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Volume 76, No. 5 December 2013

CAUSE EFFECT

WORKFORCE SHORTAGES AND THE IMPLICATIONS FOR PUBLIC HEALTH

WORKFORCE **DECREASE**

Louisiana Environmental Health Department reduced its budget by

25%

FDA RECOMMENDS

1 EMPLOYEE → 280–320 ESTABLISHMENTS

LOUISIANA

1 EMPLOYEE → 396 ESTABLISHMENTS

LOUISIANA SANITARIANS ARE EXPECTED TO PERFORM ***25%*** *MORE INSPECTIONS THAN RECOMMENDED*

Average length of time between routine inspections

2005 3.5 MONTHS →

DURATION OF **TIME** BETWEEN INSPECTIONS

→ 2009 12 MONTHS

Of the inspection records eligible for study,

46%

RESULTED IN CRITICAL VIOLATIONS

As the average days between inspections increased, the proportion of inspections resulting in critical violations also increased.

↓ WORKFORCE

↑ CRITICAL VIOLATIONS

INCREASE IN CRITICAL VIOLATIONS

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QUESTIONS?

HOW CAN I TELL IF A PRODUCT HAS BEEN EVALUATED FOR SANITATION?

WHAT IS THE PROCESS FOR FIELD EVALUATION OF EQUIPMENT?

WHY DO WATER SAMPLES HAVE SUCH A SHORT SHIPPING WINDOW?

WHEN DO THE NEW FEDERAL LEAD LAW REQUIREMENTS TAKE EFFECT?

WHO CAN I CONTACT FOR ONLINE FOOD SAFETY COURSES?

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ABOUT THE COVER

The authors of this month's cover feature, "State Health Agency Workforce Shortages and Implications for Public Health: A Case Study of Restaurant Inspections in Louisiana," investigated the effects of budget cuts on food safety inspections and the occurrence of critical violations. As our cover points out, food safety professionals in East Baton Rouge Parish are now performing 25% more inspections than before the budget cuts, the length of time between inspections has nearly quadrupled, and that increase in time between inspections has led to a significant increase in critical violations.

See page 32.

Infographic by Cognition Studio.

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Erratum

The author listing order for "Physical Conditions of a House and Their Effects on Measured Radon Levels: Data From Hillsborough Township, New Jersey, 2010–2011," published in the *Journal of Environmental Health*, *76*(3), 18–24, is incorrect. Michael Carr, MPH, REHS, Hillsborough Health Department, should be listed as the first author.

Official Publication

NATIONAL ENVIRONMENTAL HEALTH ASSOCIATION

Journal of Environmental Health
(ISSN 0022-0892)

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Published monthly (except bimonthly in January/February and July/August) by the National Environmental Health Association, 720 S. Colorado Blvd., Suite 1000-N, Denver, CO 80246-1926. Phone: (303) 756-9090; Fax: (303) 691-9490; Internet: www.neha.org. E-mail: kruby@neha.org. Volume 76, Number 5. Subscription rates in U.S.: $135 per year and $250 for two years. International subscription rates: $160 per year and $300 for two years (airmail postage included). Single copies: $12, if available. Reprint and advertising rates available at www.neha.org/JEH/. CPM Sales Agreement Number 40045946.

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

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

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

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

Printed on recycled paper.

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PRESIDENT'S MESSAGE

Alicia Enriquez Collins, REHS

Vape Me Out to the Ball Game!

When someone asks you about trends in environmental health, what comes to mind? Sustainability? Genetically modified foods? Herd sharing? Fracking? Nutritional labeling? Gourmet food trucks? Plastic bag bans? Medical marijuana or edible marijuana products? Nanotechnology? In my recent columns, I have highlighted emerging trends and how they are impacting our field of practice. One of the more recent developments I believe requires our attention is the popularity of electronic cigarettes or e-cigarettes. In this column, I would like to share personal experiences that have prompted my interest as well as concern over the potential public health impacts of this technology. I believe that environmental health has a responsibility and potentially a role in safeguarding the public from the potential threats posed by these devices. I plan to convene an e-cigarette work group to study the issue and to invite a panel of experts to our 2014 Annual Educational Conference (AEC) & Exhibition to share information with participants.

E-cigarettes

The e-cigarette is a nicotine delivery device that was patented in 2003 by Chinese pharmacist Hon Lik. First distributed in China, the technology has rapidly made its way around the world. A multitude of designs are available, including those that mimic traditional cigarettes and those that come in other sizes, shapes, and colors. Their basic design includes a battery-operated heating element and a cartridge with an atomizer. The cartridge holds the liquid (sometimes called e-liquid or smoke juice) that contains varying levels of nicotine. While this alternative to the conventional tobacco cigarette is gaining popularity, a few countries have banned e-cigarettes due to health concerns or lack of information.

> *It is important that we take a proactive role to both understand the health implications of this emerging technology and to shape policy.*

My husband and I attended a concert at the Georgia Dome, where we were a bit surprised by the clouds of white smoke eminent throughout the dome. It took us a few seconds to realize this was not smoke, but vapor clouds from e-cigarettes. After that we attended a baseball game with friends at Turner Stadium in Atlanta. Our friends, who are distinguished environmental and public health professionals, noticed an unusual odor and vapor coming from the row in front of us. They quickly realized that someone was discreetly using an e-cigarette and exhaling vapor, also known as "vaping." Our friends found this quite bothersome as the vapor was, at one point, blowing directly onto their faces. As environmental health professionals, we all questioned the unknown potential exposure to nicotine or other chemicals resulting from the vaping. The situation resulted in a difficult discussion with the party in front of us. The individual with the device immediately agreed to put it away. He proceeded to inform us, however, that 1) what we were witnessing was simply water vapor, 2) the device contained no chemicals or harmful ingredients as indicated by the label, and 3) the devices were not outlawed. Later that evening, we had an interesting discussion on the need for education about these devices, the level of misinformation, and their associated glamour. *Since one is not inhaling tobacco smoke or exposing others to secondhand tobacco smoke, the risks are perceived to have been eliminated.* But, is this the case?

E-cigarettes are also being marketed on television, in the movie industry, through the Internet, and in pop culture as a safer alternative to conventional tobacco smoking. For example, e-cigarettes are now advertised in the youth-oriented motor sports, years after tobacco ads were effectively banned. After the success of the antismoking campaigns of recent years, are we now encouraging our younger generations to begin a habit that could lead to nicotine addiction?

Because we became increasingly curious and concerned, my husband and I visited a local tobacco store where the store's owner was kind enough to provide us with an introductory lesson that included a brief overview of recommended brands, starter kits, price, design, mechanisms, life span of the different e-cigarettes, e-hookahs, flavors, liquid nicotine and the varied concentrations available, sizes and shapes, e-cigars, activation through inhaling or by an on/off switch, etc. Even as a nonsmoker, I found the myriad of devices and the related choices alluring. I don't believe we know enough, however, about the short- and long-term health effects to the users and the secondhand effects to declare they are a safe alternative to tobacco smoking.

Regulation

Through the authority of the Family Smoking Prevention and Control Act of 2009 (also known as the Tobacco Control Act), the Food and Drug Administration's (FDA's) Center for Tobacco Products currently oversees the regulation of cigarettes, cigarette and roll-your-own tobacco, and smokeless tobacco. E-cigarettes or any device with claims for therapeutic purposes are covered under the FDA's Center for Drug Evaluation and Research. If an e-cigarette manufacturer does not make a claim regarding a therapeutic purpose, such as smoking cessation, the product falls outside of any current federal regulation. We should soon see a proposed rule from the FDA that would extend their authority and definition of tobacco products.

E-cigarettes have been in existence for nearly 10 years. I believe we have a role as environmental health practitioners to ask questions and investigate these devices as they have made their way into mainstream society. The manufacturers and distributors are telling consumers that the vapor is only water vapor. Do we know this for certain? The chemical composition for the e-liquid used in the numerous cartridges and manufacturers is varied. Research is underway to identify the chemicals in exhaled vapor, but some reported ones include nicotine, propylene glycol, diethylene glycol, formaldehyde, and metals.

Expert Advice

In the span of just a few weeks, we encountered e-cigarettes in use at two public events, one indoor and the other outdoor. Currently, minimal restrictions exist in the U.S. on the purchase and use of these devices, yet there are unanswered questions about their safety. As environmental health professionals, I would like to see NEHA members at the table during discussions with policy makers. With assistance from NEHA's Technical Advisors, I will be inviting experts from around the country to hold a panel discussion and educational forum at our 2014 AEC. It is important that we take a proactive role to both understand the health implications of this emerging technology and to shape policy. We have the responsibility to explore the potential adverse impacts to public health from e-cigarettes, especially in light of the effect they may have on our youth.

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Lead, Allergen, and Pesticide Levels in Licensed Child Care Centers in the United States

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U.S. Environmental Protection Agency

Abstract **The First National Environmental Health Survey of Child Care Centers was conducted to provide information about lead, allergen, and pesticide levels in licensed U.S. child care centers. Lead levels were measured in settled dust, paint, and play area soil; indoor allergen levels were measured in settled dust; and pesticide residues were measured on indoor surfaces and in play area soil. Fourteen percent of centers had significant lead hazards, suggesting that an estimated 470,000 children under age six (approximately 10% of all children in licensed centers) attend centers with significant lead hazards. Approximately 5% of centers had levels of allergens associated with asthma and allergic conditions. Three-quarters of centers had pesticides applied (either indoors or outdoors) during the previous year. Although most centers did not appear to present risks from lead and allergens, some centers did have unsafe levels of these contaminants. These conclusions cannot be generalized to unlicensed child care arrangements.**

Introduction

The Consumer Product Safety Commission (CPSC) estimates that 13 million children are placed in nonparental child care during some portion of the day (CPSC, 1999). Often children spend a full work day (8–10 hours) in child care. As a result, a significant portion of a child's potential exposure to hazardous contaminants may occur at a child care location. Three types of contaminants present in child care centers have received particular attention in recent years: lead, allergens, and pesticides.

Lead is a toxin that damages the developing nervous system of young children and fetuses (President's Task Force on Environmental Health Risks and Safety Risks to Children, 2000). The effects of lead toxicity are well established, with clear evidence of harm found in children whose blood lead levels are above 10 µg/dL and substantial evidence that harm occurs at lower levels; no threshold has yet been identified below which adverse health effects are not found. The Centers for Disease Control and Prevention (CDC) estimated that in the 2009 reporting period, 163,000 U.S. children aged 1–5 years had blood lead levels above 10 µg/dL (CDC, 2013). Dust and soil are the most common pathways for lead exposure. Lead-based paint (LBP) is an important source of household dust lead, especially in buildings built prior to 1978 (Bornschein et al., 1985; Lanphear et al., 1998; President's Task Force on Environmental Health Risks and Safety Risks to Children, 2000).

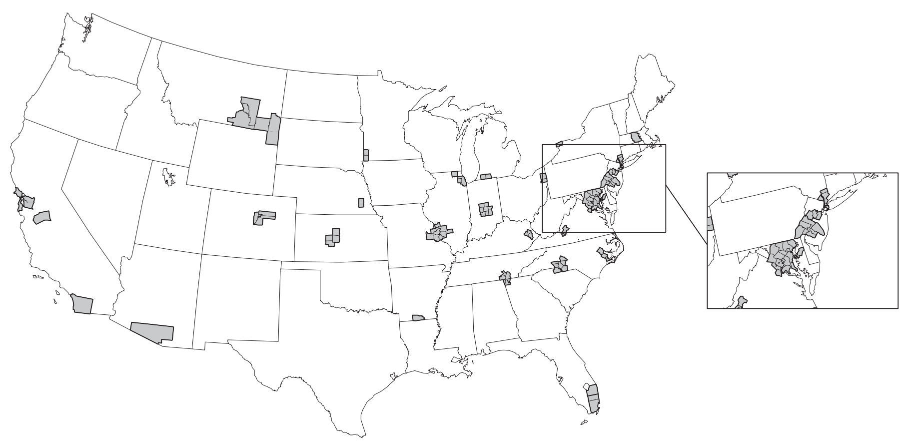
Allergens such as cockroach and dust mite allergens cause a variety of allergic reactions, including those that trigger asthma symptoms. Asthma is one of the most common chronic diseases of childhood, afflicting more than six million children nationwide (National Heart, Lung, and Blood Institute [NHLBI], 2007). The association between asthma and allergy is well documented (NHLBI, 2007).

The human health impacts of pesticides have been a concern for many years, and children may be at greater risk from pesticide exposure compared to adults (U.S. Environmental Protection Agency, 1998). Per pound of body weight, children eat and breathe more and have a more rapid metabolism than adults. Children have immature immune and metabolic systems, potentially reducing their natural protection against pesticides. Children also play on the floor and ground where pesticides are commonly applied. Pesticides have been linked to many childhood cancers and neurological diseases (Le Couteur, McLean, Taylor, Woodham, & Board, 1999).

Little is known about levels of lead, allergens, and pesticides in child care centers nationwide. As a result, the Department of Housing and Urban Development (HUD), CPSC, and the U.S. Environmental Protection Agency (U.S. EPA) collaborated on addressing this data gap by conducting the First National Environmental Health Survey of Child Care Centers. The objective of the survey was to assess children's potential exposures to these contaminants in licensed child care centers

FIGURE **1**

Locations of the 30 Primary Sampling Units



that serve children less than six years of age in the continental U.S. As the first nationally representative survey, the data provide valuable information about child care centers that is not available from any other source. This article summarizes the most significant lead and allergen results and pesticide application patterns in the nation's child care centers.

Methods

The methods used to conduct our study are fully described elsewhere (Department of Housing and Urban Development [HUD], 2003a; Tulve et al., 2006). Below is a brief description of how centers and rooms within centers were selected and the types and methods of data collection.

Selection of Child Care Centers and Rooms

The survey population included all state-licensed child care centers (generally institutional, but included some home-based centers) that served children under age six in the 48 contiguous states. Unlicensed child care centers were excluded for practical reasons.

Child care centers were selected in two steps:

1. A random sample of 30 clusters, called primary sampling units (PSUs, a metropolitan statistical area, county, or cluster of counties), with probability proportional to the population, was selected from 1,389 PSUs across the continental U.S. (Figure 1).
2. A list of licensed child care centers within each selected PSU was obtained from state licensing agencies. From these lists, roughly 11 centers were randomly selected in each PSU. Of 334 sampled centers, 68 were not eligible for the survey (out of business, not licensed, or outside of PSU boundaries). Of the remaining 266 centers, a total of 168 eligible centers agreed to participate and completed the survey, for a completion rate of 63%.

Only classrooms and "multipurpose" rooms (e.g., cafeterias, libraries, and gymnasiums) where children under age six regularly spent time were included in our study. All classrooms and multipurpose rooms were enumerated and two classrooms and one multipurpose room, if present, were randomly sampled from each list. If more than six classrooms or multipurpose rooms were present, an additional room of that room type was sampled.

Data Collection

Each center director completed a questionnaire, which asked about building construction date, number of attending children, demographics of the children's families, cleaning routines, type of heat and air conditioning, and use of pesticides at the center. Approximately 27% of directors did not know the building construction year; where possible, the ages of these buildings were determined from housing or tax authorities. For pesticides applied by a professional applicator, the applicator was contacted, with director permission, to determine more specific information.

Trained field staff recorded information about the center (number of rooms, sample room dimensions, and building condition), collected environmental samples, and made measurements in sampled rooms and outside the building. Painted surfaces of floors, walls, trim, doors, and one randomly selected window in each sampled room were tested for lead using a nondestructive X-ray fluorescence analyzer. Paint was also tested on accessible exterior walls, wall trim, windows, the most-used exterior door (major entrance), and painted nonbuilding components such as sheds, fences, and play equipment in play areas.

Dust wipe samples for lead were collected on the floor and from the sill of each randomly selected window. Floor dust wipe samples were collected from the center of the largest open floor area. One-square-foot templates were used for floor samples. The entire interior sill area was measured and wiped for window sill samples. Preference was given to wiping sills in windows that could be opened.

Dust vacuum samples collected for allergen analysis were analyzed for two dust mite allergens, *Dermatophagoides pteronyssinus* allergen 1 (Der p 1) and *Dermatophagoides farinae* allergen 1 (Der f 1), and cockroach allergen *Blattella germanica* allergen 1 (Bla g 1).

Soil samples for lead analysis were collected in the outdoor play area from bare soil (not covered with grass, concrete, asphalt, or other permanent covering), where present. If no soil was bare, soil samples were collected from covered (grass, mulch) surfaces, if possible. The top one-half inch of soil (the most accessible portion) was included in the sample.

Wipe samples from the floor and a play or work surface in each selected room and a composite soil sample from each play area were collected for pesticide analysis (Tulve et al., 2006).

Data collection occurred between July and October 2001 and was staged such that sampling occurred in all census regions simultaneously. All samples (including field quality control blank, duplicate, and spike samples) were analyzed by accredited laboratories.

Data Weighting and Statistical Analysis

Jackknife replicate survey weights were calculated to provide national estimates and appropriate confidence intervals for the number and proportion of licensed child care centers and children, overall and within subsets. Initial weights equal to the inverse of the probability of selecting each center were adjusted for nonresponse associated with building age, census region, and metropolitan status to minimize possible bias due to differential nonresponse.

The data were analyzed using Chi-square tests of association (www.westat.com/Westat/expertise/information_systems/WesVar/index.cfm). Confidence intervals for percentages were calculated using the Wilson method. Confidence intervals for means and totals were calculated from standard errors using a normal distribution assumption.

TABLE **1**

Selected Characteristics of Licensed Child Care Centers

Child Care Center Characteristic	Centers				# of Centers in Sample
	Estimate (#)	Estimate (%)	Lower 95% *CI*[a]	Upper 95% *CI*	
All centers	100,000	100			168
Construction year					
1978–2001	33,800	34	28%	41%	57
1960–1977	22,900	23	17%	30%	45
Before 1960	29,200	29	25%	34%	53
Unknown	14,110	14	9%	20%	13
Region					
Northeast/Midwest	45,200	45	39%	52%	79
South/west	54,800	55	48%	61%	89
Urbanization					
MSA[b] central city	51,200	51	36%	66%	83
Other MSA	26,600	27	16%	40%	42
Rural	22,200	22	10%	43%	43
Majority race at the center					
White	51,300	51	41%	62%	96
African-American	26,800	27	17%	40%	37
Other	19,200	19	11%	30%	31
Refusal/don't know	2,700	3	1%	8%	4
Center has Head Start program					
Yes	9,000	9	5%	17%	14
No	89,400	89	83%	94%	152
Refusal/don't know	1,500	2	0%	6%	2
Center ownership					
Private	78,900	79	69%	86%	134
Government	19,200	19	12%	29%	31
Refusal/don't know	1,800	2	1%	6%	3
Center ever tested for lead					
Yes	19,500	19	14%	27%	34
No	65,800	66	57%	73%	111
Refusal/don't know	14,600	15	10%	21%	23
Children required to have blood test for lead					
Yes	19,400	19	11%	32%	31
No	73,800	74	60%	84%	127
Refusal/don't know	6,800	7	4%	12%	10

Note. Values may not add to the total due to rounding.
[a]*CI* = Confidence limit for a 95% confidence interval for the estimated percentage.
[b]MSA = Metropolitan statistical area; the "MSA central city" includes the county in which the MSA central city is located.

Results

Based on the survey data (Table 1), an estimated 100,000 licensed child care centers (87,600 to 112,300) with an estimated enrollment of 4.6 million children (3.7 to 5.5 million) under age six exist in the continental U.S. Thirty-four percent (28% to 41%) of centers were located in buildings built since 1978, 23% (17% to 30%) between 1960 and 1977, and 29% (25% to 34%) before 1960. Building age was not obtained for the remaining 14% of buildings.

About half of the centers were located in central cities. The majority race was white in about half of the centers and African-American in one quarter of the centers. Nine percent of centers had Head Start programs and 80% were privately owned as opposed to government owned. Most centers had never been tested for lead and did not require blood tests for children before enrollment.

The following sections present summary results for the lead, allergen, and pesticide measurements in the centers. Detailed results of these analyses are fully described in the study reports (HUD, 2003b; HUD, 2003c; Tulve et al., 2006).

Prevalence of LBP in Centers

LBP is defined as any paint containing 1.0 mg lead/cm^2 or greater, regardless of the amount of damage to the paint. Twenty-eight percent (22% to 35%) of centers had LBP on either interior or exterior painted surfaces or both.

Significantly deteriorated LBP is defined for interior painted surfaces as more than 2 square feet of damaged LBP on large surface area components (walls, doors) or damage to more than 10% of total surface area of small surface area components (windowsills, baseboards, trim). For exterior painted surfaces, significantly deteriorated LBP is defined as a surface with more than 20 square feet of damaged LBP. Eleven percent (6% to 20%) of centers had significantly deteriorated LBP.

Figure 2 (solid bars) displays the percentage of centers with LBP, by paint damage category and building construction year, showing the downward trend in prevalence of LBP in centers as building age decreases. Differences among construction year categories were statistically significant ($p < .001$).

