety sector, whether in a regulatory/oversight role or in a food safety management or compliance position within the private sector. This manual has been carefully developed to help prepare candidates for the CCFS credential exam and deals with the information required to perform effectively as a CCFS.

356 pages / Spiral-bound paperback

Member: \$179 / Nonmember: \$209

Modern Food Microbiology (7th Edition)

James M. Jay, Martin J. Loessner, and David A. Golden (2005)



This text explores the fundamental elements affecting the presence, activity, and control of microorganisms in food. It includes an overview of microorganisms in food and what allows them to grow; specific microorganisms in fresh, fermented, and processed meats, poultry, seafood, dairy products, fruits, vegetables, and other products; methods for finding and measuring microorganisms and their products in foods; methods for preserving foods; food safety and quality controls; and foodborne diseases. Other section topics include biosensors, biocontrol, bottled water, *Enterobacter sakazakii*, food sanitizers, milk, probiotics, proteobacteria, quorum sensing, and sigma factors. Study reference for NEHA's Certified Professional–Food Safety credential exam.

790 pages / Hardback

Member: \$84 / Nonmember: \$89

SPECIAL LISTING

The National Environmental Health Association (NEHA) Board of Directors includes 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.



Traci (Slowinski) Michelson, MS, REHS, CP-FS
Region 5 Vice-President



Nichole Lemin, MS, MEP, RS/REHS
Region 6 Vice-President

National Officers

www.neha.org/national-officers

President—Sandra Long, REHS, RS
President@neha.org

President-Elect—Roy Kroeger, REHS
roykehs@laramiecounty.com

First Vice-President—D. Gary Brown, DrPH, CIH, RS, DAAS
FirstVicePresident@neha.org

Second Vice-President—Tom Butts, MSc, REHS
SecondVicePresident@neha.org

Immediate Past-President—Priscilla Oliver, PhD
ImmediatePastPresident@neha.org

Regional Vice-Presidents

www.neha.org/RVPs

Region 1—Frank Brown, MBA, REHS/RS
Region1RVP@neha.org
Alaska, Idaho, Oregon, and Washington. Term expires 2023.

Region 2—Michele DiMaggio, REHS
Region2RVP@neha.org
Arizona, California, Hawaii, and Nevada. Term expires 2021.

Region 3—Rachelle Blackham, MPH, LEHS
Region3RVP@neha.org
Colorado, Montana, Utah, Wyoming, and members residing outside of the U.S. (except members of the U.S. armed services). Term expires 2021.

Region 4—Kim Carlton, MPH, REHS/RS, CFOI
Region4RVP@neha.org
Iowa, Minnesota, Nebraska, North Dakota, South Dakota, and Wisconsin. Term expires 2022.

Region 5—Traci (Slowinski) Michelson, MS, REHS, CP-FS
Region5RVP@neha.org
Arkansas, Kansas, Louisiana, Missouri, New Mexico, Oklahoma, and Texas. Term expires 2023.

Region 6—Nichole Lemin, MS, MEP, RS/REHS
Region6RVP@neha.org
Illinois, Indiana, Kentucky, Michigan, and Ohio. Term expires 2022.

Region 7—Tim Hatch, MPA, REHS
Region7RVP@neha.org
Alabama, Florida, Georgia, Mississippi, North Carolina, South Carolina, and Tennessee. Term expires 2023.

Region 8—LCDR James Speckhart, MS, REHS
Region8RVP@neha.org
Delaware, Maryland, Pennsylvania, Virginia, Washington, DC, West Virginia, and members of the U.S. armed services residing outside of the U.S. Term expires 2021.

Region 9—Larry Ramdin, REHS, CP-FS, HHS
Region9RVP@neha.org
Connecticut, Maine, Massachusetts, New Hampshire, New Jersey, New York, Rhode Island, and Vermont. Term expires 2022.

NEHA Staff

www.neha.org/staff

Seth Arends, Graphic Designer, NEHA EZ, sarends@neha.org

Jonna Ashley, Association Membership Manager, jashley@neha.org

Rance Baker, Director, NEHA EZ, rbaker@neha.org

Gina Bare, RN, Associate Director, PPD, gbare@neha.org

Jesse Bliss, MPH, Director, PPD, jbliss@neha.org

Trisha Bramwell, Sales and Training Support, NEHA EZ, tbramwell@neha.org

Renee Clark, Accounting Manager, rclark@neha.org

Kristie Denbrock, MPA, Chief Learning Officer, kdenbrock@neha.org

Roseann DeVito, MPH, Project Manager, rdevito@neha.org

Steven Dourdis, MA, Human Resources Business Partner, sdourdis@neha.org

Monica Drez, Web Developer, mdrez@neha.org

David Dyjack, DrPH, CIH, Executive Director, ddyjack@neha.org

Santiago Ezcurra Mendaro, Media Producer/LMS Administrator, NEHA EZ, sezcurra@neha.org

