

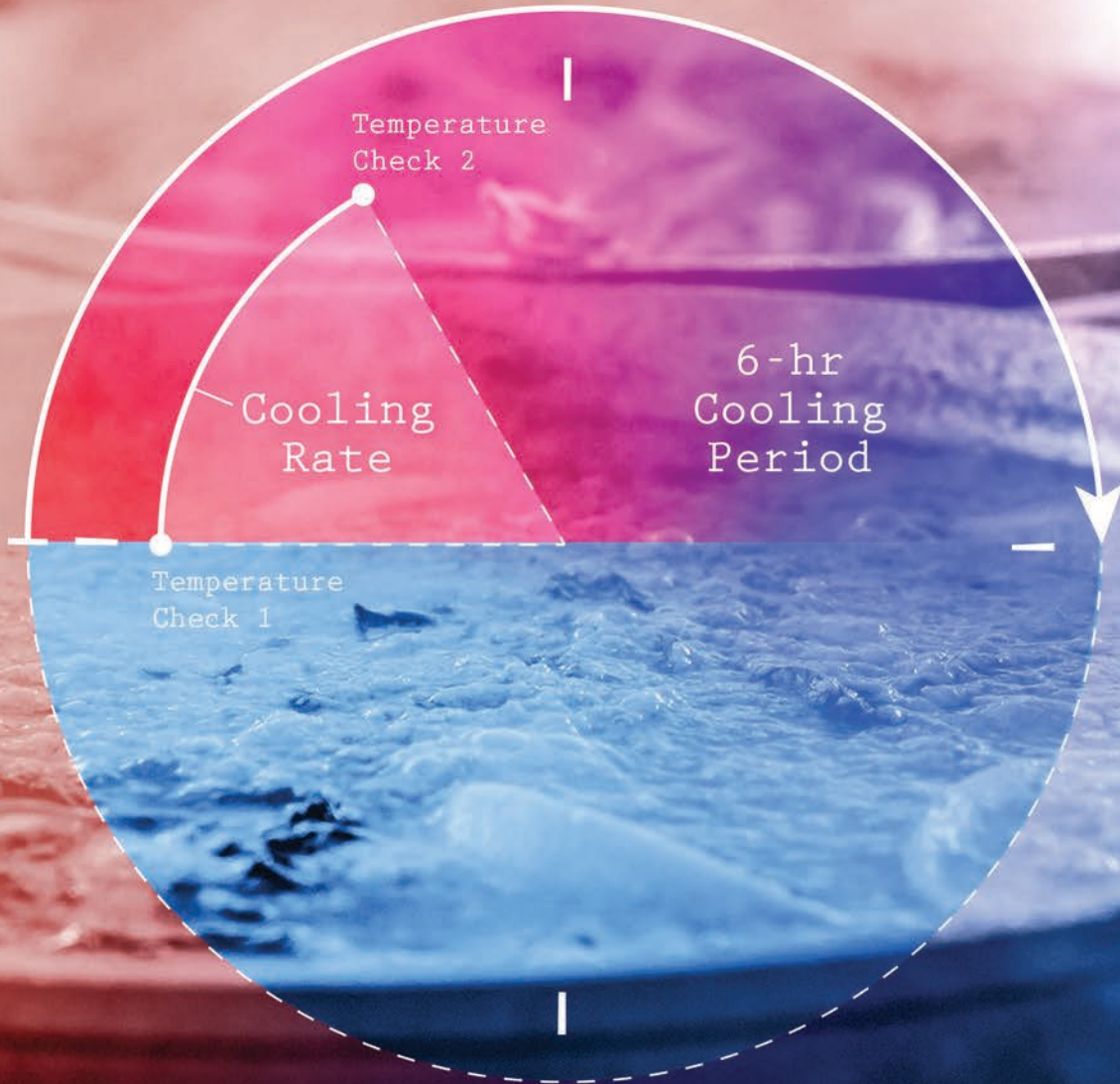
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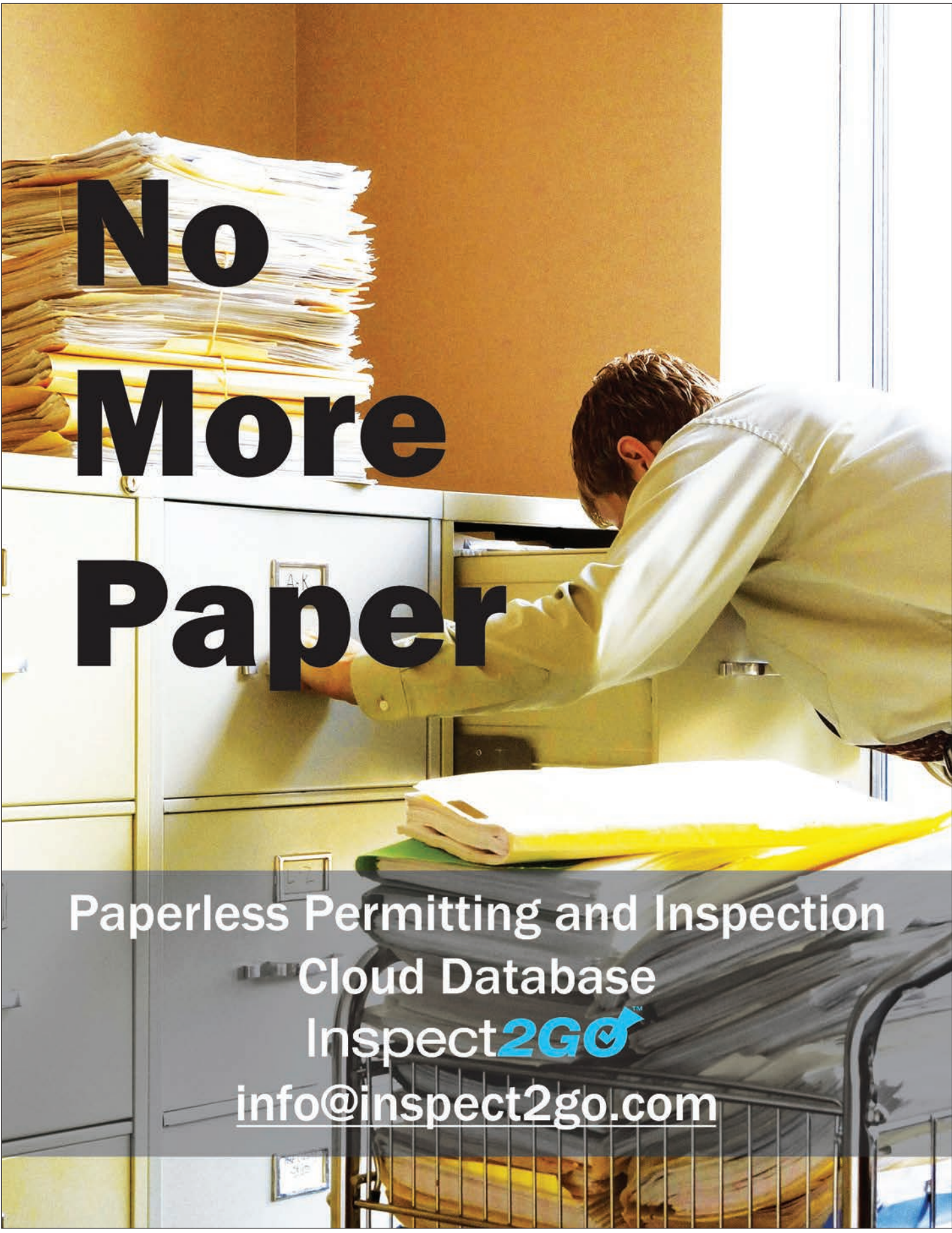
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Tools and Techniques to Promote Proper Food Cooling in Restaurants



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ABOUT THE COVER



Slow cooling of hot foods is a common pathogen proliferation factor contributing to restaurant-related outbreaks of foodborne illness. While the Food and Drug Administration model *Food*

Code provides guidelines and recommendations on proper cooling methods, restaurants continue to struggle with proper cooling of foods. This month's cover guest commentary, "Tools and Techniques to Promote Proper Food Cooling in Restaurants," provides restaurant operators and health department inspectors with methods to maximize cooling efforts. Additionally, a simple mathematic equation has been developed to help restaurant operators and health department inspectors to estimate the cooling rates of foods.

See page 8.

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Erratum

In the January/February 2022 *Journal of Environmental Health* (volume 84, number 6), the feature article, "Understanding Public Health Worker Beliefs About Radon Gas Exposure" by P. Nwako and M.L. D'Abundo, had an incorrect column label in Table 3 on pages 26 and 27. The correct column label for the far-right column is "Strongly Disagree," not "Strongly Agree" as was published.

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► PRESIDENT'S MESSAGE



Roy Kroeger, REHS

It's Time to Get Involved in Climate Change

Environmental health is a topic that is near and dear to my heart. It is something that I have been doing for nearly three decades. We have more than one dozen different environmental health programs in my office, from food safety to water quality and vector control to land use. These programs are all essential and matter to our public. An area of environmental health that I believe is just as important yet seldomly addressed is climate change.

Yes, I know many people will ask how a local health department in a community of one hundred thousand people can make a difference in climate change? It won't even make a blip on the screen in the short term. Consider that food regulations started locally in European communities and at the state level in the U.S. Small wastewater regulations were also created locally in Egypt hundreds of years ago. We need more local and state jurisdictions to start looking proactively at climate change to make a difference. Policies at local levels will evolve and become more common on the national stage. No policy maker wants to rock the boat, but community advocacy and authentic leadership can start making a difference. I feel environmental health can and should be part of that change.

So, what can local environmental health departments do to improve climate change? First and foremost, we need to engage in the conversation. Environmental health professionals know their communities and should be aware of the community issues. Take, for example, land use ordinances: when these rules are revised, we should be at the table encouraging building officials and elected officials to adopt code sections

Like it or not, climate change has become the issue of our lifetime.

that can help reduce climate change. These sections may include parts of the energy code or green building codes. Solar panels and private windmills are used in my part of the country to reduce heating costs, but they also help reduce carbon dioxide. These codes are being used to reduce the types of heating sources that emit greenhouse gases. The codes are also being used to encourage developers to create more mixed-use developments, which minimizes the need of residents to drive across town for their most basic needs. Land-use planning can also increase nonmotorized transportation routes and encourage improved parking spots for alternative fuel vehicles. There are hundreds of ideas to reduce greenhouse gas emissions locally and environmental health should be a leading advocate for these changes.

I could write pages and pages of stories on how extreme weather events have damaged the economy from flooding, fires, droughts, disease, and air quality issues. Extreme weather events have caused taxpayers to spend trillions of dollars on recovery from adverse events. The recent fires in Boulder County, Colorado, are the latest events where over 1,000 homes were destroyed and nearly

200 homes and businesses were damaged. Many residents will be out of jobs, many have lost their transportation to get to those jobs that remain, and the residents have become dependent on the community to care for them until they recover.

Extreme weather events are a huge detriment to many environmental health programs because our environmental health resources turn from doing our routine work to being a significant participant in recovery efforts. Regardless of the disaster—flood, fire, disease, etc.—we have to drop many of our routine inspections that generate revenue for our programs and start mitigating problems in restaurants, schools, homes, or other places. Most often, these efforts do not support our budgets.

Rather than focusing on the negatives that climate change has on the economy, I prefer to look at the economic opportunities created with investment into climate change initiatives. A recent study conducted at the request of the G20 Finance Ministers by the Carbon Disclosure Project was reported in *Forbes* (Ellsmoor, 2019). The report states that there are at least 2.1 trillion dollars of business opportunities in climate change according to nearly one half of the top 500 global companies mentioned in the report. The potential considers the losses that could be in the hundreds of billions due to shifting technologies and the migration of employees from one sector to another (Ellsmoor, 2019).

Climate change is a divisive political issue in the U.S. and worldwide, but so much common ground can build the foundation of change. I am not supportive of the extreme gloom and doom projections that the earth

will come to an end or that entire nations will be wiped off the face of the planet by a certain date. These projections are scare tactics that often do more harm than good. Regardless of your political affiliation, no one wants to continue having extreme weather events, nor do they want to have to spend money and use resources to recover from them. People are losing their lives and no one wants to lose a loved one to a disaster.

There are many who disagree that humans are responsible for climate change. Whether that is true or not, the facts are that the climate is changing. Some people may argue that climate change is only a cycle, and again I say if that is true or not, we are only on this planet for a minimal amount of time and we need to do what we can to improve the world

for younger generations. Regardless of who or what the cause is, the responsible solution is to try and improve the situation.

We, as environmental health professionals, have the knowledge and influence of policy makers and our communities to make a difference. We have friends and professional peers that are experts or know of experts we can turn to for more information. As public health professionals, we are responsible for participating in the conversation and representing our communities with all environmental health issues, including climate change. Like it or not, **climate change has become the issue of our lifetime.**

The National Environmental Health Association (NEHA) is committed to making a difference in the climate change debate.

For more information on that commitment, please look at the climate change information on the NEHA website at www.neha.org/climate-change.


President@neha.org

Reference

Ellsmoor, J. (2019, June 21). Businesses would gain \$2.1 trillion by embracing low-carbon tech. *Forbes*. <https://www.forbes.com/sites/jamesellsmoor/2019/06/21/businesses-would-gain-us2-1-trillion-by-embracing-low-carbon-tech/>

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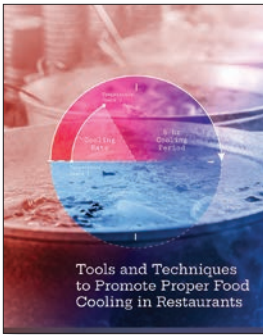
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▶ GUEST COMMENTARY



Tools and Techniques to Promote Proper Food Cooling in Restaurants

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Abstract Slow cooling of hot foods is a common pathogen proliferation factor contributing to restaurant-related outbreaks. The Food and Drug Administration (FDA) model *Food Code* provides guidelines on the time and temperatures needed for proper cooling and recommends several methods to facilitate rapid food cooling. Restaurants continue to struggle with proper cooling even given these guidelines (Hedeem & Smith, 2020). Research summarized in this guest commentary indicates that portioning foods into containers with a depth of <3 in. and ventilating the containers during the cooling process promote rapid cooling. Restaurant operators and health department inspectors could use these cooling methods to maximize cooling efforts. Additionally, a simple method (using a mathematical equation) could help restaurant operators and inspectors to estimate the cooling rates of foods. This simple method uses only two food temperatures taken at any two points in the cooling process (using the equation $[\text{Log}(T_1 - T_{\text{dr}}) - \text{Log}(T_2 - T_{\text{dr}})]/\delta t$) to estimate whether the food is expected to meet FDA cooling guidelines. This method allows operators and inspectors to identify foods unlikely to meet FDA guidelines and take corrective actions on those foods without having to monitor food temperatures for the entire cooling process, which typically takes 6 hr. More research is underway to further refine aspects of this method.

Introduction

Improper cooling of hot food by restaurants is a significant cause of foodborne illness outbreaks (Brown et al., 2012). Cooling hot foods too slowly is one of the most common pathogen proliferation factors contributing to restaurant-related outbreaks (Gould et al., 2013). Of the 251 outbreaks that occurred during 2014–2016, 10% had improper cooling as a

contributing factor to the outbreak (Lipcei et al., 2019). Hot foods should be cooled rapidly to minimize pathogen proliferation and subsequent foodborne illness risk.

The Food and Drug Administration (FDA) model *Food Code* (Section 3-501.14) provides guidelines for retail and foodservice establishments to cool foods classified as needing time and temperature control for safety. These

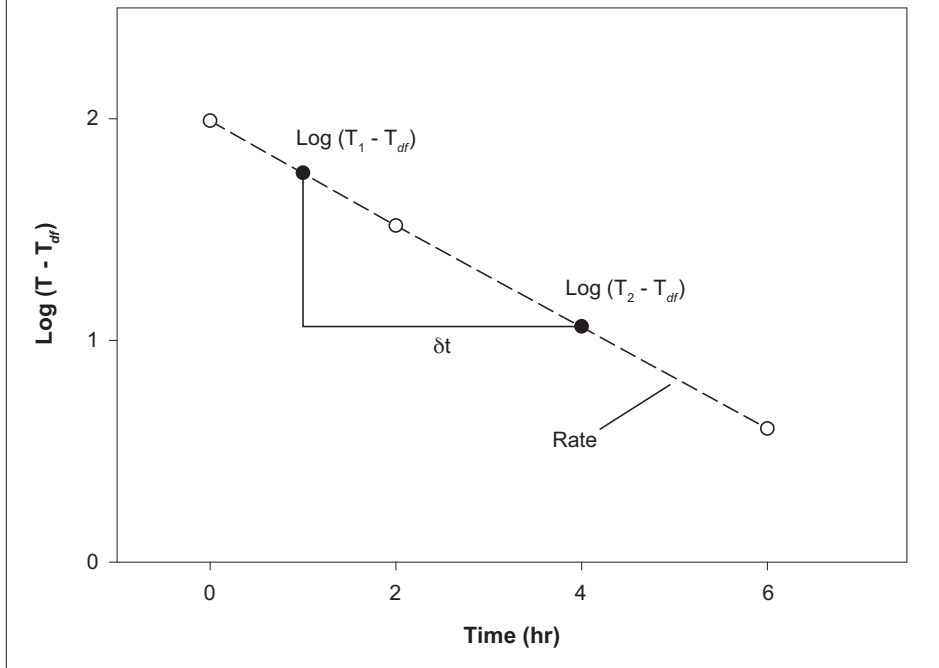
guidelines state that foods must be cooled from 135 °F (57 °C) to 70 °F (21 °C) within 2 hr, and from 135 °F (57 °C) to 41 °F (5 °C) within a total of 6 hr or less (U.S. Department of Health and Human Services, 2017). To help reduce foodborne illness risk, the *Food Code* also recommends several methods to promote rapid food cooling. These methods include separating food into smaller portions; stirring food in a container placed in an ice water bath; adding ice as an ingredient; and placing food in shallow pans, in containers that promote heat transfer, and in rapid cooling equipment. Even with these guidelines, restaurants continue to struggle with proper cooling (Hedeem & Smith, 2020). And as a model code for regulating retail and food service establishments, the *Food Code* does not specify how to apply cooling methods in varying situations or whether some methods are better than others.

