Environmental Health Priorities of Residents and Environmental Health Professionals: Implications for Improving Environmental Health Services in Rural Versus Urban Communities

Editor's Note: A supplemental document that was submitted along with this peer-reviewed article has been posted online due to publication space limitations. The Journal did not peer review or copy edit the online supplemental document; the authors are providing it as an extra resource should the reader want more information. The supplemental document can be accessed at www.neha.org/jeh/supplemental.

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Abstract **Previous research has suggested differences between public and professional understanding of the field of environmental health (EH) and the role of EH services within urban and rural communities. This study investigated EH priority differences between 1) rural and urban residents and 2) residents and EH professionals, and presents quantitative and qualitative methods for establishing locality-specific EH priorities. Residents (N = 588) and EH professionals (N = 63) in Alabama identified EH priorities via a phone or online survey. We categorized rurality of participant residences by rural–urban commuting area codes and population density, and tested whether or not EH priorities were different between urban and rural residents. Built environment issues, particularly abandoned houses, and air pollution were high priorities for urban residents—whereas, water and sanitation issues, and paper mill-related pollution were high priorities in rural communities. EH professionals ranked food safety and water and sanitation issues as higher priorities than residents did. Results highlight the importance of urbanicity on environmental risk perception and the utility of simple and inexpensive engagement methods for understanding these differences. Differences between residents and EH professionals suggest improving stakeholder participation in local-level EH decision making might lead to greater awareness of EH services, which might in turn improve support and effectiveness of those services.**

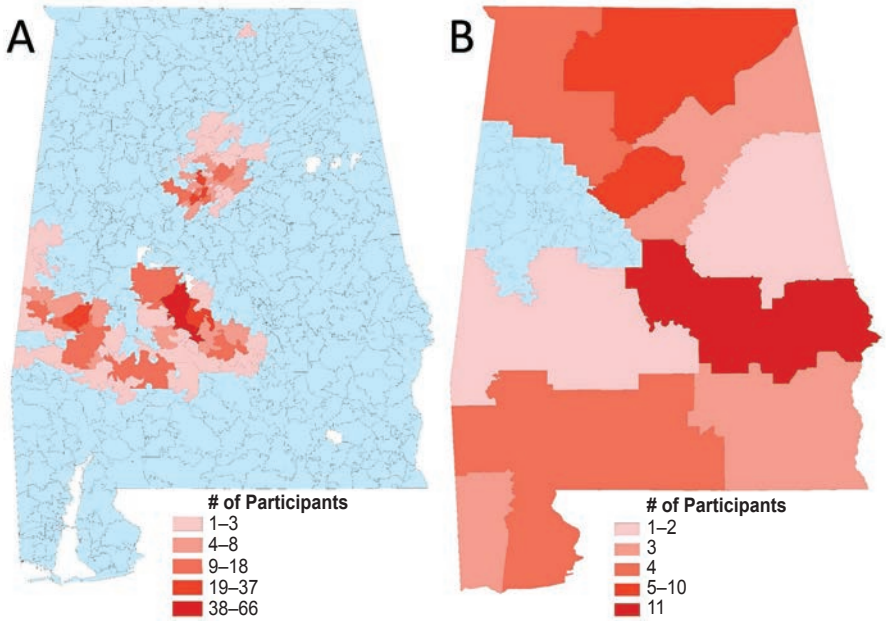
Introduction

Previous research has shown numerous environmentally mediated diseases have distinct patterns across urban, suburban, and rural environments; however, teasing apart the role of environmental versus behavioral and socioeconomic factors in the etiology of these diseases is difficult (Chow et al., 2013; Jie, Isa, Jie, Ju, & Ismail, 2013; Teo et al., 2009). In addition, health disparities in access and outcomes among minority populations are compounded by rurality (Probst, Moore, Glover, & Samuels, 2004). Surveying environmental health (EH) priorities at the community level not only raises awareness of the issues considered most important but also allows stakeholders to contribute knowledge and share responsibility in dealing with potential EH issues (Israel et al., 2005; Minkler, Vásquez, Tajik, & Petersen, 2008; O'Fallon & Dearry, 2002). Knowledge has been shown to be an important precondition for the development of competence leading to support of EH services provided by local government, such as closing a bus depot in close proximity to an elementary school in New York City after an association between high concentrations of diesel exhaust particles and high asthma rates among children were reported in the community (O'Fallon & Dearry, 2002).

EH professionals in industry and in local, state, and federal government are increasingly in need of a better understanding of perceived EH threats in the communities they serve. Research using a variety of interview and observational approaches across the U.S. uncovered a lack of awareness regarding the services that EH practitioners provide (Lindland & Kendall-Taylor, 2011). Subsequent work developed communication tools and strategies for EH-related agencies to convey

FIGURE **1**

Spatial Distributions of A) Residents From Phone Survey Conducted in Alabama, February 2016 and B) Environmental Health Professionals From Online Survey Conducted in Alabama, March 2016



their competencies and capacities, as well as the critical nature of their evidenced-based EH practices with the public (Lindland, Volmert, & Haydon, 2014; O'Neil, Simon, Haydon, & Kendall-Taylor, 2012; Simon, Kendall-Taylor, & Lindland, 2013).