Doug Farquhar, JD, Director, Government Affairs, dfarquhar@neha.org

Soni Fink, Sales Manager, sfink@neha.org

Anna Floyd, PhD, Instructional Designer, EZ, afloyd@neha.org

Madelyn Gustafson, Project Coordinator, PPD, mgustafson@neha.org

Sarah Hoover, Credentialing Manager, shoover@neha.org

Audrey Keenan, MPH, Project Coordinator, PPD, akeenan@neha.org

Kim Koenig, Instructional Designer, NEHA EZ, kkoenig@neha.org

Becky Labbo, MA, Evaluation Coordinator, PPD, rlabbo@neha.org

Terryn Laird, Public Health Communications Specialist, tlaird@neha.org

Angelica Ledezma, AEC Manager, aledezma@neha.org

Matt Lieber, Database Administrator, mlieber@neha.org

Tyler Linnebur, MAcc, CPA, Staff Accountant, tlinnebur@neha.org

Bobby Medina, Credentialing Department Customer Service Coordinator, bmedina@neha.org

Jaclyn Miller, Editor/Copy Writer, NEHA EZ, jmiller@neha.org

Avery Moyler, Administrative Support, NEHA EZ, amoyler@neha.org

Alexus Nally, Member Services Representative, atnally@neha.org

Eileen Neison, Credentialing Specialist, eneison@neha.org

Carol Newlin, Credentialing Specialist, cnewlin@neha.org

Michael Newman, A+, ACA, MCTS, IT Manager, mnewman@neha.org

Charles Powell, Media and Workforce Development Specialist, NEHA EZ, cpowell@neha.org

Kristen Ruby-Cisneros, Managing Editor, JEH, kruby@neha.org

QuiNita Spann, Executive Assistant, qspann@neha.org

Jordan Strahle, Marketing and Communications Manager, jstrahle@neha.org

Reem Tariq, MSEH, Project Coordinator, PPD, rtariq@neha.org

Christl Tate, Training Operations and Logistics Manager, NEHA EZ, ctate@neha.org

Sharon Unkart, PhD, Associate Director, NEHA EZ, sdunkart@neha.org

Gail Vail, CPA, CGMA, Associate Executive Director, gvail@neha.org

Leslie Valenzuela, MPH, Senior Project Coordinator, Food Safety, PPD, lvalenzuela@neha.org

Christopher Walker, MSEH, REHS, Senior Program Analyst, Environmental Health, PPD, cwalker@neha.org

Laura Wildey, CP-FS, Senior Program Analyst, Food Safety, PPD, lwildey@neha.org

Cole Wilson, Training Logistics and Administrative Coordinator, NEHA EZ, nwilson@neha.org