An estimated 11.8 million square feet of painted interior surfaces were covered with LBP. This represented only 3% of the area of painted interior surfaces in all centers. Almost two-thirds (62%) of this paint was found on walls, floors, and ceilings, and another 25%

FIGURE **2**

Prevalence of Lead-Based Paint (LBP) by Amount of Damage and LBP Hazard by Construction Year

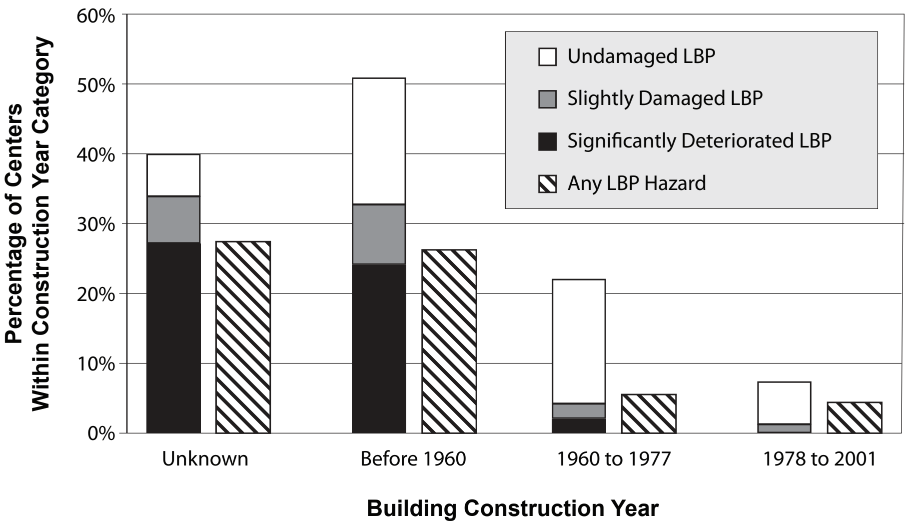
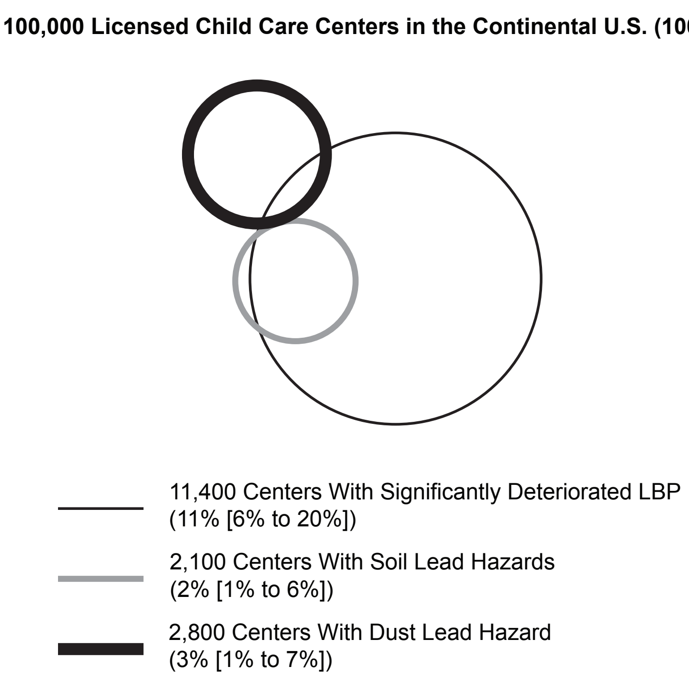


FIGURE **3**

Significant Lead-Based Paint (LBP) Hazards in Child Care Centers by Type of Hazard



on trim. An estimated 18.1 million square feet of painted exterior surfaces were covered with LBP. This represented 13% of the area of painted exterior surfaces in all centers. Exterior walls accounted for 90% of exterior LBP. Of centers with LBP, most had relatively small areas of LBP. On average, centers with LBP had 421 square feet of interior LBP and 645 square feet of exterior LBP. (For comparison, a room 10' x 12' with an 8' ceiling has a combined wall, ceiling, and floor area of 592 square feet.) Only 2% of centers had LBP on exterior nonbuilding painted components.

Prevalence of Significant LBP Hazards in Center

The presence of LBP in a building does not mean that a hazard is present. Federal law defines levels of lead in paint, dust, and soil that are considered to be hazards. Our study focused on significant LBP hazards, defined in accordance with the HUD Lead Safe Housing Rule (1996), as follows:

- Presence of significantly deteriorated LBP (defined above); or
- presence of dust lead hazard—defined as dust on floors with ≥40 µg/ft^2 lead, or dust on window sills with ≥250 µg/ft^2 lead; or
- soil lead hazard—defined as any amount of bare soil with a lead content of 400 parts per million or more in a play area.

An estimated 14% (9% to 22%) of centers had significant LBP hazards. The relative proportion of child care centers with the different types of lead hazards is shown in Figure 3. The majority of centers with hazards (11%) had significantly deteriorated LBP. Of the 3% of centers with dust lead hazards, all dust lead hazards were found on window sills—no floor dust lead hazards were identified. Only 2% of centers had a soil lead hazard.

An estimated 470,000 children under age six (170,000 to 760,000) attended licensed child care centers with significant LBP hazards. This represented 10% (4% to 17%) of all children under age six who attended these centers.

Figure 2 (striped bars) displays the percentage of centers with significant LBP hazards, due to paint, dust, or soil. The prevalence of significant LBP hazards parallels the downward trend in prevalence of LBP in centers as building age decreases. As with LBP prevalence, the percentage of centers with any significant LBP hazard varied significantly among construction year categories

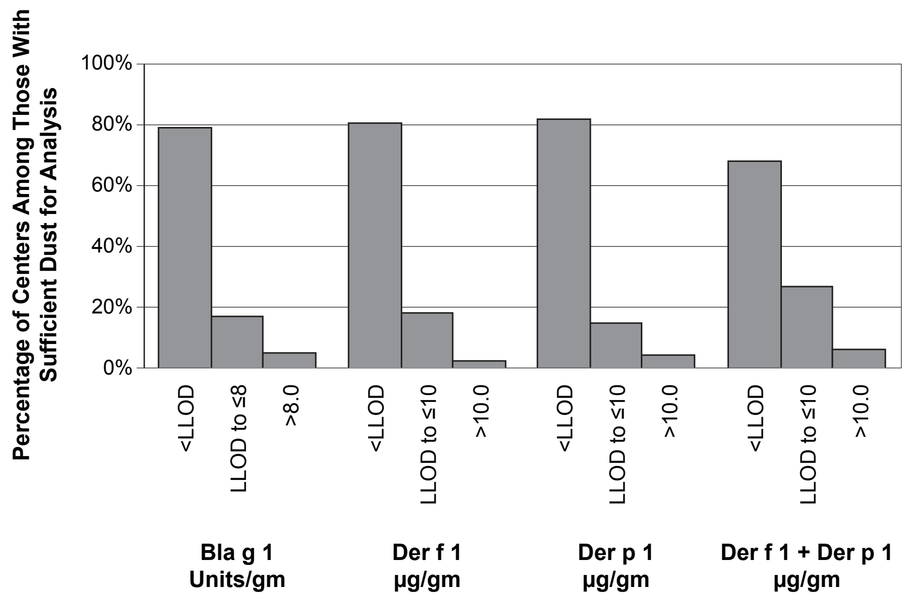
($p < .05$). Differences in LBP and significant LBP hazard prevalence by other center characteristics (geographic region, center ownership, urbanization, presence of government subsidies, or whether the building was ever tested for lead) were not significant and are not presented.

Allergen Levels in Centers

Figure 4 presents the estimated percentage of centers for which the maximum allergen measurement fell within a given allergen concentration range for dust mite allergens Der p 1 and Der f 1 (and sum of Der p 1 and Der f 1), and cockroach allergen Bla g 1. Measurements above 8 units/gm for Bla g 1 (2% of centers) and 10 µg/gm for Der p 1 and Der f 1 (1% and 2% of centers, respectively) are associated with asthma and allergic conditions (Arbes, Cohn et al., 2003; Arbes, Sever, et al., 2003). It should be noted that 26% of centers did not have enough dust for analysis. Of samples with sufficient dust, 86% of measurements were less than the lower limit of detection.

FIGURE **4**

Percentage of Centers With Allergens in Selected Ranges



LLOD = lower limit of detection; Bla g 1 = cockroach allergen *Blattella germanica* allergen 1; Der f 1 = dust mite allergen *Dermatophagoides farinae* allergen 1; Der p 1 = dust mite allergen *Dermatophagoides pteronyssinus* allergen 1.

Pesticide Usage and Levels in Centers

A detailed analysis of the usage and concentration of pesticide residues is available (Tulve et al., 2006). A summary of the pesticide usage findings is presented here.

An estimated 75% (69% to 82%) of centers reported at least one pesticide application, 18% (12% to 23%) reported no applications, and 7% (3% to 11%) were unsure of an application in the last year.

Table 2 presents the percentage of the 168 centers applying pesticides and, among those that applied pesticides, the percentage that applied specific types of pesticides based on the director's or professional applicator's questionnaire responses. Thirty-one percent of centers applied pesticides in both inside and outside locations, whereas 55% had more limited pesticide applications, applying pesticides only inside, only outside, or not at all.

A total of 375 different pesticide products were reported used across all centers during the year immediately preceding sample collection, and included fungicides, rodenticides, insecticides, herbicides, acaricides, and nontoxic mouse traps and glue boards. The lower part of Table 2 summarizes this data at the center level. For example, 14% of centers applying pesticides reported using pyrethroid products inside the center. Many child care centers that were using pesticides did not know what was being applied (reported as unknown in Table 2).

Comparison of questionnaire responses on pesticide use and measured pesticide levels in floor wipes showed that for all 115 pesticides detected, the pesticide detected matched the reported product applied 48% of the time (35% for organophosphates, 43% for pyrethroids) (Tulve et al., 2006). This suggested that questionnaire responses are not adequate for predicting potential exposure in child care centers.

Discussion

Our study found that 14% of licensed centers had significant LBP hazards; approximately 5% had levels of allergens associated with allergy and asthma, and 75% had applied pesticides in the year before the study.

LBP was banned for residential use in 1978. Because it was not banned for commercial use, it was unknown whether LBP would be present in newer buildings occupied by child care centers. LBP was found in only 7% of centers built after 1978. This was somewhat lower than the national estimate of 13% for residential units built after 1978 (Jacobs et al., 2002) and could not be attributed to centers being in newer buildings.

More than half of the child care centers in our study had LBP, which while in good condition at the time, poses a potential risk if the paint deteriorates or is disturbed. Because windows had high levels of lead dust and lead paint hazards, centers should consider replacement of old windows, which provides substantial benefits from lead poisoning prevention, energy conservation, and improved market value (Nevin, Jacobs, Berg, & Cohen, 2008).

The small quantities of floor dust found in vacuum samples collected in centers, as indicated by allergen laboratory reports, probably contribute in part to the low levels of lead and allergens found. Many states include as part of their licensing regulations cleaning requirements, such as wet cleaning floors and vacuuming carpets daily, which may account for the low dust levels. Thus, these findings might not be generalizable to unlicensed centers.

TABLE **2**

Percentage of Centers Applying Pesticides and Percentage of Centers Applying Specific Types of Pesticides[a]

Pesticide Use and Type	Location		
	Inside	Outside	Both Inside and Outside
Did center apply pesticides in the last 12 months?[b]			
Yes	63%	44%	31%
No	34%	43%	55%
Don't know	3%	13%	14%
If yes, pesticide class in product[c]			
Pyrethroids	14%	9%	13%
Organophosphates	0%	4%	1%
Carbamates	1%	2%	0%
Pesticide mix	9%	5%	4%
Unknown	41%	9%	35%
All others	41%	6%	12%

[a]Multiple applications at a center are reported only once.

[b]Weighted data.

[c]Unweighted data; centers reported product names and registration numbers; U.S. Environmental Protection Agency determined type of pesticide in product.

Seventy five percent of centers reported at least one pesticide application in the year prior to our study. While the most common product reported being used was pyrethroid pesticides, many centers were unsure of types of pesticides being applied. Because the "all others" category (reported in 41% of centers) is a listing of all nonspecific products reported, including such products as mouse traps, weed killers, rodent killers, etc., the most common pesticide used is not clear. The phaseout of many organophosphates could be reflected in the data given the low reported use.

Conclusion

Our survey provided the first data about lead, allergens, and pesticides in child care centers nationwide. Although most centers did not appear to present risks from lead and allergens, some centers did have unsafe levels of these contaminants. With some attention to damaged paint, especially on windows in older buildings, the prevalence of LBP hazards could be markedly reduced. While three-quarters of centers had pesticides applied (either indoors or outdoors) during the previous year, good building hygiene practices (routine cleaning, garbage removal, screening of windows) may reduce the need to use pesticides, thereby reducing potential exposures. Conclusions cannot be generalized to unlicensed centers and other types of child care locations and further research should be conducted in these types of locations.

Acknowledgements: HUD, CPSC, and U.S. EPA contributed to this work. The authors thank the directors of all participating child care centers, staff of the pesticide application companies, field technicians, and CPSC interviewers and recruiters for their time and assistance. This work was funded under HUD contract C-OPC-21356 and U.S. EPA contract GS-23F-8144H.

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Onsite Wastewater System Nitrogen Contributions to Groundwater in Coastal North Carolina

Abstract **The objective of the study described in this article was to evaluate the nitrogen contributions from two onsite wastewater systems (sites 1 and 2) to groundwater and adjacent surface waters in coastal Beaufort County, North Carolina. Groundwater levels and water quality parameters including total nitrogen, nitrogen species, temperature, and pH were monitored from October 2009 to May 2010. Nitrogen was also tested in groundwater from deeper irrigation or drinking water wells from the two sites and six additional neighboring residences. Mean total nitrogen concentrations in groundwater beneath onsite wastewater systems 1 and 2 were 34.3 ± 16.7 mg/L and 12.2 ± 2.9 mg/L, respectively, and significantly higher than background groundwater concentrations (<1 mg/L). Groundwater in the deeper wells appeared not to be influenced by the onsite systems. Groundwater nitrogen concentrations typically decreased with distance down-gradient from the systems, but were still elevated relative to background conditions more than 15 m from the systems and near the estuary. This was a pioneering effort to better understand the link of onsite systems, the fate of nitrogen in the environment, and public health.**

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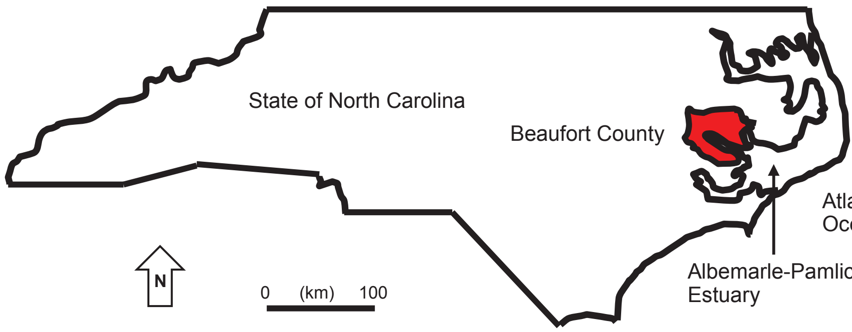
Introduction

Excess nitrogen concentrations in surface waters and eutrophication continue to be a problem for many North Carolina watersheds (North Carolina Division of Water Quality, 2010). Approximately two million onsite wastewater treatment systems (OWS) are in North Carolina, and 40,000 OWS are installed annually (Hoover, 2004). Total dissolved nitrogen (TN) concentrations in OWS effluent typically range between 33 and 171 mg/L, with dissolved organic nitrogen (ON) and ammonium-nitrogen (NH_4^+-N) as the dominant nitrogen species (Water Environment Research Foundation [WERF], 2009). If OWS drainfield trenches are installed in aerobic soils with sufficient separation from the water table, effluent NH_4^+-N can be converted to nitrate-nitrogen (NO_3^--N) via the nitrification process (Humphrey, O'Driscoll, & Zarate, 2010). Anions like NO_3^--N are susceptible to leaching and contaminating the groundwater because most soils have a slight negative charge (Brady & Weil, 2004). The U.S. Environmental Protection Agency set the maximum contaminant levels (MCL) for NO_3^--N in ground and surface waters at 10 mg/L. Risks for methemoglobinemia in infants (blue-baby syndrome) are greater when water supplies exceed this MCL for NO_3^--N (U.S. Environmental Protection Agency, 2002). Shallow groundwater NO_3^--N concentrations adjacent to OWS can exceed 10 mg/L, especially in areas with sandy soils and deep water tables (Humphrey et al., 2010). Therefore, OWS must be installed at sufficient distances away from wells and surface waters to allow for possible nitrogen concentration reduction by such processes as denitrification, dilution, and dispersion. North Carolina regulations (15A NCAC 18A .1950d) require at least a 15–30 m setback distance from OWS to surface waters and wells. If nitrogen concentrations derived from OWS remain elevated in groundwater beyond the setback distances, the environment and public health may be compromised due to possible contamination of water supply wells, eutrophication of surface waters, and the potential exposure of the public to those waters.

Approximately 25% of North Carolina residences rely on private groundwater wells for their water supply, and 50% use OWS for wastewater treatment (North Carolina Conservation Network, 2010; Pradhan, Hoover, Austin, & Devine, 2007). A study conducted in eastern North Carolina in the early 1990s found that 25% of domestic wells tested had NO_3^--N concentrations that

FIGURE **1**

Research Location



Research sites were located in Beaufort County, North Carolina (shaded in red), within the Tar-Pamlico River Basin and adjacent to the Albemarle-Pamlico Estuary and Atlantic Ocean.

exceeded 10 mg/L; while agriculture was the most likely source of NO_3^--N, proximity to OWS was identified as a potential factor in the contamination (Stone, Novak, Jennings, McLaughlin, & Hunt, 1995). Findings of that study indicated that levels of NO_3^--N often exceeded the MCL in water of shallow wells (<30 m), but the MCL was not exceeded in water of deeper wells.

While the MCL for NO_3^--N is set at 10 mg/L, surface water concentrations of NO_3^--N or NH_4^+-N an order of magnitude less may stimulate algal blooms and eutrophication, which have been problematic in North Carolina and other regions of the U.S. (Fear, Gallow, Hall, Loftin, & Paerl, 2004; Patel, Pederson, & Kotelnikova, 2010). Thus our study objective was to evaluate the fate and transport of nitrogen derived from OWS for two residences in Beaufort County, North Carolina. More specifically, the goal was to determine whether OWS were impacting shallow groundwater, deeper groundwater used as a water supply or irrigation source, and adjacent surface waters. On the basis of prior research, we hypothesized that elevated nitrogen levels exist beyond the 15 m setback.

Methods

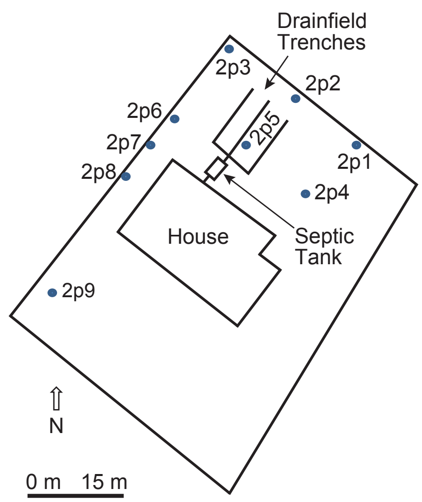
Site Instrumentation and Water Table Monitoring

Two volunteered residential sites in coastal Beaufort County, North Carolina, were selected for our study because of their close proximity to the nutrient-sensitive waters of the Tar-Pamlico estuary (Figure 1) and the presence of water supply or irrigation wells on site or in their respective neighborhoods. The OWS at sites 1 and 2 were both conventional gravity systems with a 3,780-L septic tank, distribution box, and three drainfield trenches, each approximately 15 m in length. Two occupants lived at site 1 and three occupants lived at site 2.

OWS components, including the septic tanks and drainfield trenches, were located

FIGURE **3**

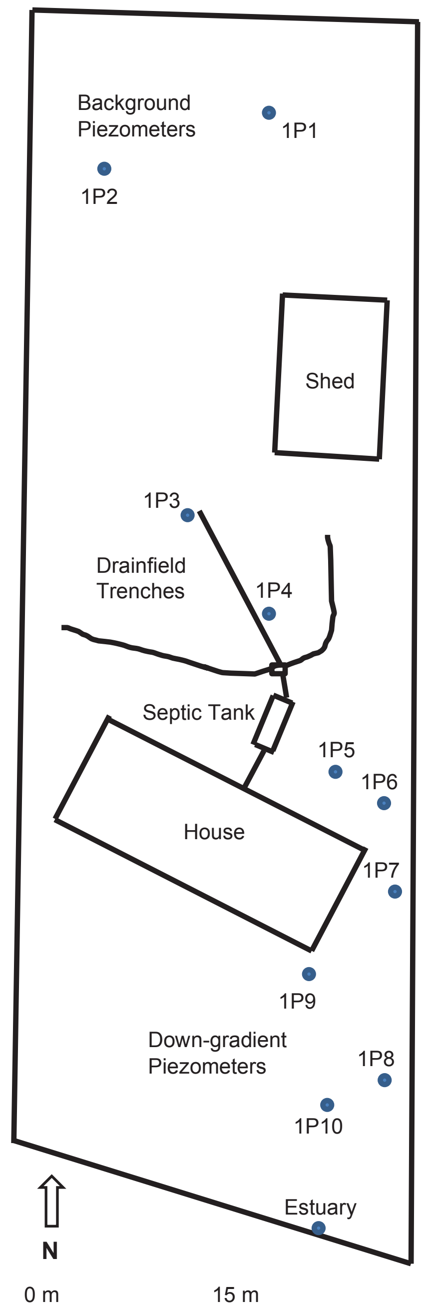
Site 2 Map



Showing onsite wastewater system components, piezometer locations, and the residence (2p1–2p9 indicate piezometers 1–9 at site 2).