The *Food Code* recommends that retail food establishments verify that their cooling practices are effective as well as monitor and record food temperatures during the cooling process, but research suggests that many establishments do not always engage in these practices (Brown et al., 2012; Hedeem & Smith, 2020). A study by FDA (2018) found that cooling practices did not meet FDA guidelines at least once in 72% of 273 full-service restaurants where cooling was observed.

Cooling is difficult for operators and inspectors to assess because of the time required to adequately monitor the cooling process. Restaurant operators work in a dynamic and busy environment, and fre-

FIGURE 1

Equation to Calculate the Cooling Rate of a Food



quent monitoring of temperatures is not always feasible. Multiple factors influence an operator’s ability to monitor food temperatures to ensure proper cooling. These factors can include insufficient staffing, the time of day foods are cooled (e.g., early or late shifts), and how busy a restaurant is throughout the day (Green & Selman, 2005). Inspectors are typically in an establishment for fewer than the 6 hr needed to document proper cooling. Other options for assessing proper cooling include discussions with the restaurant manager, review of temperature logs to determine cooling start time, and subsequent comparison with food time and temperatures taken during the inspection. Use of thermocouples and data loggers for later retrieval or returning later in person to continue the inspection and check temperatures are other options, although inspectors cannot always conduct multiple visits to an establishment during a day. Focusing on specific cooling methods, rather than the full cooling process, might be another way to identify cooling issues during routine inspections.

Identification of practices that best promote proper food cooling can support operators and inspectors in their efforts to cool

food properly. Research conducted by the Centers for Disease Control and Prevention’s Environmental Health Specialists Network (EHS-Net), Rutgers University, and the Minnesota Department of Health has identified two common themes described next regarding cooling methods that ensure proper cooling (Hedeem & Smith, 2020; Igo et al., 2021; Schaffner et al., 2015).

Shallow Depth and Ventilation

Schaffner et al. (2015) examined 596 food items being cooled in refrigerators in 410 restaurants. They measured the temperature of these foods at two time points, approximately 80 min apart, and used modeling to determine the cooling rates and compliance with *Food Code* guidelines. Foods not actively monitored by food workers were more than twice as likely to cool more slowly than recommended in the *Food Code*. Foods stored at a container depth >3 in. were twice as likely to cool more slowly than specified in the *Food Code*. Moreover, unventilated foods were almost twice as likely to cool more slowly than specified in the *Food Code*.

Hedeem and Smith (2020) used data loggers to collect time and temperature data

points at 5-min intervals for 34 cooling food items. They plotted the data points to form a cooling curve for each food item. They then assessed the cooling curves of the foods and found that those cooled in containers with a depth <3 in. were more likely to meet the first cooling parameter (i.e., 140 °F to 70 °F within 2 hr) than those cooled in containers with a depth ≥3 in. ($p = .035$). As almost all the food items in this study were ventilated, the relationship between ventilation and cooling rates was not evaluated. Using these same cooling curves, Igo et al. (2021) also found that food depth has a strong influence on cooling and verified that containers with a food depth ≥3 in. were more likely to have cooling rates slower than the cooling rate specified in the *Food Code*.

Using containers with a depth of <3 in. and ventilating foods during refrigerated cooling (as recommended in Section 3-501.15 of the *Food Code*) are simple ways for operators to maximize cooling efforts. They also serve as indicators for inspectors to assess cooling at restaurants. The extra space needed to use shallow pans and ventilation is a potential drawback; to address this drawback, restaurants could small-batch recipes or use speed racks in walk-in coolers.

Two-Point Temperature Monitoring

Schaffner et al. (2015) identified a simple two-point method to measure cooling rates in restaurants and identify cooling issues. This method was developed using on-site observations of cooling food times and temperatures. Operators and inspectors can use this method to quickly determine if the cooling method used is expected to cool foods properly before the entire 6-hr period has elapsed.

The equation to calculate the cooling rate of a food is $[\text{Log}(T_1 - T_{df}) - \text{Log}(T_2 - T_{df})] / \delta t$, where T_1 and T_2 are any two temperatures measured during the cooling process, T_{df} is the driving force temperature (i.e., the temperature of the cooling environment), and δt is the time between the two temperature measurements (Figure 1). When the temperature and time values from the *Food Code* guidelines for food cooling results are plugged into this equation, and a driving force of 37 °F is assumed, this produces the best fit (i.e., highest R^2 value). The slope of this best-fit line equates to a cooling rate of 0.23 when time

is measured in hours (or 0.0039 when time is measured in minutes). Thus, a food with a cooling rate faster or equal to 0.23 would meet *Food Code* recommendations, but a rate slower than 0.23 would not (Igo et al., 2021; Schaffner et al., 2015). Under some circumstances, the driving force will not be constant, which can influence the cooling rate estimate.

Igo et al. (2021) used cooling curves for 29 different foods that were collected in 25 different restaurants to verify the two-point rate calculation method. Cooling curves were divided into two categories: typical and atypical. Curves were considered atypical when they had many dips and peaks, which are typically caused by stirring the food or changing the cooling method. Most cooling curves (21 out of 29) were considered typical (i.e., log linear rate changes with time). Atypical cooling curves (8 of 29) had non-log linear rate changes with time resulting from stirring or other factors.

Almost all typical cooling curves identified had highly predictable cooling rates (Igo et al., 2021). Among 9 foods with typical cooling curves that did not meet the cooling times recommended in the *Food Code*, the two-point model identified 6 as having slow cooling rates and 3 as having marginal cooling rates; among 12 foods identified by the two-point model as having acceptable cooling rates, 10 met the cooling times recommended in the *Food Code*. Among 8 foods that were considered to have atypical cooling curves, 6 failed to meet the cooling times recommended in the *Food Code*. These findings indicate that for most foods that are cooling at a steady rate (e.g., not stirred, not moved to a different environment), taking only two

temperature measurements at any point in the cooling process should reliably indicate whether the food is going to meet the cooling guidelines in the *Food Code*.

During routine inspections, this two-point method could help inspectors identify cooling issues. Specifically, when inspectors see a food item cooling, they could note an initial time and temperature of the food. Then they could take a second temperature reading, preferably at the end of their inspection to allow for the greatest elapsed time between the two temperature readings. The simple equation described previously would enable inspectors to estimate the cooling rate. They could use the calculated rate to determine whether the cooling rate of the food is predicted to follow the recommendations in the *Food Code*. Inspectors could use this tool to educate restaurant operators. If the equation predicts that a food will not cool within the guidelines of the *Food Code*, the inspector could discuss alternative cooling methods with operators and develop a plan for properly cooling the food. Operators could also use this method to help verify whether their cooling process is effective or to evaluate the effect of changes in their process.

Additional research is needed to potentially determine ideal times during the cooling process when inspectors should take the two temperature readings (i.e., between 135 °F and 70 °F and then again after the food is below 70 °F). Differences in time between the two temperature measurements also might affect the outcome (e.g., are measurements 60 min apart better than measurements 15 min apart?).

Foodborne disease outbreaks resulting from improper cooling continue to occur

(Lipcsei et al., 2019). Proper cooling is sometimes difficult for restaurants to accomplish and for inspectors to verify. Although the *Food Code* provides valuable information on suggested cooling methods, beyond specifying to monitor temperatures, it does not provide guidance on determining how cooling is to take place. Logging continuous time and temperature data is an ideal way to determine if foods are cooled correctly, but this process is not always practical for operators or inspectors. Portioning foods into containers with a depth <3 in. and ventilating them during the cooling process are best practices that can promote rapid cooling and that restaurants can easily apply. As described in this study, calculating cooling rates to determine if foods meet FDA *Food Code* recommendations is one way that operators and inspectors can determine if a cooling method can be expected to work without having to monitor a food for the entire 6-hr cooling process. More research is underway to further refine aspects of this method. 🐷

Disclaimer: The findings and conclusions in this guest commentary are those of the authors and do not necessarily represent the views of the Centers for Disease Control and Prevention or the Agency for Toxic Substances and Disease Registry.

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Did You Know?

NEHA is a partner association of the Retail Food Safety Regulatory Association Collaborative, a group of agencies and associations working to reduce the incidence of foodborne illness at the retail level. The Collaborative has posted a variety of resources including a toolkit to help jurisdictions adopt the latest editions of the Food and Drug Administration *Food Code*, an assessment of the impact of active managerial control incentive programs, an interactive map of *Food Code* adoption by state, and more. Check it out at www.retailfoodsafetycollaborative.org.

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Extreme Winter Storms: Environmental Impacts of Public Utility Policies on Vulnerable Populations

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Abstract Winter Storm Uri, one of the coldest in decades, brought snow and ice to Texas along with record subfreezing temperatures for 5 days February 13–17, 2021, and was followed by Winter Storm Viola, which brought more of the same February 18–19, 2021. Millions of Texans lost electricity and clean, running water for several days, which some suggest was due in part to a state-regulated energy market. Many Texas schools shut down for the entire week, as the death toll rose from these storms due to hypothermia and exposure, carbon monoxide poisoning, fire, drowning, and poor road conditions. Not only were COVID-19 vaccinations halted due to impassable roads but also Texas hospitals struggled to provide electricity and water pressure needed to perform life-saving medical treatments for their patients. The purpose of this article is to provide an overview of the historic winter storm event, identify vulnerable populations and key public health policies, and highlight the potential environmental public health risks associated with the storms.

Introduction

This article examines the impact of Winter Storms Uri and Viola on vulnerable populations in Texas as well as the impact of public utility policies, highlighting those related to the Texas electrical grid and the Electric Reliability Council of Texas (ERCOT). Winter storms are defined as a weather event in which the main types of precipitation are snow, sleet, or freezing rain. There are clear links between the storms and increased injuries and deaths statewide from February 13–17, 2021, particularly in areas with people of lower socioeconomic status. Several lawsuits have been filed against ERCOT. We evaluated the role of public utility policy

in the negative health outcomes related to the winter storms and the impact of nearly 5 million Texans losing power and 14.5 million Texans being subjected to boil water notices. The final report from the Disaster Mortality Surveillance Unit of the Texas Department of State Health Service identified 246 deaths related to the winter storms in Texas, with mortalities ranging in age from infancy to 102 years, across 77 counties (Svitek, 2022). Experts suggest, however, that the true mortality rate from the storms cannot be accurately calculated and the actual death toll was likely much higher at closer to 700 storm-related deaths (Svitek, 2022).

Winter Storms Uri and Viola in Texas

While the effects of Winter Storm Uri were felt coast to coast February 12–16, 2021, no state was hit harder than Texas in terms of loss of infrastructure and negative health outcomes. Snow covered 80% of the state, with 4 in. of snow and ice recorded in both Dallas and Houston, two of the largest cities in Texas (weather.com, 2021a). In Austin, the state capital, it snowed 6.4 in., the largest amount since 1949. Right after, Winter Storm Viola hit and lasted February 17–19, 2021. In some cases, this additional snow and ice accumulation led to structural failures and the collapse of roofs (weather.com, 2021b). In Del Rio, Texas, which typically gets 1.2 in. of snow each year, a record 9 in. of snow fell in a 24-hr period due to Viola (weather.com, 2021b).

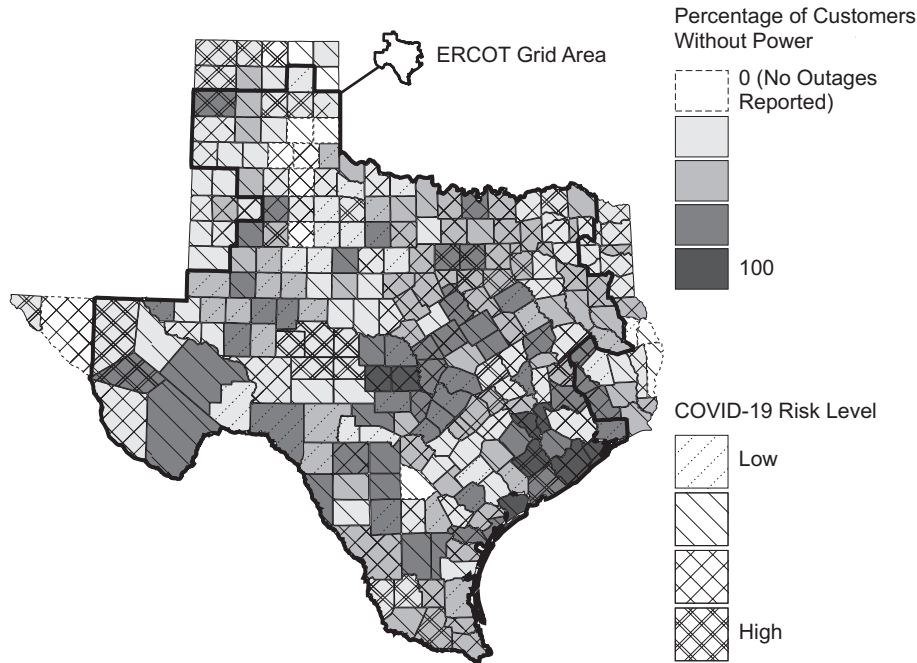
Both storms wreaked havoc on Texas roadways and Texans endured record low temperatures while approximately 11% of the state and more than 4.5 million people lost power, many for several days (Pollock, 2021; Popovich et al., 2021, PowerOutage.us, 2022). Figure 1 was created with a combination of freely available data on the ERCOT power-grid and records of COVID-19 case rates in Texas counties provided by the Texas Department of State Health Services. We completed a literature review of Texas storm-related research and articles during February 2021.

Discussion

The Texas Department of State Health Services reports that 246 Texans lost their lives

FIGURE 1

Texas County Power Outages and COVID-19 Risk Levels During Winter Storm Uri on February 16, 2021



Note. Figure created from data available on PowerOutage.us (2022) and the Texas Department of State Health Services (2021). ERCOT = Electric Reliability Council of Texas.

to the storms in a myriad of ways including hypothermia, carbon monoxide poisoning, falling on the ice, vehicular accidents on icy roads, fires, and failure of medical equipment due to lack of water pressure; hypothermia was the leading cause of death from the storms (Findell, 2021; Svitek, 2022). Texas has 254 counties and officials in each county are responsible for investigating and determining if deaths were related to the 2021 winter storms. Overall, 31.3% of counties reported storm-related deaths (Svitek, 2022).

The 246 cases identified by county officials are then reevaluated by state epidemiologists to determine an overall count. Robert Jensen, head of a company that helps to assess death counts after disasters such as Hurricane Katrina, said in an interview with the *Houston Chronicle*, “Mass fatalities scare people, and they’re very political. I don’t think it’s intentionally misleading, it’s just a very screwed-up process” (Findell, 2021).

Electric Reliability Council of Texas Regulations

Texas is the only state in the U.S. with an independent, state-regulated power grid. The Federal Power Act, enacted in 1935 by President Franklin Roosevelt, created the Federal Power Commission (FPC) that regulates electricity sales across state lines (Kim, 2021). By keeping Texas’s power usage separate, the state avoids being subjected to FPC policies and regulations. FPC regulations require weatherized and winterized pipelines and equipment; every other power grid in the U.S. goes beyond these minimal regulations to also maintain weatherized back-up generators (Schuetz et al., 2021).

Despite devastating damage from a winter storm 10 years ago, Texas did not winterize and weatherize its systems to prevent a repeat of that disaster (Eiserer & Trahan, 2021). Texas created ERCOT in 1970 after a series of blackouts caused serious damage in the Northeastern U.S. ERCOT is tasked with

maintaining system reliability, facilitating a competitive wholesale market and a competitive retail market, and ensuring open access to transmission of electricity with the state (Chute, 2021).

Then 5 years later the state created the Public Utility Commission (PUC). The commission consists of three members who are appointed by the Texas governor and legislature to help regulate Texas utilities (Chute, 2021). The Texas legislature has appointed committees to address electrical failures more than once over the last two decades; however, instead of winterizing or weatherizing the power grid or setting resiliency standards, the only significant changes made were to double the maximum payment per mega-watt hour to \$9,000 (Chute, 2021; Texas House Select Committee, 2009).

Governor Greg Abbott called the 2021 failure of ERCOT unacceptable and requested another state congressional committee to investigate the power outages following the 2021 storms (Chappell, 2021). As the winter storms ended, the governor worked with PUC to temporarily stop any Texans from losing water or electricity due to their inability to pay and temporarily stopped billing for electricity after one Texan reported being charged \$16,752 (Pollock, 2021). ERCOT initially was directed by PUC to raise electricity prices during the winter storms (Chute, 2021). ERCOT said it could have been much worse—even with more than 4.5 million Texans losing power, they said they were moments away from a total system collapse that would have left much of Texas without power for months (Schuetz et al., 2021).

The ERCOT board is composed of 13 members, many of whom are not Texans, and most of whom are former industry executives. For reportedly working between 5 and 15 hr/week at ERCOT, board members earned five-to-six-figure salaries, peaking with CEO Bill Magness’s salary of \$883,000, according to publicly available 2018 tax records. ERCOT stands by their decision to stop electrical service and to ensure rolling blackouts during the winter storms; however, many Texans are suing ERCOT as well as their specific electrical provider for storm-related deaths and injuries (Findell, 2021).

Sovereign immunity prevents key governmental agencies from being sued and is granted to select agencies to avoid the

disruptions from lawsuits in vital governmental services, such as utilities. Because ERCOT is derived from PUC, which enjoys sovereign immunity, ERCOT argues that they too should be exempt from liability (*Electric Reliability Council v. Panda Power*, 2018). In March 2021, the Texas Supreme Court delivered a five to four decision, ruling that they cannot decide if ERCOT has sovereign immunity or not (*Electric Reliability Council v. Panda Power*, 2021). The question of ERCOT's ability to avoid lawsuits is still being hashed out in Texas appellate courts. Like the Texas Supreme Court, the state's Fourth Court of Appeals also avoided ruling on ERCOT's potential sovereign immunity and instead directed plaintiffs to go before the Texas PUC before pursuing litigation (Tomaso, 2021). As of January 2022, 170 lawsuits with over 400 plaintiffs have been filed against utility companies and ERCOT due to outages during the 2021 Texas winter storms. Many of these lawsuits, however, are stuck in a holding pattern awaiting higher courts to rule on the two key questions of immunity and duty of the utility providers and grid operators (Despart, 2022).