2020–2021 Technical Advisors

www.neha.org/technical-advisors

CLIMATE AND HEALTH

David Gilkey, PhD
dgilkey@mtech.edu

Jennie McAdams
jenniemcadams@franklincountyohio.gov

Richard Valentine
rvalentine@slco.org

Felix Zemel, MCP, MPH, CBO, RS, DAAS
felix@pracademicsolutions.com

DATA AND TECHNOLOGY

Darryl Booth, MBA
dbooth@accela.com

Timothy Callahan
tim.callahan@dph.ga.gov

EMERGENCY PREPAREDNESS

Marcy Barnett, MA, MS, REHS
mbarnett@nnphi.org

Martin Kalis
mkalis@cdc.gov

Christopher Sparks, MPH, MPA, RS
christopher.sparks@houston.tx.gov

FOOD SAFETY

Eric Bradley, MPH, REHS, CP-FS, DAAS
eric.bradley@scottcountyiowa.com

Tracynda Davis, MPH
tracynda.davis@fda.hhs.gov

Cindy Rice, MSPH, RS, CP-FS, CEHT
cindy@easternfoodsafety.com

GENERAL ENVIRONMENTAL HEALTH

Michael Crea, RS
crea@zedgepiercing.com

Tara Gurge, MS, RS, CEHT
tgurge@needhamma.gov

Crispin Pierce, PhD
piercech@uwec.edu

Clint Pinion, Jr., DrPH, RS, CIT
clint.pinion@eku.edu

Sylvanus Thompson, PhD, CPHI(C)
sthomps@toronto.ca

HEALTHY COMMUNITIES

Stan Hazan, MPH
hazan@nsf.org

Robert Powitz, MPH, PhD, RS, CP-FS
powitz@sanitarian.com

Kari Sasportas, MSW, MPH, REHS/RS
ksasportas@lexingtonma.gov

Robert Washam, MPH, RS, DAAS
b_washam@hotmail.com

INFECTIOUS AND VECTORBORNE DISEASES

Mark Beavers, MS, PhD
gbeavers@rollins.com

Christine Vanover, MPH, REHS
npi8@cdc.gov

Tyler Zerwekh MPH, DrPH, REHS
tyler.zerwekh@dshs.texas.gov

SPECIAL POPULATIONS

Cynthia McOliver, MPH, PhD
mcoliver.cynthia@epa.gov

Welford Roberts, MS, PhD, REHS/RS, DAAS
welford@erols.com

Jacqueline Taylor, MPA, REHS
bljacnam@aol.com

WATER

Andrew Pappas, MPH
apappas@isdh.in.gov

Maureen Pepper
maureen.pepper@deq.idaho.gov

Jason Ravenscroft, MPH, REHS, CPO
jravensc@marionhealth.org

Sara Simmonds, MPA, REHS
sara.simmonds@kentcountymi.gov

WORKFORCE AND LEADERSHIP

Robert Custard, REHS, CP-FS
bobcustard@comcast.net

Michèle Samarya-Timm, MA, HO, MCHES, REHS, CFOI, DLAAS
samaryatimm@co.somerset.nj.us

Affiliate Presidents

www.neha.org/affiliates

Alabama—Beverly M. Spivey
beverly.spivey@adph.state.al.us

Alaska—Joy Britt
jdbritt@anthc.org

Arizona—David Morales
david.morales@maricopa.gov

Arkansas—Richard Taffner, RS
richard.taffner@arkansas.gov

Business and Industry—Alicia Enriquez Collins, REHS
nehabia@outlook.com

California—Darryl Wong
president@ceha.org

Colorado—Keith Seimsen
KeithSeimsenCEHA@gmail.com

Connecticut—Kevin Elak, RS, REHS, CP-FS
kevin.elak@middletownct.gov

Florida—DaJuane Harris
dajuane.harris@flhealth.gov

Georgia—Jessica Badour
jessica.badour@agr.georgia.gov

Idaho—Jesse Anglesey
janglesey@siph.idaho.gov

Illinois—Justin Dwyer
jadwyer84@gmail.com

Indiana—Jammie Bane
jbane@co.deleware.in.us

Iowa—Robin Rajjean
robin.rajjean@linncounty.org

Jamaica (International Partner Organization)—Karen Brown
info@japhi.org.jm

Kansas—Tanner Langer
tdlanger@cowleycounty.org

Kentucky—Charlie Ward
charlie.ward@ky.gov

Louisiana—Carolyn Bombet
carolyn.bombet@la.gov

Massachusetts—Diane Chalifoux-Judge, REHS/RS, CP-FS
diane.chalifoux@boston.gov

Michigan—Drew Salisbury, MPH, REHS
dsalisbury@meha.net

Minnesota—Ryan Lee, RS
rmllee07@gmail.com

Missouri—Deb Sees
dsees@jacksongov.org

Montana—Jeff Havens
jeffphavens@hotmail.com

National Capital Area—Julia Balsley
NCAEHA.President@gmail.com

Nebraska—Sarah Pistillo
sarah.pistillo@douglascounty-ne.gov

Nevada—Brenda Welch, REHS
welch@snhd.org

New Jersey—Lynette Medeiros
president@njeha.org

New Mexico—John S. Rhoderick
john.rhoderick@state.mn.us

New York State Conference of Environmental Health Directors—Elizabeth Cameron
lcameron@tompkins-co.org

North Carolina—Josh Jordan
josh.jordan@dhs.nc.gov

North Dakota—Marcie Bata
mabata@nd.gov

Northern New England Environmental Health Association—Brian Lockard
blockard@ci.salem.nh.us