FIGURE **2**

Site 1 Map



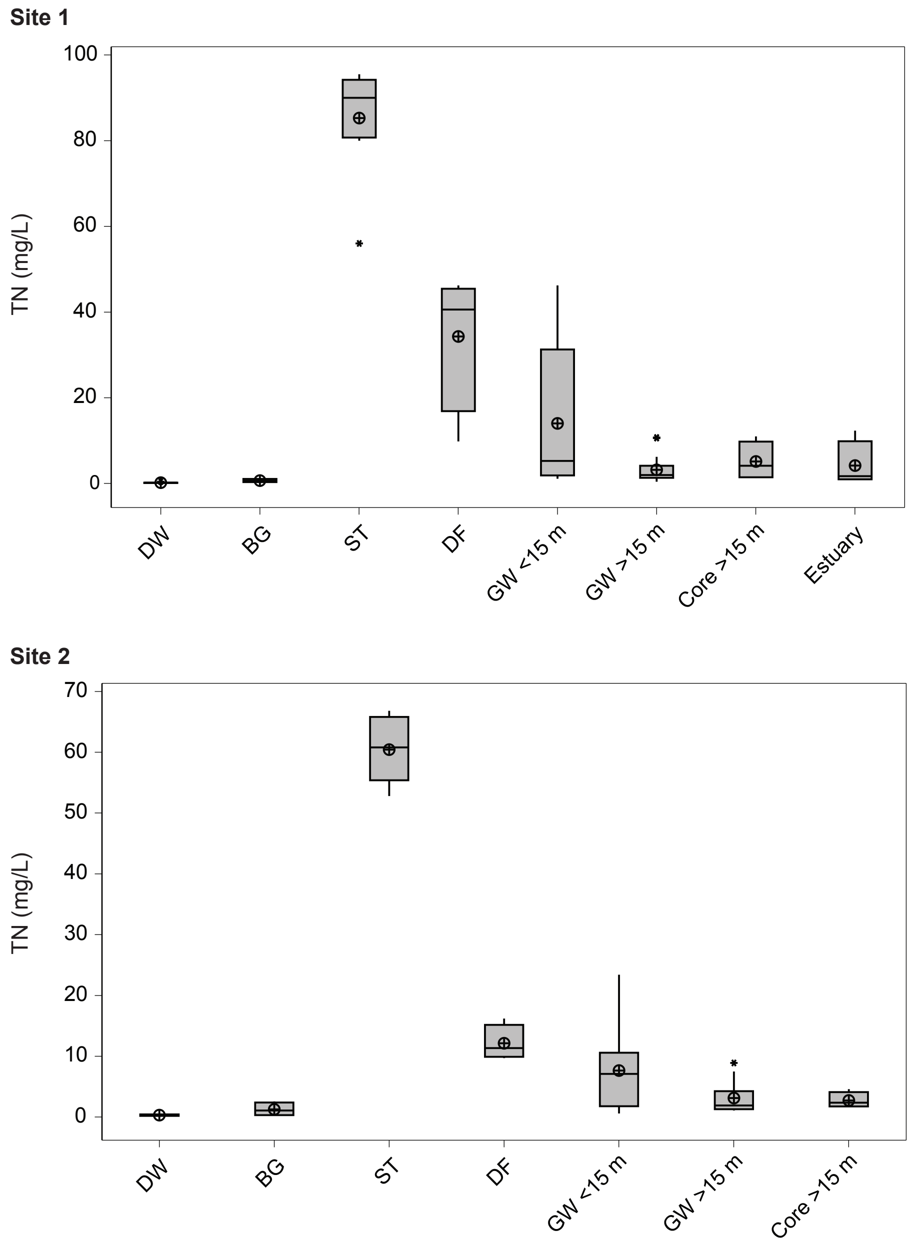
Showing onsite wastewater system components, piezometer locations, and the residence (1P1–1P10 indicate piezometers 1–10 at site 1).

by use of tile drain probe rods. The orientation of the septic plumes was estimated by use of an OhmMapper TR1 electrical resistivity mapper and the direction of groundwater flow was estimated on the basis of the hydraulic gradient as determined from a three-point problem solution at each site (Heath, 1998; Humphrey, Deal, O'Driscoll, & Lindbo, 2010). Piezometers were installed up- and down-gradient of the OWS flow paths for groundwater sample collection and monitoring (Figures 2 and 3). Bimonthly water table depths were determined manually by use of a Solinst model 107 temperature level and conductivity meter. Automated water level loggers were installed in piezometers near the drainfield disposal trenches, and they were programmed to record water levels every 0.5 hours. The automated water level measurements were used to observe temporal vertical separation distance (trench bottom and water table) dynamics. A YSI 556 field meter was used to determine groundwater and septic tank pH levels.

Two predominate soil series were at site 1 including soils similar in characteristics to the Tarboro sand (Mixed, thermic Typic Udipsamments), and Seabrook loamy sand (Mixed, thermic Aquic Udipsamments) (U.S. Department of Agriculture [USDA], 1995). The Seabrook soils have seasonal high water table depths typically within 1.2 m of the surface and were located at the beginning of the drainfield trenches and between the OWS and the estuary. The Tarboro soils are better drained and were located at the distal ends of the drainfield trenches and further from the estuary. Both soil series are sandy and have extremely permeable subsoils (>15 cm/hr) (USDA, 1995). The predominate soil series at site 2 was also Tarboro sand. Soil samples were collected from sites 1 and 2 for laboratory analysis including effective cation exchange capacity (ECEC).

FIGURE **4**

Total Dissolved Nitrogen (TN) Concentrations at Sites 1 and 2



Including drinking and/or irrigation wells (DW), background wells (BG), septic tanks (ST), groundwater beneath the drainfield trenches (DF), groundwater (GW) within 15 m (<15 m) of the onsite wastewater treatment system (OWS), groundwater more than 15 m (>15 m) from the OWS, plume core wells (Core), and the estuary.

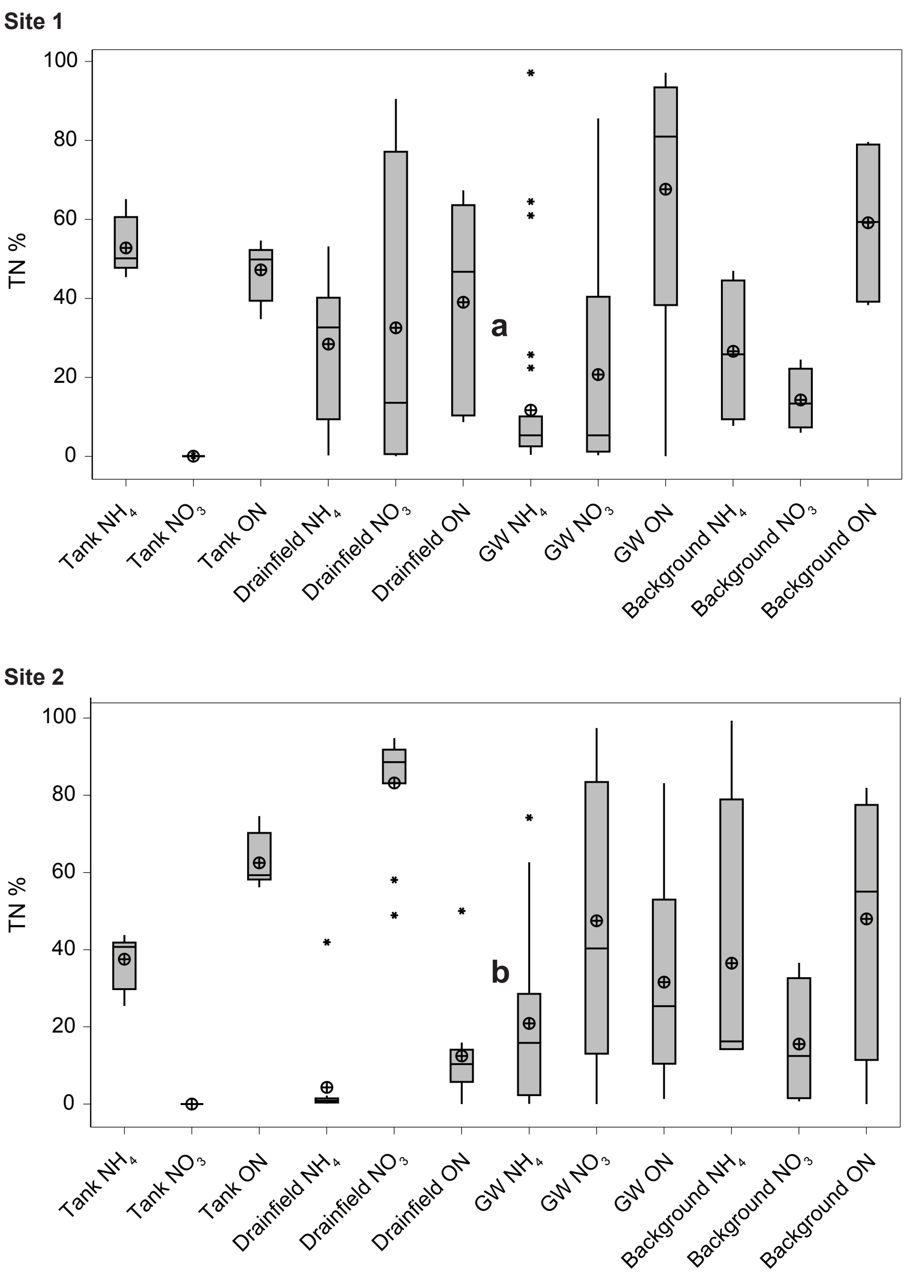
Sampling Procedure

Septic tanks were sampled monthly from October 2009 to May 2010, and groundwater samples from piezometers and surface water samples from the estuary were collected bimonthly from November 2009 to May 2010. Wells for drinking water or irrigation were sampled monthly from the two sites, and from November 2009 to January 2010 samples from six additional neighboring residences were collected for the purpose of assessing the potential effects on other adjacent wells.

A new bailer was used for collecting groundwater samples from each piezometer. Piezometers were purged prior to sampling. Water samples were analyzed for pH and temperature by use of the YSI and Solinst field meters. Samples were kept on ice and delivered to the East Carolina University Central Environmental Laboratory within 12

FIGURE **5**

Nitrogen Speciation



Dissolved organic nitrogen = ON; ammonium = NH_4; nitrate = NO_3; TN = organic + NO_3 at sites 1 and 2 monitoring locations, including the tanks (Tanks), groundwater beneath drainfield trenches (Drainfield), groundwater down-gradient from the trenches (GW), and background groundwater (Background).

hours where they were filtered prior to nitrogen analyses. Ammonia was analyzed by use of the Solorzano method (Eaton, Clesceri, & Greenberg, 1995). Kjeldahl nitrogen and nitrate/nitrite were analyzed by use of the Smart Chem 200 method.

Statistical Comparison Groups

Concentrations of TN in septic tank effluent were compared to those of groundwater beneath the OWS trenches to assess the effectiveness of these systems in reducing TN concentrations before discharge to groundwater. Concentrations of TN in groundwater beneath the drainfield trenches were compared to TN levels in background groundwater and drinking/irrigation water from deeper wells to help assess the effects of OWS on shallow and deeper groundwater. Groundwater down-gradient and ≤15 m (horizontal distance) of OWS was compared to groundwater down-gradient and >15 m from systems to determine whether setback regulations were effective at reducing TN concentrations. The piezometers most influenced by the OWS and >15 m down-gradient were referred to as the "plume core." Mann Whitney or Wilcoxon rank sum tests (Conover & Iman, 1981; Davis, 2002) were used to determine whether significant differences in TN existed between comparison groups because the sample sizes were small and the data did not show a normal distribution.

Results

Average septic effluent TN concentrations varied between the sites (83.9 ± 13.5 mg/L for site 1 and 59.6 ± 5.2 mg/L for site 2), but they were within the typical ranges (33 to 171 mg/L) for domestic wastewater reported in a recent study (WERF, 2009). Groundwater TN concentrations beneath the drainfield trenches were significantly ($p < .05$) lower than septic effluent concentrations (site 1: 34.3 ± 16.7 mg/L and site 2: 12.2 ± 2.9 mg/L), but the groundwater TN concentrations were still elevated when compared to background conditions (site 1: 0.7 ± 0.4 mg/L and site 2: 0.3 ± 0.1 mg/L) (Figure 4). Mean TN concentrations in groundwater beneath drainfield trenches at sites 1 and 2 were 59% and 80% lower, respectively, than septic effluent concentrations for their respective tanks. Concentrations of TN typically decreased with distance from the OWS. At site 1, groundwater within 15 m of the OWS had mean TN concentrations of 20.9 ± 20.1 mg/L, while groundwater >15 m from the OWS had TN concentrations of 3.1 ± 3.4 mg/L (Figure 4). At site 2, groundwater within 15 m of the OWS had mean TN concentrations of 10.8

± 2.8 mg/L, while groundwater >15 m had mean TN concentrations of 3.6 ± 3.3 mg/L (Figure 4). At times, however, TN concentrations in groundwater samples >15 m from the OWS systems at both sites were greater than 7 mg/L (plume core) (Figures 4 and 5). In addition, the mean groundwater TN concentration at the shore of the estuary ~40 m from the OWS was elevated at site 1 (4.2 ± 5.5 mg/L) (Figure 4). Drinking water or irrigation wells for sites 1 and 2 and the six adjacent properties never had TN concentrations greater than 1 mg/L.

Significant variation in nitrogen speciation was found across the sites and for the different samples. ON and NH_4^+-N were predominant in septic effluent for both sites (Figure 5). Groundwater beneath the drainfield trenches, down-gradient from the system, and in background groundwater had predominately ON, followed by NH_4^+-N and NO_3^--N at site 1 (Figure 5). Dominant forms of nitrogen in groundwater beneath the drainfield trenches and down-gradient were NO_3^--N, followed by ON and NH_4^+-N at site 2, while background groundwater was mostly ON, followed by NH_4^+-N and NO_3^--N (Figure 5).

At site 1, groundwater levels were within 45 cm (North Carolina separation distance for group 1 soils) of the bottom of the drainfield trench for most of the period of November 2009–March 2010, with several short periods when groundwater levels were above the bottom of the drainfield trench (trench flooding) (Figure 6). During late fall and winter, from November 2009 to the end of March 2010, the mean separation from trench bottom to water table at site 1 was 31 cm. The overall mean separation distance for the study period at site 1 was 44 cm. At site 2, groundwater levels were much deeper, except for a few days when the water table rose after heavy rain events (Figure 7). The mean separation over the entire study period at site 2 from trench bottom to water table was 91 cm, more than twice the mean separation distance relative to site 1. From November to March 2010, the mean separation was 83 cm at site 2.

Mean water temperatures were highest for septic effluent at both site 1 (17.7 ± 4.2°C) and site 2 (19.3 ± 3.2°C) (Table 1). All other groundwater samples had similar mean temperatures with a range from 15.3 ± 3.7°C for groundwater beneath the site 1 drainfield to 16.7 ± 4.7°C for groundwater adjacent to the estuary at site 2 (Table 1). Mean pH levels were all slightly acidic and relatively similar, ranging from 5.5 ± 0.3 for the site 2 background groundwater to 6.8 ± 0.9 for the site 2 irrigation well water. The mean pH levels at site 1 ranged from 5.9 ± 0.5 (groundwater >15 m from the system) to 6.5 ± 0.9 (background groundwater) (Table 1). The soil analysis indicated that the ECEC of the Tarboro and Seabrook soils was less than 2 cmol/kg (centimoles of charge per kilogram of soil).

FIGURE **6**

Variation in Groundwater Elevation for Site 1, November 2009–May 2010

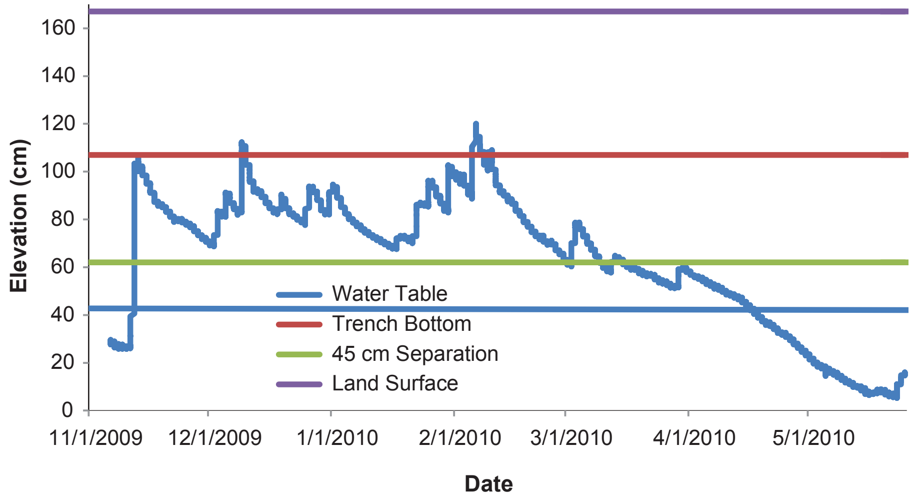


FIGURE **7**

Variation in Groundwater Elevation for Site 2, November 2009–May 2010

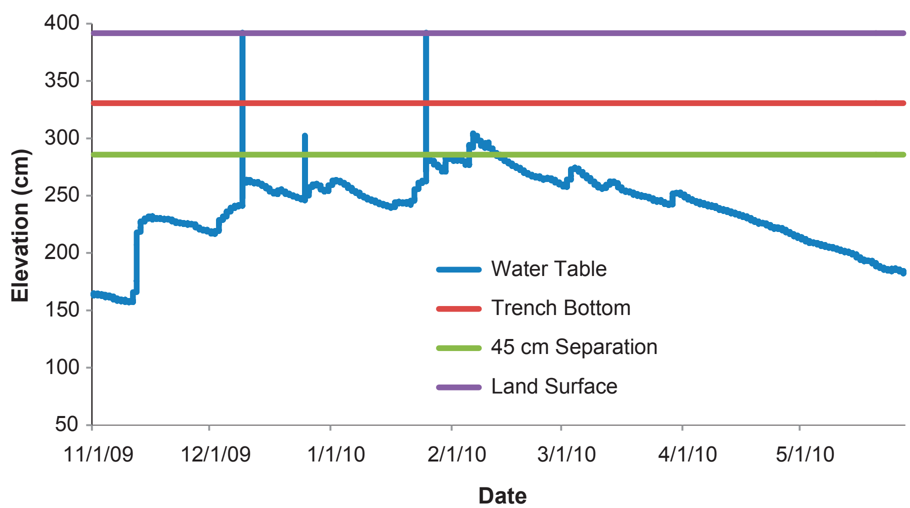


TABLE **1**

Temperature (°C) and pH Values for Site 1 and Site 2 Monitoring Locations

Site 1[a]	pH	Temperature	Site 2[a]	pH	Temperature
BG	6.5 ± 0.9	15.3 ± 4.2	BG	5.5 ± 0.3	15.6 ± 2.8
ST	6 ± 1	17.7 ± 4	ST	6.1 ± 0.7	19.3 ± 3.2
DF	6.1 ± 0.5	15.3 ± 4.3	DF	5.8 ± 0.6	15.4 ± 3.5
<15 m	6.2 ± 0.5	15.5 ± 3.7	<15 m	5.6 ± 0.7	15.6 ± 3.2
>15 m	5.9 ± 0.5	16.0 ± 3.2	>15 m	6.1 ± 0.7	15.4 ± 3.1
Est	6.1 ± 0.9	16.7 ± 4.7	Est	–	–
DW	6.1 ± 0.9	15.4 ± 3.7	DW	6.8 ± 0.9	16.2 ± 4.1

[a]BG = background groundwater; ST = septic tank effluent; DF = groundwater beneath the drainfield trenches; <15 m = groundwater within 15 m of drainfields; >15 m = groundwater further than 15 m from drainfields; Est = the estuary; DW = drinking/irrigation wells.

At site 1, the groundwater level data suggested that the predominant groundwater flow direction was to the south, towards the estuary. Water table data at site 2 suggested that the direction of groundwater flow is predominately from east to west across the site, but the direction may shift seasonally in response to significant recharge events and water table elevation variations.

Discussion

Onsite systems at sites 1 and 2 were both contributing elevated concentrations of nitrogen to shallow groundwater beneath the systems. The site 1 OWS was less efficient at reducing TN contributions to groundwater than the site 2 OWS, possibly because of a smaller separation from the water table and less potential for nitrification and denitrification processes (Figure 6).

Aerated soil beneath drainfield trenches is needed to provide conditions necessary for nitrification, a necessary precursor to denitrification. At site 1, the mean water level was within 45 cm of the trench bottom, and the dominant groundwater nitrogen species beneath the drainfield were NH_4^+-N and ON. Inhibition of nitrification has been reported for systems in sandy soils with less than 45 cm separation from the water table (Humphrey et al., 2010). Site 2 had a larger separation from the water table (mean = 91 cm), and the dominant groundwater nitrogen species beneath the drainfield was NO_3^--N; thus, nitrification was not inhibited at site 2.

Groundwater TN concentrations decreased further away (>15 m) from both systems, indicating dilution or other concentration reduction processes. While shallow groundwater TN concentrations were elevated, drinking/irrigation water samples from deeper wells had much lower TN concentrations (all <1 mg/L) and did not seem to be affected by the systems. An aquitard (confining layer) was discovered at site 2 approximately 5 m below the surface. This aquitard may have promoted lateral, rather than vertical, movement of groundwater, thus preventing deeper groundwater contamination (Stone et al., 1995).

At site 1, elevated TN concentrations were found adjacent to the estuary and down-gradient from the onsite system. Therefore, groundwater discharge to the sound, with elevated TN from the OWS, seemed likely. At site 2, the dominant form of nitrogen beneath the drainfield trenches and down-gradient from the system was NO_3^--N, showing the mobility of NO_3^--N in groundwater, a trait referenced by many other studies (Aravena & Robertson, 1998; Harmon, Robertson, Cherry, & Zanini, 1996; Robertson, Cherry, & Sudicky, 1991). The dominant form of nitrogen beneath the drainfield trenches and down-gradient from the OWS at site 1 was ON, indicating that ON was also mobile in the groundwater system. This is an important finding because unlike groundwater NO_3^--N, which may denitrify in organic-rich sediments adjacent to surface waters (Robertson et al., 1991), groundwater ON will not denitrify in sediments before discharge to the estuary and thus may contribute to the surface water TN loading. Prior studies have also indicated the mobility of OWS-derived ON or NH_4^+-N in groundwater down-gradient from systems (Carlile, Cogger, Sobsey, Scandura, & Steinbeck, 1981; Corbett, Dillon, Burnett, & Schaefer, 2002). The research sites for our study are located in the Tar-Pamlico River Basin, where the Nutrient Sensitive Waters Management Strategy (15A NCAC 2B) calls for a reduction in the TN loading to the river. Thus OWS may be a TN-loading source via groundwater transport of organic and ammonium nitrogen.

Study Limitations

The main limitation of our study was funding, which impacted on the number of sites that were included. A representative sample size would have allowed drawing conclusions applicable to other OWS in the coastal region of North Carolina where the study took place.

Conclusion

Our study has been a pioneering collaborative effort to better understand the potential link of OWS, the fate of nitrogen that could be applied to this coastal setting, and public health. Nitrogen derived from OWS can impact shallow groundwater beneath OWS and adjacent surface waters. ON and NO_3^--N were found at the sites, which indicate that speciation is needed when accounting for the fate of nitrogen in the environment. Levels of NO_3^--N beyond state setback regulations can be higher than background levels. It appears that deeper groundwater is protected. More work is needed, however, and has been planned to better delineate wastewater plumes, quantify nitrogen speciation and attenuation processes, and discharge rates relative to existing required setback distances.