Vulnerable Populations and Environmental Hazards

In addition to nearly 5 million Texans losing power, 14.5 million Texans were instructed to boil water before using it for drinking or cooking, and many had no water at all. The loss of power and water led to negative health impacts, especially among the most vulnerable populations including children, older adults, and low-income individuals. Among the most vulnerable populations, those who suffer from poor mental health are often left out of the conversation.

Mental Health Effects

Exposure to natural disasters such as Winter Storms Uri and Viola can exacerbate mental health problems in vulnerable populations (Amstadter et al., 2009; DeSalvo et al., 2007; Kessler et al., 2005; Neria et al., 2008). In the aftermath of other natural disasters, evidence has shown that more than one year following the event, anxiety and mood disorders are substantially elevated and related mental health conditions are broadly distributed among the population.

Those who experienced Hurricane Katrina are prime examples. Individuals experienced storm-related physical illness or injury, physical adversity, and property loss. For Mississippi residents who were affected, there was an increased prevalence of self-reported psychological and physical intimate partner violence. For all individuals affected by Hurricane Katrina, self-reported poor physical health has been correlated with self-reported poor mental health after the storm (DeSalvo et al., 2007). If these effects are the natural course after experiencing such a horrific event, what should we expect for those who experienced Winter Storms Uri and Viola?

If one were to think in the context of a dose-response relationship, the magnitude of the response of those affected will be determined by the amount of exposure (here the dose). In short, the mental health challenges experienced by storm survivors will be decided by the type of exposure, the length of the exposure, and the ongoing stressors related to the exposure. We've seen these trends and patterns before upon the examination of the aftermath of other storms. For example, elevated levels of post-traumatic stress disorder (PTSD) and psychological distress among vulnerable populations have also been observed up to five years after a hurricane (Tracy et al., 2011). Moreover, researchers have suggested that slow government responses may have exacerbated mental health problems and argued that an efficient emergency response can help to minimize the mental health impacts of natural disasters (Schneider, 2008).

There is also that nagging challenge of displacement. Those who were uprooted by Winter Storms Uri and Viola, especially those who experienced loss, could be at risk for short- and long-term mental health effects. Evacuees often experience increased risk of short-term acute stress disorder, while populations who are displaced or who experienced or witnessed traumatic events are at increased risk of long-term mental health effects, including PTSD, depression, anxiety, and suicidal ideation (Cepeda et al., 2010; Kunii et al., 2016; Orui et al., 2018). Women, Blacks, and those with prior psychiatric history, poor physical health, and weak social networks have been identified as particularly vulnerable (Benevolenza & DeRigne, 2019). There is also an increased risk for substance use among these groups. Were the vulnerable

populations that were affected by Uri and Viola subject to the same challenges?

While the literature has been clear that there is a relationship between traumatic events and mental health challenges, the relationship has been elucidated using a limited methodology of cross-sectional studies (Stein et al., 2010; Tashiro et al., 2021; Thomas & Savoy, 2014). As a result, a complete story could not be told. That is, prestorm mental health challenges such as depression or PTSD levels could not always be ascertained. Hence, conclusions are limited about cause-effect relationships between storms and subsequent mental health outcomes. In order for prevention of poor outcomes and ill effects, ongoing mental health surveillance, appropriate intervention, and adaptation strategies must be a priority.

Fire and Carbon Monoxide Poisoning

In response to the coldest night in Houston in 32 years, many Texans without power resorted to BBQ pits, gas grills, gas powered generators, space heaters, fireplaces, lanterns, and candles for light and warmth (Wu, 2021a). These alternative heating sources, in turn, led to more than 700 reports of carbon monoxide poisonings and multiple fires in Harris County and surrounding areas, which ultimately resulted in multiple injuries and deaths (Edwards, 2021a; Slater, 2021; Wu, 2021a). Additionally, the siphoning of gasoline for use in many of these alternative heating sources likely resulted in increased incidence of gasoline exposure for individuals obtaining the gasoline, as well as for family members (Cox et al., 2008). Further, efforts to insulate dwellings by closing windows and vents likely increased residents' exposure to combustion byproducts (Iqbal et al., 2012; Johnson-Arbor et al., 2014). Lack of ventilation likely also increased the risk of fire in dwellings as heat created by alternative heat sources was unevenly distributed and was prevented from ventilating properly (Edwards, 2021a; Kalifa, 2021).

Women and children in particular, because they spend more time in the home, are at increased risk of exposure to carbon monoxide and other combustion byproducts (Iqbal et al., 2012). Children's smaller body mass also puts them at greater risk of toxin-related health outcomes at similar exposure levels and durations (Friis, 2018; Iqbal et al., 2012).

Lack of health literacy and education may have played a role as well; many Texans went to their cars for warmth and to access power to charge their cell phones—but oftentimes they left their garage doors down, which resulted in carbon monoxide poisonings and deaths (Powell et al., 2021).

Plumbing Insurance Claims

Without electricity to maintain heat, uninsulated water pipes in homes and businesses froze and burst, causing injury and property damage, as well as resulting in 13 to 15 million Texans lacking a supply of fresh water for drinking, cooking, and bathing (Edwards, 2021b; Texas Seeks Relief, 2021). According to the Texas Department of Insurance, more than 400,000 insurance claims were made in response to the winter storms due to damage from burst pipes and fires from alternative heat sources; the majority were resolved within 1 month of the initial filing (New, 2021; Wu, 2021b). In 2020, the property damage on average in Texas from a frozen, burst pipe was approximately \$15,500, which includes damages to floors, ceilings, drywall, and plumbing (Wu, 2021b). The cost of the deductible for Texans who were already strapped for cash during the pandemic could prove insurmountable. Likewise, there are still long wait times for plumbers and contractors (Wu, 2021b). Houston does not require renters to have renters' insurance; therefore, while the property itself may be fixed by landlords, many Texans who lost personal property and do not carry renters' insurance did not have funds to replace their clothing and furniture that was damaged by the storms (Wu, 2021b).

Hypothermia

While death from hypothermia is relatively rare in the U.S. and extremely rare in Texas, several instances of death from it occurred during the winter storms in Texans ages 11–95 years. Hypothermia is diagnosed when a person's body temperature falls below 95 °F, and when the core temperature falls to 82 °F or lower, individuals typically fall unconscious and go into cardiac arrest (Powell et al., 2021). This occurrence most often happens when people are out in the elements, but in the case of these winter storms and due to the power outages, it happened to people sleeping in their homes (Powell et al., 2021).

Additionally, water pipe bursts released large amounts of frigid water into homes and businesses, further decreasing people's ability to keep warm as their clothing and bodies were soaked with water (Texas Seeks Relief, 2021). Lack of potable water and power within many Texans' homes also caused many people to travel to university campuses, stadiums, and grocery stores in search of filtered water and fuel for heat (Kalifa, 2021). This lack of utilities put many Texans at increased risk of hypothermia as they spent prolonged periods waiting in lines in the cold and snow. While a vast majority of Texans were at risk of hypothermia due to poor weatherproofing, several groups were put at increased risk. Children, due to their small body mass, are at increased risk of hypothermia even at similar ambient temperatures and exposure durations (Friis, 2018; McDonnell Nieto del Rio et al., 2021).

Moreover, the winter storms were particularly dangerous for Texans with lower socioeconomic status, as well as for racial and ethnic minorities who experienced increased power outages and have less protective housing (Ura & Garnham, 2021). People with jobs who are in lower economic levels face instability of access to electricity necessary for heating: juggling rent payments and utility payments from month to month, many of these individuals had their power shut off due to missed payments when the winter storms hit (Desmond, 2016). More affordable housing in Texas is usually farther away from areas (i.e., cities and larger towns) with vital infrastructure such as hospitals, which are also the area's structures that are most likely to maintain power (Ura & Garnham, 2021). Similarly, public transportation throughout the state shut down during the storm, and without access to their own vehicles or public transportation, those in areas farther away from cities and larger towns could not reach warming centers. Further exacerbating the problem, the majority of winter-weather communications by Texas officials were broadcast only in English (Ura & Garnham, 2021).

Disproportionate numbers of people who are Black or Hispanic live in older neighborhoods in dwellings that are less protected from winter weather due to failing insulation and plumbing (Ura & Garnham, 2021). Research suggests that due to a lack of enforcement of civil rights laws, racial segregation in the

housing market persists (Hahn et al., 2018). Moreover, the pandemic has affected Black and Hispanic communities harder with higher morbidity and mortality rates related to COVID-19 (Ura & Garnham, 2021). A U.S. national survey showed that compared with White adults, Black and Hispanic adults are not only at an increased risk of infection from COVID-19 but also have increased risks for hospitalization and death from the disease (Niño et al., 2021). Additionally, vaccine efforts in Texas were delayed because of the storms. Not only were patients and clinicians unable to travel but also the supply chain was disrupted due to icy roads. Likewise, electrical failures to cooling units caused the loss of a number of vaccines due to the failure to maintain the required storage temperatures for the Pfizer and Moderna vaccines.

Hospitalizations

Texas hospitals faced increased patient volume from storm-related injuries along with approximately 27,900 new confirmed cases of COVID-19 in the state during the period of Winter Storms Uri and Viola (Texas Department of State Health Services, 2021; Texas Seeks Relief, 2021). Additionally, poor road conditions created supply chain issues that likely limited hospitals' access to necessary supplies such as IV bags and personal protective equipment (Kalifa, 2021; Lobo et al., 2019; Norros et al., 2016). Outpatient clinics and dialysis centers whose infrastructure had been compromised referred patients to nearby hospitals still in operation, and inpatient hospitals whose infrastructure had been compromised struggled to evacuate patients to other sites for continued care (Kalifa, 2021; Texas Seeks Relief, 2021). This combination of high patient volume and reduced healthcare resources likely limited access to healthcare in the aftermath of Uri and Viola.

While many people experience reduced access to care for conditions including hypothermia, carbon monoxide poisoning, and foodborne illness in the wake of winter storms, individuals with chronic illnesses are affected more severely due to their preexisting need for healthcare services independent of storm conditions. Poison control center data can improve epidemiological surveillance after a natural disaster when hospital and clinical sites are unavailable or unutilized (Wolkin et al., 2014). Dialysis patients, for

instance, require regular blood transfusions to filter toxins from their body in the absence of kidney function; when hospitals experience shortages of warmed, treated water necessary for running dialysis machines (Texas Seeks Relief, 2021), these patients risk toxin accumulation and its consequent effects. Additionally, individuals with lung conditions require oxygen supplies to prevent their blood oxygen levels from dropping too severely; if hospitals cannot receive new shipments of oxygen tanks or store existing ones, these individuals might lose access to these medical equipment resources that are necessary to their health (Texas Seeks Relief, 2021).

Nursing Homes and Assisted Living Facilities

Similarly, nursing home residents face increased risk for infection and death from COVID-19 (Foxhall, 2021). Therefore, the loss of power and water was particularly concerning for this population. Texas requires nursing homes to maintain generators for life-support machines and emergency systems, but not HVAC units. Many nursing homes had generators, but found that not all of them worked, and many were not strong enough to maintain heat throughout the entire building, which resulted in selective heating and the grouping of residents together in the areas that maintained heat (Foxhall, 2021).

Fortunately, nursing home residents and older adults in Texas were among the first to be vaccinated, which offered additional protection from the virus. Without heat, temperatures inside some facilities dropped into the 50s (Foxhall, 2021). Texas nursing homes, however, were innovative, using multiple blankets, donated hats and gloves, and in some cases socks for mittens (Foxhall, 2021). Administrators and staff in many locations slept on site to help troubleshoot winter-weather related problems. One nursing home administrator called in family members to help with resident food service when employees could not travel to work due to impassable roads (Foxhall, 2021). Maintaining a healthy environment without running water and electricity affected laundry, dishwashers, refrigeration, plumbing and toilet flushing, and medical equipment. Of the 3,220 nursing homes and assisted living facilities in Texas, only 64 evacuated, in part due to poor road conditions (Foxhall, 2021). Approximately, 600 nursing homes

in Texas reported power outages or property damage related to the winter storms (Foxhall, 2021).

Foodborne and Waterborne Illness

In addition to increased risk of hypothermia and potential exposure to combustion byproducts, the loss of power experienced in Texas likely increased residents' exposure to foodborne and waterborne illnesses. The power outages spanned the state and compromised water treatment systems (Edwards, 2021b; Texas Seeks Relief, 2021), which led to an inability to remove spilled toxins or pathogens from the water supply (Cox et al., 2008). These compromised water treatment systems likely led to increased rates of toxic exposure and waterborne gastrointestinal diseases (McKay & Scharman, 2015).

In the absence of power, perishable items cannot be preserved at safe temperatures or cooked to kill off any pathogenic bacteria and thus food supplies can become compromised (Kalifa, 2021; McKay & Scharman, 2015). Individuals who consume contaminated foods unknowingly can be at greater risk of food poisoning and other gastrointestinal diseases. Children again are at disproportionate risk of foodborne and waterborne illness due to their smaller body mass: with smaller blood volumes and lower counts of affected tissue cells, children experience more severe effects than adults from similar levels of exposure to pathogens and waterborne toxins (Friis, 2018; Iqbal et al., 2012). While boil water notices eliminate biological contaminants, chemicals are still present (Ratnapradipa et al., 2018).

Road Conditions

The adverse weather conditions also created risks for Texans outside the bounds of their homes. Winter storms such as Uri and Viola create dangerous road conditions that pose significant risks for vehicle users. As temperatures fall below freezing, friction between tires and the road decrease because of ice formation, which increases the incidence of vehicle crashes (Lobo et al., 2019). Additionally, snowfall and icy surfaces contribute to greater roadway congestion as vehicles reduce their speed to maintain control (Kalifa, 2021; Lobo et al., 2019). The combination of congestion and reduced vehicle control results in crash risk increases of between

470% and 740% (Norros et al., 2016). While departments of transportation frequently advise against travel during winter storms, many people must brave these hazards due to their occupation.

Truck drivers represent a significant risk group, as their occupation necessitates constant use of roadways during work hours. Additionally, truck drivers are often important links in supply chains that connect people with important resources such as food and medicine, and they cannot simply take days off when inclement weather arises. Similarly, many other service sector workers are put at increased risk of a vehicle crash because of the nature of their occupation. Many of these positions necessitate their physical presence at their workplace, precluding them from working from home during winter storms (Kalifa, 2021). Furthermore, community design, which increasingly separates one's residence from their workplace (Heaton et al., 2010), increases many workers' exposure to dangerous road conditions as they must travel further to and from work.

Conclusion

The Winter Storms Uri and Viola have in combination caused considerable damage across the U.S., and this damage was particularly severe in Texas, due in part to the state's deregulated energy market. While the injury and illness left in the wake of these storms was in part because of individual-level factors such as winter safety knowledge and individual risk perception, it is apparent that structural and environmental factors in Texas had a significant effect on people's health outcomes during the winter storms. By identifying vulnerable groups that are disproportionately affected by storm-related environmental risk factors as well as key public policies influencing these environmental risk factors, state emergency response organizations can make better, actionable recommendations about preparation for and response to future weather-related disasters. 🐼

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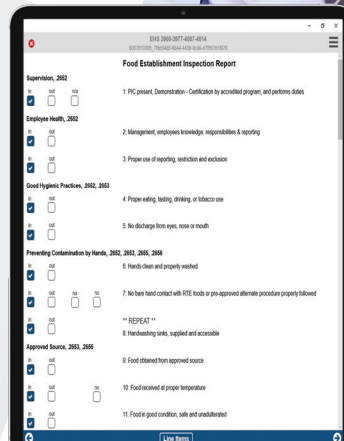
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Horse Owner Practices and Equine and Human Arboviral Encephalitis in North Carolina

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Abstract Researchers have long studied comparative medicine related to the One Health approach (Centers for Disease Control and Prevention, 2021a). An element of the One Health approach suggests that animals can serve as early-warning sentinels for infectious diseases in humans. In this study we compare cases of human and equine Eastern equine encephalitis (EEE), human West Nile neuroinvasive disease (WNND), and equine West Nile fever (WNV)/WNND reported during 2008–2018 in North Carolina. West Nile is a priority zoonotic disease in need of more investigation. We documented year-to-year variation in human and equine cases and noted a relative increase in WNND in 2016–2018. We detected a correlation between numbers of human and equine cases of EEE. We also surveyed North Carolina equine owners to assess vaccination practices, knowledge, and concern about mosquitoes and EEE and WNV virus transmission. Most owners (93%) reported vaccinating their horses against these viruses. Equine owners and those who work with horses were minimally concerned about their own health risks related to mosquitoes and associated diseases. Mosquitoes were considered a nuisance during some types of farm activities. Respondents occasionally protected themselves from mosquito exposure by wearing long-sleeved shirts/pants and/or permethrin-treated clothing, self-applying repellent, and/or applying insecticides to properties via barrier treatments. There remains a clear need to effectively communicate the risks of arboviral diseases and the benefits of personal protection measures.

Introduction

Exotic and native zoonoses continue to threaten human and animal health, changing the landscape of mosquito-borne disease in the U.S. over the last 20 years. There are frequent human outbreaks associated with exotic mosquito-borne pathogens such as the zoonotic West Nile virus (WNV), as well as intermittent focal outbreaks of anthroponotic chikungunya, dengue, and Zika viruses

(Rosenberg et al., 2018). Native mosquito-borne viruses—such as La Crosse virus and particularly Eastern equine encephalitis virus (EEEV), one of the deadliest mosquito-borne pathogens—continue to cause substantial human morbidity and mortality. EEEV and WNV can infect equines, causing significant mortality. Although these diseases are vaccine-preventable in equines, cases are regularly reported each year.

WNV (family Flaviviridae) was first isolated in 1937 in Uganda. There were sporadic and major outbreaks during the 1990s, mainly in the Mediterranean Basin and Europe (Fall et al., 2017). This virus emerged in the U.S. in 1999 and has since spread throughout the Americas (Grinev et al., 2017; Kramer et al., 2019). Subsequent studies have revealed that nonhuman hosts include horses, dogs, cats, chickens, and livestock (e.g., cattle); however, these animals, like humans, are “dead-end” hosts for WNV, as their viremias do not support secondary transmission (Bosco-Lauth & Bowen, 2019).