Ohio—Steve Ruckman, MPH, RS
mphosu@gmail.com

Oklahoma—Jordan Cox
coxmj12@gmail.com

Oregon—Sarah Puls
sarah.puls@co.lane.or.us

Past Presidents—Adam London, MPA, PhD, RS
adam.london@kentcountymi.gov

Rhode Island—Dottie LeBeau, CP-FS
deejaylebeau@verizon.net

South Carolina—M.L. Tanner, HHS
tannerml@dhec.sc.gov

Tennessee—Kimberly Davidson
kimberly.davidson@tn.gov

Texas—Stevan Walker, REHS/RS
mswalker@mail.ci.lubbock.texas.us

Uniformed Services—LCDR Kazuhiro Okumura
kazuhiro.okumura@fda.hhs.gov

Utah—Talisha Bacon
tbacon@utah.gov

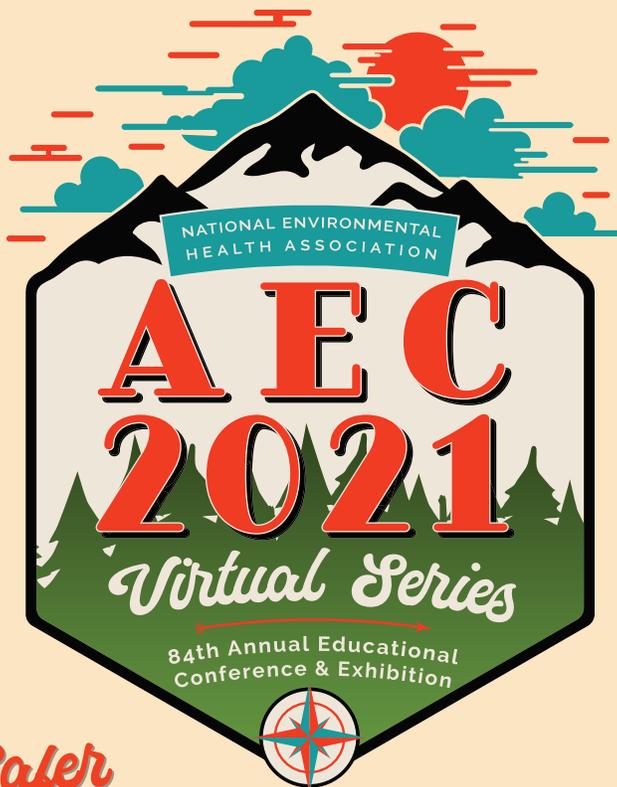
Virginia—Jessica Stewart
jessica.stewart@virginiaeha.org

Washington—Tom Kunesch
tkunesch@co.whatcom.wa.us

West Virginia—Jennifer Hutson
wvaos@outlook.com

Wisconsin—Mitchell Lohr
mitchell.lohr@wisconsin.gov

Wyoming—Chelle Schwoppe
chelle.schwoppe@wyo.gov



*Together a Safer
and
Healthier Tomorrow*

**STANDARD ATTENDEE
REGISTRATION**

Member: \$295 • Nonmember: \$445

**STANDARD ATTENDEE REGISTRATION
+ 1-YEAR NEHA MEMBERSHIP**

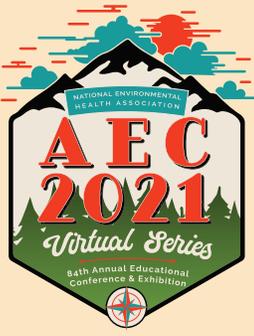
Member/Nonmember: \$395

**STUDENT OR RETIREE
REGISTRATION**

Student: \$95 • Retiree: \$95

GROUP REGISTRATION

Groups of 2-4: \$295/person
Groups of 5+: \$245/person



Virtual Series Agenda

APRIL 20 & 21

Tuesday, April 20

Opening Keynote
Food Safety
Infectious & Vectorborne Diseases
Uniformed Services
Workforce & Leadership

Wednesday, April 21

Environmental Justice & Children's EH
Food Safety
General Environmental Health
Workforce & Leadership

JUNE 1 & 2

Tuesday, June 1

Opening Panel
Climate & Health
Emergency Preparedness & Response
Healthy Communities
Workforce & Leadership

Wednesday, June 2

Climate & Health
Emergency Preparedness & Response
Healthy Communities
Water Quality

JULY 14 & 15

Wednesday, July 14

Data & Technology
Food Safety
General Environmental Health
Water Quality

Thursday, July 15

Closing Session
Climate & Health
Data & Technology
General Environmental Health
Water Quality

Visit us online for
the latest information.
[NEHA.ORG/AEC](https://www.neha.org/aec)



PRESENTING SPONSOR:



PEOPLE ON THE MOVE

Dr. Herman Koren Authors New Books on Management Practices for Environmental Professionals

Dr. Herman Koren, MPH, HSD, DLAAS, REHS, long-time member of the National Environmental Health Association (NEHA), has coauthored a new two-volume set of books: *Management and Supervisory Practices for Environmental Professionals*. Now in its fourth edition, the two-volume set provides up-to-date information for newly promoted or management-aspiring professionals in the fields of environmental

health, occupational health and safety, water and wastewater treatment, and public health.

“Supervision and management positions are not about power. They are about helping people to carry out their assignments successfully. Only when we achieve a high level of cooperation between management and their staff will we become truly successful. Environmental health, occupational health and safety, and public health are not jobs or vocations—they are a calling to help people avoid and overcome disease and injury, and to protect our planet,” stated Dr. Koren.

The first volume explains the basic principles supervisors need to understand the structure of their organization, what leadership is, how to effectively plan and budget, how to manage other people, and best practices for achieving success in a management position. The second volume explains the advanced principles that supervisors need to understand the art of communications, how to resolve communications problems, and the supervisor/manager role in teaching, counseling, and managing employee performance, health, and safety. The set is also an excellent resource for students interested in learning management skills prior to entering the workforce.

The updated set offers a practical set of methods, tools, and techniques, all illustrated and easy to understand, for achieving leadership qualities. It provides concise and essential discussion material for each topic. The set also includes thorough updates and many new case problems with answers provided. Finally, the set introduces self-testing questions for different situations and practical exercises that utilize an individual’s own work experience for answers.