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Public Health Implications of Animals in Retail Food Outlets

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Abstract **Growing societal interest to permit animals into retail food outlets presents both risks and benefits to the dining public and consumers. This article summarizes a literature review that evaluated the associated potential public health issues related to this subject. Using the EBSCOhost research protocol and Google search engines between March 2010 and June 2011, the authors have compiled and synthesized scientific research articles, empirical scientific literature, and publicly available news media. While pets are known carriers of bacteria and parasites, among others, the relative risk associated with specific pet-human interactions in the dining public has yet to be established in a clear and consistent manner. Much of the available health-risk-factor evidence reflects pets in domestic conditions and interaction with farm animals. Special consideration is recommended for vulnerable populations such as children, asthmatics, the elderly, pregnant women, and the immunocompromised.**

Introduction

While pet-human relationships have been fostered over thousands of years, surprisingly little rigorous literature exists regarding the risk factors associated with allowing animals in places that serve or sell food. The California Conference of Directors of Environmental Health (CCDEH) requested us to conduct a literature search in an effort to provide CCDEH the evidence base for informed decision making related to management of animals in retail food and eating establishments. The primary aim of this effort was to complete a literature review and determine the scientific basis for contemporary policies, practices, and applicable legislation as practiced throughout the U.S.

Methods

We conducted a comprehensive environmental scan using EBSCOhost and Google search engines between March 2010 and June 2011. The EBSCOhost research protocol provided the foundation for the scientific and empirical literature reviews. The search terms included animals, zoonoses, restaurants, retail food establishments, food establishments, pets, dogs, cats, and policy. The Google search engine was also used to supplement the EBSCOhost findings, primarily to identify relevant lay articles in the public press. The combination of the two search methodologies facilitated the identification of published scientific literature while also providing social insight through evaluation of relevant publicly available news articles and stories of interest.

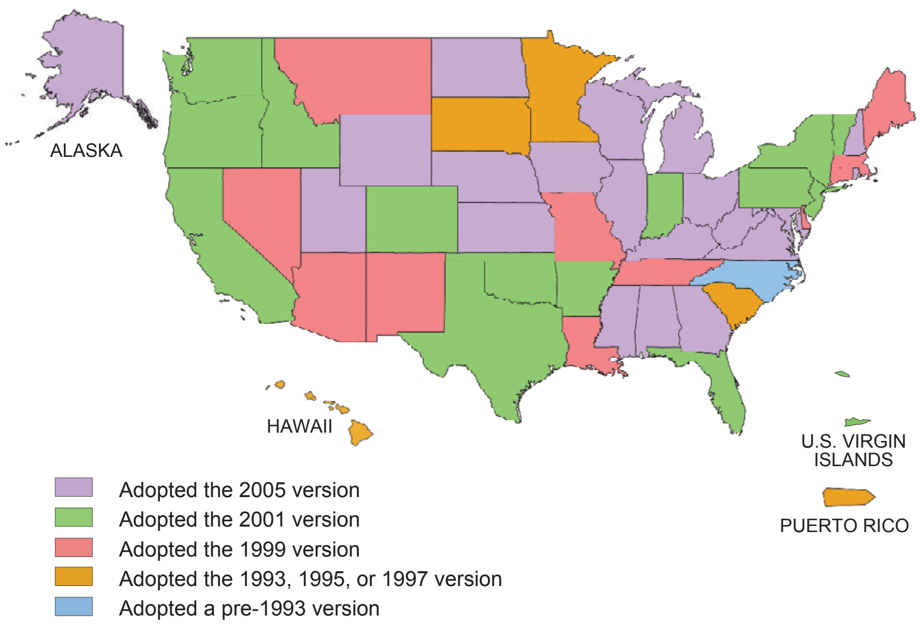
The review was inclusive of potential bacterial, fungal, parasitic, and viral infections; allergens; ecto-parasites; incontinence; poorly trained or disruptive animals; and other issues germane to pets and animals. Evaluation efforts included a review of the Americans With Disabilities Act of 1990 (ADA), which establishes the legal foundation for service animals to accompany individuals in public. Red Cross policies and procedures for temporary shelters were also assessed. Comfort or companion animals and exotic varieties (e.g., aquatic pets, reptiles, and birds), were included in the review.

Background

Forty-nine of 50 U.S. states possess public health regulations patterned on Food and Drug Administration (FDA) guidelines in the 1993, 1997, 1999, 2001, and 2005 versions of their federal *Food Code* (FDA, 2010). States generally restrict pets from the indoor premises of food establishments; however, several states and select cities permit local legislative bodies to create variances for retail food establishments to serve patrons accompanied by pets outdoors (City of Miami, 2006; Dallas City Code, 2007; Gordon, 2004; Regulations for Supplemental License for Permitting Dogs in Designated Outdoor Areas at Retail Food Establishments, 2008). A major exception to the policy and practice pattern noted above evolved from the ADA (FDA, 2009). The ADA emphasizes that service animals cannot be prohibited from any area that is normally accessible to the general public, such as bathrooms and dining areas.

FIGURE 1

U.S. State Food Codes (Food and Drug Administration, 2010)



Results

Existing Policy and Practices

The FDA *Food Code* provides the basis for most U.S. state food codes (Figure 1). Data released from the FDA in March 2010 suggests that 49 of the 50 states have patterned their respective food codes after FDA's federal food codes dating from 1993 to 2005: 20 states adopted the 2005 version, 14 states adopted the 2001 version, 11 states adopted the 1999 version, and 4 states adopted versions from 1993, 1995, or 1997. One state adopted the 1976 version (FDA, 2010).

Because the vast majority of the states comply with FDA food codes, these were reviewed to assess the specific sections that relate to animals in retail food establishments, including permitted pets, other permitted live animals, rodents and pests, and particular areas of the restaurant where animals are permitted.

The FDA *Food Codes* for 1997, 1999, 2001, and 2005 contain similar content regarding animals except for the exclusion of a discussion of service animals in the 1997 version (FDA, 1997). Most of the above food codes recommend that live animals should not enter the indoor premises of food service establishments (FDA, 1997, 1999, 2001, 2005, 2009). Exceptions exist; certain animals (e.g., service animals) may be allowed in particular circumstances providing that no risk exists of contamination of food; equipment, utensils, and linens; and unwrapped single-service and single-use articles (FDA, 2009).

Service Animals

Title III of the ADA prevents businesses from discriminating against those with disabilities and mandates that service animals be permitted in all U.S. restaurants (FDA, 2009). A service animal was originally defined by the ADA as an animal trained to provide assistance to an individual with a disability (U.S. Department of Justice, 2011). A service animal is not considered a pet. On July 23, 2010, the definition of a "service animal" was changed to include only dogs and miniature horses (Service Dog Central, 2012). The ADA supersedes state and local law and requires that businesses permit disabled patrons and their service animals to visit wherever other customers are present.

Public Health Concerns

The Sidebar on page 26 presents a comprehensive inventory of zoonotic diseases (i.e., zoonoses), which are recognized to be shared between animals and humans. The range of zoonoses is inclusive of parasitic (e.g., *Cheyletiella*), bacterial (e.g., *E. coli*), fungal (e.g., *Histoplasma capsulatum*), and viral (e.g., influenza A) diseases. Individuals may be exposed to organisms through direct contact with infected animals or fomites (Adaszek, Winiarczyk, Zietek, Kutrzuba, & Garbal, 2009). Between 1996 and 2008, approximately 100 human infectious disease outbreaks involving animals in public settings were reported to the Centers for Disease Control and Prevention (CDC, 2009).

Infections with enteric bacteria and parasites are reported to pose the highest risk for human disease from animals in public settings (CDC, 2009, 2011). These include Shiga toxin–producing *E. coli*, *Campylobacter, Salmonella*, and *Cryptosporidium*. Symptomatic and otherwise healthy appearing animals may harbor infectious pathogens (CDC, 2009). In light of CDC's finding that enteric bacteria pose the greatest risk, the authors prioritized the review of these organisms.

E. coli

E. coli is a bacterium that is commonly found in the gut of humans and warm-blooded animals. While most *E. coli* research has focused on foodborne illness, some inquiry has been conducted on the potential of *E. coli* transmission from pets to humans, with inconclusive or inconsistent findings (refer to section on synanthropic flies below).

In contemporary life many humans are exposed to dogs and dog feces; however, canine fecal material has not been directly implicated as a reservoir of *E. coli* with extra-intestinal pathogenic capability for humans (Johnson et al., 2000). Stenske and co-authors examined 61 healthy dog-owner pairs and an additional 30 control humans to assess within-household sharing of *E. coli* using pulsed-field gel electrophoresis to compare bacterial isolates (Stenske et al., 2009). The study found a 9.8% prevalence rate of the microbial isolates, which were common among pets and their owners ($p < .001$) when compared to across household pairs (0.03%), although no specific risk behaviors among the owners and their pets were identified as contributing factors. Interestingly, the humans in this study harbored more multidrug-resistant *E. coli* strains than did the dogs (Stenske et al., 2009).

The World Health Organization (WHO) reports that visiting farms and other venues where the general public might come into direct contact with farm animals is the most important nonfood risk factor for *E. coli* exposure (WHO, 2005a). In 2000, two *E. coli* O157:H7 outbreaks in Pennsylvania and Washington were linked to farm animal contact. Risk factors identified in both outbreaks were direct animal contact and inadequate hand washing (CDC, 2001; Crump et al., 2002).

Campylobacter

Campylobacters are bacteria that are generally regarded as the most common bacterial cause of gastroenteritis worldwide (WHO, 2005b). *Campylobacter* infections in children under the age of two years are especially frequent, sometimes resulting in death. In almost all developed countries, the incidence of human *Campylobacter* infections has been steadily increasing for the last several years. The reasons for this are unknown (WHO, 2005b).

Various strains of *Campylobacter* are of potential concern and risk analysis studies have shown evidence that pet ownership has been linked to *Campylobacter* infections in humans, including direct evidence of transmission of a *Campylobacter jejuni* strain between a human and a dog living in the same household (Damborg, Olsen, Møller Nielsen, & Guardabassi, 2004). To complicate matters, healthy household dogs are also suspected carriers of *Campylobacter*. In one study, a child and the healthy family dog shared the same strain of *Campylobacter* (*Campylobacter coli*) (Wardak, Duda, & Wojsa, 2009). This suggests that direct contact with infected pets may play an important role in the development of campylobacteriosis in humans (Wardak et al., 2009).

While direct contact with infected pets is a risk factor, the actual importance of pets as a source of *Campylobacter* infections in the general human population remains unclear.

Salmonella

Salmonella can be acquired directly from animals such as pet birds, fish, dogs, cats, and turtles (Olsen, 2000). Up to 36% of dogs and 18% of cats carry the organism and shed it for an extended period of time after initial infection. Dogs and particularly cats are recognized to carry the organism in their saliva.

Approximately 90% of pet reptile feces contain *Salmonella*. Roughly 74,000 (6%) of the estimated 1.2 million annual *Salmonella* infections in the U.S. result from contact with amphibians and reptiles (CDC, 2009). FDA banned the sale of turtles smaller than four inches wide in 1975 to prevent the spread of *Salmonella.*

Cryptosporidium

The role of companion animals in the transmission of human cryptosporidiosis is not clear (Xiao et al., 2007). Dogs have been suspected to be a significant source of human cryptosporidiosis. This has been largely predicated on the observation of direct transmission of *Cryptosporidium parvum* from calves to humans coupled with the suggestion that *C. parvum* is responsible for cryptosporidiosis in all mammals, which has not been firmly established. Case-control studies conducted in the U.S. have suggested only a weak association between the occurrence of

Zoonoses From Pets

Dogs

Brucella canis infection
Campylobacter infection
Cryptosporidium infection
Dipylidium infection
Giardia infection
Hookworm infection
Leishmania infection
Leptospira infection
Lyme disease
Q fever (*Coxiella burnetii*)
Rabies
Ringworm
Rocky Mountain spotted fever
Roundworm: see *Toxocara* infection
Salmonella infection
Tapeworm (flea tapeworm): see *Dipylidium* infection
Toxocara infection (toxocariasis, roundworm)

Birds

Chlamydia psittaci infection—parakeets and parrots
Cryptococcus infection (cryptococcosis)
Salmonella infection (salmonellosis)—baby chicks and ducklings
Influenza A

"Pocket Pets"

Salmonella from pocket pets
Lymphocytic choriomeningitis virus from pet rodents

Reptiles and Fish

Salmonella infection (salmonellosis)

Cats

Campylobacter infection (campylobacteriosis)
Cat scratch disease (*Bartonella henselae*)
Coxiella burnetti infection (Q fever)
Cryptosporidium infection (cryptosporidiosis)
Dipylidium infection (tapeworm)
Hookworm infection
Leptospira infection (leptospirosis)
Plague (*Yersinia pestis*) infection
Q fever (*Coxiella burnetii*)
Rabies
Ringworm
Roundworm: see *Toxocara* infection
Salmonella infection (salmonellosis)
Tapeworm (flea tapeworm)
Toxocara infection (toxocariasis, roundworm)
Toxoplasma infection (toxoplasmosis)

Farm Animals

Bovine spongiform encephalopthy
Brucella infection (brucellosis)
Campylobacter infection
Cryptosporidium infection
E. coli O157:H7
Q fever (*Coxiella burnetti*) infection
Rabies
Ringworm
Salmonella infection (salmonellosis)
Yersinia enterocolitica (yersiniosis)

cryptosporidiosis in immune-deficient individuals and contact with dogs (Glaser, Safrin, Reingold, & Newman, 1998). Contact with dogs and cats was not found to be a risk factor for cryptosporidiosis in England (Goh et al., 2004), and counterintuitively was noted to be a protective factor in Australia (Robertson et al., 2002). Recent molecular epidemiological studies have shown that dogs and cats are infected almost exclusively with *Cryptosporidium canis* and *Cryptosporidium felis*, respectively; whereas humans are infected mostly with *Cryptosporidium hominis* and *C. parvum* (Xiao & Ryan, 2004). Thus, the role of companion animals in the transmission of human cryptosporidiosis appears to be limited. Even though a small number of humans are infected with *C. canis* and *C. felis*, recent findings of concurrent *C. hominis* infection in *C. canis*–infected persons suggest that many of the *C. canis* infections in humans may be due to human-to-human transmission rather than zoonotic in nature (Cama et al., 2006).

Other Diseases

While CDC reports that enteric diseases represent the greatest public health risk presented by pets under routine domestic exposure conditions, other zoonotic and safety concerns exist. These are briefly explored below in alphabetical order.

Aeroallergens

Animal allergens such as dander, saliva, urine, fur, feathers, and scales may accumulate in the indoor enclosed environments such as those found in retail food outlets. According to the Allergy and Asthma Foundation of America, between 15% and 30% of Americans are allergic to dogs and cats. People generally become more sensitive to allergen exposure as the period of exposure increases (National Institute of Occupational Safety and Health [NIOSH], 1998). Sensitivity may take several months to develop, and individuals will improve or completely recover if exposure is removed (NIOSH, 1998).

Cat allergen, known to be a potent asthma trigger, is in the respirable range, with particle sizes ranging from 1 to 20 μm in diameter, and at least 15% of those particles are <5 μm in diameter (Platts-Mills, Vaughn, Carter, & Woodfolk, 2000). Dog allergen appears to distribute in a manner similar to that of cat allergen, with approximately 20% of its allergen particles remaining airborne for extended periods (Wood, 2001).

Cowpox, Monkeypox, Tularemia

While unlikely to be an issue in restaurants, three diseases associated with pets have been noted in the literature. Cowpox virus has been shown to transmit from pet rats to humans (Campe et al., 2009). Monkeypox virus transmission from pets such as prairie dogs to humans has been reported (CDC, 2003). Tularemia transmission to humans has been reported from prairie dogs and possibly pet hamsters (CDC, 2005a, 2005b).

Methicillin-Resistant Staphylococcus aureus *(MRSA)*

MRSA is an antibiotic-resistant bacterium that can infect pets and their owners (Faires, Tater, & Weese, 2009). Data suggest that interspecies transmission of MRSA is possible (dog, cat, horse, pig, human), yet definitive evidence has yet to be established (Faires et al., 2009; Nienhoff et al., 2009; Truszczyński & Pejsak, 2009).

Rabies

Rabies is especially high among stray cats, with 15.1% of strays infected among reported incidents and 9.0% of stray dogs (Roseveare, Goolsby, & Foppa, 2009). While cats (both strays and domestic) were involved in fewer incidents overall than dogs, stray cats alone were involved in more incidents than stray dogs and also frequently had rabies (Roseveare et al., 2009). In contrast, most reported incidents of human exposure to animals with rabies have been associated with pet dogs. Among reported incidents, domestic animals were more likely to be exposed to rabies than humans.

Toxocara

Toxocariasis is an infection caused by the ingestion of larvae of the dog roundworm *Toxocara canis* or the cat roundworm *Toxocara cati*. Studies showed it to be unlikely to transmit directly from pet to human. Most people with toxocariasis also displayed a history of pica (Overgaauw et al., 2009).

Synanthropic Flies

One risk associated with pets in restaurants is an increased presence of flies. Flies are a nuisance and threaten public health by carrying pathogenic organisms (Forster, Klimpel, Pfeffer, Sievert, & Messler, 2009). They act as a vector for many organisms including bacteria, viruses, fungi, and parasites (Forster et al., 2009). Enteropathogenic *E. coli* was isolated from flies caught at a dog pound, potentially supporting the hypothesis that dogs are a reservoir for enteropathogenic *E. coli* (Forster et al., 2009). *Campylobacter* spp. detection in wild flies suggests that flies may act as vectors for *Campylobacter* species (Forster et al., 2009).

Infections

Transmission of ectoparasites and endoparasites presents a potential animal-human interaction risk factor (CDC, 2011). *Sarcoptes scabiei* is a skin mite that infests humans and animals, including dogs and cats. Although human infestation from animal sources is generally self-limiting, skin irritation and itching can occur. Fleas from animals that bite humans increase the risk for infection or allergic reaction. Additionally, fleas sometimes carry a tapeworm species that can infect children who swallow the flea (Currier, Kinzer, & DeShields, 1993; Molina, Ogburn, & Adegboyega, 2003).

Safety

Undisciplined, uncontrolled, or unruly animals present self-evident safety and injury concerns, which are outside the scope of this review.

Public Health Risk

A paucity exists of published scientific inquiry directly related to risk factors associated with pets in restaurant seating areas. Much of the available health risk-factor evidence reflects pets in domestic conditions and farm animals, which may or may not be relevant to companion animals in retail food outlets. What is clear is that scientific evidence shows that pets are carriers of bacteria and parasites and are potentially problematic as sources of aeroallergens.

While pets are carriers of bacteria and parasites, the relative risk associated with specific pet-human interactions has yet to be established in a clear and consistent manner. The case of *E. coli* is representative of the uncertainty. Available peer-reviewed literature has established that intrahousehold sharing of *E. coli* among dogs and humans exists, and that flies captured near dog pounds carry *E. coli*. Alternately, no scientific literature exists that unambiguously links dog feces with human disease.

Vulnerable populations such as children, the elderly, pregnant women (and their fetuses), and the immunocompromised (e.g., individuals undergoing chemotherapy or who are HIV positive) represent at-risk populations due to 1) a greater probability of acquiring infection and 2) the severity of the resulting disease. Disease transmission may occur in the absence of direct animal contact if a pathogen is disseminated in the environment (fomites, aeroallergens) (CDC, 2009). The risk for infection is increased by certain human factors and behaviors, especially in children. These factors include inadequate hand washing, lack of close supervision, hand-to-mouth activities (e.g., use of pacifiers, thumb sucking, and pica) and a general lack of awareness of disease risk factors. Children are particularly attracted to animals and have increased risk for serious infections (CDC, 2009).

While the overall public health risk based on probability and severity of injury or illness to an individual patron enjoying a meal in animal-friendly food establishments is probably low when accompanied by rigorously enforced safety, sanitation, and hygiene practices, the risks remain present. Potentially serious illnesses can occur, as in the case of an asthma episode precipitated by proximity to a cat aeroallergen. For example, in at-risk populations (e.g., asthmatics), exposure to furry pets should be minimized (Moorman et al., 2007). The ADA has established the legal environment that permits service animals into eating areas. Prudence suggests the public health profession should focus efforts on policies and procedures that emphasize prevention, taking into account the legal requirements of the ADA.

Conclusion

Efforts on prevention should be tailored on training retail food outlet staff on common zoonoses and hygiene associated with animals. Many stakeholders have a vested interest in the outcome of this sensitive subject—the presence of animals in eating establishments. The political environment is amplified in part by the success and sensitivities associated with the ADA and people's passion for their pets. Health professionals are encouraged to remain in touch with evolving public attitude and to continually assess emerging veterinary, basic science, and public health literature.

Acknowledgements: The authors wish to acknowledge the considerable contributions and insight provided by Mr. John Rogers, Ms. Alicia Enriquez, and Mr. Val Seibel of the California Conference of Directors of Environmental Health in the development of this paper.

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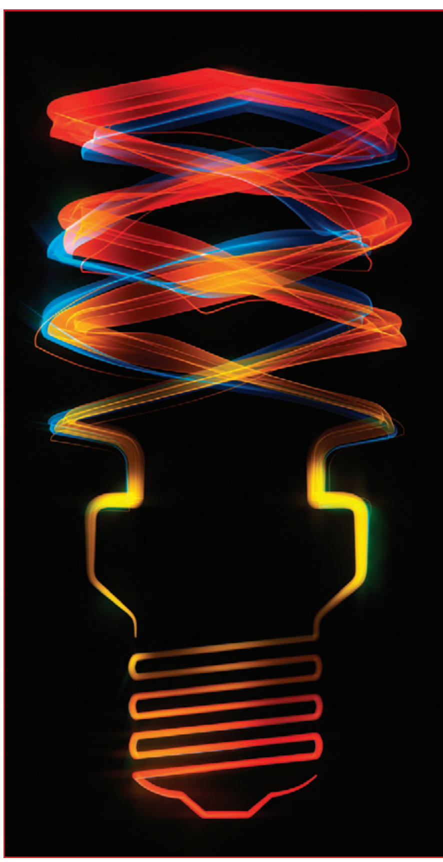

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State Health Agency Workforce Shortages and Implications for Public Health: A Case Study of Restaurant Inspections in Louisiana

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Abstract **The study described in this article evaluated the effects of public health workforce cuts on routine food safety inspections and the occurrence of critical violations. Routine inspection information was collected from two Louisiana databases for permanent food establishments categorized as risk category 3 or 4 in East Baton Rouge Parish, Louisiana, for the years 2005, 2007, and 2009. The length of time between routine inspections nearly quadrupled from 2005 to 2009. For risk category 4 establishments, a significant increase occurred in the proportion of inspections that resulted in a critical violation between the three years. The amount of time between routine inspections was significantly higher for inspections that resulted in a critical violation versus those that did not. Lastly, the amount of time between routine inspections, an establishment's risk category, and history of complaint were found to have significant predictive effects on the incidence of a critical violation during a routine inspection, although results varied by year. Study results indicate that decreased workforce capacity in Louisiana may negatively affect the outcomes of routine food safety inspections.**

Introduction

State environmental health professionals are critical members of the public health workforce, accounting for 10% of public health professionals (Center for State and Local Government Excellence, 2008). Ensuring a safe food supply is a key responsibility of environmental health programs, particularly in state and local health departments. According to a 2006 survey conducted by the Association of State and Territorial Health Officials, 82% of state environmental health units administer food protection programs (Association of State and Territorial Health Officials, 2007). In Louisiana, the Center for Environmental Health in the Office of Public Health oversees the food safety program and ensures safety for almost 32,000 food establishments, including full service restaurants; fast food businesses; cafeterias in hospitals, prisons, nursing homes, and schools; concession stands; delis; bars; and grocery stores. Among other functions, the Louisiana food safety program conducts food establishment inspections and responds to consumer complaints and reports of foodborne illness.