Culex spp. of mosquitoes are the primary enzootic and epizootic vectors of WNV. In late summer after key bird species (i.e., American robins) migrate, *Culex* spp. become more opportunistic in their blood feeding habits, feeding on mammals, including humans (Hamer et al., 2009). WNV (WNV) and WN neuroinvasive disease (WNND; encephalitis) cases, however, peak in humans and equines in late summer and early fall in some areas; this pattern could be due to amplification of WNV in *Cx. pipiens* populations in July and August (Hamer et al., 2009; Kilpatrick et al., 2006).

In the U.S., equines account for approximately 97% of reported cases of WNND in nonhuman mammals (American Association of Equine Practitioners, 2021; Centers

for Disease Control and Prevention [CDC], 2021b). Overt clinical manifestations of WNV infection in equines include weakness, ataxia, and muscle fasciculation. WNV infections, however, can also result in exclusively neurological symptoms, with approximately 10% of infected equines having neurological disorders (Bunning et al., 2002; Castillo-Olivares & Wood, 2004). Since 1999, there have been multiple WNF/WNND outbreaks in equines in the U.S. In 2002, there were approximately 15,000 laboratory-confirmed equine cases in the U.S. (CDC, 2002). In 2003, however, the U.S. Department of Agriculture reported WNF/WNND in approximately 4,000 equines from 41 states, with the lower rate that year attributed to widespread vaccination (Castillo-Olivares & Wood, 2004).

EEEV (family *Togaviridae*) also causes neuroinvasive disease in humans and equines. This virus is maintained in nature by a mosquito-bird enzootic transmission cycle in freshwater hardwood swamps that involves the mosquito *Culiseta melanura* Coquillett as the primary enzootic vector (CDC, 2021c; Soghigian et al., 2018). In the U.S., EEEV was first recognized in 1931 following the deaths of 75 equines after encephalitic illnesses, although reports of epidemics of equine deaths like EEE have been reported since the early 19th century (Giltner & Shahan, 1933; Kumar et al., 2018). EEEV is endemic in the U.S. and generally found east of the Mississippi River (Calisher, 1994; Heiberlein-Larson et al., 2019). In North Carolina, EEE was first reported in 1955 in veterinary cases (i.e., pheasants) (Alexander & Murray, 1958). Infection from EEEV can result in morbidity and high mortality rates in equines (80–90% mortality, long-term neurological sequelae in 66% of survivors) and humans (30–70% mortality, long-term neurological sequelae in 30% of survivors) (Goodman et al., 2015; Porter et al., 2017; Young et al., 2008).

Human EEE cases are rare in the U.S. (approximately 11 cases/year); however, veterinary infections are common, with equines averaging 169 cases/year between 2005 and 2019 (CDC, 2021c; U.S. Department of Agriculture, 2021). Unvaccinated equines are vulnerable to EEEV infection and are likely to die within a few days after symptoms begin. Clinical symptoms include muscle fasciculation, sleepiness, and a weak or staggering gait (Louisiana State University Agricultural Center, 2005).

While there are no commercially available vaccines to protect humans against WNV or EEEV infection, there are equine vaccines (Bosco-Lauth & Bowen, 2019). More than 300,000 equines live in North Carolina and this industry is valued at approximately \$2 billion/year (www.horsecouncil.org).

Overreliance on insecticides, resulting in the emergence of widespread insecticide resistance, has advanced the need for integrated mosquito management programs to control vector species (Rose, 2001). Integrated mosquito management programs should make control decisions based on evidence obtained from surveillance to protect public and veterinary health from diseases such as WNF, WNND, and EEE. In states such as North Carolina where funding may be limited for arboviral and mosquito surveillance, however, effective and timely communication between mosquito control programs, agriculture officials, and public/environmental health personnel can be lacking. One Health recognizes that humans, animals, and the environment are interconnected (CDC, 2020). Thus, using existing or systematic placement of animals as sentinels could help in predicting, controlling, and preventing human cases of WNF, WNND, and EEE.

In this study, we assess whether equine and human cases of these diseases are correlated in time. As equine vaccines are available and could affect the relationship between equine and human cases, we also measured knowledge, concern, and vaccination practices of North Carolina equine owners with respect to mosquito-borne diseases.

Methods

Data for EEE, WNF, and WNND for 2008–2018

We gathered data for EEE, WNF, and WNND in North Carolina for 2008–2018. Reports from the North Carolina Department of Health and Human Services (NC DHHS) were analyzed for veterinary (equine) and human (neuroinvasive only) cases. Deidentified county/city level data (including onset dates) were obtained. We obtained human surveillance data for EEE and WNND from the North Carolina Electronic Disease Surveillance System (NCEDSS) via a data use agreement (DUA) established between East Carolina University and the Division of

Public Health within NC DHHS (UMCIRB 18-001987). Human cases are reported using standard case definitions (<https://ndc.services.cdc.gov>). In North Carolina, only neuroinvasive human cases (WNND) attributed to WNV infection are reported, unlike some other states that also report non-neuroinvasive human cases (i.e., WNF). We also obtained veterinary data from NC DHHS but a DUA was not required. Veterinary cases in North Carolina do not follow the same case definitions as human cases (www.ncagr.gov/vet/vetdis.htm), as any veterinary case is reportable (not solely neuroinvasive cases).

We also analyzed the publicly available Centers for Disease Control and Prevention (CDC) ArboNET human and equine surveillance data and compared the human data to the NCEDSS databases to check reporting accuracy for WNND and EEE cases. Human and veterinary cases were deidentified to show onset dates and city/county information only.

Survey of Equine Farms

We developed an 18-question survey (UMCIRB 18-001987; see the Supplemental Appendix at www.neha.org/jeh/supplemental for the survey) in Qualtrics for distribution via email, Facebook, and/or postal mail to North Carolina equine farms. Equine farms in North Carolina are not required to register with the North Carolina Department of Agriculture and Consumer Services, thus we developed a contact list for North Carolina equine farms using internet searches and other publicly available databases (e.g., North Carolina Horse Council). We defined an equine farm as any operation with at least one equine and tracked the number of equines at each farm in the survey.

Respondents of surveys administered via email or other online delivery method entered their responses directly into Qualtrics. Investigators manually entered survey data received by postal mail into Qualtrics. Results were tabulated and displayed graphically to evaluate trends for specific survey questions of interest.

We offered each participant a \$10 gift card to encourage participation. There were 416 surveys deployed to equine farms in North Carolina (112 to the western region, 136 to the central region, and 168 to the eastern region) and 314 of these were delivered

successfully (i.e., not returned due to inaccurate contact information). Of the 416 total surveys, 260 surveys were sent via email. A total of 232 surveys were emailed successful, with 16 emails bounced back due to inactive email accounts and 12 emails delivered to multiple individuals from the same farm. An additional 94 surveys were sent via postal mail (12 were returned as undeliverable) and 62 surveys were sent via Facebook or other social media platforms.

Statistical Analyses

Statistical analyses were carried out using SAS with an $\alpha = .05$. Temporal trends in case incidence were visualized in bar charts between months (month of disease onset), years, and counties. Pearson correlation analyses were conducted to determine the extent to which equine and human cases were correlated in each year. Fisher’s exact tests were used to analyze gender differences between human cases of EEE and WNND.

Results

EEE, WNF, and WNND in North Carolina, 2008–2018

For 2008–2018, 26 North Carolina counties (3 from the western region, 10 from the central region, and 13 from the eastern region) experienced at least one human case attributed to infection with either EEEV or WNV, with WNND cases observed statewide and EEE more common in central and eastern regions (Figure 1). In North Carolina, only neuroinvasive cases are reported in humans; thus, case data obtained refer to WNND. Reported human cases of WNND ranged from 0–10 cases/year during 2008–2018 (10-year mean = 3.6 cases/year; Figure 2). In contrast, reported cases of WNF/WNND in equines were lower during 2008–2018 (10-year mean = 1.3 cases/year; Figure 2). While equine cases were reported between September and October, reported human WNND cases ranged from May–November. Humans and equines experienced an increase in cases of WNND and WNF/WNND, respectively, over the last 3 years of the study (i.e., 2016–2018). Most of the time, reported human cases of WNND occurred during the same year of reported equine cases of WNF/WNND, except for 2 years (i.e., 2011 and 2014) when no human WNND cases were reported.

FIGURE 1

Distribution of Human West Nile Neuroinvasive Disease (WNND) and Eastern Equine Encephalitis (EEE) in North Carolina, 2008–2018

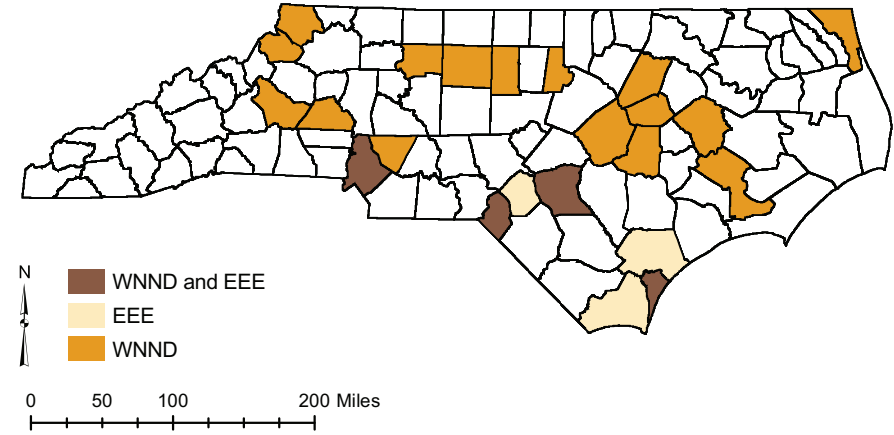
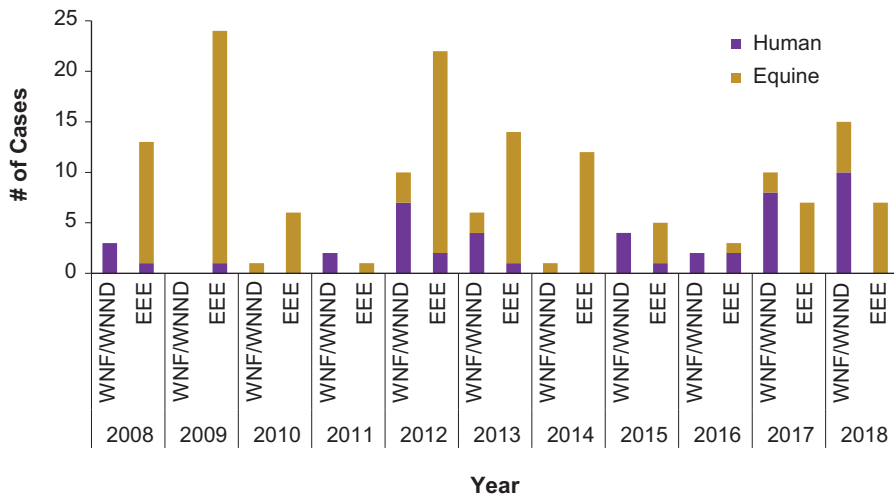


FIGURE 2

Eastern Equine Encephalitis and West Nile in North Carolina, 2008–2018



Note. EEE = Eastern equine encephalitis; WNF = West Nile fever; WNND = West Nile neuroinvasive disease. For humans, only WNND cases are reported. For equines, both WNND and WNF cases are reported.

Similar to WNF/WNND, both humans and equines had reported cases of EEE between 2008 and 2018 (Figure 2). The mean number of reported human EEE cases, however, was lower (10-year mean = 0.73 cases/year). Few demographic patterns were associated with human cases of WNND and EEE, although there was a significant gender difference in

human EEE cases (100% men, 0% women, $p = .014$). Equine EEE cases were significantly higher (10-year mean = 9.67 cases/year) than human cases. For 2008–2018, there was a significant correlation between equine and human EEE cases ($r = .30$, $p = .002$, 95% confidence interval [0.29, 0.31]). In general, years in which at least one human EEE case was

TABLE 1

Actions Taken by Survey Respondents to Protect Against Mosquitoes

Action	Respondents # (%)	95% CI
Removal of empty containers such as tires, flowerpots, and bird baths	62 (83)	[72.6, 89.6]
Cleaning gutters or removing leaves, pine needles, and other debris	55 (73)	[62.4, 82.1]
Use of drainage system for stormwater such as ditches	52 (69)	[58.2, 78.6]
Personal protection by wearing repellent	52 (69)	[58.2, 78.6]
Personal application of insecticides targeting mosquitoes	37 (49)	[38.3, 60.4]
Personal protection by wearing appropriate clothing	34 (45)	[34.6, 56.6]
Hiring professional mosquito control services to conduct pesticide treatments*	4 (5)	[2.1, 12.9]

Note. CI = confidence interval.
* For example, Pest Arrest, Mosquito Tek, and county mosquito control programs.

reported experienced at least 3 times as many equine EEE cases—with the exception of 2016, when there were more reported human cases of EEE than equine cases by 2:1 (Figure 2). See the Supplemental Figures (S1–S4) and Table (S1) Appendix at www.neha.org/jeh/supplemental for additional information.

Comparison of ArboNET and NCEDSS

CDC maintains a database (ArboNET) of arbovirus surveillance for human and veterinary cases, mosquitoes, dead birds, and other sentinel animals (wwwn.cdc.gov/arboNET/Maps/ADB_Diseases_Map/index.html). Analysis of human WNND data retrieved from NCEDSS and ArboNET showed a discrepancy in reporting for North Carolina in 2013 during the period of study—in 2013 NCEDSS reported WNND human cases in four counties (Nash, Wilson, Mecklenburg, Johnston) but ArboNET showed WNND human cases in three counties (Nash, Wilson, Mecklenburg). Nevertheless, data sets reported in the two surveillance systems were comparable.

Survey of Equine Farms

Surveys ($N = 84$, 26.7% response rate) were used to determine equine vaccination knowledge and use in North Carolina. We received 84 surveys, of which 9 respondents answered

only the consent question. Hence, we calculated an overall response rate of 24% (75 responses/314 successfully delivered surveys). Most respondents ($n = 48$, 64%) stated they had >15 equines, while others had 11–15 equines ($n = 14$, 19%), 5–10 equines ($n = 9$, 12%), or ≤ 4 equines ($n = 4$, 5%).

Awareness of equine vaccines for the prevention of WNF/WNND and EEE was reported by most respondents ($n = 73$, 97%). Most ($n = 72$, 96%) reported their equines had not experienced illness associated with WNF/WNND and EEE. For those indicating equine illness, two equines died due to EEEV infection and one equine contracted WNV and lived, but with long-term health issues. Most respondents vaccinated equines against WNV and EEEV each year via a veterinarian ($n = 50$, 67%) or by administering the vaccine on their own ($n = 20$, 27%). Some ($n = 5$, 7%), however, did not vaccinate their equines for the following reasons: too expensive, vaccine does not work, mosquito-borne diseases are not an issue, one equine previously had an adverse reaction to the vaccine.

Many indicated it was very important ($n = 39$, 52%) or important ($n = 30$, 40%) to protect equines from mosquitoes, whereas only 6 (8%) stated this protection was unimportant. Thus, respondents and equines were protected from mosquito bites using various means (Table 1).

Respondents were concerned about the health of equines related to mosquito-borne disease with most ($n = 39$, 52%) reporting in the agree or strongly agree category. Some were not concerned with equine health related to mosquito-borne disease, with 20 (27%) reporting in the disagree or strongly disagree categories. See the Supplemental Figures (S5–S8) Appendix at www.neha.org/jeh/supplemental for additional information.

Discussion

We found a correlation between the year-to-year numbers of human and equine cases of EEE during the period of study. Onset of EEE symptoms in humans typically occur within 4–10 days of a mosquito bite, while onset occurs within 5 days for equines (CDC, 2021c; Louisiana State Agricultural Center, 2005). A previous study identified use of clinical signs along with month of occurrence as indicators of prevalence of WNV infections (Leblond & Lecollinet, 2017; Saegerman et al., 2014). Hence, unvaccinated equines might be good sentinels for human EEE cases. A few weeks of warning lead time could elicit a mosquito-control response by public health and veterinary health agencies, possibly preventing or limiting human cases.

Case data in North Carolina for these diseases should be monitored and compared with national trends. It is possible that information from North Carolina could be used to help other jurisdictions or states that conduct similar analyses. A multiyear study on EEEV in New York, for example, showed four adjacent counties with similar patterns of transmission over time (Oliver et al., 2020). Communication with mosquito control programs (MCPs) and public health and veterinary health agencies should be facilitated for timely response to potential mosquito-borne disease threats.

In 2018, WNV was the most common cause of human neuroinvasive arboviral disease (92% of cases) in the U.S. (McDonald et al., 2019). The same study showed the number of U.S. WNND cases in 2018 was approximately 25% higher than annual cases reported from 2008–2017. Historical and real-time data can be used to help develop action thresholds applied in operational MCPs at the local level (Nasci & Mutebi, 2019); however, complex interactions of factors contributing to WNV and EEEV transmission and epidemiology can compli-

cate risk predictions. It has been suggested that Florida, which has year-round EEEV transmission, is a major source of EEE epizootics in the Northeastern U.S. (Heberlein-Larson et al., 2019). North Carolina and other states should take advantage of wide-scale monitoring of arboviral disease in other states, such as Florida, to improve its own risk predictions.

Adequate response in an early warning system requires organized and effective mosquito control infrastructure. There is, however, a general lack of funding for mosquito surveillance and control programs in many areas of the U.S., including North Carolina (Del Rosario et al., 2014; Vazquez-Prokopec et al., 2010) and this gap in resources could prevent the effective use of an early warning arboviral disease system in North Carolina. A survey by the National Association of County and City Health Officials (2017) assessed 1,906 MCPs in the U.S. and classified 84% of the programs as needing improvement. Lack of sustained funding for North Carolina MCPs remains a significant public health issue that should be addressed to protect public health (Del Rosario et al., 2014). Reactive rather than proactive approaches in mosquito control can be costly and usually occur after human and/or animal cases have happened (Nasci & Mutebi, 2019). Long-term surveillance systems should be instituted to monitor a) mosquito abundance and b) virus presence in mosquitoes and/or sentinel animals with an action plan implemented when threshold levels are reached (Nasci & Mutebi, 2019).