Additional research has shown understanding locality-specific EH concerns is useful to estimate the potential for acceptance and uptake (e.g., using a willingness to pay approach) of intervention programs prior to implementation (O'Fallon & Dearry, 2002), and therefore it is an essential component for estimating the cost-effectiveness of a service provided. This finding has encouraged further interest in the investigation of EH priorities to assist resource allocation and assess the impact of EH interventions, such as the effectiveness of household level measurements (radon, lead, mold, drinking water) by rural nurses for reducing exposure and improving health outcomes (Butterfield, Hill, Postma, Butterfield, & Odom-Maryon, 2011). Identifying the variation in EH priorities between rural and urban residents can inform state-level EH practitioners about the potential cost-effectiveness of EH policies and programs in rural versus urban communities in their state (Smith, Humphreys, & Wilson, 2008).

Therefore, establishing an efficient process for identifying locality-specific EH priorities can generate important data to estimate acceptability of programs and policies, as well as to engage stakeholders in the development of meaningful EH interventions (Corburn, 2005; Israel et al., 2006; Wakefield, Elliott, Cole, & Eyles, 2001; Wallerstein & Duran, 2010).

Quantitative, semiquantitative, and qualitative methods (including focus groups, written surveys, phone surveys, etc.) have been utilized to identify EH priorities; however, comparisons of results across methods are rarely made (Arcury & Christianson, 1993; Bernhard et al., 2013; Collins, Grineski, Chakraborty, & McDonald, 2011; King, Amy Snipes, Herrera, & Jones, 2009; Lewis et al., 2013; Minkler, Vásquez, & Shepard, 2006; Schulz et al., 2005). Arcury and Christianson (1993) conducted a random-dial telephone survey (N = 624) in the Kentucky River Drainage Basin in the U.S. and found there were significant differences in environmental worldview and environmental knowledge between rural and urban participants. Only four items were included as potential environmental concerns (noise, fuel shortage, air pollution, and drinking water), with a 4-point response scale ranging from "not at all" to "a great deal" and no significant difference was found between rural and urban participants. The EH field encompasses a wider range of issues, so the format of the survey could have hindered accurate characterization of urban–rural differences in EH priorities.

As an attempt to fill this gap, Bernhard and coauthors (2013) used a focus group format to increase the openness of the discussions on EH issues. Their findings indicate that abandoned houses and their social and physical sequelae were priorities in urban communities, whereas adequate sewer and water services and road maintenance were the reported priorities in rural communities. Their findings, however, are limited by small sample size (with 40 participants from rural communities and 33 from urban communities) and nonrandom, referral sampling of residents.

Thus, EH professionals and residents may have different EH priorities due to differences in their knowledge and experience. Residents with community intuition, cultural tradition, and experiential knowledge of place have privileged insights into local EH issues, while professionals investigate EH issues based on the amount and rigor of scientific evidence available and legal standards from experimental, epidemiologic, and statistical perspectives (Corburn, 2005). For instance, issues related to uncertainty and social values impact risk perception, but tend to be poorly characterized or neglected in scientific investigations (Corburn, 2005). Therefore, comparing the EH priorities between residents and EH professionals will not only test if there is a large gap between these two groups, but give us a chance to double-identify EH priorities that pose a serious threat to the local community from the perspectives of residents and EH professionals.

The major goals of this study were to characterize EH priorities collected from a large, generalizable sample of urban and rural residents (N = 588) and EH professionals (N = 63) working in Alabama. Our specific hypotheses were 1) there are EH priority differences between rural and urban communities and 2) EH professionals have dif-

ferent priorities than residents do. We then compared the results to qualitative methods previously used in these communities and present the advantages of different methods to further participatory methods for intervention planning and implementation.

Methods

Survey Design

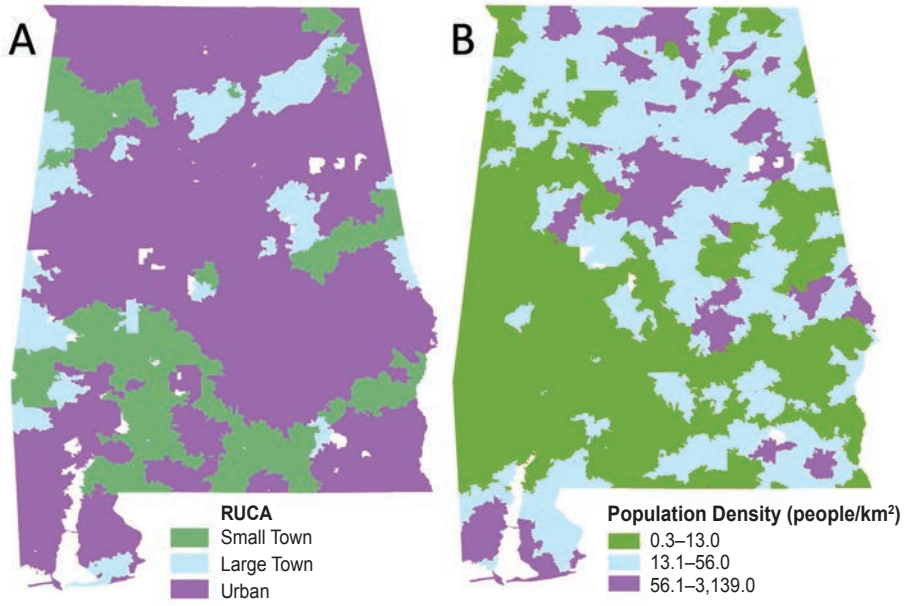
We conducted phone and online surveys in Alabama between February and March 2016 by the Survey Research Unit (SRU) at the University of Alabama at Birmingham. Full phone script and online survey instruments are available in the online supplemental document (www.neha.org/jeh/supplemental).