Food safety inspections serve as one of the most fundamental public health activities intended to prevent foodborne illness from occurring, but no definitive evidence exists indicating that poor restaurant inspection results accurately predict the potential for foodborne illness. The Seattle-King County (Washington) Health Department performed a study in 1987, which found that "restaurants with poor inspection results were at increased risk of foodborne outbreaks (Irwin, Ballard, Grendon, & Kobayashi, 1989)," and that routine inspections by the health department could help identify restaurants with an increased risk of an outbreak. Florida Department of Health epidemiologists conducted a similar study, however, and found no correlation between lower inspection results and increased outbreak risk (Cruz, Katz, & Suarez, 2001).

The literature is in conflict about how often food establishments should be inspected and whether less frequent inspections result in poorer inspection outcomes. Allwood and co-authors found that restaurant inspection scores were significantly higher (better) when restaurants were inspected four times a year, compared to three times a year (Allwood, Lee, & Borden-Glass, 1991). In contrast, a 2008 Canadian study did not find a statistical difference between food safety outcome measures based on inspection frequency, but concluded that "food premise inspections should continue to play an important role in protecting the public from foodborne illnesses by educating workers (Newbold, McKeary, & Hart, 2008)."

The El Paso County (Colorado) health department has lacked staff resources to perform two inspections per year of restaurants and other food providers as required by law (Auge, 2009). A report on the health care infrastructure in Colorado Springs (in El Paso County) revealed complaints about restaurant cleanliness and employee hygiene had increased from 60 in 2005 to 219 in 2007 (Emery, 2008). Although the county had not seen an increase in major foodborne outbreaks, individual complaints of sickness from food poisoning increased nearly threefold from 2005 to 2006 (Limbert & Beard, 2008). Limbert and Beard's report suggests that decreased restaurant inspections due to workforce shortages may present increased public health risks.

The Food and Drug Administration (FDA) recommends that to sustain an effective risk-based food safety program, state agencies should maintain well-resourced programs; i.e., at least one-full time staff member devoted to every 280–320 food establishments (FDA, 2009). In Louisiana, the ratio of sanitarians to the number of expected food establishments in need of inspection is already much higher than FDA's recommendation. For example, in the East Baton Rouge area in 2010, approximately 2,775 food establishments were open but only seven sanitarians were employed, creating a ratio of 396 retail food establishments to be inspected per sanitarian. Thus, these sanitarians are expected to perform nearly 25% more inspections than FDA recommends for an effective program. Additionally, food safety inspections constitute only one aspect of the environmental health sanitarian's overall job duties. Sanitarian inspection responsibilities cover a wide range of program areas, including beach monitoring, building and premises, commercial seafood, disease/vector control, food and drug, infectious waste, milk and dairy control, mollusks and shellfish, onsite wastewater, and retail food establishments.

Nationwide, the existing environmental health workforce shortage (Perlino, 2006) and even more severe budgetary constraints on environmental health programs (Gurwitt, 2009) threaten food safety programs. In Louisiana, budget cuts have directly affected the state's ability to maintain core environmental health staff. For example, in fiscal year 2010–2011, the environmental health department was required to reduce its budget by 25% to meet state budgetary constraints. To do this, the department removed six environmental health sanitarian staff from payroll, thus reducing the capacity to perform public health inspections and reducing response time by the department for other public health issues. These cuts exacerbated the potential impact of prior year workforce reductions. As state environmental health programs are forced to defend and justify their programs in the face of increased budgetary constraints, they must demonstrate the value of environmental health services. The purpose of our study was to evaluate Louisiana's electronic food inspection database to assess potential trends in inspection results and inspection frequency over time, as Louisiana Department of Health and Hospitals has faced workforce shortages.

Methods

Our study compared food safety inspections among 2005, 2007, and 2009 in East Baton Rouge to identify potential predictors of critical violations. A critical violation as defined by the FDA 2001 *Food Code* is a violation "that, if in noncompliance, is more likely than other violations to contribute to *food* contamination, illness, or environmental health *hazard* (FDA, 2004a)." Inspection records of establishments in risk categories 3 and 4 (RC3 and RC4) were utilized because they represent sites at most risk for foodborne outbreaks, with RC4 higher than that of RC3 establishments. Risk category designations are generally defined by the types of food served, required preparation steps, volume of food served, population served, and compliance history (FDA, 2004b). Examples of RC3 and RC4 establishments include full service restaurants that have extensive menus and handle raw ingredients, as well as restaurants that involve the cooking, cooling, and reheating of potentially hazardous food. A food establishment may also be rated as an RC3 or RC4 if the primary service population may be at increased risk of foodborne illness, such as schools and nursing facilities. The incidence of critical violations was used as a surrogate to indicate greater potential risk of foodborne disease.

Two Louisiana Department of Health and Hospitals data systems provided information. The Automated Inspection Records System is used by sanitarians in the field to record inspection results. The Sanitarian Event Tracking System is used by sanitarians to record establishment location, risk category, permit status, etc. These two systems are linked electronically and help inform sanitarians when they need to perform routine inspections.

Variables compiled in an Excel 2007 database were restaurant permit number, date of routine inspection, and previous routine inspection; the number of days between the date of routine inspection and previous routine inspection; number of critical violations received; number of noncritical violations received; history of complaint since last routine inspection; risk category; and year of inspection. A "complaint" occurs when a member of the public contacts the department regarding an issue with a food facility and the environmental health department is obligated to follow up on the complaint by performing an inspection at the facility to verify the validity of the complaint and enforce remediation if necessary. Up to six critical violations per inspection were abstracted.

Statistical Analysis

SAS 9.1 was used for statistical analysis. Descriptive analyses determined the number of inspections performed each year and within each risk category; the mean number of violations cited during an inspection; the frequencies of inspections resulting in critical violations, noncritical violations, and no violations; the frequency of inspections with a history of complaint; and the average days between routine inspections for establishments of different risk categories and between years. Chi-square tests determined if trends over time and between risk categories were statistically significant. Analysis of variance compared the average days between routine inspections from year to year. One-sided *t*-tests determined whether the average days between inspections resulting in critical violations versus ones that did not were statistically different. One-sided *t*-tests also determined if the average days between inspections with a history of complaint were statistically different from those without such history. Logistic regression analysis evaluated whether days since last routine inspection, history of complaint, and risk category predicted the incidence of critical violations.

Results

A total of 3,488 (57.3%) inspection records were eligible for study among 6,090 inspection records evaluated. A previous inspection date could not be found for 1,067 records, 670 records collected were risk category 1 or 2, and 865 records were missing risk category information. Routine inspection records were not found for January–April, 2005; thus, this analysis included only May–December 2005. Of all eligible inspections, 1,615 (46.3%) resulted in critical violations, 2,988 (85.7%) resulted in noncritical violations, and 445 (12.8%) resulted in no cited violations (Table 1). Forty-two different types of critical violations were cited across the three years. The most commonly cited were related to equipment cleanliness ($n = 610$), toxic storage ($n = 452$), and employees eating or drinking in a food preparation area ($n = 341$).

A greater proportion of RC4 establishments had a routine inspection resulting in a critical violation. The number of critical violations received by an establishment during an inspection ranged from 0 to 17 with a mean of 0.95, while the number of noncritical violations ranged from 0 to 40 with a mean of 4.37. The total number of violations per inspection ranged from 0 to 48 and averaged 5.32. Chi-square tests for trend showed that the proportion of critical violations varied significantly ($p < .0001$) by year for all inspections as well as for RC4 establishments only (Table 1).

The average number of days between routine inspections (regardless of risk category) was 252 days, ranging from 2 to 1,421 days. The annual means increased over time from about 100 to over 400 days for RC3, RC4, and all establishments combined. Variance F statistics revealed that the time between inspections increased significantly ($p < .0001$) from 2005 to 2009 for RC3, RC4, and all inspection categories. Table 2 indicates that for RC4 establishments, the average number of days between routine inspections that resulted in critical violations was significantly greater than those that did not ($p < .0001$); RC3 results were not statistically significant.

Chi-square analyses of an establishment's history of complaint, stratified by risk category and year, demonstrated statistically significant ($p < .0001$) positive trends in complaints for RC3, RC4, and all inspection categories. Chi-square tests (Cochran-Mantel-Haenszel option) supported ($p < .0001$) the hypotheses that a history of complaint would increase the

TABLE **1**

Violation Details by Year and Risk Category

Risk Category		Year			Chi-Square (p-Value)
		2005	2007	2009	
		# of Inspections (% of Total Within Year)			
Risk category 3	No violations cited	45 (13)	49 (8)	77 (13)	
	Only noncritical violations cited	167 (48)	340 (53)	250 (44)	
	Critical violation cited	136 (39)	254 (40)	245 (43)	1.51 (.22)
	Total	348	643	572	
Risk category 4	No violations	85 (17)	107 (14)	82 (13)	
	Only noncritical violations cited	188 (38)	285 (37)	198 (30)	
	Critical violation cited	225 (45)	380 (51)	375 (57)	17.2 (<.0001)
	Total	498	772	655	
All inspections	No violations cited	130 (15)	156 (11)	159 (13)	
	Only noncritical violations cited	355 (42)	625 (44)	448 (37)	
	Critical violation cited	361 (43)	634 (45)	620 (51)	13.5 (<.0001)
	Total	846	1415	1227	

TABLE **2**

Number of Days Between Inspections That Resulted in Critical Violations Versus Those That Did Not, for Each Risk Category and All Inspections

Risk Category	Resulted in a Critical Violation	#	Mean # of Days Between Inspections (95% *CI*[a])	t-Test Statistic (p-Value)*
Risk category 3	No	928	251.9 (238.5–265.3)	-0.92 (.36)
	Yes	635	261.8 (245.4–278.1)	
Risk category 4	No	945	225.9 (213.8–237.9)	-5.08 (<.0001)
	Yes	980	272.0 (258.9–285.2)	
All inspections	No	1873	229.7 (238.8–247.8)	-4.02 (<.0001)
	Yes	1615	257.8 (268.0–278.2)	

[a]*CI* = confidence interval.
*For all inspections and risk category 4 establishments, the Satterthwaite t statistic was used. For risk category 3 establishments, the pooled t-test was used.

TABLE **3**

Mean Number of Days Between Inspections With a Complaint History Versus Those That Did Not, Stratified by Risk Category and for All Inspections

Risk Category	History of Complaint	#	Mean # of Days Between Inspections (95% CI[a])	*t*-Test (*p*-Value)
Risk category 3	No	1442	239.3 (229.2–249.3)	-9.1 (<.0001)
	Yes	121	462.9 (430.2–495.7)	
Risk category 4	No	1816	236.0 (227.3–244.7)	-9.67 (<.0001)
	Yes	109	472.3 (424.6–519.9)	
All inspections	No	3258	237.4 (230.8–244.0)	-13.3 (<.0001)
	Yes	230	462.9 (430.2–495.7)	

[a]*CI* = confidence interval.

TABLE **4**

Adjusted Odds Ratios (*OR*) and 95% Confidence Interval (*CI*) for Critical Violations—Logistic Regression Analysis for All Inspections and Stratified by Year

Year	Variable (Effect)	Adjusted *OR* Estimate*	95% *CI*		Goodness-of-Fit Chi-Square (*p*-Value)
All inspections	Date_difference	**1.001**	**1.000**	**1.001**	20.28 (.009)
	Risk category	**1.545**	**1.349**	**1.77**	
	Complaint	**1.742**	**1.309**	**2.319**	
2005 (*n* = 846)	Date_difference	**1.006**	**1.002**	**1.009**	15.926 (.04)
	Risk category	1.30	0.983	1.723	
	Complaint	0.55	0.16	1.89	
2007 (*n* = 1415)	Date_difference	0.99	0.998	1.000	7.407 (.493)
	Risk category	**1.514**	**1.244**	**1.910**	
	Complaint	**2.688**	**1.644**	**4.394**	
2009 (*n* = 1227)	Date_difference	**1.001**	**1.000**	**1.001**	12.61 (.126)
	Risk category	**1.835**	**1.46**	**2.307**	
	Complaint	**1.484**	**1.02**	**2.159**	

Note. Values in bold are statistically significant.
*Wald confidence interval adjusted *OR* estimate.

odds of having an inspection that resulted in a critical violation in all (odds ratio [*OR*] = 1.88) and RC4 (*OR* = 4.09) establishment categories; RC3 results were nonsignificant. A *t*-test analysis (Table 3) evaluated history of complaint, and shows that, regardless of risk category, the mean number of days between routine inspections for establishments that had a complaint since their last routine inspection was substantially and significantly ($p < .0001$) longer compared to those that did not.

A logistic regression analysis evaluated predictive factors for the occurrence of a critical violation during a routine inspection. The logistic model included risk category (4 vs. 3), complaint history (yes vs. no), and number of days between routine inspections, and was run for all years combined and for each year separately. Table 4 displays the Wald confidence interval adjusted *OR*s. For all years, having a history of complaint (*OR* = 1.74) and being a RC4 establishment (*OR* = 1.55) were strong predictors of the incidence of a critical violation, while the number of days between routine inspections was a weaker but still-significant predictor. Every additional day between routine inspections increased the odds of a critical violation by about 0.1%. In other words, if a routine inspection was supposed to occur every 100 days, waiting another 30 days to do the inspection increased the odds of a critical violation by about 3.5%.

When stratified by inspection year, the logistic model results varied substantially. The days between inspections demonstrated a slightly stronger effect in 2005 compared to all years (*OR* = 1.006). Risk category demonstrated the strongest predictive effect in 2009 (*OR* = 1.84). A history of complaint was the strongest predictive variable for inspections in 2007 (*OR* = 2.69). The 2005 analysis was markedly different in that a history of complaint showed no predictive effect (*OR* = 0.55). The Hosmer and Lemeshow goodness-of-fit test stratified by year revealed good fits for 2007 and 2009, but the odds ratios for 2005 and all years combined should be interpreted with caution.

Discussion

These results document several very important trends in food safety inspections in East Baton Rouge, Louisiana. From 2005 to 2009, the amount of time between routine inspections almost quadrupled. In 2005, the average time between routine inspections for all establishments was approximately three and a half months. By 2009, however, the average time between routine inspections had increased to over a year. This was most likely a result of decreased workforce capacity within the department from layoffs and hiring freezes caused by state budget cuts. The data also show only minor differences in the days between routine inspections for RC3 versus RC4 establishments.

RC4 establishments tend to have more hazardous food production processes than RC3 establishments and present greater risk of potential foodborne illness. Our study found that a larger proportion of RC4 establishment inspections resulted in critical violations and that risk category demonstrated the most consistent predictive effect on critical violations. These findings support FDA's rationale that RC4 establishments should be inspected more often than other establishments.

While the average days between inspections increased between 2005 and 2009, a significant positive trend also occurred in the proportion of inspections resulting in critical violations. Statistically significant differences were observed in days between inspections that resulted in critical violations versus those that did not, with more time between inspections resulting in critical violations. The logistic regression analysis demonstrated that time between routine inspections was a weak but significant factor in predicting the incidence of critical violations. Thus, the significant increase in the amount of time between inspections from 2005 to 2009 could explain the positive trend in the proportion of inspections resulting in critical violations. Routine inspections provide excellent opportunities for sanitarians to educate restaurant staff and managers on food safety. The three most frequently cited critical violations—equipment cleanliness, toxic storage, and employees drinking and eating in a food preparation area—are all behaviors and circumstances that can be minimized with regular food safety education.

The proportion of inspections with a history of complaint in East Baton Rouge also increased significantly between 2005 and 2009. A significant increased difference occurred in the days between routine inspections that had a history of complaint compared to those that did not. One possible explanation for this association is that with reduced resources, inspections conducted to investigate a complaint are being substituted for routine inspections. Based on the inspection records studied, it appears that when investigating a complaint, sanitarians remark on the purpose of the complaint but also perform the duties of a routine inspection and note any other violations. Thus, the inspection may act as a routine inspection, pushing back the time frame for the next inspection. A history of complaint also proved to be a fairly strong predictor, however, although not as consistent as risk category, for the incidence of a critical violation during routine inspections. Therefore, while inspections for investigating complaints may serve informally as routine inspections, Louisiana sanitarians should try to prioritize these establishments for more frequent routine inspections.

Our study is one of a few efforts to evaluate a state food safety inspection program and can provide a model for similar evaluations elsewhere. One strength of our study was its large sample size, including nearly 3,500 inspection records. Close to 2,000 inspection records were missing a risk category designation or a previous inspection date, however, and could not be included in the analysis. This could affect the ability of the sample to represent the entire picture in East Baton Rouge.

The unexpected gap in inspection data for 2005 could have affected the results of our study; this gap may have resulted from issues being resolved in the electronic system, which was brought online in 2003. No reason exists, however, to believe that results of inspections from January to April would have been very different from May through December. Nonetheless, the missing data could have introduced unexplained biases that could account for the differences in results between 2005 and the other two years.

Data entry errors in the electronic system could have led to information bias within our study. Further, personnel changes over time could have contributed to differences in inspection result trends. Each region in Louisiana has at least one "standardization officer," who trains and tests sanitarians in the field to ensure consistency across all inspections (C. Bombet, personal communication, August 18, 2010). For the timeframe of our study, all inspections would have been performed by an inspector who had gone through training with a standardization officer. Therefore, an inspection by any sanitarian in Louisiana should have similar results. Budget cuts in the past two years have forced the Center for Environmental Health to reduce the number of standardization officers in its central office in Baton Rouge. In the future, it may become more difficult to ensure consistency in inspections among sanitarians without the capacity to do adequate training for sanitarians entering the field.

Conclusion

Based on our study, decreased frequency of inspections could be responsible for an increasing proportion of routine inspections that result in critical violations, especially among RC4 establishments. Additionally, increased time between inspections from 2005 to 2009 was paralleled by a significant increase in complaints. We recommend that the Louisiana Department of Health and Hospitals prioritize the inspection of RC4 establishments and those establishments with a history of complaint to reduce the risk of foodborne illnesses.

Acknowledgements: We would like to thank the staff at the Center for Environmental Health, Office of Public Health, Louisiana Department of Health and Hospitals for the use of their inspection data and cooperation in this study. Lindsey Realmuto would also like to thank The George Washington School of Public Health and Health Services for the Capital Connection Fund grant that allowed her to travel to Louisiana for this study.

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Did You Know?

The International Federation of Environmental Health (IFEH) will bring its 13th World Congress to the NEHA 2014 AEC. IFEH is an organization whose members are national associations representing the interests of environmental health professionals throughout the world. The 2014 AEC is a unique opportunity to meet environmental health professionals from all over the globe!

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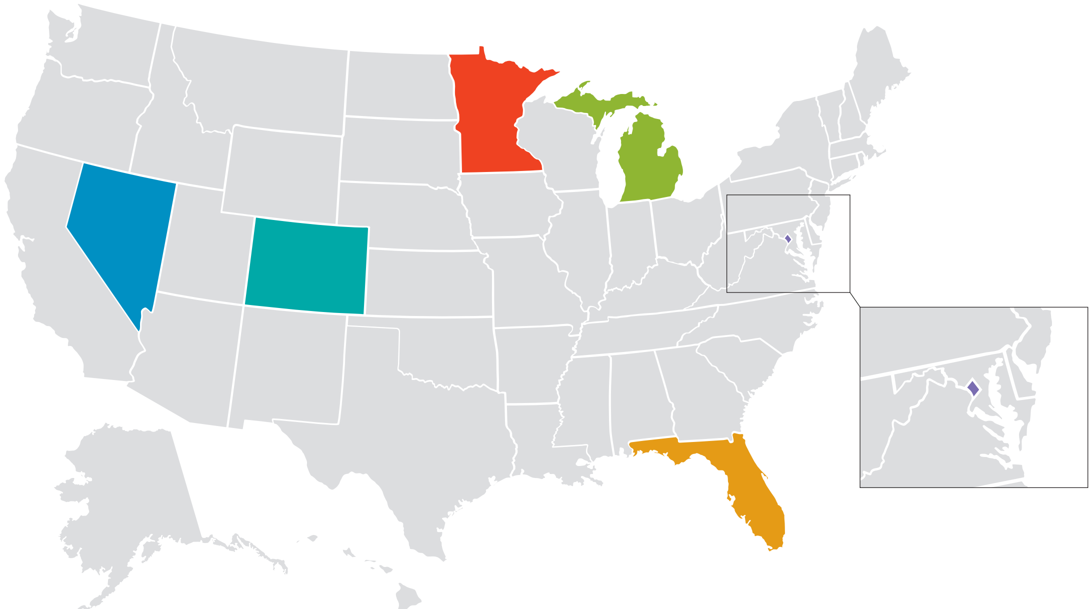
ACROSS THE COUNTRY WHAT'S HAPPENING IN ENVIRONMENTAL HEALTH



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

COLORADO

Safety in the Aftermath of Flooding

While waters from the 2013 Colorado floods have receded, an ongoing effort to cleanup and rebuild hard-hit areas is still underway. The flooding occurred the week of September 9, 2013, when a slow-moving cold front stalled over Colorado and resulted in heavy rain and catastrophic flooding along Colorado's Front Range from Colorado Springs north to Fort Collins. Boulder County was worst hit with up to 17 inches of rain recorded by September 15. This is comparable to Boulder County's average annual precipitation.

Boulder County's flood cleanup Web site (www.bouldercounty.org/flood/health/pages/default.aspx) provides residents and businesses with crucial information on how to stay safe during cleanup efforts. Guidelines for reopening are provided for body art facilities, child care and preschools, and restaurants and grocers. Information on health and safety issues regarding debris collection and removal, food safety, and mold are posted. And water and waste issues, from drinking water to septic systems to sewage backups, are covered.