Another element to an early warning system can be arbovirus surveillance in mosquitoes. Due to the lack of sustained and structured funding for MCPs in North Carolina, however, only a few programs routinely submit mosquito samples for arbovirus testing to NC DHHS and there has not been a standard-

ized tracking method for reporting and using these data to inform operational control decisions. Therefore, these incomplete data are not included, and the tracking method should be improved for the future. Currently in North Carolina, no MCPs use sentinel chickens for arbovirus surveillance (e.g., WNV, EEEV), although many used them in the early 2000s.

We acknowledge limitations of this study, including the relatively low response rate, which potentially could be improved in future studies by increasing the number of surveys administered and providing additional incentives for completion of the surveys. Furthermore, as North Carolina reports only neuroinvasive human cases of WN, data for non-neuroinvasive human cases is under-reported and this issue could limit comparisons in areas where both WNF and WNND are jointly occurring. Data on mosquito pool testing for WNV and EEEV were not available and would have improved the study's spatiotemporal comparisons.

Conclusion

The survey of equine owners in North Carolina that we conducted demonstrates a lack of concern for mosquito exposure and arboviral disease for the equine owners personally. Equine vaccination rates reported were high (93%), thereby possibly reducing some concern for disease and likely decreasing the sensitivity of an equine-triggered early warning system. Further studies could conduct mosquito surveillance at equine farms across North Carolina to determine seasonality and abundance of mosquitoes likely to be involved in WNV and EEEV transmission.

Supplemental assessment of blood-fed mosquitoes could be utilized in determining blood-feeding hosts. In this study, equine EEE

cases were significantly higher than human cases and equine and human EEE cases were significantly correlated in 2008–2018. Our study findings indicate that, in years when human EEE cases were reported, there are at least 3 times as many equine EEE cases. We analyzed a span of 10 years in this study; however, analyses of additional years would also be beneficial to examine trends over time. Taken together, these tools can be used to underscore the importance of equine vaccinations.

In summary, we found: a) numbers of human and equine cases of EEE were correlated in most years of the study (2008–2018), but this correlation was not found for WNF/WNND; b) communication with MCPs and public health and veterinary health agencies should be facilitated for timely response to potential mosquito-borne disease threats; and c) most equine owner participants reported vaccinating equines against EEEV and WNV and were minimally concerned about their own health risks related to mosquitoes and associated diseases. 🐛

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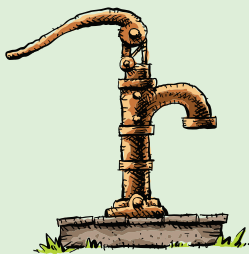
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Strengthening the Environmental Health Professional Pipeline From Education Into Practice

Editor's Note: In an effort to promote the growth of the environmental health profession and the academic programs that fuel that growth, the National Environmental Health Association has teamed up with the Association of Environmental Health Academic Programs (AEHAP) to publish two columns a year in the *Journal*. AEHAP's mission is to support environmental health education to ensure the optimal health of people and the environment. The organization works hand in hand with the National Environmental Health Science and Protection Accreditation Council (EHAC) to accredit, market, and promote EHAC-accredited environmental health degree programs.

This column provides AEHAP with the opportunity to share current trends within undergraduate and graduate environmental health programs, as well as efforts to further the environmental health field and its available resources and information.

Ben Ryan is the president of AEHAP and a clinical associate professor at Baylor University. Kim Hall is the past president of AEHAP and an associate professor at Western Carolina University.

Environmental health professionals (EHPs) stand on the front lines of routine public health efforts and responses to disasters and pandemics (Brooks & Ryan, 2021). These efforts and responses include managing risks related to drinking water, hazardous and general waste, sanitation, food safety, communicable diseases, vector issues, and mass gatherings (Ryan et al., 2020). These expansive areas of expertise were put to work during the COVID-19 pandemic with EHPs supporting and leading the development

of strategies to enable society to function in the safest possible manner. This work included mitigation of virus spread in public spaces, contact tracing, modification of shelter activities, food safety assessments and education, workplace training on COVID-19 risk factors, monitoring of safety measures in older adult facilities, guidance for the reopening of facilities, and waste management (Rodrigues et al., 2021). Such activities took priority during COVID-19 and were conducted instead of day-to-day functions—a trend that is increasing due to

the frequency of disaster response activities and a limited workforce (Rodrigues, et al. 2021).

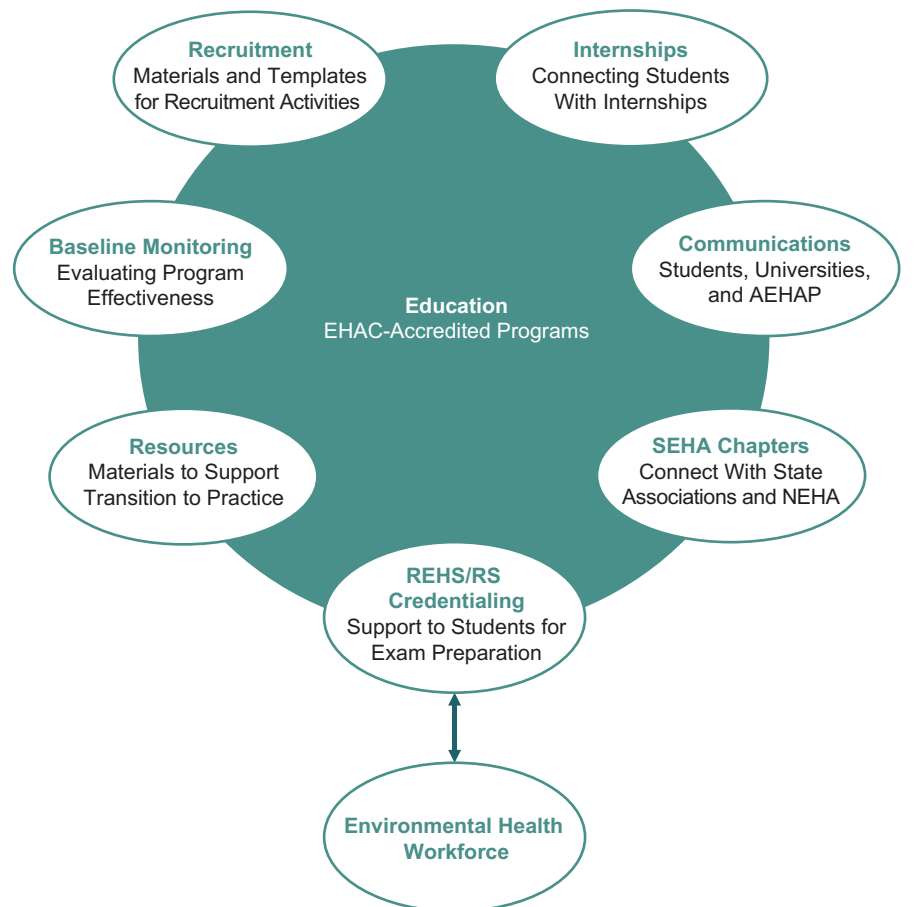
Strengthening the environmental health profession now and into the future will require a robust pipeline from education into practice. Without immediate action, there is an imminent EHP workforce shortage. For example, more than 67% of tribal, 64% of state, and 60% of local environmental health programs report insufficient staffing capacity for COVID-19 response, and industry workers have also reported high levels of burn-out (Environmental Health Workforce Act, 2021). This shortage is a significant concern and risk for the public because as a profession and practice, environmental health is one of the most significant contributors to state, tribal, local, and territorial public health (Gerding et al., 2019).

The Centers for Disease Control and Prevention recognized this risk, prior to the pandemic, when it launched the Understanding the Needs, Challenges, Opportunities, Vision, and Emerging Roles in Environmental Health (UNCOVER EH) initiative to better understand EHP needs and demands. This study engaged more than 1,700 professionals and found approximately one quarter (26%) of EHPs are expected to retire in the coming years and there are increasing difficulties in retaining and recruiting staff (Gerding et al., 2019).

To address this challenge, a “whole of environmental health sector” approach is required to strengthen the EHP pipeline from education into practice. This “all-hands-on-deck” approach requires:

FIGURE 1

Conceptual Framework for Strengthening the Environmental Health Professional Pipeline From Education Into Practice



Note. AEHAP = Association of Environmental Health Academic Programs; EHAC = National Environmental Health Science and Protection Accreditation Council; NEHA = National Environmental Health Association; REHS/RS = Registered Environmental Health Specialist/Registered Sanitarian; SEHA = Student Environmental Health Association.

- an increase in the number of environmental health undergraduate and graduate students,
- support to prepare recent graduates and current students of programs accredited by the National Environmental Health Science and Protection Accreditation Council (EHAC) to join the Registered Environmental Health Specialist/Registered Sanitarian (REHS/RS) ranks, and
- building sustainable partnerships between universities, government agencies, and the private sector.

Developing strategies across these areas would allow current and future EHP workforce needs to be strengthened, supported,

and prepared to fulfill the critical role of responding to public health threats.

The mechanisms to translate this strategy into practice exist within current environmental health organizational structures, which are designed to support EHAC-accredited degree programs. For example, the Association of Environmental Health Academic Programs (AEHAP) works to increase the environmental health workforce by promoting and supporting EHAC-accredited degree programs. EHAC was established in 1967 to accredit undergraduate and graduate programs in the field of environmental health and is identified as the benchmark qualifica-

tion for government and military sectors. AEHAP, EHAC, and the National Environmental Health Association (NEHA) working in synergy can allow the profession to capitalize on this opportunity and revitalize environmental health for current and future generations.

There are seven interconnected actions that AEHAP could use to strengthen the environmental health pipeline (Figure 1). Providing resources and guidance to students at EHAC-accredited degree programs is necessary to support their transition into environmental health practice. These resources would help students in their preparation for the REHS/RS credential exam and be complemented by cultivation of systematic connections between Student Environmental Health Association (SEHA) chapters and NEHA structures at the local, state, and regional levels. Recruitment materials and strategies could be developed to encourage students to join EHAC-accredited degree programs, possibly leveraging the SEHA chapters, with emphasis on diversity within academic programs and the environmental health professions.

These actions can facilitate recruitment of EHAC-accredited degree program students to an array of inclusive and equitable internship opportunities in the government sector that reflect growing student diversity. The effectiveness of this approach to strengthen the professional pipeline from education into practice would require establishment of a baseline to understand the extent to which EHAC-accredited degree programs are currently engaging in these actions and monitoring future progress.

The concept discussed provides a path forward towards a sustainable pipeline from education to practice. Strengthening this pathway is necessary, timely, and urgent. A once-in-a-generation opportunity exists to rebuild the profession starting at the foundation of EHPs—students of EHAC-accredited degree programs. It provides a mechanism to support students into practice to help ensure there are suitability qualified and credentialed EHPs, a vital step towards ensuring efficient and effective delivery of essential environmental health services to local communities. Now is the time to strengthen the EHP pipeline as we recover from the COVID-19 pandemic and move toward anticipating future environmental public health challenges. 🌱

Acknowledgement: We would like to thank the 2021–2022 AEHAP Board of Directors for their input and contribution toward developing a conceptual framework for strengthening the environmental health professional pipeline from education into practice.

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Did You Know? The application period is open for the 2022 National Environmental Public Health Internship Program (NEPHIP). NEPHIP exposes environmental health students to the important mission and work of public health departments. Applications for the summer session closes on March 9 for students. Applications for health departments will be ongoing. Learn more at www.neha.org/nephip.



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Protecting Retail Food Safety by Strengthening Partnerships and Collaboration

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 tools, resources, and guidance for environmental health practitioners. The conclusions in these columns are those of the author(s) and do not necessarily represent the official position of CDC.

Laura Brown leads the Safe Food Section of the Water, Food, and Environmental Health Services Branch at CDC. She conducts research through the Environmental Health Specialists Network (EHS-Net) to understand the environmental factors that lead to foodborne illness. Chris Smith is a branch director in the Division of Retail Food Protection with the Office of State Cooperative Programs within the Food and Drug Administration. Laura Wildey is a food safety senior program analyst with NEHA.

I lead the Safe Food Section of the Division of Environmental Health Science and Practice within the Centers for Disease Control and Prevention (CDC). A primary goal of the section is to support retail food safety by identifying and promoting best practices for environmental health professionals to ultimately reduce foodborne illness in retail food establishments. As the CDC advisor to the Retail Food Safety Regulatory Association Collaborative (Collaborative), I would like to tell you a little about the Collaborative and why we at CDC are excited to participate in this innovative and promising project.

The Collaborative is a group of organizations working together to reduce foodborne illness associated with retail food establishments. In 2018, representatives from the Food and Drug Administration (FDA) began talks with leadership from the Association of Food and Drug Officials, Conference for Food Protection, National Association of County and City Health Officials, and National Environmental Health Association to initiate a collaborative effort to reduce foodborne illness associated with the retail sector in the U.S. In 2019, these organizations identified strategies to reduce foodborne illness and brought

CDC on board (Figure 1). In 2020, under an FDA cooperative agreement, the Collaborative began to execute its strategic plan.

The Collaborative is working toward meeting six main objectives to improve retail food safety nationally:

1. Develop a national strategy for adoption of the latest edition of the FDA *Food Code*.
2. Promote risk-based inspection and intervention strategies.
3. Increase enrollment and active participation in FDA's Voluntary National Retail Food Regulatory Program Standards.
4. Improve foodborne illness outbreak investigations.
5. Improve food safety management systems at retail food facilities.
6. Enhance effective communications and sharing of best practices among retail food protection partners.

CDC supports the Collaborative as it has the right organizations and the right priorities. CDC recognizes the importance of the organizations in the Collaborative to retail food safety and has worked with them on food safety projects over the years. The members of these organizations are typically on the front lines of retail food safety, conducting retail establishment inspections, food safety training, and foodborne illness outbreak investigations, as well as developing food safety regulations and guidance. As such, they have the commitment, expertise, and experience to succeed, and are therefore best positioned to meaningfully improve retail food safety.

The key to the Collaborative is that these organizations are working together. Although these organizations often have similar food

FIGURE 1

List of Organizations Along With the Centers for Disease Control and Prevention That Comprise the Retail Food Safety Regulatory Association Collaborative



safety goals, there has never before been a concerted working effort to achieve these goals. The Collaborative allows each organization to leverage its expertise and resources to focus on priorities that will significantly improve retail food safety.

CDC also recognizes the importance of the Collaborative's priorities. The Collaborative supports the FDA (2021) New Era of Smarter Food Safety Blueprint. Success in meeting

these priorities will lead to improved food safety. CDC has engaged in several activities that support these priorities.

- For almost 25 years, CDC has supported national adoption of the FDA *Food Code*. In 1997, David Satcher, director of CDC, stated that the "Nation's frontline of defense against the growing, evolving threat of foodborne disease and illness is the uniform, nationwide application of

this food safety guidance and regulation based on the best-available science that is embodied in the 1997 *Food Code*" (Food and Drug Administration, 2015). CDC research has strengthened the evidence on the importance of the *Food Code* to food safety; Kambhampati et al. (2016) found that states that had adopted specific provisions of the *Food Code*, compared to states that had not, had lower foodborne illness outbreak rates.

- CDC has a long history of supporting foodborne outbreak investigations. CDC has funded surveillance and investigation activities in all 50 states and has produced reports of foodborne outbreak investigations conducted by local and state health departments since 1938 (Centers for Disease Control and Prevention [CDC], 2019). CDC understands the value of outbreak investigations. In the short-term, they can help stop the outbreak and prevent more people from getting sick; in the long-term, investigation data provide valuable insights into the agents and foods that cause illness. Recently, CDC has focused on collecting data on the environmental causes of outbreaks—the factors that contributed to the outbreak and the events that led up to the occurrence of those factors. These data are key to outbreak prevention. CDC has developed free, comprehensive training on this component of outbreak investigations (CDC, 2021).
- CDC research supports strong food safety management systems. CDC has conducted several studies on retail food safety best practices. CDC has found that components of a strong food safety management system—procedures, training, and monitoring—are linked with better food safety outcomes (Brown, 2021). For example, restaurants with cleaning procedures had norovirus outbreaks with fewer sick people when compared with restaurants that did not have cleaning procedures (Hoover et al., 2020). Restaurants with food safety trained and certified managers had fewer violations on their inspections compared with restaurants that did not have trained and certified managers (Cates et al., 2009). Furthermore, Schaffner et al. (2015) found that restaurants that monitored cooling food temperatures more often held cooling food at appropriate temperatures com-

TABLE 1

Food Safety Research From the Centers for Disease Control and Prevention

Restaurant Situation	Outcome	Source	Learn More
Cleaning procedures	Smaller norovirus outbreaks	Hoover et al., 2020	www.cdc.gov/nceh/ehs/nears/norovirus-outbreaks-restaurant-practices.html
Managers trained and certified in food safety	Fewer violations on their inspections	Cates et al., 2009	www.cdc.gov/nceh/ehs/ehsnet/plain_language/kitchen-manager-certification-and-food-safety.htm
Procedures for monitoring food during cooling	Food cooled at appropriate temperatures more often	Schaffner et al., 2015	www.cdc.gov/nceh/ehs/ehsnet/plain_language/food-cooling-improvements.html

pared with restaurants that did not monitor cooling food temperatures (Table 1).

CDC is excited to support the collective effort of the Collaborative. CDC's work has shown the value of the Collaborative's priorities in retail food safety and its focus on these priorities will significantly advance retail food safety in the U.S. For more information on the Collaborative, visit www.retailfood-safetycollaborative.org.