Each volume is eligible for up to 20 hours of self-reported continuing education contact hours to go toward a NEHA credential. The set is coauthored with Professor Alma Mary Anderson and was published in February 2021 by CRC Press.

Dr. Koren has 65 years of practical experience in the environmental and public health field. Over his career, he has been an environmental health practitioner, professor, researcher, consultant, and mentor. He is also the author of 22 books. Dr. Koren currently is a professor emeritus of health and safety at Indiana State University. He is also a member of the NEHA History Project Task Force and is lending his research and writing expertise to help write the living history of environmental health and NEHA. In 2005, Dr. Koren received the Walter S. Mangold Award, NEHA’s highest honor. He was recognized as a Diplomate Laureate of the American Academy of Sanitarians (AAS) in 2012—one of just 11 people to hold this recognition. He was also the recipient of the Davis Calvin Wagner Sanitarian Award from AAS in 2018.

Election of Dr. Charles Hart to Diplomate Laureate in the American Academy of Sanitarians

The American Academy of Sanitarians (AAS) is pleased to announce the election of Dr. Francis Charles Hart, PhD, CIH, CSP, RS, as its eleventh Diplomate Laureate. Dr. Hart began his career as a sanitarian with the Summit County Health Department in Cuyahoga Falls, Ohio. He went on to serve as health commissioner in Ashtabula County and had a long and successful career as environmental health and safety director and adjunct faculty at Ohio University, Case Western Reserve University, and Kent State University. Dr. Hart also served on numerous professional advisory boards and as a private consultant. He was recognized as a Diplomate in AAS in 1994.

Formed in 1966, AAS is an organization that elevates the standards, improves the practice, advances the professional proficiency, and promotes the highest levels of ethical conduct among professional sanitarians in every field of environmental health. Certification by AAS is open to individuals who have attained high professional stature through leadership and accomplishment in the field of environmental health and meet the criteria for selection as a Diplomate.

AAS created the certification of a Diplomate Laureate in 1999 to recognize Diplomates who have demonstrated exceptional professional growth, accomplishment, and leadership in the sanitarian profession. The Laureate must demonstrate longevity in the profession, in addition to meeting six additional criteria that include extraordinary accomplishments in the field of environmental health and the professional practice as a sanitarian. 🐾

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

NEW IN 2021!

Dr. Bailus Walker, Jr. Diversity and Inclusion Awareness Award



The Dr. Bailus Walker, Jr. Diversity and Inclusion Awareness Award honors an individual or group who has made significant achievements in the development or enhancement of a more culturally diverse, inclusive, and competent environment.

Application deadline is April 15, 2021.

To access the online application, visit www.neha.org/about-neha/awards/dr-bailus-walker-jr-diversity-and-inclusion-awareness-award.



THANK YOU for Supporting the NEHA/AAS Scholarship Fund

Erick Aguilar
Abdihakim Ahmed
Mary A. Allen
American Academy
of Sanitarians
Jonna Ashley
Steven K. Ault
Rance Baker
James J. Balsamo, Jr.
Gina Bare
Edward Barragan
Cynthia Bartus
D. Gary and Deby
Brown
Tom Butts
Kimberley Carlton
Kathy Cash
Renee Clark
Valerie Cohen
Gary E. Coleman
Brian Collins
Richard F. Collins
Jason Colson
Roz Custard
Daniel de la Rosa

Alan J. Dellapenna, Jr.
Kristie Denbrock
Concetta A. DiCenzo
Kimberly M. Dillion
Michele R.R. DiMaggio
Catherine A. Dondanville
Monica Drez
David T. Dyjack
Diane R. Eastman
Alicia R. Enriquez
Collins
Doug Farquhar
Darryl J. Flaspahler
Anna Floyd
Debra Freeman
David P. Gilkey
Cynthia L. Goldstein
Brittany Grace
Carolyn J. Gray
Joshua Greenberg
Harry E. Grenawitzke
Carrie Gschwind
Eric S. Hall
F.C. Hart
Ken Hearst

Donna K. Heran
Robert E. Herr
William Holland
Scott E. Holmes
Chao-Lin Hsieh
Maria Huanosta
Gregory D. Kearney
Roy Kroeger
Tom E. Kunesh
Becky Labbo
Michael F. LaScuola
Philip Leger
Sandra M. Long
Patricia Mahoney
Jason W. Marion
Aruworay Memene
Cary Miller
Jaclyn Miller
Leslie D. Mitchell
Wendell A. Moore
George A. Morris
Timothy J. Murphy
Alexus Nally
Eileen Neison
Stephen B. Nelson

Deirdre O'Connor
Priscilla Oliver
Dick Pantages
Brandon Parker
Munira Peermohamed
Stephen E. Pilkenton
Greg Pol
Robert W. Powitz
Laura A. Rabb
Vincent J. Radke
Larry A. Ramdin
Nicole M. Real
Roger T. Reid
Matthew Reighter
Jacqueline Reszetar
Jonathan P. Rubingh
Kristen Ruby-Cisneros
Lea Schneider
Ryan Schonewolf
Michele E. Seeley
Mario Seminara
Francis X. Sena
Celine P. Servatius
Zia Siddiqi
Derek Smith