The site also provides documents that cover specific cleanup precautions such as cleaning and sanitizing with bleach, lead paint considerations, personal hygiene after a disaster, and pest control after flooding.

FLORIDA

Shell Yeah!: Partnering to Rebuild Reefs

St. Lucie County, located on Florida's east coast between Orlando and Miami, is improving the environment by partnering with more than a half a dozen local restaurants and raw bars. Through the St. Lucie County Mosquito and Coastal Resources Department, the county is collecting and recycling oyster shells from area eateries and rebuilding oyster reefs in the fragile Indian River Lagoon.

This year alone, area restaurants have donated more than 3,500 gallons of oyster shells. Instead of ending up in the landfill, these shells are set aside to dry for three months before being placed into mesh bags by volunteers, taken out into the shallow waters of the Indian River Lagoon, and dropped in spots where the county has permits to create the reefs. Eventually, tiny oyster larvae float by and cling to the empty shells where they grow up and become adults, forming a living reef. An adult oyster can filter up to 50 gallons of water a day, while the reefs provide habitat for fish and other marine life.

Source: Erick Gill, Public Information Manager, St. Lucie County Board of County Commissioners.

MICHIGAN

Sustaining the Sustainability Effort

Located in Grand Rapids, Michigan, the Center for Sustainability (C4S) at Aquinas College is a student-run and faculty-directed organization providing a web-based clearinghouse of information for consumers, business people, nonprofit organizations, students, and governmental agencies interested in sustainable practices. Aquinas College is the first institution in the U.S. to offer undergraduate degrees in sustainable business.

Two separate events marked the recent efforts of C4S—the Zero Waste Initiative and "Mount Trashmore." The Zero Waste Initiative, held during Homecoming 2013, focused on a variety of sustainability practices including selling Michigan-brewed beer using reusable cups to decrease waste from the event. Electronic communications and broadcasting were widely used to significantly decrease the amount of paper.

On October 10, 2013, all campus garbage from the previous day was gathered and dumped in the Wege Plaza to create "Mount Trashmore." Students and volunteers sorted through the waste, picking out items for compost or recycling. This event raised awareness about environmentally conscious living. Aquinas has set a goal of becoming waste free by 2014. As a results of this event, 9 bags of composting, 11 bags of recycling, and only 1 bag of trash was generated.

MINNESOTA

Cute and Furry and Possibly Deadly

The Minnesota Department of Health has confirmed that at least three children were infected with *E. coli* O157:H7 after coming into contact with cattle and goats at a farm and pumpkin patch in Dayton, Minnesota. Health officials are following up with other visitors to determine if more are ill.

The farm owners have been cooperating fully with the investigation and public access to the cattle and goat areas is being prohibited. The best way to prevent infections from contact with animals is to wash hands thoroughly with soap and water immediately afterwards. Hand sanitizers might afford some protection until hands can be washed with soap and water but do not work well against some germs or when hands are visibly soiled. Food, drinks, and items that promote hand-to-mouth contact (e.g., pacifiers) should never be brought into animal areas.

Source: www.foodsafetynews.com.

NEVADA

Driving Towards Food Safety

The Nevada Highway Patrol (NHP) conducts routine inspections on commercial vehicles just outside of Las Vegas, Nevada. Occasionally, the truck inspectors discover food that is being transported in an unsafe manner. In April 2013 the NHP pulled over a refrigerated box truck for a routine inspection when they noticed that the condenser unit was not running. It is not uncommon for trucks to try to save fuel by turning off the condensers in a refrigerated truck. When these trucks drive for hours through the desert, however, the foods become temperature abused.

Due to the temperature of the truck and food items in question, NHP called the Southern Nevada Health District (SNHD) to assist them on site. Once SNHD inspectors arrived, they discovered that the majority of the product was whole fruits and vegetables; however, unlabeled white tortillas and thawing slabs of beef were also found. The tortillas and meat were discarded and denatured by the driver on site due to unapproved source and temperature abuse, respectively.

This incident was a driving force in establishing a relationship between SNHD and NHP. SNHD inspectors now routinely visit the truck inspection site to ensure the safe transport of food into Las Vegas.

WASHINGTON, DC

Removing Hazardous Chemicals From the Shelves

Environmental health professionals usually find themselves focusing on existing and "after-the-fact" issues. It is clear that exposure to hazardous chemicals pose long-term health effects, so trying to mitigate these hazards is challenging. What is the solution?

Last April, Safer Chemicals, Healthy Families, along with dozens of health and environmental groups, urged the nation's top 10 retailers—including Wal-Mart, Target, and Costco—to rid their store shelves of 100-plus hazardous chemicals. It asked them to develop a plan within one year to phase out their use in products.

In September, Wal-Mart announced a new policy to require manufacturers of cosmetics and cleaning products to disclose ingredients in their products and remove priority hazardous chemicals. Wal-Mart joins an industry shift away from potentially toxic chemicals in consumer products.

In October, Target announced a new "Sustainable Product Standard" that would rate thousands of cleaners, personal care, beauty, and baby care products based on the safety and sustainability of their ingredients. The new system favors products that avoid a list of slightly more than 100 known toxic chemicals nearly identical to the list proposed for retailers by Safer Chemicals, Healthy Families in April.

Source: www.saferchemicals.org.

DIRECT FROM ATSDR

Peter J. Kowalski, MPH, CIH

Barbara A. Anderson, MSEnvE, PE

(Authors not pictured)
Susan Moore, MS
Lynn Wilder, PhD, CIH

Spotlight on ATSDR: Exposure Investigations

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

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

The conclusions of this article are those of the author(s) and do not necessarily represent the views of ATSDR, CDC, or the U.S. Department of Health and Human Services.

Peter J. Kowalski is a captain in the U.S. Public Health Service and is serving as the lead for the Data Analysis and Exposure Investigation Team in ATSDR's Division of Community Health Investigations. Barbara A. Anderson is an environmental health scientist on the Data Analysis and Exposure Investigation Team.

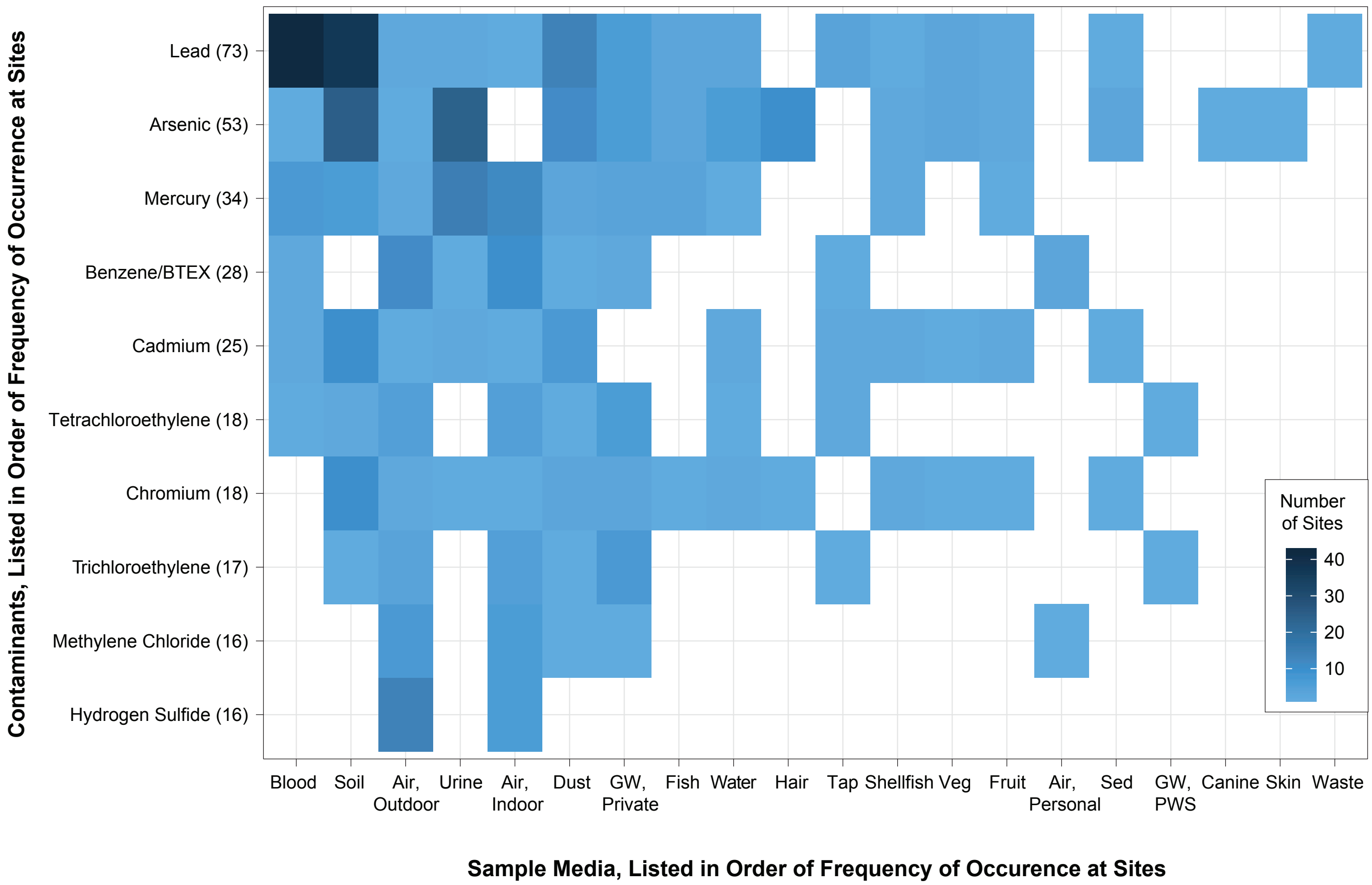
One way that the Agency for Toxic Substances and Disease Registry (ATSDR) accomplishes its mission of serving the public by promoting healthy and safe environments and preventing harmful exposures is by investigating and evaluating the potential public health consequences of exposures to environmental contamination at a community or site-specific level (ATSDR, 2013a). The first step in this process often involves reviewing and analyzing existing environmental and exposure-related data to find out whether people have been, are being, or may be exposed to environmental contaminants. ATSDR typically relies on environmental and exposure-related data provided by state and federal partners. In cases where critical data are not available and may not be forthcoming from another agency, ATSDR can conduct a site-specific exposure investigation to fill an identified data gap. Exposure investigations may include collection of (1) environmental samples of soil, water, air, or biota (e.g., fish, crab, fruits, or vegetables that people consume) and/or (2) biological samples of a person's urine or blood that may contain biomarkers suggesting exposure to a specific contaminant.

ATSDR uses the following criteria to determine whether a proposed exposure investigation is feasible:

- Can an exposed population be identified?
- Does a critical data gap exist that affects our ability to determine if a health hazard exists?

FIGURE **1**

Top 10 Contaminants, Associated Sample Media, and Site Counts for Agency for Toxic Substances and Disease Registry Exposure Investigation Sites, 1995–2013



BTEX = benzene, toluene, ethylbenzene, xylenes; GW = groundwater; Veg = vegetables; Sed = sediment; PWS = public water supply.

- Can an exposure investigation be designed that will address the critical data gap?
- Will the results of the exposure investigation affect the public health decision(s) for the site?

Additionally, during the planning stages, specific and detailed attention must be given to the design of an exposure investigation to ensure that it is grounded in published scientific methods. In practical terms, this means that for exposure investigations involving environmental sampling, valid sample collection, sample analytical methods, and health-based comparison values for the environmental media being tested must be available. Similarly, for exposure investigations involving biological sampling, appropriate exposure biomarker methods and blood or urine reference ranges for the biomarker must be defined.

ATSDR has completed approximately 250 exposure investigations since the program began in 1995; almost half (45%) involved biological sampling and two-thirds (68%) involved some type of environmental sampling. The top three most frequently detected contaminants at exposure investigation sites were lead (found at 73 sites), arsenic (53 sites), and mercury (34 sites) (Figure 1). Those three metals were most often associated with mining or smelting operations. The most common volatile organic compounds were benzene-related compounds such as benzene, toluene, ethylbenzene, and xylenes, found at 28 sites. Of note, ATSDR conducted 20 exposure investigations for hydrogen sulfide in air; 15 exposure investigation sites involved polychlorinated biphenyls (PCBs); and 13 exposure investigation sites involved dioxins in various sample media.

ATSDR performed exposure investigations in rural, semirural, and urban areas with diverse local settings ranging from residential neighborhoods and public parks to municipal landfills and commercial oil/gas operations. The number of samples collected during an exposure investigation varied depending on site-specific factors such as the exposure pathway, sample media, and the number of persons potentially exposed. The number of participants for biological exposure investigations has ranged from less than 10 to more than 100 people.

The results of an exposure investigation may inform decisions about prioritization of public health actions, changes in policy, the allocation of resources, and the type or extent of environmental cleanup activities. In that sense, an exposure investigation can be used to support actions of both public health and regulatory agencies. Exposure investigation results have prompted changes in state regulations. For example, in Ohio, regulations governing the siting of construction and demolition landfills were revised (ATSDR, 2009) and in Minnesota, regulations regarding concentrated animal feeding operations were modified (Minnesota Department of Health, 2009). Exposure investigations have also led to public health actions that directly prevented human exposure. After an exposure investigation in South Carolina, public water lines were installed (Orloff et al., 2004) and in Alabama, officials began monitoring unregulated contaminants (ATSDR, 2013b). In some cases, exposure investigations have led to health studies such as the large-scale evaluation of residents living near a former PCB plant in Alabama (Silverstone et al., 2012).

An exposure investigation is one approach ATSDR can use to better characterize and evaluate past, current, and future human exposures to environmental contaminants at a site-specific level, particularly when such evaluations are constrained by critical data gaps. It is important, however, to acknowledge that not all sites are good candidates for this approach. Careful consideration of the feasibility and scientific design aspects of an exposure investigation are necessary for successful implementation at a site. Over the years, ATSDR has developed expertise in conducting a variety of different types of exposure investigations (Figure 1) and demonstrated a number of successes in terms of promoting healthy and safe environments at the community level.

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2014 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 the best in the profession. NEHA is currently accepting nominations for this award by an affiliate 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 environmental health.

Nominations are due in the NEHA office by Monday, March 17, 2014.

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

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DIRECT FROM CDC ENVIRONMENTAL HEALTH SERVICES BRANCH

Erik W. Coleman, MPH

Kristin C. Delea, MPH, REHS

The Use of Public Health Informatics to Improve Environmental Health Practice

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

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

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

Erik W. Coleman is a public health informatics fellow at EHSB. Kristin C. Delea is an epidemiologist at EHSB.

Reliable, accurate public health information technology is essential for monitoring health and for evaluating and improving the delivery of public health practice (AbouZahr & Boerma, 2005). As the complexity and interdependencies of environmental health issues have grown, environmental health programs have begun to identify the emerging need for the integration of data from diverse sources. Environmental health agencies find it beneficial to share data not only between programs and divisions within their own departments, but also with other agencies within the state, region, and nation (Ohio Department of Health, 2011).

Fragmentation of environmental health data directly affects the ability of environmental health programs to protect the communities they serve. Currently, the enormity of available data and the paucity of usable information from the data are a paradox that often frustrates federal, state, and local environmental health officials. The barriers to accessing and using environmental health data restrict the ability of public health officials to address emerging health problems, educate decision makers and the public on the full impact of specific environmental hazards, and evaluate the effectiveness of interventions (Public Health Foundation, 1997). In order for environmental health programs to be effective and grow, the programs need reliable, timely information to make information-driven decisions, improve communication, and improve tools to analyze and present new data (Friede, Blum, & McDonald, 1995).

Using information technology to capture, manage, analyze, and share information is a core capacity of public health informatics. Public health informatics is the application of information science and technology into public health practice and research (Yasnoff, O'Carroll, Koo, Linkins, & Kilbourne, 2000). Specifically, public health informatics supports the mission of disease prevention and health promotion by leveraging information technology solutions, therefore enabling environmental health programs to achieve public health goals more effectively, efficiently, and inexpensively.

In 2001, the Centers for Disease Control and Prevention's National Center for Environmental Health integrated public health informatics approaches into environmental health practice by developing the Environmental Health Specialists Network Information System (EHSNIS), a web-based application accessible anywhere Internet connectivity is available, including mobile devices (e.g., smartphones, tablets). EHSNIS coordinates and supports data collection activities in the area of foodborne and waterborne illness outbreak prevention, specifically in the following activities:

- National Voluntary Environmental Assessment Information System, a standardized reporting tool for foodborne illness outbreak environmental assessments;
- *Listeria* Retail Deli Study, a risk assessment to better understand how *L. monocytogenes* is transmitted in the retail environment; and
- Private Well Initiative Inventory, a standardized reporting tool for datasets with information on domestic private wells.

EHSNIS is also available to other government agencies and nonprofit organizations, such as the following, to support their data collection needs relating to environmental health:

- Minnesota Department of Health—Raw Fish/Sushi Study, an assessment of risk factors for foodborne illness present in restaurants preparing and serving raw fish items;
- Georgia State University—Environmental Health Specialists Survey, a survey characterizing environmental health specialists food safety and work related duties; and
- NEHA—Insect and Rodent Control Needs Assessment, a survey to collect data on training offered during NEHA's Annual Educational Conference & Exhibition.

EHSNIS primarily supports two methods of data collection: surveillance or evaluation and web-based survey. The surveillance or evaluation data collection generally includes data collected in the field by registered users of EHSNIS using a structured data collection tool. Conversely, web-based surveys send electronic survey invitations to targeted audiences who do not have to be registered users of EHSNIS to provide survey responses. Web-based surveys support both anonymous and identified-participant survey designs. The data collected within EHSNIS can be electronically downloaded into comma-separated value files for data analysis using analytic software packages (e.g., SAS, Microsoft Excel). This benefits public health practice by providing easy, rapid access to a data collection system and the environmental health data collected (Friede et al., 1995).

EHSNIS is a platform that assists in mitigating and ultimately eliminating some gaps in environmental health data; however, it will not solve all existing data issues. Improving the quality of environmental health data collected, data collection protocols, and data analysis and dissemination depends on long-term planning, standardizing environmental health data, documenting contributions of public health informatics to improving environmental health, and garnering and properly allocating new resources.

Updating existing approaches to data collection and management and developing new analytical techniques to take advantage of evolving environmental health data sources may help improve the environmental health functions of notifiable disease reporting, outbreak detection, emergency response, and program evaluation (Centers for Disease Control and Prevention, 2012). If your food or water safety program is interested in using EHSNIS for your data collection activities or if you have additional questions or comments please contact EHSNIS@cdc.gov.

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Centers for Disease Control and Prevention Environmental Health Informatics Resources

- **Environmental Health Specialists Network Information System**: Free environmental health data collection tool at www.cdc.gov/nceh/ehs/EHSNet/resources/ehsnis
- **e-Learning on Environmental Assessment of Foodborne Illness Outbreaks**: Free virtual reality-style training on how to conduct environmental assessments at ddrewww.cdc.gov/nceh/ehs/eLearn/EA_FIO
- **National Voluntary Environmental Assessment Information System**: Free standardized reporting tool for foodborne illness outbreak environmental assessments at www.cdc.gov/nceh/ehs/NVEAIS

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DEMYSTIFYING THE FUTURE

Thomas Frey

The Great Freelancer Movement: Eight Reasons Why Your Next Job Will Be a Project

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

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

Thomas Frey is Google's top-rated futurist speaker and the executive director of the DaVinci Institute®. At the Institute, he has developed original research studies enabling him to speak on unusual topics, translating trends into unique opportunities. Frey continually pushes the envelope of understanding, creating fascinating images of the world to come. His talks on futurist topics have captivated people ranging from high-level government officials to executives in Fortune 500 companies. He has also authored the book *Communicating with the Future*. Frey is a powerful visionary who is revolutionizing our thinking about the future.

By 2025, over 75% of the workforce will be comprised of millennials, a group many refer to as the Facebook generation. That's just over 11 years away.

For big corporations this should come as shocking news. Most have been content to ride out the economic turmoil with little to no hiring, and what little did take place was rarely from this generation. Only 7% of millennials have worked for a Fortune 500 company.

As most millennials have come to realize, finding a job is an entrepreneurial activity. They're selling their skills to the highest bidder, or most often, just anyone willing to pay for them. If they can't find a full-time job, a part-time one will do for now. Even project work will be fine.

With scant opportunity to move into a "career position," they learn to get by with piecemeal work, often living at home because they haven't stabilized their income to the point of being credit worthy, something most landlords are quick to pick up on.

After testing out a variety of filler jobs, part-time positions, and gig work, finding the next project becomes a way of life. Before they know it, they've entered the world of involuntary entrepreneurship, a path that neither academia nor any other aspect of learning has prepared them to take.

But millennials are savvy networkers, connected to an average of 16 other coworkers and hundreds of other close friends. This "awareness network" is quick to spot new opportunities.

Within the next 10 years, the average person who turns 30 will have worked on between 200 and 300 different projects.

Here are many of the things you haven't heard about this trend, and why your next job will likely be anything but permanent.

The Emerging, Course-Shifting Millennial Generation

Young people today are different than previous generations, but maybe not in ways that you think. Here are 15 fascinating facts about millennials:

1. By next year, millennials will account for 36% of the U.S. workforce and by 2025, they will account for 75% of the global workplace (U.S. Bureau of Labor Statistics/the Business and Professional Women's Foundation).
2. Only 6 in 10 millennials have jobs, and half of those are part-time (Harvard University).
3. Over 280,000 American college graduates were working in minimum-wage jobs in 2012 (*Wall Street Journal*).
4. Forty-eight percent of employed college graduates work in jobs that don't require

a four-year degree (Center for College Affordability and Productivity).

5. Sixty-three percent know someone who had to move back home because of the economy (Pew Research).
6. Thirty-five percent of employed millennials have started their own business on the side to supplement their income (Iconoculture).
7. Ninety percent say being an entrepreneur is really a mindset instead of just the role of a business owner (Millennial Branding/oDesk).
8. Over 63% of Gen Y workers have a bachelor's degree (Millennial Branding/PayScale).
9. They are now on track to become the most educated generation in American history (Pew Research).
10. Ninety-two percent believe that business success should be measured by more than just profit (Deloitte).
11. Fifty-six percent of Gen Ys won't work at a company if they ban social media access (Cisco).
12. Sixty-nine percent believe office attendance is unnecessary on a regular basis (Cisco).
13. Average tenure for Gen Y is two years (it is five years for Gen X and seven years for baby boomers) (Millennial Branding/PayScale).
14. It costs an average of $24,000 to replace each Gen Y employee (Microsoft Experience, Inc.).
15. Millennials will account for 40% of the voting electorate by 2020 (Center for American Progress).