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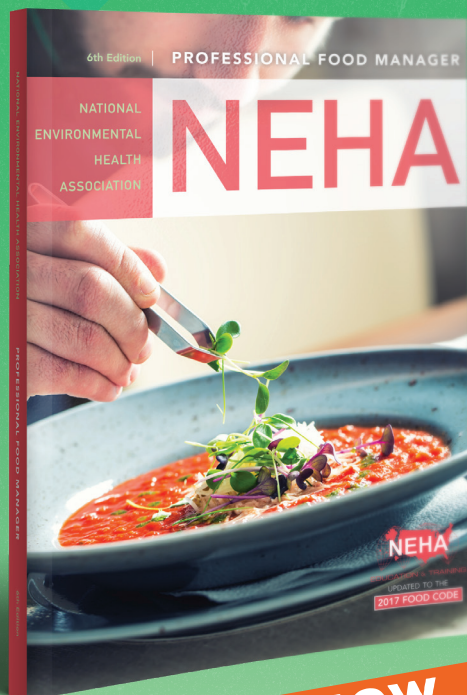


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Climate Change: Everyone, Every Day

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, we feature this column from ecoAmerica whose mission is to build public support and political resolve for climate solutions. NEHA is an official partner of ecoAmerica and works closely with their Climate for Health Program, a coalition of health leaders committed to caring for our climate to care for our health. The conclusions in this column are those of the author(s) and do not necessarily represent the official position of NEHA.

Rebecca Rehr is the director of ecoAmerica's Climate for Health Program and Robert Perkowitz is the founder and president of ecoAmerica.

If you follow the polls on climate change, you will discover something interesting: 74% of people in the U.S. are concerned about climate change, with 46% saying they are very concerned. When you ask them if others around them are concerned, however, only 23% say others around them are very concerned. That is one half the number of people who are actually very concerned about this issue (ecoAmerica, 2020). The gap in actual versus perceived climate concern contributes to inaction on the issue and points to the increasingly urgent need for visible climate leadership and engagement.

While 74% of respondents say they are concerned about climate change, 6% report that they hear people they know talking about climate change at least once per week and 13% say it is once a month. That leaves 81% who speak about it a few a times a year or less (Leiserowitz et al., 2021). Why, if so concerned about climate change, don't people talk about it?

Climate change can be a difficult subject. Not many of us can understand the science

behind our computers, our air transportation, or the weather, much less climate change. And climate change has become a politically polarized issue. No telling what will happen when you bring it up—you could be challenged from the right, from the left, or by a scientist. Rather than rise to that challenge, many of us keep our climate perspectives to ourselves.

Also, results from an American Psychological Association (2020) survey show that while 7 in 10 U.S. adults say they wish there were more they could do to combat climate change, 51% say they don't know where to start. If you don't know what to say or do about climate change, it can be challenging to engage with confidence on the issue.

The good news is we can answer the question, "What can I do?" with concrete and tangible solutions. We can each take action at home, in our communities, at our workplaces, and with policy makers. We need to visibly lead on this issue—the biggest challenge in environmental health—and spread climate solutions with everyone, every day.

As environmental health professionals, we all should have climate change as a priority, if not our very top priority. We can all be climate solutions champions. As a core component of the public health workforce, environmental health professionals also have a way to connect with people on climate solutions. We can effectively deliver the message on the climate–health nexus. We can cut through the noise caused by the very vocal antiscience contingent and the political polarization by connecting to people. Research conducted by ecoAmerica shows that protecting personal and public health is the top reason people in the U.S. (76%) select for supporting climate solutions. Health even led jobs, with 71% of respondents saying they would support climate solutions if they increased good paying jobs (ecoAmerica, 2021).

So, what can we do to bring people along to advance climate solutions in our spheres of influence? We can meet people where they are in their climate journeys to accelerate their actions. Let us suggest three steps:

- 1. Learn:** What do you need to know and need to do about climate change? The National Environmental Health Association and ecoAmerica provide simple 2-page guides on what you need to know and what you need to do to address climate change in your personal life, workplace, and community, as well as with policy makers (Climate for Health, 2021).
- 2. Live your values (visibly):** That doesn't mean walk everywhere, go vegan, and wear winter coats in your freezing cold home. It means do what you can to practically and steadily move toward a more sustainable lifestyle. When you insulate your home, get a new car, buy food, and run errands—think about it. Maybe set some guidelines and goals. There are many simple ways to

reduce your carbon pollution that make a lot of sense from a health, financial, and community perspective. The small steps add up. You might consider buying offsets or even eliminating your historical emissions by going positive and using offsets.

3. **Make it personal:** Climate change is about people—move from people to climate, not the other way around. Start from their perspectives and values, and the climate realities all around them, not from the science. Focus on solutions and benefits. We all can make a difference and save money and protect our families and communities at the same time. Tell them how you are making a difference and how they can as well.

When you engage with others on climate change in a positive, personal way it does more than just advance the issue in their minds. Acknowledging and addressing climate change empowers people in a way that helps them overcome uncertainty and anxiety. ecoAmerica and the American Psychological Association released the 2021 edition of *Mental Health and Our Changing Climate*, which outlines the myriad ways climate change impacts our individual and community mental health and well-being, including psychological barriers to action and climate attitudes that can spur action. As it turns out, getting started on solutions can combat any despair or uncertainty you might have been feeling about your inaction (Clayton et al., 2021).

“We knew the science and had solutions years ago, we need to bring people along.”

**Katharine Hayhoe,
Atmospheric Scientist,
Professor, and Author**

The next time you have the opportunity to start or join a climate conversation, jump in. You are not alone in your climate concerns. Sometimes just getting started is the hardest part. Get your climate conversation starter ready and help engage everyone, every day in ambitious climate solutions. 🐼

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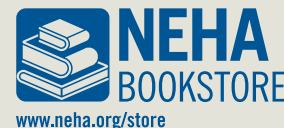
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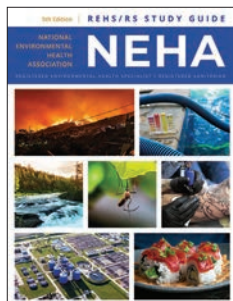
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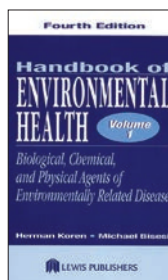
foodborne illness, HACCP plans and active managerial control, cleaning and sanitizing, conducting facility plan reviews, pest control, risk-based inspections, sampling food for laboratory analysis, food defense, responding to food emergencies and foodborne illness outbreaks, and legal aspects of food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

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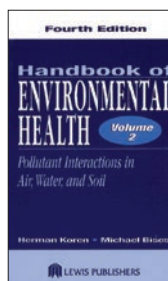
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Herman Koren and Michael Bisesi (2003)



A must for the reference library of anyone in the environmental health profession, this book focuses on factors that are generally associated with the outdoor environment. It was written by experts in the field and copublished with NEHA. A variety of environmental issues are covered such as toxic air pollutants and air quality control; risk assessment; solid and hazardous waste

problems and controls; safe drinking water problems and standards; onsite and public sewage problems and control; plumbing hazards; air, water, and solid waste programs; technology transfer; GIS and mapping; bioterrorism and security; disaster emergency health programs; ocean dumping; and much more. Study reference for NEHA's Registered Environmental Health Specialist/Registered Sanitarian credential exam.

876 pages / Hardback

Member: \$215 / Nonmember: \$245

JEH QUIZ

FEATURED ARTICLE QUIZ #5

Horse Owner Practices and Equine and Human Arboviral Encephalitis in North Carolina

Available to those with an active National Environmental Health Association (NEHA) membership, the *JEH* Quiz is offered six times per calendar year and is an easily accessible way to earn continuing education (CE) contact hours toward maintaining a NEHA credential. Each quiz is worth 1.0 CE.

Completing quizzes is now based on the honor system and should be self-reported by the credential holder. Quizzes published only during your current credential cycle are eligible for CE credit. Please keep a copy of each completed quiz for your records. CE credit will post to your account within three business days.

Paper or electronic quiz submissions will no longer be collected by NEHA staff.

INSTRUCTIONS TO SELF-REPORT A *JEH* QUIZ FOR CE CREDIT

1. Read the featured article and select the correct answer to each *JEH* Quiz question.
2. Log in to your MyNEHA account at <https://neha.users.membersuite.com/home>.
3. Click on Credentials located at the top of the page.
4. Select Report CEs from the drop-down menu.
5. Enter the date you finished the quiz in the Date Attended field.
6. Enter 1.0 in the Length of Course in Hours field.
7. In the Description field, enter the activity as "*JEH* Quiz #, Month Year" (e.g., *JEH* Quiz 5, March 2022).
8. Click the Create button.

JEH Quiz #3 Answers December 2021

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

→ Quiz effective date: March 1, 2022 | Quiz deadline: June 1, 2022

1. West Nile virus (WNV) emerged in the U.S. in
 - a. 1937.
 - b. 1967.
 - c. 1989.
 - d. 1999.
2. Studies have revealed that nonhuman hosts for WNV include
 - a. horses.
 - b. dogs and cats.
 - c. chickens and livestock.
 - d. all the above.
 - e. none of the above.
3. In the U.S., equines account for approximately ___ of reported cases of West Nile neuroinvasive disease (WNND) in nonhuman mammalians.
 - a. 96%
 - b. 97%
 - c. 98%
 - d. 99%
4. Human Eastern equine encephalitis (EEE) cases are ___ in the U.S.
 - a. common
 - b. uncommon
 - c. rare
5. For 2008–2018, ___ North Carolina counties experienced at least one human case attributed to infection with either EEE virus or WNV, with WNND cases observed statewide and EEE more common in central and eastern regions.
 - a. 26
 - b. 46
 - c. 66
 - d. 86
6. In general, years in which at least one human EEE case was reported experienced at least ___ times as many equine EEE cases.
 - a. 2
 - b. 3
 - c. 4
 - d. 5
7. Of the 416 surveys deployed to equine farms in North Carolina, a total of ___ surveys were returned.
 - a. 75
 - b. 84
 - c. 95
 - d. 104
8. Awareness of equine vaccines for the prevention of West Nile fever/WNND and EEE was reported by ___ of survey respondents.
 - a. 67%
 - b. 73%
 - c. 83%
 - d. 97%
9. The following reasons were mentioned by survey respondents for not vaccinating their equines:
 - a. vaccine does not work.
 - b. mosquito-borne diseases are not an issue.
 - c. vaccine is too expensive.
 - d. both a and b
 - e. all the above.
10. Of the survey respondents, ___ indicated that it was very important to protect equines from mosquitoes.
 - a. 40%
 - b. 42%
 - c. 50%
 - d. 52%
11. Onset of EEE symptoms in humans typically occur within ___ days of a mosquito bite, while onset occurs within ___ days for equines.
 - a. 4–10; 5
 - b. 4–10; 6
 - c. 5–10; 5
 - d. 5–10; 6
12. In 2018, WNV was the most common cause of human neuroinvasive arboviral disease in the U.S. with ___ of the cases.
 - a. 82%
 - b. 87%
 - c. 92%
 - d. 97%

2022 Walter F. Snyder Award

Call for Nominations Nomination deadline is May 14, 2022

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 (NEHA).

Nominations for the 2022 *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.
 - Leadership in securing action on behalf of environmental and public health goals.

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

2021: Kevin Smith	2011: Gary P. Noonan	2000: Friedrich K. Kaerferstein	1990: Harvey F. Collins	1980: Ray B. Watts
2020: Joseph Cotruvo	2010: James Balsamo, Jr.	1999: Khalil H. Mancy	1989: Boyd T. Marsh	1979: John G. Todd
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2016: Steve Tackitt	2006: Arthur L. Banks	1995: Leonard F. Rice	1985: William G. Walter	1974: James J. Jump
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2012: Harry E. Grenawitzke	2001: Robert W. Powitz	1991: Trenton G. Davis	1981: Charles H. Gillham	

The 2022 Walter F. Snyder Award will be presented during the NEHA 2022 Annual Educational Conference & Exhibition being held in Spokane, Washington, June 28–July 1, 2022.



For more information or to download a nomination form, please visit www.nsf.org or www.neha.org or contact Stan Hazan at NSF International 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 will be presented by AAS during the National Environmental Health Association (NEHA) 2022 Annual Educational Conference & Exhibition. The award consists of an individual plaque and a perpetual plaque that is displayed in the NEHA office.

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, 2022.

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

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.



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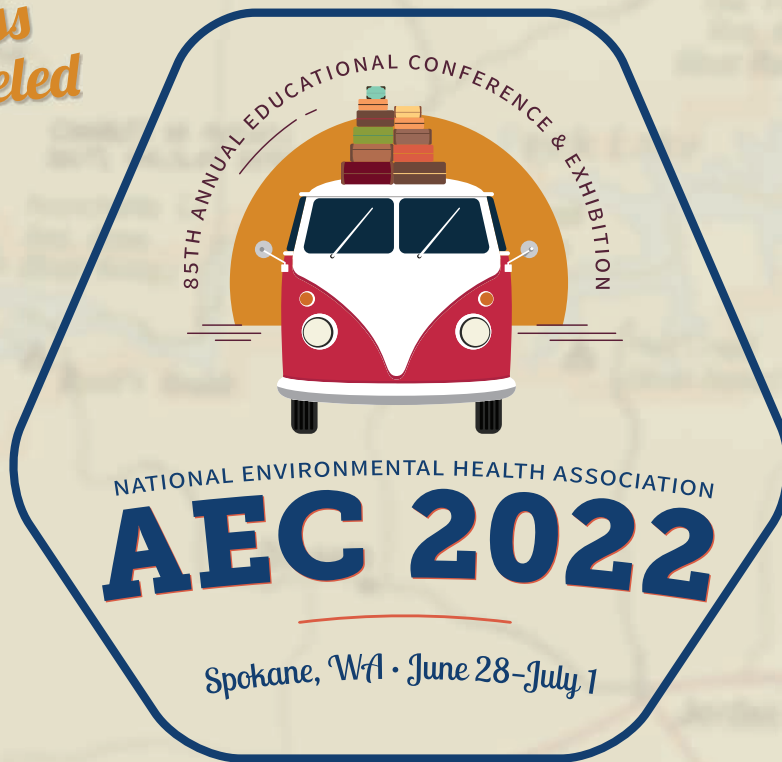
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NEHA SECOND VICE-PRESIDENTIAL CANDIDATE PROFILES

The National Environmental Health Association (NEHA) is governed by a corporate board of directors who oversee the affairs of the association. The board is made up of two groups: national officers and regional vice-presidents. NEHA elects its national officers through a ballot that goes to all active and life members prior to the annual conference. Among other things, the ballot features the election for the position of NEHA second vice-president. The person elected to this position begins a 5-year commitment to NEHA that involves advancing each year to a different national office, eventually to become NEHA's president.

Election policy specifies that candidate profiles for the second vice-president be limited to 800 words in total length. If a candidate's profile exceeds that limit, the policy requires that the profile is terminated at the last sentence before the 800-word limit is exceeded. In addition, the submitted profiles have not been grammatically edited, but presented as submitted and within the 800-word limitation. This year, NEHA presents two candidates for the office of second vice-president. The candidates are listed alphabetically.



Michele DiMaggio, REHS

Michele R. DiMaggio has a Bachelor of Science in Biological Science with a concentration in Entomology. She began her career in 1995 as a Seasonal Agricultural Biologist with the California Department of Agriculture; then became employed with Contra Costa Mosquito and Vector Control District as a Vector Control Technician. In 2001, she began her

Environmental Health journey as an Environmental Health Specialist (EHS) with Contra Costa County, Health Services Department, Environmental Health Services in California. As an EHS, Michele taught Food Safety Certification for Manager Courses for 6 years and joined the California Department of Public Health's Environmental Health Training in Emergency Response (EHTER) as a Subject Matter Expert and an instructor. Starting in August 2013, she took on the responsibility as a Supervising Environmental Health Specialist for the division's Retail Food program. She is a member of the Contra Costa Health Services Department's Emergency Management and Foodborne Illness Outbreak Investigation Teams. In response to the COVID-19 pandemic, Michele is currently deployed as a Disaster Service Worker as a Locations Investigator Manager in the Public Health Case and Contact Tracing Branch. She has the obligation of overseeing the unit responsible for outreach, guidance, and data input for hospitals, detention facilities, day care, preschools, law enforcement, emergency responders, food facilities, gyms, and most workplaces in Contra Costa County experiencing COVID-19 cases and close contacts.

Additionally, Michele is a National Environmental Health Association (NEHA) Region 2 Vice-President and Food Safety Subject Matter Expert. As a NEHA representative, Michele is a member of Centers for Disease Control and Prevention's Board of Scientific Counselors, Food Safety Modernization Act (FSMA) Surveillance Working Group. She has had the privilege and joy to be a NEHA/CDC Instructor and Mentor for the U.S. Virgin Islands and Puerto Rico Hurricane Supplemental Projects and currently a NEHA Environmental Health Leadership Academy Mentor. She also participates on the Partnership for Food Protection (PFP) Training & Credentialing and Surveillance, Response, and Post-Response Workgroups. Additionally, she is a U.S. Food and Drug Administration's (FDA), Office of Training, Education and Development Food Safety Subject Matter Expert and Temporary Food Estab-

lishments Course Trainer. She has served as a Food Safety Matter Expert for the collaborative U.S. FDA Integrated Food Safety System (IFSS) National Curriculum Standard (NCS) Framework since 2015. Locally, Michele serves as a member of the California Retail Food Safety Coalition.



Larry Ramdin, MPH, MA, REHS/RS, CP-FS, HHS, CHO

My name is Larry Ramdin and I am a candidate for NEHA second vice-president and I am asking for your vote and support of my candidacy.

I began my environmental health career over 40 years ago in Trinidad and Tobago, starting as a field operator in an *Aedes aegypti* control program. I attended the

Barbados Community College where I completed a 2-year Certificate in Public Health Inspection and graduated at the top of my class. I also earned a Diploma in the Inspection of Meat and Other Foods from the Barbados Community College. I attended Northeastern University, Boston MA and earned a BS in Health Sciences, Magna Cum Laude and a Master of Public Health. I also have an MA-Public Administration, Framingham State College. I am a NEHA Registered Environmental Health Specialist/Registered Sanitarian (REHS/RS), Certified Practitioner-Food Safety (CP-FS), Healthy Housing Specialist (HHS) and a Massachusetts Certified Health Officer (CHO).

I was elected to the NEHA Board of Directors (BOD) in 2016 as the Region 9 Vice-President and I have served on all Board committees except the Nominations Committee and I am currently Chair of the Credentialing Committee. As a Board member, I have vociferously advocated for the marketing of environmental health as a profession as many are unaware of what environmental health professional does and the value we bring to the Public Health arena. I was able to secure NEHA e-mails and contributed to the development of an onboarding process for new Board members.