Jeff Smith
Dorothy A. Soranno
James M. Speckhart
Rebecca Stephany
Elena K. Stephens
Martin J. Stephens
John Steward
Jordan Strahle
Dillion Streuber
M.L. Tanner
Elizabeth Tennant
Cyndi A. Tereszkievicz
Andrew Tsang
Sharon D. Unkart
Gail Vail
Linda Van Houten
Leon F. Vinci
Thomas A. Vyles
Brian S. White
Marcel White
Lisa Whitlock
Edward F. Wirtanen
Erika Woods
Melinda A. Young
Linda L. Zaziski

To donate, visit www.neha.org/about-neha/donate.

NEHA NEWS

Earth Day Twitter Chat

Climate change is one of the greatest threats to global health we currently face. It harms health by decreasing the quality of the air we breathe, increasing our exposure to more frequent and intense extreme weather events, increasing extremes of precipitation including flooding and drought, expanding the geographic distribution and number of disease-carrying vectors, and exacerbating health inequities. Around the world, these impacts increase the risk of chronic and infectious diseases, harm mental health and well-being, threaten the safety and security of communities, trigger food insecurity, and place a disproportionate burden on our most vulnerable populations. These populations include children, people of color, older adults, people with disabilities, and people living in low-income and poorly resourced communities.

The Earth Day Network's theme for Earth Day 2021 is "Restore Our Earth" and focuses on local communities that are disproportionately affected by climate change. The National Environmental Health Association (NEHA) recognizes the role of environmental health in addressing racism as an environmental health issue (<https://www.neha.org/NEHA-Racism-Position-Statement>) and is committed to addressing justice, equity, diversity, and inclusion.

In promotion of Earth Day, NEHA will host a Climate Justice Twitter Chat on April 22, 2021. This event will initiate conversations about how climate impacts health and address the reality of communities being disproportionately affected by climate change. To join the conversation, visit @nehaorg on Twitter or search the #EarthDayChat hashtag.

NEHA Staff Profiles

As part of tradition, NEHA features new staff members in the *Journal* around the time of their 1-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. This month we are pleased to introduce you to two NEHA staff members. Contact information for all NEHA staff can be found on page 38.

**Doug Farquhar**

I am an attorney with 30 years of experience working with policy makers on environmental health issues. I direct Government Affairs at NEHA, providing guidance on federal, state, and local governmental policies to our members and funders. I also work with policy makers, sharing policies that have been adopted by the NEHA Board of Directors.

I joined NEHA in April 2020 but have been involved with NEHA for many years. I have presented on environmental health policy at many NEHA Annual Educational Conference (AEC) & Exhibitions, including those held in Anchorage, Alaska; Atlanta,

Georgia; Atlantic City, New Jersey; and Albuquerque, New Mexico—to just name the cities beginning with A. The NEHA past presidents asked about developing a government affairs program at the 2008 AEC in Tucson, Arizona.

I received my law degree from the University of Denver (DU) and undergraduate degree from the University of Texas in Austin. I am an adjunct professor in the DU Graduate School of Environmental Policy and Management and an affiliate professor at the University of Washington School of Public Health.

I received the NEHA Sabbatical in 2010, spending 3 weeks in the UK. Staying at the Mad Hatter Inn, I got to visit the many boroughs of London and meet their environmental health directors. I also golfed St. Andrews. If you ever want to read my report, I'll be glad to share that with you.

Prior to coming to NEHA, I directed the environmental health program for the National Conference of State Legislatures. I also worked in the Texas House of Representatives and for Colorado Congressman Daniel Schaefer in Washington, DC.

I've climbed every 14er (i.e., a mountain peak over 14,000 ft) in Colorado, Mt. Rainier in Washington, and many peaks in California where I climbed with staff from the San Diego Environmental Health Department. My wife and I are empty nesters. Our daughter lives in Fort Collins, Colorado, preparing for graduate school and our son does laboratory wastewater work for Full Sail Brewing Company in Hood River, Oregon.

**Jaelyn Miller**

I joined NEHA as editor/copywriter in the Entrepreneurial Zone department in April 2020, right as pandemic office closures were taking place, with the goal of giving NEHA a distinguishable, unifying voice while creating and editing content for course resources, marketing materials, and social media. I have a strategic communications degree

from Ohio State. Prior to my role at NEHA, I worked as a freelance content creator for various clients, including The DoSeum (a STEM-focused children's museum in San Antonio, Texas), *FITT Magazine*, and Salesforce. In my early career, I worked as a music journalist for *Fashion Meets Music*, a magazine out of Columbus, Ohio, for which I interviewed and profiled artists including Awolnation, Betty Who, Børns, O.A.R., and more.