With this backdrop, let's look at how the millennial generation is about to collide with some of the other driving forces in the business world.

The Shift to Project Work

Millennials are in the driver's seat. It may not feel like it to them, but they come with far more flexibility, a less-encumbered lifestyle, and a resilience that makes them perfect for doing project work.

Their willingness to "do what it takes," coupled with an innate ability to shift gears quickly, is positioning them for an adventure-based lifestyle with far greater freedom and an ability to select meaningful work, two things that mesh very well with Gen Y thinking.

Here are eight overarching drivers that will make this shift to project work seem exceedingly normal:

1. Companies Are No Longer a Place

For many companies, the need for a physical location is either dwindling or disappearing. Business is becoming very fluid in how it operates, and the driving force behind this liquefaction is a digital marketplace that connects buyers with sellers faster and more efficiently than ever in the past.

Even though Yahoo and others are pushing for a more in-house workforce, the overarching trend is still in the other direction.

Yes, physical businesses will still exist in the future, but the concepts of proximity and place will have less value in the years ahead.

2. Freelancer Toolbox Is Improving

The Internet is a sophisticated communication toolbox able to match the needs of a business with the talent of individuals in far more precise ways than ever before, and these tools are getting better every day.

As an example, oDesk, the online work marketplace, recently announced they hit the magical tipping point of $1 billion in brokered work between businesses, many of them solopreneurs and freelancers who moonlight, and in many cases earn their entire living online.

According to MBO Partners' "State of Independence in America" report, the number of independent workers is expected to rise to 23 million by 2017.

3. Proliferation of Long-Tail Job Niches

In the past, if you produced a product that only appealed to 1 in 35,000 people it was a very hard sell. Few retailers would have wanted to carry that product on their store shelf. Today, however, the Internet enables us to connect buyers and sellers of niche products far more efficiently.

The same goes with niche skills. With niche skills and niche demand for those skills, people specializing in econometrics and Robotframe are well suited to be freelancers. They can charge a premium for their service, but employers only need them for short periods of time.

4. Companies Have an Obligation to Hire the Fewest Number of People They Can Get Away With

Hiring a full-time staffer is an expensive proposition. According to Microsoft, it costs them $24,000 to replace a Gen Y worker.

Over the years a tremendous number of laws have been written to govern the employer-employee relationship, and managing a business in what some would term an onerous human resources environment have many searching for alternatives.

The overhead costs alone for the average full-time employee in the U.S. are now in excess of $10,000 per year.

For these reasons, companies have an obligation to hire the fewest number of people they can get away with. They have an obligation to their shareholders, current staff, and even their customers to find cheaper ways of doing business and to survive.

As a result, employers are constantly looking for ways to circumvent the traditional hiring process.

5. The Appeal of the Sampler Path

When stepping into a brewery or winery it's easy to get overwhelmed with dozens of choices. To solve this problem, most places simply offer a sampler tray to allow you to taste your way to a good decision.

Similarly, most young people have little understanding of the job that will best fit their personality, giving the sampler approach great appeal. Working a dozen projects in a dozen different industries will naturally give someone a better appreciation of the work involved and will offer a more logical approach to finding their best career choice.

6. The Freelancer Benefit Package

No, being a freelancer doesn't come with health insurance, vacation time, or a 401k plan. But what it does offer is far greater.

You're in control so you get to decide who you want as a client, when you're available for work, and most often, how much you'll get paid. Yes, sometimes you'll get fired from a project, but you can also fire your client.

Freelancing done right will give you a far higher salary, a far more influential circle of friends, and an ability to make a difference.

7. Freelancing Can Create a Powerful Win-Win Relationship

People who hire a freelancer have respect for your abilities. At the same time, with any good relationship, you'll have respect for the work they're trying to accomplish.

Over time you'll be able to influence the nature of projects, as well as the path to accomplishment, and take pride in your achievements.

Rather than settling for whoever wanted to hire you, you have the ability to migrate to the top quickly, avoiding all the infighting and office politics involved in climbing the corporate ladder, sway people's thinking, and make a meaningful difference along the way.

8. Ability to Control Your Own Destiny

Naturally the greatest appeal comes from the feeling of being in control.

Rather than letting some manager decide every detail of your life—when to arrive, what your priorities are today, and who you get to work with—as a freelancer you get to sit behind the steering wheel of your own life.

Certainly, when you choose the life of a solopreneur, not everything is within your control. And not everyone can manage all the variables of a project lifestyle. But for those who can, the differences are startling.

When you add up all of the positives—flexibility, freedom, purpose, meaning, and an ability to control your own destiny—the freelancer lifestyle brings with it some powerfully compelling reasons to switch.

Business Colonies

Since many freelancers won't be good at lining up one project after another, I have predicted that many of today's coworking facilities will begin to evolve into what I call Business Colonies.

Most coworking spaces consist of an aggregation of talent with additional capacity to take on extra projects, so this makes them a natural forerunner.

However, Business Colonies will form in many different ways. Some will be private colonies run by large corporations. Others will form around a specific talent pool with specialties in such areas as metallurgy, bioinformatics, data mining, social mapping, or video production. Still others will be nonprofit colonies formed around a specific cause like clean water, halting the spread of malaria, or rebuilding Haiti.

Final Thoughts

The business world is constantly being tasked with doing more for less. Virtually any company that cannot find ways to do things more efficiently and reduce costs will not survive.

Typically the largest number on a company balance sheet is the cost of labor.

Business colonies are an organic process of matching labor to projects for the exact duration of the contract. No more, no less. Overhead costs, compliance, and accounting issues are all minimized to improve the overall efficiency of the operation.

I don't see business colonies as a way for corporations to take advantage of cheap labor, although some may try. Rather, the coming era of skill shortages will put talented people in the driver's seat with many commanding increasingly high rates for their unique abilities.

Over time, people will be credentialed by the colonies they are associated with. Each colony will carry a certain pedigree, and the earliest among them will become the Harvards and Yales of the colony world.

In the future, few will be able to relate to the elaborate hiring and firing systems that we use today. As we enter the era of freelancers and business colonies, business, as we know it, will become a thing of the past.

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

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

Students Don't Be Left Out!

Applications for the 2014 NEHA/AAS Scholarship Program are now available. Last year, $7,000 was awarded to four students who demonstrated the highest levels of achievement in their respective environmental public health degree programs. If you would like an application or information about the NEHA/AAS Scholarship, do one of the following before the deadline:

Visit

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

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

Write, Phone, or Fax

Cindy Dimmitt with a request for an application and information.

Write: NEHA/AAS Scholarship
720 S. Colorado Blvd., Ste.1000-N
Denver, CO 80246-1926

Phone: 303.756.9090, ext. 300

Fax: 303.691.9490

Deadline: February 1, 2014

CAREER **OPPORTUNITIES**

Food Safety Inspector

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

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Albuquerque, NM	New Orleans, LA
Baton Rouge, LA	Pittsburgh, PA
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Cleveland, OH	Shreveport, LA
Dallas, TX	Spearfish, SD
Jacksonville, FL	Virginia Beach, VA
Little Rock, AR	Washington, DC
McAllen, TX	

Past or current food safety inspecting is required.

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

California State University, Fresno Assistant/Associate Professor Department of Public Health

Duties include teaching undergraduate courses in public health and possibly some graduate courses in the masters of public health (MPH) program. Undergraduate teaching will focus on the environmental/occupational health and safety option with emphasis in environmental health (water safety and vector control). An earned doctorate (PhD, EdD, or DrPH) from an accredited institution in environmental/occupational health and safety or a related field is required. Candidates nearing completion of a doctorate (ABD) may be considered, but for continued employment the doctorate must be completed by August 17, 2014. Please apply online at http://apptrkr.com/399078. For full consideration applications must be completed by November 18, 2013. California State University is an affirmative/equal opportunity institution.

IN MEMORIAM

Thomas "Tom" Edmonson

NEHA was saddened to learn that Tom Edmonson passed away in May 2013. Edmonson was a past president of the North Texas Mosquito Control Association, the Texas Environmental Health Association, and the Texas Association of Municipal Health Officials. He also served on NEHA's board of directors. He retired in 1997 from the Wichita County Health Department in Texas where he oversaw mosquito control, water quality and treatment, public health care clinics, restaurant inspections, and a number of other programs where his knowledge and devotion to the field made him a standout in the state of Texas.

Edmonson was recognized as a capable and effective leader. He is remembered for his stellar wit. As Robert Galvan, a NEHA member and colleague from Texas, stated, "We have lost a legend and a true giant in the environmental health and public health arena. Tom touched the lives of many individuals throughout his career and we will miss him, his humor, his wit, and his professionalism."

NEHA wishes to express its deepest sympathies to Edmonson's family, colleagues, and friends. He was an exemplary figure in environmental health and will be greatly missed.

Philip Kirkwood, Jr.

NEHA was saddened to learn that Philip Kirkwood passed away on September 6, 2013. Kirkwood was a highly respected leader in environmental health, dedicated to serving the community around him and his profession. Kirkwood was the director of environmental health for Calhoun County, Michigan, in the 1970s and went on to become the director of the department of environmental health for the state of Michigan from 1975 to 1997. He also served on the NSF Council of Public Health Consultants from 1987 to 1998 and was chair in 1994. After retirement he started up a consulting firm that did food sanitation training and certification for several cruise ship lines.

Kirkwood was actively involved in environmental health at the local and national level. He was president of the Michigan Environmental Health Association in 1976. Kirkwood went on to serve on NEHA's board of directors as a regional vice president and was the president of the association in 1983–1984. His leadership brought NEHA through a tough fiscal period and helped to ensure the future of the organization. As Harry Grenawitzke, a NEHA past president, stated, "Phil was a leader, motivator, and a sanitarian who was dedicated to his family, our profession, and NEHA. I remember many strategy sessions with the [NEHA] officers and board during his tenure where we discussed and made decisions that molded NEHA into the functional organization that would be sustainable both on principles and financially."

Kirkwood was chair of the search committee in 1983 that selected Nelson Fabian to be NEHA's executive director. "I owe much to Phil. He was my first full-year president at NEHA. The faith he had in me and the love he had for NEHA made for a tremendously powerful first impression that continues to shape me to this day. His example made me a believer in what was possible once you were willing to invest passion in what you did. He also modeled leadership for me with his willingness to take on any issue—no matter how controversial or complex. Thank you, Phil, for these wonderful life lessons," expressed Fabian.

It is extremely important to note that the NEHA scholarship fund was established under Phil's leadership as NEHA president. NEHA Past President Jim Balsamo shared, "Phil was a man of ideas and while my interactions with him were not as many, he had a personable way of making you feel important while you were speaking with him. Having served as a member and chair of the NEHA/AAS Scholarship Committee for many years and having seen the role that these scholarships play in the lives of those who pursue an environmental health profession, I certainly am grateful that he, for his own reasons, pushed the idea of student scholarships through NEHA. I feel that alone, and I am sure there are many more such reasons, puts him at the top of the class for those who have contributed substantially to NEHA and our profession."

NEHA wishes to express its deepest sympathies to Kirkwood's family, colleagues, and friends. He was an exemplary figure in the field of environmental health and will be greatly missed.

Editor's Note: The *Journal* will publish the In Memoriam section twice a year in the June and December issues. If you would like to share information on the passing of a noteworthy environmental health professional, please contact Kristen Ruby at kruby@neha.org.

Did You Know?

National Handwashing Awareness Week is December 1–7, 2013. Its goal is to decrease the spread of infectious diseases by empowering individuals to educate and help protect their communities through proper hand washing and hygiene behaviors.

EH CALENDAR

UPCOMING NEHA CONFERENCES

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

NEHA AFFILIATE AND REGIONAL LISTINGS

Alabama
April 9–11, 2014: 2014 Annual Education Conference, sponsored by the Alabama Environmental Health Association, The University of Alabama at Birmingham, AL. For more information, visit www.aeha-online.com.

Arizona
March 13, 2014: AZEHA Spring Conference, sponsored by the Arizona Environmental Health Association, Arizona State University, Tempe, AZ. For more information, visit www.azeha.org/AZEHA-Spring-Conference.html.

California
March 31–April 4, 2014: 63rd Annual Educational Symposium, "Harvest the Knowledge," hosted by the Redwood Chapter of the California Environmental Health Association, Napa Valley Marriott Hotel, Napa, CA. For more information, visit www.ceha.org/events.

Idaho
March 19–20, 2014: 2014 Annual Educational Conference, sponsored by the Idaho Environmental Health Association, Boise, ID. For more information, visit www.ieha.wildapricot.org.

Iowa
April 1–2, 2014: Iowa Governor's Conference on Public Health, partnered by the Iowa Environmental Health Association, Scheman Conference Center, Ames, IA. For more information, visit www.iowapha.org.

Kentucky
February 18–20, 2014: KAMFES Conference, sponsored by the Kentucky Association of Milk, Food, and Environmental Sanitarians, Marriott Griffin Gate Resort, Lexington, KY. For more information, visit www. kamfes.com.

Michigan
March 18–21, 2014: 2014 Annual Education Conference, sponsored by the Michigan Environmental Health Association, Big Rapids, MI. For more information, visit www.meha.net.

Ohio
April 15–16, 2014: 2014 Spring Annual Education Conference, sponsored by the Ohio Environmental Health Association, Worthington Double Tree Hotel, Columbus, OH. For more information, visit www.ohioeha.org/annual-education-conference.aspx.

Texas
December 4–6, 2013: 10th Annual South Texas Chapter Educational Conference, sponsored by the South Texas Chapter of the Texas Environmental Health Association, Isla Grand Beach Resort, South Padre Island, TX. For more information, contact Victor Baldovinos at (956) 761-3226 or tehastc@gmail.com.

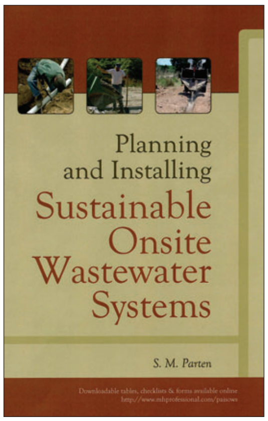
RESOURCE CORNER

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

NEHA BOOKSTORE
www.neha.org/store

Planning and Installing Sustainable Onsite Wastewater Systems

S.M. Parten (2010)

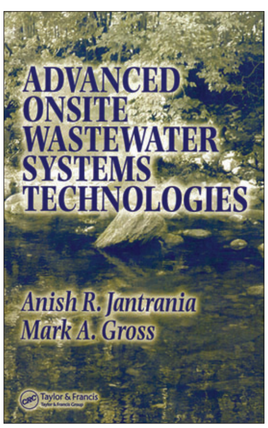


Covering technical principles and practical applications, this comprehensive resource explains how to design and construct sound and sustainable decentralized wastewater systems of varying sizes and in different geophysical conditions. This book covers state-of-the-art techniques, materials, and industry practices, and provides detailed explanations for why certain approaches result in more sustainable projects. In-depth design and construction information highlights nonproprietary methods proven to be very sustainable and cost-effective on a long-term basis for many geographic settings.

412 pages / Hardback / Catalog #1084
Member: $69 / Nonmember: $73

Advanced Onsite Wastewater Systems Technologies

Anish R. Jantrania and Mark A. Gross (2006)

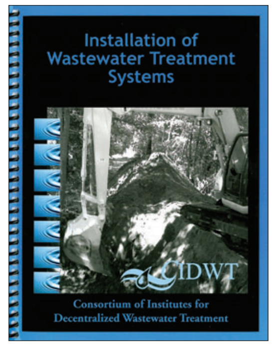


This book discusses a regulatory and management infrastructure for ensuring long-term, reliable applications of onsite systems for wastewater management. It provides an overview of advanced onsite systems technologies and compares them to conventional onsite systems and centralized wastewater systems. Key concepts for decentralized wastewater solutions and information on advanced onsite wastewater treatment and effluent dispersal technologies currently available are presented. The book delineates a management, regulatory, and planning framework for adopting the use of advanced onsite systems technologies as alternatives to conventional septic systems and centralized collection and treatment plants.

261 pages / Hardback / Catalog #487
Member: $103 / Nonmember: $108

Installation of Wastewater Treatment Systems

Consortium of Institutes for Decentralized Wastewater Treatment (2009)

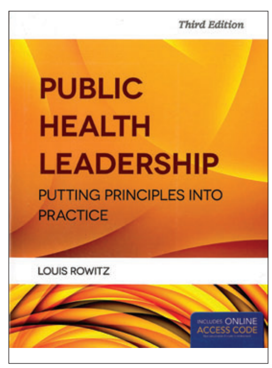


This manual is the definitive source for information on installing decentralized wastewater treatment systems. Developed by a team of experts, this manual provides installers with training materials geared specifically to address installation—one of the many vital aspects of programs for managing decentralized wastewater treatment systems. Installers, regulators, and designers of onsite wastewater treatment systems will gain a better understanding of the activities related to proper installation and startup to maximize system efficiency, longevity, and performance. This manual is a recommended study reference for NEHA's Certified Installer of Onsite Wastewater Treatment Systems (CIOWTS) credential.

454 pages / Spiral-bound paperback / Catalog #1125
Member: $68 / Nonmember: $79

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

Louis Rowitz (2014)



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

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


More trained employees = Fewer sick customers
"Research on foodborne illness risk factors has indicated that most outbreaks associated with food service establishments can be attributed to food workers' improper food preparation practices...The findings from this study and others indicate that education is important for food safety."
CDC EHSB epidemiological study by Green/Selman, 2005
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JEH QUIZ

FEATURED ARTICLE QUIZ #3

Lead, Allergen, and Pesticide Levels in Licensed Child Care Centers in the United States

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

1. Read the featured article carefully.
2. Select the correct answer to each *JEH* Quiz question.
3. a) Complete the online quiz at www.neha.org (click on "Continuing Education"),
   b) Fax the quiz to (303) 691-9490, or
   c) Mail the completed quiz to
      JEH Quiz, NEHA
      720 S. Colorado Blvd., Suite 1000-N
      Denver, CO 80246.

   Be sure to include your name and membership number!
4. One CE credit will be applied to your account with an effective date of December 1, 2013 (first day of issue).
5. Check your continuing education account online at www.neha.org.
6. You're on your way to earning CE hours!

Quiz Registration

Name

NEHA Member No.

Home phone

Work phone

E-mail

JEH Quiz #1 Answers

July/August 2013

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

➔ Quiz deadline: March 1, 2014

1. The Consumer Product Safety Commission estimates that __ children are placed in nonparental child care during some portion of the day.
   a. one million
   b. seven million
   c. 13 million
   d. 20 million

2. The Centers for Disease Control and Prevention estimated in 2009 that __ U.S. children aged 1–5 years had blood lead levels above 10 µg/dL.
   a. 57,000
   b. 163,000
   c. 240,000
   d. 470,000

3. __ and __ are the most common pathways for child lead exposure.
   a. Water; dust
   b. Food; water
   c. Food; soil
   d. Soil; dust

4. Asthma is one of the most common chronic diseases of childhood.
   a. True.
   b. False.

5. Which of the following rooms were not included for sampling in this study?
   a. Gymnasiums.
   b. Cafeterias.
   c. Bathrooms.
   d. Classrooms.

6. Of the child care centers surveyed, __ had been built after lead-based paint (LBP) was banned for residential use.
   a. 86%
   b. 57%
   c. 34%
   d. 29%

7. __ of the centers had LBP on either interior or exterior painted surfaces and __ of the centers had significantly deteriorating LBP.
   a. Eleven percent; 34%
   b. Twenty-eight percent; 11%
   c. Twenty-eight percent; 14%
   d. Thirty-four percent; 28%

8. Only 3% of the centers surveyed had a soil lead hazard.
   a. True.
   b. False.

9. Of the centers that had sufficient dust for sampling, 86% of the measurements for allergens were __ the lower detection limit.
   a. less than
   b. equal to
   c. higher than

10. An estimated __ of the centers reported at least one pesticide application in the last 12 months.
    a. 7%
    b. 18%
    c. 55%
    d. 75%

11. Of the centers that claimed to use pesticides, __ was the pesticide class identified the most often as being used.
    a. pyrethroids
    b. organophosphates
    c. carbamates
    d. organochlorines

12. Over 50% of the centers indicated that they never have tested their facility for lead.
    a. True.
    b. False.

NEHA MEMBERSHIP

WHAT DOES MEMBERSHIP IN THE NATIONAL ENVIRONMENTAL HEALTH ASSOCIATION OFFER YOU?

As a member of the National Environmental Health Association (NEHA), you join over 4,500 environmental health and protection professionals from across the nation and around the world in the public and private sectors as well as academia and the uniformed services in the only association serving ALL of environmental health and protection and ONLY environmental health and protection!

Benefits of NEHA membership include:

A Free Subscription to the Esteemed Journal of Environmental Health

- Find out why subscribers from around the world go to the *Journal of Environmental Health (JEH)* to stay current on the latest technological, legal, and research-based advancements in environmental health and protection. The *JEH* is an esteemed, peer-reviewed journal published ten times a year to keep you informed!
- **NEW!** Get an electronic copy of the *JEH*. Beginning with the November 2013 issue, NEHA members will receive the *JEH* in an electronic format for free in addition to receiving it in print.

Continuing Education

- Maintain your NEHA credential(s) with access to free educational courses and continuing education credits through NEHA's e-Learning site.
- Study environmental health abroad through the NEHA/UL Sabbatical Exchange Program!
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- Receive big discounts on attendance to the NEHA Annual Educational Conference & Exhibition where you can acquire practical and real-world information, expertise, and training on a variety of environmental health topics and network with other professionals and experts in the field.
- Get significant discounts on credentialing fees as you look to advance yourself professionally by earning a credential offered by NEHA.
- Receive discounts on more than 150 environmental health and protection publications available in NEHA's online Bookstore!

National Environmental Health Association

Join/Renew Today at neha.org/member

NEHA is also working hard to bring you a membership that fits your particular wants and needs. We are working to evolve the NEHA membership options available to you including a multiyear dues option and the opportunity to receive an electronic version of the Journal of Environmental Health. *Updates and information are available at neha.org.*

SUPPORT THE NEHA ENDOWMENT FOUNDATION

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

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

Thank you.