NEHA is doing a great job at serving the membership and is blessed with a knowledgeable and competent staff led by our outstanding Executive Director, Dr. David Dyjack. Our team is doing a largely unrecognized job in serving the profession and our members.

However, there will always be areas in which our activities can be enhanced to create greater value for our members and the profession at large. I pledge to work tirelessly to advocate for the following if elected second vice-president:

NEHA SECOND VICE-PRESIDENTIAL CANDIDATE PROFILES

- I chose Environmental Health because this profession has the greatest impact on human lives and activities. We are the boots on the ground but are hardly recognized for the work we do. We can do a better job at marketing the profession. The majority of our practice is at the local level so we can develop tools for our affiliates and local partners to effectively advocate for the profession while increasing visibility for the profession. We are at a watershed moment in Public Health and must seize the opportunities
- I sincerely believe that information is useless unless it is shared. We can and should create some platform for the exchange of ideas and knowledge across the profession. We deal with many issues across the practice and many times someone else has encountered similar challenges and can share that knowledge. A place where a practitioner in Oregon can seek advice on an EH issue and get advice from practitioners across the country or globe. Because despite geography EH issues and solutions are universal.
- I believe that a mentoring program for our emerging members and students is key to the advancement of our profession. We are blessed with a wealth of knowledge in the profession from the seasoned practitioners, our Academics, and members who have achieved the singular practice honor of being elected to the American Academy of Sanitarians. We can utilize some medium to develop such a mentoring program.

- EH as a profession is made up of both private and public sector members including our service members. We can enhance our inter-sector collaboration, so we increase our knowledge of each other's perspectives while furthering the cause of EH.

I was recognized for my contributions to the profession with several awards. I was most recently recognized for my contributions on the BOD with a NEHA Presidential Citation. I have served as President of the Massachusetts Environmental Health Association and was awarded the Dr. Joseph S. Goldfarb Award for significant contribution during their professional career in the field of environmental health in the Commonwealth of Massachusetts. The Robert Perriello award (Massachusetts Sanitarian of the Year) that acknowledges professional achievements made by Sanitarians in the field of Environmental Health and the Leon Bradley Award that recognizes significant contributions to the Environmental Health field in New England.

I, like you love this profession, we did not choose it because of financial gain or personal recognition but because we can make a difference in the lives of our communities.

I chose to run for second vice-president because I believe my experience and knowledge will serve the profession and NEHA as an organization well and I ask for your support and your vote.



ENVIRONMENTAL HEALTH

It's a tough job.

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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



NEHA REGIONAL VICE-PRESIDENTIAL CANDIDATE PROFILES

The National Environmental Health Association (NEHA) is governed by a corporate board of directors who oversee the affairs of the association. The board is made up of two groups: national officers and regional vice-presidents (RVPs). NEHA has nine different regions. See page 42 for a listing of the regions and the states/groups each region represents. RVPs are elected by NEHA active and life members in their respective regions. RVPs serve 3-year terms.

Election policy specifies that candidate profiles for RVPs be limited to 400 words in total length. If a candidate's profile exceeds that limit, the policy requires that the profile is terminated at the last sentence before the 400-word limit is exceeded. In addition, the submitted profiles have not been grammatically edited, but presented as submitted and within the 400-word limitation. Three regions are up for election this year—Region 4, Region 6, and Region 9. The candidates for Regions 4 and 6 are listed alphabetically by region; there were no candidates received for Region 9.



Region 4

Kim Carlton, MPH, REHS

Kim Carlton has served as the NEHA Region 4 Vice-President since 2018. Kim oversees a team at the Minnesota Department of Health (MDH) who provide training, program evaluation, outreach opportunities and resources, technical expertise, and outbreak coordination to state and local environmental health programs statewide. Before joining MDH, she worked for local public health agencies for 14 years. Her varied work experience has created opportunities to build strong relationships with environmental health professionals throughout the country.

The last two years have profoundly changed the landscape of environmental health. We are challenged to balance COVID-19 priorities with “routine” environmental health duties, and there is an imperative need to ensure diversity, inclusion, and representation in our workforce and outreach. Kim is honored to work with the talented, motivated, forward-thinking group of environmental health professionals on the NEHA board, and she would be honored to be reelected as Region 4 Vice-President.

The last two years have profoundly changed the landscape of environmental health. We are challenged to balance COVID-19 priorities with “routine” environmental health duties, and there is an imperative need to ensure diversity, inclusion, and representation in our workforce and outreach. Kim is honored to work with the talented, motivated, forward-thinking group of environmental health professionals on the NEHA board, and she would be honored to be reelected as Region 4 Vice-President.



Region 6

Nichole Lemin, MEP, RS/REHS

Niki Lemin joined Franklin County Public Health, in Columbus, Ohio, as Assistant Health Commissioner and Environmental Health Director in 2013. Prior to that, Niki served in several state and local capacities. Niki currently serves on the National Environmental Health Association (NEHA) Board of Directors as

Regional Vice-President for Region 6 and is Cochair of the International Code Council/NEHA Pandemic Task Force. Niki earned her Master of Science degree in Environmental, Health and Safety Management from The University of Findlay and Bachelor of Science degree in Environmental Studies from Ohio Northern University. She is a Registered Environmental Health Specialist with the State of Ohio and National Environmental Health Association, and a Master Exercise Practitioner. 🐾

Did You Know?

The Environmental Health Tracking Podcast Series features four different environmental health departments and their tracking programs. Each podcast shares the history, challenges, and successes of the program and goals for the future. Topics include how the health department increased their tracking data content and awareness, how tracking data is used to address health inequities, evaluation strategies of the program, and different examples of data visualization. Listen to the podcasts at www.neha.org/trackingpodcastseries.

The podcasts feature the following environmental health tracking programs and staff:

- Deyonne Sandoval from the New Mexico Department of Health,
- Brittany Saltsman Bell from the Kentucky Department for Public Health,
- Jill Maras from Michigan Environmental Public Health, and
- Matthew Montesano from the New York City Department of Mental Health and Hygiene.

2022

ACCEPTING NOMINATIONS NOW

Walter S. Mangold Award

The Walter S. Mangold Award recognizes an individual for extraordinary achievement in environmental health. Since 1956, this award acknowledges the brightest and best in the profession. NEHA is currently accepting nominations for this award by an affiliate in good standing or by any five NEHA members, regardless of their affiliation.

The Mangold is NEHA's most prestigious award and while it recognizes an individual, it also honors an entire profession for its skill, knowledge, and commitment to public health.

**Nomination deadline is
March 15, 2022.**



For application instructions, visit www.neha.org/mangold-award.



2022 Joe Beck Educational Contribution Award

This award was established to recognize NEHA members, teams, or organizations for an outstanding educational contribution within the field of environmental health.

Named in honor of the late Professor Joe Beck, this award provides a pathway for the sharing of creative methods and tools to educate one another and the public about environmental health principles and practices. Don't miss this opportunity to submit a nomination to highlight the great work of your colleagues!

Nomination deadline is March 15, 2022.

To access the online application, visit www.neha.org/beck-award.



NEHA NEWS

The NEHA Office Has Moved!

By Kristen Ruby-Cisneros (kruby@neha.org)

The National Environmental Health Association (NEHA) is excited to announce the new location of the Denver office! We have moved from our suite of offices on the 10th floor to a new suite on the 1st floor of the same building.

Prior to the COVID-19 pandemic, the Denver NEHA staff were working in the office 4–5 days a week, with most staff having individual offices. With the growth of the association and in anticipation of the upcoming lease ending on December 31, 2021, NEHA leadership started to explore office space needs. After surveying the staff and assessing needs, it appeared that NEHA would need to find a space larger than the 12,000 ft² it was currently using. Then the COVID-19 pandemic hit.

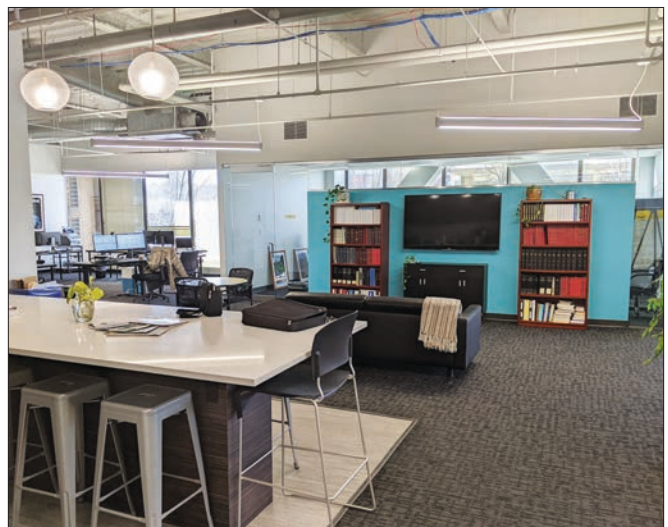
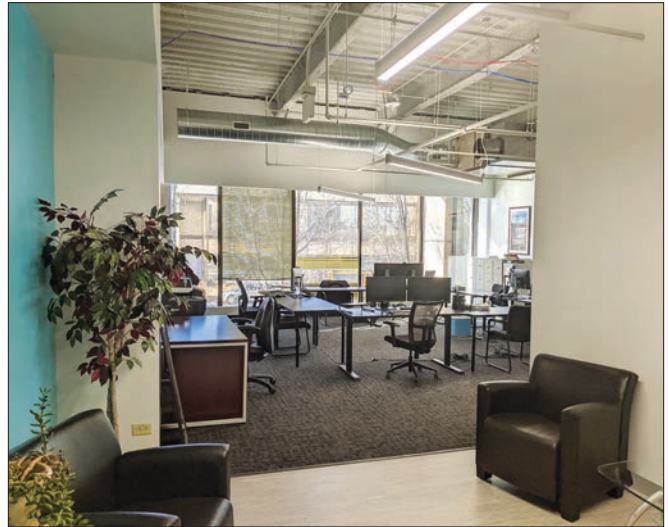
Starting on March 16, 2020, NEHA staff have been working remotely almost exclusively. Prior to the pandemic, NEHA had been updating its office technology capabilities, such as moving to cloud-based applications and providing staff with laptop computers. As a result, staff had the tools necessary to transition to remote work with little disruption to the day-to-day operations of the association. It was apparent to NEHA leadership that the model of individual offices and working exclusively in an office were outdated and NEHA needed to transition to a more flexible and sustainable office environment.

The new office space is approximately 6,000 ft² and offers an open floor plan conducive to collaboration and flexibility. Numerous workstations are available throughout the office for staff to use, as well as individual offices to reserve for work and meetings. The space also has a large conference room, central gathering area, kitchenette, and storage room. Extra storage space was secured in the basement to house historical documents and the *Journal of Environmental Health* archive. As seen in the photos taken in early January (courtesy of Kristen Ruby-Cisneros), we are still in the process of organizing and setting up our new space.

The first permanent office for the association was established in Los Angeles, California, in 1941. As the association grew it became clear that the national office needed to be centrally located. The decision to move to Denver was approved at the 20th annual conference held in Chicago, Illinois, in July 1956. The first Denver office was established on the University of Denver campus in 1957. The association moved into the current office building on Colorado Boulevard in late 1984, with offices first on the 9th floor of the South Tower and then moving to the 10th floor of the North Tower in July 2006. The official opening of the new office space on the 1st floor occurred on January 1, 2022.

The new NEHA address is: 720 South Colorado Boulevard, Suite 105A, Denver, Colorado, 80246-1910. NEHA phone numbers and email addresses have not changed (see pages 42–43 for a listing of staff emails and www.neha.org/staff for full contact information).

We look forward to working toward our mission to build, sustain, and empower an effective environmental health workforce in our new space.



NEHA Requests Input on Body Art Model Code

NEHA announced it will be updating its model code for body art and is requesting review and comment from the environmental health and body art communities. The NEHA Body Art Model Code serves as a resource for local and state organizations to update their own body art codes to protect public health.

The perception of body art has changed from extreme to generally accepted. A 2019 U.S. poll (www.ipsos.com/en-us/news-polls/more-americans-have-tattoos-today) illustrates this change, finding that about 30% of people living in the country have at least one tattoo, compared to 21% in 2012. Further, the poll found that 40% of people 18–34 years old and 35% of people 35–54 years old have at least one tattoo. Many individuals report having more than one tattoo. Body piercing has also grown in popularity. It is estimated that approximately 61% of adults in the U.S. have had a body piercing.

While most body art can be performed safely, it does carry risks, including the spread of bloodborne pathogens, skin infections, serious infections like methicillin-resistant *Staphylococcus aureus*, allergic reactions, keloids, nerve damage, and bleeding. The transmission of bloodborne pathogens, including hepatitis B, hepatitis C, and HIV, can occur when dirty needles are reused or when proper cleanup techniques are not used. Body art codes set standards for mitigating these risks to individuals and communities.

The NEHA Body Art Model Code includes guidance on:

- professional standards;
- specific considerations for piercing, branding, and scarification;
- jewelry standards;
- public health notification;
- recordkeeping;
- informed consent;
- disinfection and sterilization;
- biomedical waste;
- licensing requirements;
- inspection; and
- enforcement.

“Our goal is to provide the best, most useful guidance possible so that environmental health professionals at the local level can focus on the real work of partnering with body art facilities to keep communities safe and healthy,” said David Dyjack, DrPH, CIH, NEHA executive director.

NEHA first introduced the Body Art Model Code in 1998, updated it in 2019, and created a supporting Annex in 2021. NEHA has also published a policy statement on body art (www.neha.org/body-art-policy-statements). NEHA advocates for national, state, and local policies, regulations, research, and resources that will enhance the ability of environmental health professionals to ensure the practice of safe body art procedures to better protect public health.

Anyone who would like to recommend changes to the current NEHA Body Art Model Code should go to www.neha.org/BAMC Change by **June 30, 2022**, to submit their comments. Comments are requested on both grammar and content.

National Environmental Public Health Internship Program

The National Environmental Public Health Internship Program (NEPHIP) is a 10-week internship opportunity that links environmental health undergraduate and graduate students from universities accredited by the National Environmental Health Science and Protection Accreditation Council (EHAC) with qualified public health departments. NEHA has partnered with the Water, Food, and Environmental Health Services Branch of the Centers for Disease Control and Prevention (CDC) for the past 7 years to support state, tribal, local, and territorial (STLT) public health department internships for environmental health students through NEPHIP. NEPHIP aims to encourage environmental health students to consider careers at STLT environmental public health departments following graduation.

In 2022, NEHA is launching a revised and expanded NEPHIP. The expanded program will offer a variety of additional features:

- Opportunity to enroll in summer (2022), fall (2022), and spring (2023) internships (accepting up to 50 interns).
- Diversity and inclusion within the environmental health workforce. (Please note that NEHA measures diversity across many variables including being a first-generation college student, age, ethnicity, race, socioeconomic status, gender, neurodiversity, disability, language, religion, sexual orientation, geographical area, etc.).
- Participation in a series of professional career mentorship sessions with environmental health professionals in STLT departments.
- Opportunity to attend the first ever NEPHIP virtual career fair.
- Networking and engagement opportunities for interns at the NEHA Annual Educational Conference & Exhibition, including a professional development preconference workshop.
- Sustained support and promotion for internship work through publications and media.
- Improved coordination and evaluation efforts.
- Focus on projects that explore climate and health, sustainability, health inequities, and environmental justice issues.
- Support packages for participating environmental public health departments to help offset costs for hosting interns.

Through the expanded NEPHIP, students will be exposed to exciting career opportunities as well as the benefits and challenges of working with environmental public health agencies throughout the nation. The program connects highly qualified environmental health students at undergraduate and graduate levels with influential STLT public health departments with the purpose of:

- Exposing environmental health students to the important purpose and work of STLT public health departments.

NEHA NEWS

- Presenting students with career and mentorship opportunities at public health departments.
- Providing STLT public health departments with a qualified intern, at no cost, who is eager to gain field experience and contribute to the work of the department.
- Increasing awareness of EHAC-accredited programs and the value of working with and hiring their students and graduates. NEHA administers NEPHIP and is supported by cooperative agreement CDC-RFA-OT18-1802.

The application period for students and health departments opened on January 27 and will close on March 9 for summer session applications. Student applications will be accepted on a rolling basis if positions are open and available past the deadline. The application portal will be ongoing for interested health departments.

To learn more and submit an application, visit www.neha.org/nephip.

2022 InFORM Conference



The Integrated Foodborne Outbreak Response and Management (InFORM) Conference brings together the network of

public health officials involved with foodborne and enteric disease outbreak response, including federal, state, and local public health and environmental health specialists, epidemiologists, health communicators, and laboratory scientists. Held every 2 years, the conference consists of a keynote speaker, plenary and discipline-specific sessions, and poster presentations.

The 2022 InFORM Conference will be held virtually on April 26–29. Invited participants include public health colleagues from local, state, tribal, or federal agencies and departments involved in enteric disease surveillance and outbreak response. This invitation includes but is not limited to:

- Environmental health specialists involved in enteric disease outbreak investigations.
- Epidemiologists who investigate local or multistate enteric disease outbreaks.
- Health communicators involved in enteric disease outbreaks, prevention, and food safety education.
- Laboratory scientists who are a part of PulseNet or who are interested in learning more about PulseNet.

Several awards will be presented at the 2022 InFORM conference, including the Kati Kelley Award for Exceptional Service to PulseNet, Bill Keene Award for Excellence in Epidemiology, John J. Guzewich Environmental Public Health Team Award, and The People's Protector Communication Award.

Online preregistration is required. Early bird registration ends April 1. Registration scholarships are available. Scholarship applications must be submitted no later than March 14 to be considered. To register and learn more, visit www.neha.org/inform.

NEHA Adopts Positions on Key Environmental Health Concerns

NEHA has researched and carefully crafted a series of new policy statements in response to concerns from environmental health professionals and industry. The statements include topics on body art, food safety, vector control, well water testing, mosquito control, the role of environmental health in preparedness, and a uniform and integrated food safety system.

“One of our responsibilities is to raise the voice of the environmental health profession on issues our members and leadership have identified as concerns,” said David Dyjack, DrPH, CIH, NEHA executive director. “Our team of subject matter experts is able to conduct the research on best practices on behalf of local, state, territorial, and tribal areas and provide recommendations about how to protect public health.”