I have discovered through my content management journey that I feel most fulfilled when communicating the story and voice of an organization that both aligns with my personal values and serves the common good—one that I can be proud to promote. NEHA is, indeed, such an organization. During my first year in this position, I have really enjoyed creating and editing material that has a clear purpose and application, working with enormously talented and passionate individuals, and being a part of a team that is genuinely

NEHA NEWS

dedicated to making a lasting, positive impact on the environmental health community. I hope to continue evolving with NEHA by discovering creative, impactful ways to expand our reach.

Having lived in several different cities—Charlotte, North Carolina; Youngstown and Columbus, Ohio; Austin, Texas; and now, Denver, Colorado—I have always felt the unshakable urge to explore and experience. Since moving here in October 2019,

Colorado has kept my adventurous spirit well-fed. I love just about anything outdoors (hiking, rollerblading, swimming, nature photography), and as a self-proclaimed “music consumer,” I have never turned down a concert or live music event. In fact, when COVID-19 is finally behind us, I’m fairly certain that is the first place you’ll find me. 🎧

Did You Know?

You can stay in the loop every day with NEHA’s social media. Find NEHA on

- Facebook: www.facebook.com/NEHA.org
- Twitter: <https://twitter.com/nehaorg>
- LinkedIn: www.linkedin.com/company/national-environmental-health-association

DirecTalk

continued from page 46

you can connect with an employee to assist you whether they are in the office or not.

Execution: We strive to provide our members what they need when they need it. We were challenged by COVID-19 to produce training materials and remote learning in Spanish. It is what our Puerto Rican colleagues needed, and as I type these words, those products are almost ready for prime time. We have streamlined and modernized our accounting systems and share our audited financial statements so that membership can trust that the resources they and other sponsors entrust to us are professionally and ethically managed.

This train of thought now brings me full circle to Istanbul.

One sunny day we purchased a sightseeing boat tour that brought us from the Eminonu Pier in Kadıköy to Anadolu Kavağı, a small fishing village at the northern edge of the Bosphorus. We slowly and methodically hiked up the steep incline to ruins at the top of the hill that provided a panoramic view of the Baltic and surrounding area. I was mesmerized. History. Politics. Religion. Global commerce. The focal points of humanity seemed to amalgamate before my eyes, united by a simple waterway blessed by deep waters. The ties that bind.

The way our organization lives by its values bind us beyond a credentialing arrangement,



Homes along the Bosphorus. Photo courtesy of David Dyjack.

a membership benefit, or mission statement. What we do and how we conduct ourselves in honoring you and our profession reveal our true corporate self. The forces that would deliberately or incidentally serve to cleave us from our values are abundant and often seductively present themselves masquerading as opportunity, a new partnership, or access to influence.

The image of the many homes constructed along the Bosphorus directly on the shores of the strait reveal an inordinate amount of trust the occupants have in their instincts

and knowledge of the tides, storms, and other natural events that might otherwise undermine their foundations. That trust must have been built over centuries of experience and observation. We aim to build the same trust with you as you observe our values in action. We aim to be the professional warmth of the sun during the coldest of winter days. 🎧

Dave

ddyjack@neha.org
Twitter: @DTDyjack

► **DirectTalk** MUSINGS FROM THE 10TH FLOOR

David Dyjack, DrPH, CIH

Apricity

Expiring frequent flyer miles and adventurous family members represent a dodgy confluence of emotion and motivation, particularly around the holiday season. To harness the potential of the moment, we depleted what seemed like a working lifetime of accumulated airline miles and in December 2012, the Dyjack family departed for the historic capital of the Ottoman Empire, Istanbul. Time and space do not permit me to gush about architecture, history, food, and of course, the coffee. While the eye candy was mesmerizing, what I remember most is the Bosphorus.

The Bosphorus is a 19-mile strait that passes through Istanbul from the Black Sea on its journey to the Sea of Marmara, forming part of the traditional boundary between Europe and Asia. It is historically considered where East meets West, and represents a major commercial artery connecting the residents of the shores of the Black Sea with the rest of the world. The waterway is a critically important fishery and supports an abundant tourism industry. It is literally the main artery of the region bringing resources and investment from around the planet. Its economic and cultural value to the region would be difficult to overestimate.

Memories of that once in a lifetime family holiday recently flooded the portion of my mind that drives self-reflection. Our association is slowly and methodically working through a strategic planning process, and we are now considering our values statements. These represent the core principles and philosophical ideals that will serve to guide our

We aim to build the same trust with you.

decisions and behaviors much as the Bosphorus serves as the aquatic network that binds a region together. As I completed the online poll with my recommendations for values statements, I recognized that mine are only one set out of a couple dozen that will be considered by the NEHA Board of Directors, which means they might not make the short list for final consideration. Having said that, as executive director, you might find it useful to understand the values I hold close as a member of our organization's leadership team.