DELEGATE CLUB ($25–$99)

Name in the Journal for one year and endowment pin.

George F. Pinto
Elgin, IL

HONORARY MEMBERS CLUB

($100–$499)

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

Michele R. DiMaggio
Martinez, CA

H. Harold Lehman
Potomac Falls, VA

Bette J. Packer, REHS
Andover, MN

James M. Speckhart, MS
Norfolk, VA

21st CENTURY CLUB ($500–$999)

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

Scott M. Golden, RS, MSEH
Grove City, OH

Massachusetts Environmental Health Association in Memory of Joseph "Jay" Walsh, Jr.
Milton, MA

Peter M. Schmitt
Shakopee, MN

Dr. Bailus Walker, Jr.
Arlington, VA

SUSTAINING MEMBER CLUB

($1,000–$2,499)

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

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

George A. Morris, RS
Dousman, WI

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

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($2,500–$4,999)

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

EXECUTIVE CLUB AND ABOVE

($5,000–$100,000)

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

NEHA ENDOWMENT FOUNDATION PLEDGE CARD

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

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

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

Signature ____________ Print Name ____________

Organization ____________ Phone ____________

Street Address ____________ City ____________ State ____________ Zip ____________

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

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

Signature ____________

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

1312JEHEND

SPECIAL NEHA MEMBERS

Sustaining Members

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www.county.allegheny.pa.us

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

Arlington County Public Health Division
www.arlington.us

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

Association of Environmental Health Academic Programs
www.aehap.org

Chemstar Corporation
www.chemstarcorp.com

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

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

City of Houston Environmental Health
www.houstontx.gov/health/Environmental/
(832) 393-5155

Columbia County Health Department
www.columbiacountyny.com/depts/health2/

Decade Software Company LLC
Darryl Booth
www.decadesoftware.com

DEH Child Care
www.denvergov.org/DEH

DeltaTrak, Inc.
Vallierie Cureton
www.deltatrak.com

Department on Disability Services, District of Columbia
http://dds.dc.gov

Digital Health Department, Inc.
www.digitalhealthdepartment.com

Diversey, Inc.
Steve Hails
www.diversey.com

DuPage County Health Department
www.dupagehealth.org

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

EcoSure
charlesa.arnold@ecolab.com

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

Erie County Department of Health
www.erie.gov/health/

Food Marketing Institute
www.fmi.org

Gass Weber Mullins LLC
www.gasswebermullins.com

GLO GERM/Food Safety First
Joe D. Kingsley
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HealthSpace USA Inc
Joseph Willmott
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Industrial Test Systems, Inc.
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Inspect2Go
www.inspect2go.com

Inspek Pro LLC
mail@inspekpro.com
www.inspekpro.com

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

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

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NEHA NEWS

Staff Profile: Eric Fife

I joined NEHA in 2012 as learning content producer. I work with NEHA's Entrepreneurial Zone (EZ) team members, subject-matter experts, and contractors to develop learning products in support of NEHA credential programs. One of the things I like best about my work here at NEHA is that it allows me to make use of the various skills I've developed during my nearly 30 years in the media and professional training development fields.

After earning bachelor's degrees in journalism and French from Washington and Lee University, I began my career as a reporter/producer at an ABC-affiliated TV station in Sarasota, Florida. I later moved to Denver to attend graduate school, but was sidetracked by an offer to work on developing training materials for an upstart publishing software developer, Quark, Inc. While there, I learned a great deal about the publishing and software industries—and how to teach people about both. After years in publishing, I started getting the itch to work with video again, so I took a job as producer at an interactive media development firm. There I helped develop media-rich e-learning, market education, and employee training applications for clients as varied as Pepsico and the state of Wyoming.

Now at NEHA, I'm glad to be part of an industry of professionals who care deeply about the work they do. I'm excited to be working with the EZ team to create new products that both improve learning and strengthen NEHA's role as a leader in environmental health education.

Assessment of Foodborne Illness Outbreak Response and Investigation Capacity in U.S. Environmental Health Food Safety Regulatory Programs

Many organizations are involved in efforts to mitigate the effects of foodborne illnesses on public health. Outbreak detection, response, control measures, and prevention actions are impacted by budgets and staff capacity to manage both routine inspections and outbreak investigations. Depending on its size (i.e., number of ill people) and complexity, a foodborne illness outbreak may be investigated solely by a single local agency or may involve the collaboration of a multi-jurisdictional team of local, state, territorial, tribal, and federal agencies.

Agencies with responsibility for food safety—foodborne illness response, control, and prevention—have a variety of available resources, including personnel experience, skills, and a system to share expertise and data with partner agencies and disciplines (epi, lab, and medical staff, etc.). NEHA was asked by members of the Council to Improve Foodborne Outbreak Response (CIFOR) to conduct an assessment of the capacity of local and state agencies to undertake foodborne illness outbreak investigation and response. Of concern were the potential impacts of ongoing budget reductions on staffing, training, outbreak response, control, and prevention activities, as well as the current status of interagency cooperation to share resources.

With the Food Safety Modernization Act (FSMA) emphasis on local, state, and federal partnerships, it is important to understand the workload of local and state agencies. In general, local agencies have oversight of retail facilities—33% of local agencies report more than 1,000 retail operations and 10% indicate more than 50 manufacturing facilities in their jurisdictions. Nearly half of state agencies (49%) report more than 10,000 retail facilities in their jurisdictions. Given the complexity of food production, the large number of retail food operations and manufacturing/processing facilities, and probable staffing decreases, CIFOR members were interested in learning the scope and impact of budget cuts over the last two years. How has the capacity of local and state regulatory food safety programs changed—specifically those programs that conduct environmental investigations during foodborne disease outbreaks?

Based on results of NEHA's initial assessment on food safety program capacity, "Environmental Health Regulatory Food Safety Program Capacity Assessment" (www.neha.org/pdf/food_safety/InitialEHRegulatoryFoodSafetyProgramCapacityAssessment_ResultsReport_April2011.pdf), and continuing repercussions of the economy on local and state agencies, it is expected that this assessment specific to foodborne illness outbreak capacity will document a decrease in the frequency of inspections, number of staff, and training/outreach provided to retail food facilities and the general public. The purpose of this report is to evaluate the current status of resources available to local and state agencies to effectively respond to foodborne illness outbreaks.

This report is based on a total of 163 responses—123 (75%) participants identify themselves as working at local agencies and 40 (25%) at state agencies. Questions were asked on topics such as budget impacts on staffing, food safety program funding, training opportunities, outbreak detection and response capacity, capacity to implement control measures and prevention activities, interagency collaboration, and utilization of the *CIFOR: Guidelines for Foodborne Disease Outbreak Response* (www.cifor.us/documents/CIFORGuidelinesforFoodborneDiseaseOutbreakResponse.pdf). Examples of trends indicating an overall reduction in foodborne illness program capacity are as follows.

Staff Capacity

- Workforce numbers are declining and the loss of experienced environmental health professionals will be compounded by pending retirement, particularly at the local level.
- Lack of opportunity and static salaries may impact the number of people entering the environmental health workforce in the future.
- Staff reductions and turnover in local agencies have had a detrimental impact on their ability to meet routine inspection requirements, as well as to conduct comprehensive outbreak response activities.

- Mandated furlough days and other reductions in staff and budgets have led agencies to prioritize inspections and outbreak response activities.

Environmental Health Food Safety Training Opportunities

- More training opportunities are available for state personnel than for local agency personnel, although local agencies report a greater need.
- State-agency-sponsored training opportunities play an important role in ensuring foodborne illness outbreak response training.

Outbreak Detection and Response Capacity

- Both local and state agencies report discipline-specific staffing needs to meet outbreak response requirements.
- Overall local agencies report a lack of staff time to investigate foodborne illness outbreaks with little or no overtime available. This would lead to the need to assign additional workloads during foodborne illness outbreaks.

Capacity to Implement Control Measures and Prevention Activities

- Both local and state agencies with responsibility in that area are able to handle facility closures adequately; however, a lack of capacity exists to implement other, more long-term control measures, such as trace backs, recalls, and embargoes.
- Local agencies with responsibilities in that area indicated a broad range of training needs for staff not currently trained in foodborne illness outbreak response tasks and control measures.

Interagency Collaborations and Cooperation

- Local agencies are less able to handle outbreaks, have less staff time available for investigation, and may require more assistance from state and federal partners on larger outbreaks.
- Most local and state agencies have either a written or informal memorandum of understanding with other agencies to provide information and expertise during an outbreak; however, 23% of local agencies have no partnering agreements.

Budget Impacts on Staffing and Food Safety Program Funding

- Local agency programs are supported by license fees and general county funds, and both funding sources are static or decreasing.
- Few local agencies are recipients of grant opportunities to fund food safety programs.
- Local agency foodborne illness response responsibilities and capacity are rarely used in budget planning.

Outbreaks of foodborne illness can have severe and even deadly consequences. Therefore, it is critical for public health to have the capacity to detect, respond to, and control exposure to foodborne pathogens to prevent or minimize the occurrence of disease and its economic consequences. Foodborne illness outbreaks occur "unexpectedly" and are often variable with respect to type of pathogen, mode of transmission, and extent of exposure. Therefore, they can be challenging to adequately plan for, requiring flexibility and a mechanism for "surge capacity" response. Unfortunately, this can be problematic when sufficient numbers of adequately experienced and trained staff are not available at the local, state, or federal levels and when other duties, for example routine inspections, generate revenue for a departmental budget.

State and local food safety programs and the professionals who staff these agencies are an integral and essential part of the nation's food safety and foodborne illness response capability. With the passage of FSMA the systemic importance of state and local programs has never been more apparent. As FSMA moves us toward the critically important goal of building a truly integrated national food safety system, the assessment of state and local capacity becomes a strategic necessity. Estimates place the number of retail food establishments in the U.S. at a minimum of at least one million outlets. Clearly, the various federal agencies tasked with food safety responsibilities are unprepared to provide regulatory oversight over this vast number of establishments. Moreover, as regulatory models stress the need for risk-based inspections that are founded on scientifically accepted consensus standards, the need for state and local involvement becomes even more apparent. Without a robust state and local program capacity, there is simply no practical way to assess, regulate, provide surveillance, or implement any effective prevention model.

It is from this framework that NEHA began this assessment of the state and local food safety workforce, such an essential part of the national food safety capability. It is imperative to examine and document the impact the national economic recession has had on this segment of the environmental/public health workforce. The results of this study should be of concern to anyone seeking to understand the disproportional impact the economy has had on the food safety workforce and the resulting implications for the national food safety system.

NEHA would like to emphasize that this report is a picture of the current situation. It hopes the information provided will be a valuable resource for future prioritizing, planning, and budgeting at the local, state, and federal level.

NEHA conducted this project with support from the Food and Drug Administration (FDA)/Center for Food Safety and Applied Nutrition/Office of Food Defense, Communication and Emergency Response through a contract with the Association of Public Health Laboratories (APHL). The contents are solely the responsibility of the authors and do not necessarily represent the official views of FDA or APHL.

Thank you to the partners who contributed to this project: the Association of Food and Drug Officials, the Association of State and Territorial Health Officials, and the National Association of County and City Health Officials.

To learn more and with greater detail, please see the full report, "Assessment of Foodborne Illness Outbreak Response and Investigation Capacity in U.S. Environmental Health Food Safety Regulatory Programs" (www.neha.org/pdf/NEHA_FBIOutbreakCapacityAssessment_ResultsReport.pdf).

Managing Editor's Desk
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row looks like yesterday. The velocity of globalization and the IT revolution is such that we desperately need more than ever before employees who are motivated to keep pace.

The old understanding that hard work and playing by the rules will safeguard your job is quietly being replaced with the new understanding that to keep your jobs you have to work harder and smarter and learn and relearn faster than ever before.

Another aspect to this trend merits a word or two. Historically, workforces have been able to institutionalize work practices through the power of unions and collective bargaining agreements. It is of note that the share of today's workforce that belongs to unions has fallen to a 97-year low at 11.3%. In 1916, it was 11.2%. This downward slide is evident in unions representing both private- and public-sector employees. As many of you know, legislatures in Michigan, Wisconsin, and Indiana have now enacted right-to-work legislation that prohibits requiring employees at unionized workplaces to pay union dues. Union membership in Wisconsin fell by 13% and in Indiana by 18% in the year after these laws were passed. Weaker unions suggest less resistance for cash-starved employers to implement the very kinds of changes I've been describing.

3. **The personal health care system will become a source of funding for environmental health while governmental funding will continue to decline.**

The Affordable Care Act has put into motion the largest wave of hospital mergers in over 20 years. As the health care system transitions into these big box enterprises called affordable care organizations (ACOs), opportunities for new funding for environmental health from these ACOs will emerge just as government funding for our work will continue to decline. I say that because the financial incentives within the system are changing from being paid to provide services to being paid for keeping populations healthy.

ACOs will contract with public and environmental health to prevent serious and expensive health problems from developing because it will be in their financial best interests to do so. The amount of new funding that we can secure will depend, however, on our ability to change the perception of environmental health from being a discipline that deals with contaminants in our air, water, and food to a discipline that can be seen as a protector of a community's health.

4. **The millennials and their values will come to increasingly shape and define the workplace.**

Get ready for the millennials! The values of Generation Y will increasingly come to dominate workplace cultures, especially in the use of social media in work, IT in general, and workplace norms that are likely to become more oriented toward personal happiness, participation in decision making, relationships, causes, and even short-term job commitments.

We are today witnessing the largest transfer of human capital in human history. From now until 2030, every eight seconds, someone will turn 65. By 2015, there will be more Gen Xers and Yers in the workforce than baby boomers. In just 11.5 years, millennials will constitute 75% of the workforce! That workforce will function differently than today's workforce.

5. **More and more of our work will migrate to apps.**

An extraordinary offshoot of the IT revolution involves the astounding rise of both mobiles and apps. Cisco predicts that by the end of this year, the number of mobile-connected devices will exceed the number of people on earth and global mobile traffic will increase 13-fold by 2017!

And we haven't seen anything yet. Attachable devices that turn you into a mobile device are now coming out of laboratories. The whole definition of mobile is changing from a handheld device to you.

In any case, increasing amounts of all of our work will be carried out through apps on mobiles.

6. **Environmental health will evolve to embrace such contemporary topics as health effects of global climate change, sustainability, healthy communities, built environments, and smart growth, to name just a few.**

Watch for core jobs in traditional areas of environmental health to continue to disappear, in part due to the impact of the IT revolution and in part due to the emergence of post-recession new financial norms now taking root across all governments.

New job opportunities for environmental health *will* emerge, however, in contemporary topics such as sustainability, the built environment, health effects of global climate change, and healthy communities.

Students coming out of environmental health programs are passionate about working in these topic areas. At the same time, policy makers are committing new dollars to fund work for these concerns. Environmental health brings a specialized expertise to the table that in tandem with the expertise offered by other professions makes for a powerful community response to these urgent issues.

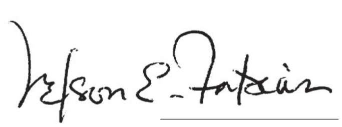
Success on this one front has the potential for transforming this profession from one that is in decline to one that has promising opportunities before it.

In Closing

When I give presentations, I talk to my audiences through the device of text polls. In the case of these six predictions, I've asked my audiences if they either mainly agree or mainly disagree with me. It has been fascinating to consistently see results that by margins of about 10–1, environmental health professionals of all stripes are in accord with all or most of these predictions.

How about you? I'd love to hear if you also see a future of this nature. You can join the conversation by accessing my blog posting at http://neha-org.blogspot.com/ and expressing your opinion.

This is our future … your future. What do you think? Same old same old, something new and adventurous, or something in between? Let's listen together to what our community has to say about this!



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REASONS WHY

Attending the NEHA AEC Is a Wise Investment for You and Your Organization

Don't miss this unique opportunity: The NEHA 2014 AEC is being held in collaboration with the International Federation of Environmental Health! This is an unprecedented and exciting opportunity to explore innovative ideas, approaches, and methods with environmental health professionals from all over the world.

1. The NEHA AEC is a unique opportunity for you to gain the skills, knowledge, and expertise needed to build capacity for environmental health activities, help solve your environmental health organization's daily and strategic challenges, and to make recommendations to help improve your bottom-line results.
2. The NEHA AEC has fantastic session speakers that are environmental health subject matter experts, industry leaders, peers that share common challenges, and this year—speakers will come from all over the world!
3. Your attendance at the NEHA AEC is a solid investment in your organization that will result in immediate and longer-term benefits.
4. You can earn continuing education (CE) credit to maintain your professional credential(s).
5. NEHA is committed to providing you with a training and educational experience that also provides a return on investment (ROI) made for you to attend the AEC.

Need additional reasons why you should attend?

Check out the videos on neha2014aec.org to hear what other environmental health professionals are saying about the NEHA AEC.

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The Perfect Destination to Mix Business and Pleasure

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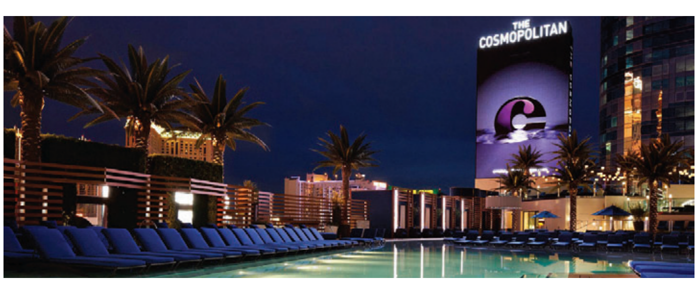

NEHA AEC Venue & Hotel

The Cosmopolitan of Las Vegas

3708 Las Vegas Boulevard South, Las Vegas, NV 89109

Discounted room rates will be available starting at $139 USD per night plus taxes and fees.

NEHA 2014 AEC
PRELIMINARY SCHEDULE

Schedule is subject to change.

Saturday // July 5	Sunday // July 6	Monday // July 7	Tuesday // July 8	Wednesday // July 9
EHAC Meeting	EHAC Meeting	IFEH Council Meeting	Educational Sessions	Exhibition Open
	IFEH Business Meeting	IFEH Annual General Meeting	"Thank You for Staying at the Designated Hotel" Luncheon	Poster Session
	IFEH Faculty Forum & EHAC Joint Meeting	IFEH Regional Meetings	Awards Ceremony & Keynote Address	Silent Auction
	IFEH Council Meeting	Community Event	Exhibition Grand Opening & Party	Student Research Presentations
		1st Time Attendee Workshop		Networking Luncheon
		Annual UL Event		Educational Sessions

Thursday // July 10	Friday // July 11	Saturday // July 12	Sunday // July 13
Town Hall Assembly	Credential Review Courses	Credential Review Courses	Credential Exams
Educational Sessions			
Lunch On Your Own			
President's Banquet			

IFEH = International Federation of Environmental Health

EHAC = National Environmental Health Science & Protection Accreditation Council

Registration

Registration information is available at neha2014aec.org. For personal assistance, contact Customer Service toll free at 866.956.2258 (303.756.9090 local), extension 0.

	Member	Non-Member
Full Conference Registration	$575	$735
One Day Registration	$310	$365
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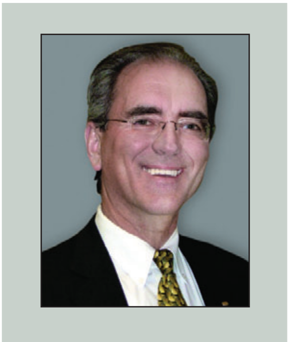
Stay at the designated AEC hotel—The Cosmopolitan of Las Vegas—and attend a free "Thank You for Staying at the Designated Hotel" Luncheon on Tuesday, July 8.

Certain terms and conditions apply.

neha2014aec.org

MANAGING EDITOR'S DESK



Nelson Fabian, MS

The Future of Environmental Health

I'm a person who prefers to listen so that I can learn. (I am also a rabid reader for the same reason.) Yet I can't deny that I also enjoy the opportunity to think through an issue and then excite others about what I've come up with. In this vein, I often present recommendations to our board, suggest alternative scenarios for our staff to consider, and provoke audiences I'm addressing to embrace new or different ways of thinking and problem solving.

Over the fall months, I've spent a fair amount of time standing at podiums around the country, talking about my sense for where environmental health is heading. As my thoughts on this topic are the product of a significant amount of study … and listening … I thought I'd devote this column to telling you what I've been telling various environmental health audiences for these last several months. I hope you find the following discussion to be both thought provoking and helpful.

In particular, I see at least six future visions for our profession:

1. **Environmental health will move into big data while inspector and even midlevel (skilled)-type jobs will be lost to sensor, automation, and simulation technologies.**

   Think about it. We have carbon monoxide sensors in our homes, tire pressure sensors in our cars, toxic substances sensors on our air pollution control equipment, and so on. It isn't that far of a jump to think about temperature, microbe, and visual sensors in our restaurants, food manufacturing facilities, and food processing centers, especially if this leads to significant cost savings for our employers, which is arguably the mantra of our times.

   I also anticipate that computer simulations will increasingly complement, supplement, and even replace our analyses of problems and situations. If software can already provide medical diagnoses and legal research, why can't it also provide guidance on how to conduct an investigation of a foodborne illness outbreak? (A recent study from Oxford University calculates that 47% of the total U.S. employment could be replaced by computers.)

   A more promising corollary to this notion is that well-trained environmental health professionals will be moving more into big data analysis as their jobs will focus more on what the data mean rather than on data collection. Moreover, as we develop the capabilities to accomplish interoperability across our database systems, we'll have available to us mountains of environmental and health data that can be analyzed for correlations, trends, and cause-effect relationships. This is where the expertise that we have can really come into play as we can look (with the help of pattern recognition algorithms) for patterns in the data to inform us as to where environmental, enforcement, education, or policy interventions would seem most appropriate to protect the public's health.

> *New job opportunities for environmental health **will** emerge in contemporary topics such as sustainability, the built environment, health effects of global climate change, and healthy communities.*

2. **Our employment will increasingly become less a function of the education and experience that we bring to our jobs and more a function of the extent to which we develop ourselves through continuing education.**

   This is a subject that I have passionately written about in previous editorials. Many of you are administrators. You know how rapidly the agenda for our profession is changing. From the emergence of a new food safety infrastructure, to new and emerging pathogens, to unpredictable emergencies, to the impact of social media on our work, no tomor-

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