Each statement has been vetted by NEHA and adopted by the NEHA Board of Directors as official statements of the association. The policy statements are shared with local, state, and federal policy makers, including both the executive and legislative branches and relevant environmental and public health boards. NEHA policy statements remain active for 3 years.

The new policy statements include:

Body art: The current landscape of body art legislation is fragmented with inconsistent safety standards and professional requirements, as well as a lack of enforcement mechanisms. NEHA recommendations include robust legislation requiring that body artists are licensed and work in licensed facilities, that facilities have met licensing thresholds, and that there is an enforcement mechanism in place.

Food safety: The current capacity for tracking and surveilling foodborne disease outbreaks is fragmented and not sufficiently standardized across agencies and organizations that protect public health. Additionally, the lack of traceability and transparency in the supply chain has made tracking outbreaks more difficult and time consuming, resulting in more illnesses, deaths, and money lost. Recommendations include improved technology for tracking and intervention, education, credentialing, and training food safety regulators.

Vector control: Deficiencies in funding, research, and surveillance—paired with increased contact between humans, animals, and the environment—make preventing vectorborne diseases a challenge that the U.S. is not currently equipped to handle. NEHA recommendations include incorporating the vector management framework outlined by CDC, the American Mosquito Control Association, and World Health Organization, while also integrating a One Health approach.

Well water quality testing: More than 15% of the population relies on a private well as their primary source of drinking water, for which there are no federal water quality requirements. Most states do not regulate private well water quality. NEHA recommendations include

implementing local or state legislation requiring and regulating private well water quality testing and collecting and sharing information about identified contaminants in the area with the community.

Mosquito control: Increasing urbanization, changing land use patterns, and expanding international travel and trade bring humans and animals into more frequent contact with mosquitoes, while climate and other environmental changes also fuel their spread. There is insufficient sustained and organized funding for mosquito control programs, which has led to nationally inconsistent and socioeconomically biased programs. As such, NEHA recommends incorporating the vector management framework outlined by CDC, the American Mosquito Control Association, and World Health Organization, as well as the foundation of a national public health framework for the prevention and control of vector-borne diseases in humans as outlined by CDC.

Uniform and integrated food safety system adoption: It is estimated that approximately 48 million people in the U.S. become sick from a domestically acquired foodborne illness annually. Of these people, 128,000 are hospitalized and 3,000 die. The economic impact of foodborne illness has been estimated at \$152 billion annually for direct medical care and loss of quality of life. NEHA recommendations include adoption of the most up-to-date Food and Drug Administration model *Food Code*, consistent reporting of data, using an integrated food safety system, and training food service personnel.

Role of environmental health in preparedness: Environmental health professionals play a critically important role in public health preparedness, response, and recovery to mitigate injury and illness during and after emergencies and disasters. NEHA recommendations include integrating environmental health into public health emergency preparedness and providing practical function and skills-based training for environmental health professionals.

All current NEHA policy and position statements, as well as past statements, are available at www.neha.org/policy-position-statements.

NEHA Celebrates Public Health Thank You Day



November 22 was Public Health Thank You Day. In partnership with NEHA, Representative Robert Wittman (VI-R) submitted a concurrent resolution to Congress recognizing the profound contribution that environmental and public health professionals have made in

response to the COVID-19 pandemic and make every day to the health, safety, and economic security of the country during Public Health Thank You Day.

“One of the many lessons highlighted throughout the COVID-19 pandemic is that our nation’s strength and resilience relies heavily on our dedicated public health and environmental health professionals. With 26 years of experience working in the Virginia Department of Health before coming to Congress, I recognize and appreciate that research and practice are vital to the security, economic development, and well-being of people throughout our nation. Recognizing these dedicated individuals through this Resolution on Public Health Thank You Day 2021 is the least we can do to honor the service and sacrifice our public health professionals play in keeping our communities safe, healthy, and prosperous,” said Representative Wittman.

The resolution states that environmental and public health professionals should be “applauded, extolled, and thanked on Public Health Thank You Day for their deeply important contributions to the Nation.”

The work of environmental and public health professionals has been vital to successfully reducing and abating many of the health threats our communities face, from measles and foodborne illnesses to hazardous waste, lead poisoning, and bioterrorism agents.

“Environmental health professionals are modestly compensated, unseen, and unrecognized by most,” said David Dyjack, DrPH, CIH, NEHA executive director. “Yet they remain dedicated to protecting our communities and have even taken on expanded duties under stressful conditions during the pandemic.”

Learn more about this resolution and celebration at www.neha.org/node/62329.

NEHA Giving Tuesday Campaign Success

By Alexis Nally (atnally@neha.org)



A very special thank you to those individuals who gave to our Giving Tuesday campaign on November 30, 2021, to support the NEHA/American Academy of Sanitarians (AAS) Scholarship Program. Throughout this unprecedented time, you have chosen to stick by our side. On behalf of the NEHA board and staff, we thank you for your commitment, it has meant so much to us all.

Thank you immensely to the 50 of our advocates who contributed to raising 85% of our goal. Contributions to the NEHA/AAS Scholarship Program make a long-lasting impact on deserving students in need and inspires them to persist as they prepare to join you in the environmental health workforce. It is for these students that we continue to come together. Whether you donated, shared our social media posts, or even ran your own fundraiser on our behalf, you were instrumental in helping make our campaign a triumph. We are humbled by your generosity and excited for the future we can give dedicated students pursuing environmental health programs.

NEHA NEWS

For those who gave a tribute gift on behalf of someone from your community, please know that their legacy will be honored through the work we do to fulfill our mission to build, sustain, and empower an effective environmental health workforce.

Thank you to our Giving Tuesday supporters:

Rance Baker, in memory of Brian Hess
 Gina Bare, in memory of Brian Hess
 Marcy Barnett
 Jesse Bliss, in memory of Dr. Samuel Soret
 D.G. Brown, in memory of Dr. Carolyn H. Harvey
 Thomas J. Butts
 Kimberley Carlton
 Renee Clark
 Brian K. Collins, in memory of George Nakamura
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 Alan M. Croft
 Kristie Denbrock
 Michele R. DiMaggio, in memory of George Nakamura
 Gery M. DuParc
 David T. Dyjack, in memory of George Nakamura
 Soni Fink
 Cynthia Goldstein
 Karen Hoffman Bender
 Donna M. Houston
 Nola Kennedy
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 Liz Otero
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 Welford Roberts
 Kristen Ruby-Cisneros

Peter H. Sansone
 Lynn Schneider
 Christopher J. Smith
 Chintan Somaiya, in memory of Dr. Samuel J. Soret
 James Speckhart
 Jordan Strahle
 Denise K. Takehara
 Christl Tate
 Ned Therien
 Gail P. Vail
 Tom A. Vyles
 Lisa Whitlock
 Webster Young, Jr.
 Margaret Zarriello

Read more about our Giving Tuesday campaign at www.neha.org/giving-tuesday.

Thank You for Supporting NEHA

By Alexis Nally (atnally@neha.org)

On behalf of the NEHA board, staff, and program participants, we thank you for your commitment in supporting us throughout 2021. From over 300 donors, many of them being recurring donors and a surprising number of major donors, we have accomplished another year of ample investments to our funds—the NEHA/AAS Scholarship Program, NEHA Endowment Fund, and NEHA General Fund. These avenues exist so that you, our supporters, can give back to your professional association, helping us to advance the environmental health profession.

Thank you for your patience as we adjusted our work environments, took time for our health, and found steady ground while navigating the uncharted territory of COVID-19 and its different variants. Our commitment to you is that we will continue to remain steadfast in our mission to build, sustain, and empower an effective environmental health workforce.

Through the support we have received in years past, we are proactively planning opportunities for our supporters that will ignite a sense of community, teamwork, and promise. It is our time to lend a greater hand in healing our communities and we hope you will join us in the year ahead. Learn more about how to donate to NEHA at www.neha.org/donate.

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, learning, community, and influence. Learn more at www.neha.org/join.

Preconference Offerings at the NEHA 2022 Annual Educational Conference & Exhibition



The NEHA 2022 Annual Educational Conference (AEC) & Exhibition—to be held on June 28–July 1 in Spokane, Washington—will include a full preconference schedule offering attendees the opportunity to take a credential review course or attend a workshop or training on a variety of environmental health topics.

More details and registration information about the preconference offerings can be found at www.neha.org/aec/preconference.

Certified Professional–Food Safety (CP-FS) Credential Review Course (June 26–27)

This 2-day refresher course is designed to enhance your preparation for the NEHA CP-FS credential exam. The course will cover exam content areas as described in the CP-FS Candidate Information Brochure. The instructor will be available during and after the course for questions. The CP-FS exam will not be offered during the review course and an additional application and fee to take the exam must be completed separately online. *Cost: \$449 for NEHA members and \$549 for nonmembers. Registration includes the CP-FS Study Package (CP-FS manual and flash cards).*

Registered Environmental Health Specialist/Registered Sanitarian (REHS/RS) Credential Review Course (June 26–28)

This 2.5-day refresher course is designed to enhance your preparation for the NEHA REHS/RS credential exam. The course will cover exam content areas as described in the REHS/RS Candidate Information Brochure. The REHS/RS exam will not be offered during the review course and an additional application and fee to take the exam must be completed separately online. *Cost: \$549 for NEHA members and \$649 for nonmembers. Registration includes the REHS/RS Study Guide (5th edition).*

Affiliate Leadership Workshop (June 28)

NEHA affiliate leaders are invited to collaborate, learn, and network at this half-day workshop. The goal of the workshop is to provide affiliates with tips and resources for running successful associations. *Cost: Free, preregistration is required.*

NEHA and ATSDR Environmental Health and Land Reuse (EHLR) Certificate Program (June 27–28)

This training course, developed and hosted by NEHA and the Agency for Toxic Substances and Disease Registry (ATSDR), aims to build capacity among environmental health professionals and within communities to help remediate and redevelop brownfield sites. The training explores 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. Course participants will receive an EHLR Certificate upon completion of all five modules of the program. *Cost: \$25 for NEHA members and \$50 for nonmembers.*

NEHA and FDA National Retail Food Regulatory Program Standards Self-Assessment and Verification Audit Workshop (June 26–28)

This workshop is designed to provide participants with an overview of the National Retail Food Regulatory Program Standards criteria and an in-depth understanding of the self-assessment and verification audit processes, worksheets, and forms. Participants should be program managers or those directly responsible for conducting program self-assessments and preparing for verification audits. *Cost: \$140 for all registrants.*

NEHA and Climate for Health Ambassador Training (June 28)

NEHA has again partnered with ecoAmerica's Climate for Health to offer this training to build the capacity of environmental health professionals to make a difference in their local climate and health conversation. The training will equip environmental health professionals with knowledge, hands-on experience, and resources to speak and act confidently on climate change and solutions. *Cost: Free, preregistration is required.*

NEHA and NOWRA Taking Septic Systems to the Next Level (June 28)

NEHA has partnered with the National Onsite Wastewater Recycling Association (NOWRA) to offer this 1-day training. Over the last 20 years, the challenges and solutions related to septic systems have both been on the rise. This course, taught by national academic experts, will discuss key pollutant treatment of nutrients and contaminants of emerging concern, challenging soil and site conditions and related solutions, and management programs for long-term sustainability. *Cost: \$125 for NEHA members and \$175 for nonmembers.*

Private Water Network Workshop: Environmental Health Professional's Guide to Positively Influencing Domestic Well Water Testing Behavior (June 28)

This workshop is designed for environmental health professional working with private drinking water systems. It will feature a combination of presentations and facilitated roundtable discussions on effective resources and innovative approaches to positively influence the well water testing behavior in private well owners. *Cost: Free, preregistration is required.*

The 11 Principles of Leadership (June 28)

The 11 Principles of Leadership is a motivational, inspirational, and educational seminar about leadership and foundational concepts on being the best we can be. It will provide attendees with valuable tools they can use every day to apply or provide purpose, motivation, and direction to daily activities and long-term goals. *Cost: Free for NEHA members and \$100 for nonmembers, preregistration is required.*

Using a Health in All Policy Approach to Addressing Childhood Lead Poisoning (June 28)

This workshop will share the tools and resources developed in collaboration with key stakeholders to address lead in homes. It will include jurisdictions that have used these tools and will share their successes and lessons learned. *Cost: Free, preregistration is required.* 🐾

NOMINATIONS OPEN!

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, 2022.

To access the online application, visit www.neha.org/walker-diversity-award.




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NEHA.ORG/REHS-STUDY-REFERENCES



DiracTalk

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to form, environmental health considerations were absent in the notice of funding opportunity. Opioids, check. Health education, check. Environmental health, absent. Same as it ever was.

I'm struck by the current pandemic and reference to its novelty. Novel coronavirus. Exactly 300 years ago as I type these words there was a smallpox outbreak in Boston, Massachusetts. As the New England community struggled to contain the outbreak, you won't be surprised to learn that there were criticisms of the efforts to protect and promote public health. The drill is eerily familiar. *Quarantine will hurt the economy. Government should not impede on individual freedoms. There was politically motivated suspicion seeded around inoculation efforts.* Sound familiar? Nothing has changed in 300 years. If you doubt me, please conduct your own research.

This time is our moment in history to probe for a new way forward. A way that frames infrastructure as environmental health. A way that frames investments in the public health workforce inclusive of environmental health. A way that frames pandemic management inclusive of the centrality of environmental health. Rest assured, your staff at the National Environmental Health Association are working on this challenge.

I leave you with one final observation. When consuming the news, we are collectively assaulted by national experts reporting



Tybee Island Light Station. Photo courtesy of David Dyjack.



Spanish moss. Photo courtesy of Angela Dyjack.

and tendering recommendations on COVID-19. So, I googled the academic qualifications of these influential experts. Do you know how many of these committed professionals have degrees in public or environmental health? Not one. Discretion dictates that I don't call them out by name.

The Route 301 Governor Harry W. Nice Memorial/Senator Thomas "Mac" Middleton Bridge unites Virginia with Maryland. It is a two-lane monstrosity that will be replaced with a new span sometime next year. An overdue transportation renaissance. The 1

a.m. drive over the old span steals my breath away. I exhale with relief as I enter Charles County, Maryland, and inhale the seasonal pine-infused vapors released by my neighborhood's coniferous forest. Arriving home exhausted, the hinges squeal as I unlock the deadbolt on my front door. I drink deeply from the days experience, inebriated by the vision and courage of the Tybee waders. 🐢

Dave

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► DirecTalk



David Dyjack, DrPH, CIH

Tybee

I breathe out. Trees breathe in. Life is tethered to this relationship. I ponder this unspoken arrangement while motoring on I-80 east of Savannah, Georgia, at day-break, a time of day that delivers an ethereal setting for Spanish moss cloaked Southern Live Oaks, *Quercus virginiana*.

My ambitions today reflect an absurd sense of possibilities as I aim to dine al fresco on Thanksgiving leftovers while ensconced on the island beaches of Tybee, Georgia, and Kiawah, South Carolina. Travel mercies will be necessary if I hope to arrive at the terminus of this adventure safely—home tonight in Maryland. I chuckle at the prospect of me qualifying, in some perverse sense, as a modern-day midnight Rambler.

The incongruence of Tybee leaves me breathless. It is at once a charming, coastal barrier island replete with eye candy in the way of the iconic light house. Then a seedier, disturbing past knocks on the door. The 10th Street Savannah Beach played host to the Tybee Island Wade-Ins, a 1960s Jim Crow-era effort by Black residents who defied local norms by wading into the surf of what had historically been an all-White beach. A group of Black youths, literally students, imbued with beryllium-like strength and courage. A story worth unearthing.

The pluck and mettle of the Tybee waders seduce me into a deep state of reflection as I hit the road to Kiawah. The highways are in various states of disrepair, aggravated by holiday traffic and what seems at first glance to be largely road widening projects. Infrastruc-

The incongruence of Tybee leaves me breathless.

ture. President Joe Biden signed the \$1.2 trillion infrastructure bill earlier in November, and it seems our profession has once again been relegated to the periphery of the conversation. Nonetheless, our interests are central to much of the investment, which possesses a backstory worth sharing.

I release an exasperated sigh as I take in the emerging saga of the infrastructure bill. Exhibit A is the Red Hill Bulk Fuel Storage Facility near Honolulu, Hawaii, a city I know well from my time of collaboration with the Hawaii Environmental Health Association. The Hawaii Department of Health recently ordered the U.S. Navy to take immediate action to clean the drinking water at Joint Base Pearl Harbor–Hickam after the World War II-era petroleum storage facility was determined to be leaking into the Red Hill aquifer. Reportedly more than 700 people have been forced from their homes while the environmental health issue is resolved.

While leaking petroleum storage facilities represent classic point sources of groundwater contamination, Lowndes County in Alabama illustrates a nonpoint source infrastructure challenge. County residents largely rely

on septic systems, many of which are failing. Reports of sewage backing up into homes on days with heavy precipitation are legendary. It's not just unsightly and disgusting, it's a health hazard. A 2017 study found hookworms, commonly associated with poverty and unsanitary conditions, to be prevalent among the local population.

Then there is Benton Harbor, Michigan, a predominantly Black community with lead service lines. Old and failing infrastructure have subjected community members to the risk of lead exposure. Regrettably the drill is all too common. The state's governor and the U.S. Environmental Protection Agency have intervened.

These stories are derived from the papers to which I have a subscription. Many of us conjure up the vision of roads, bridges, ports, and rails when infrastructure is discussed. My impression is admittedly distorted; skewed toward the pulse of modern life—eating, drinking, recreating, and breathing. Our stuff.

It doesn't end there. I received an electronic message a few weeks ago from the Centers for Disease Control and Prevention. It seems they received a \$400 million appropriation from Congress to invest in future public health leaders. They were soliciting people like me to review Public Health AmeriCorps grant applications. The program's noble aim is to supplement the existing public health workforce while priming the pump for individuals who potentially aspire to a career in public health. I readily agreed to be a reviewer. True

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WATER TESTING NEEDS?

WATER QUALITY

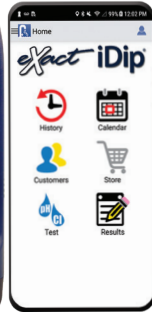
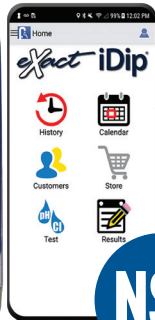
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