Servant Leadership: I feel we should serve the common good of the profession, starting with our employees and members, and radiating outward to our affiliates and the profession writ large. You might have observed this leadership in 2020 when we made our entire inventory of online continuing professional education free during the early stages of the pandemic, irrespective of membership status. Thousands of people took tens of thousands of our courses. We subsequently offered the Digital Defense conference in August 2020, again at no cost, that provided up to 12 hours of continuing professional education to over 2,400 people throughout the world.

Thought Leadership: Our aim is to establish a richer and more meaningful relation-

ship with the profession through our intellectual products and contributions to science. We have submitted or published 11 scientific journal articles since 2019, which represents a dramatic increase over prior years. Much of that effort was focused on you, the environmental health workforce. We believe we possess a deep understanding of your needs and challenges, and are using that knowledge to advance advocacy for the profession.

Care: We care about the well-being and success of our employees. Their safety, health, and success have guided our decision making as we pivot into the future. In illustration, we have provided each employee a stipend to underwrite the cost of their home wireless system and they have also been provided a one-time financial allocation to purchase furnishings to make their home office suitable for their individual set of circumstances. Additionally, each employee receives an annual continuing professional education investment that is used at their discretion.

Innovation: We strive to connect new ideas to today's problems. In that spirit, we nimbly toggled from face-to-face training in 2019 to an entirely online format in 2020. Our formal catalog of Food and Drug Administration training went remote. We provided—and continue to provide—numerous online trainings and just-in-time programs, including a new program of web-based updates on government affairs. Our credentialing program is rapidly moving to a paperless application and management system. We no longer have land phone lines in our Denver office, which means

continued on page 45

Thank You!

Thank you to all who've tirelessly pursued public health and safety since COVID began, upholding NEHA's mission "To advance the environmental health professional for the purpose of providing a healthful environment for all." Our country needs more people like you.

All of us at Ozark River Manufacturing Co. send our endless gratitude.

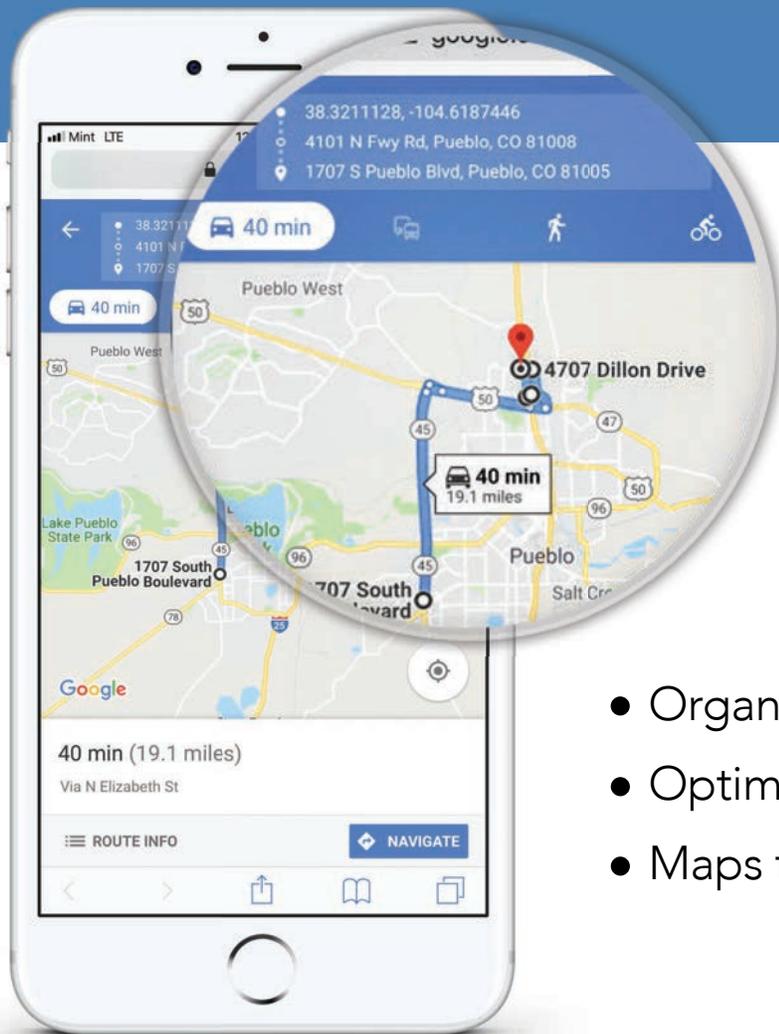


Let us know how we can help at 866.663.1982
www.OzarkRiver.com



Can your data management system optimize and map your inspector's daily schedule?

Ours can.



HS
HEALTHSPACE

- Organizes all daily inspections
- Optimizes the route
- Maps turn by turn directions

Enable your inspectors to get the most out of their day with HealthSpace. Learn more by visiting

info.gethealthspace.com/NEHA