First, resident participants were given a brief description of EH: "The field of environmental health deals with the ways in which things in our environment affect our health. For example, restaurants are inspected to make sure they are safe places to eat, and public pools are inspected to make sure they are safe places to swim. Environmental health specialists ensure that the air, water, and soil in our communities are safe. I would like to know your opinion on some environmental health issues." Second, participants were asked open-ended questions requesting they report two local EH issues they were most concerned about. Both surveys included demographic questions (including income, education level, and asking participants to identify the group or groups that best represents their ancestry/ethnicity/race) to account for potential covariates across urban and rural communities.

We used random number landline and cell phone dialing to sample households. This approach is consistent with the sampling strategy used by the SRU to conduct the 2015 Behavioral Risk Factor Surveillance System funded by the Centers for Disease Control and Prevention (CDC), a health-related telephone survey mainly focusing on U.S. resident health-related risk behaviors, chronic health conditions, and use of preventive services (CDC, 2017). A total of 2,500 phone numbers were attempted at least once (and up to 9 times) in the Public Health Area 4 (PHA 4, which includes Jefferson County) and 3,000 phone numbers in PHA 7 (Sumter, Choctaw, Marengo, Hale, Perry, Dallas, Wilcox, and Lowndes counties) (Figure 1).

FIGURE **2**

Spatial Distributions of A) Rural-Urban Commuting Area (RUCA) Code Categories[a] and B) Population Density Tertiles[b] Across Alabama



[a]Calculated using RUCA version 3.10 and Categorization B.
[b]Calculated using U.S. Census Bureau 2010 population densities calculated from total populations and land surface areas.

These public health areas were chosen to match with a previous study that conducted focus groups to identify EH priorities in underserved communities in urban (Birmingham) and rural (southwest) Alabama (Bernhard et al., 2013). A total of 830 responses were recorded during the phone survey (with the response rate of approximately 15.1%). After excluding 237 records (approximately 28.6%) without a valid ZIP code (N = 46) or no answer to the EH priority question (N = 225), 593 were included in this study. We e-mailed Alabama Environmental Health Association members three separate invitations to participate in a web-based version of the survey. A total of 79 EH professionals participated in the online survey. After excluding 16 records (approximately 20.3%) without answers to the EH priority question, 63 remained in the analysis. The research protocol was reviewed and approved by the institutional review boards of Virginia Polytechnic Institute and State University (Protocol #15-827) and the University of Alabama at Birmingham (Protocol #E151029003).

Data Analysis

We used participant reported ZIP codes to categorize each participant by rurality. There is no universally accepted definition of rural and urban areas in the U.S., and different measures are used to classify these two groups (Hall, Kaufman, & Ricketts, 2006)—so we adopted two common ZIP code-level measures: the rural–urban commuting area (RUCA) codes, version 3.10 and Categorization B (urban, large rural city/town, and small rural and isolated town) (U.S. Department of Agriculture, 2014) and Census 2010 population density tertiles (U.S. Census Bureau, 2012) to define rural, suburban, and urban areas in Alabama (Figures 1 and 2).

These categorizations have been used in previous research, showing the greatest health disparities in urban cores and isolated rural regions in Alabama (Kent, McClure, Zaitchik, & Gohlke, 2013). We conducted participant ZIP code categorization in ArcGIS 10.2. Not all respondents (N = 593) were spatially grouped (586 using RUCA codes and 588 with population density) because some ZIP codes reported by respondents were not identifiable.

TABLE **1**

Demographic Information of Rural, Suburban, and Urban Participants in Phone Survey Conducted in Alabama, February 2016

Category	Model 1 (RUCA Codes)				Model 2 (Population Density)			
	Rural # (%)	Suburban # (%)	Urban # (%)	*p*-Value[a]	Rural # (%)	Suburban # (%)	Urban # (%)	*p*-Value[a]
Number	93	19	474		141	134	313	
Age				.084				.087
Maximum	89	81	96		89	96	93	
Minimum	20	45	9		9	18	9	
Median	59	70	64		61	62	64	
Sex				.875				.277
Male	27 (29.0)	5 (26.3)	146 (30.8)		36 (25.5)	46 (34.3)	96 (30.7)	
Female	66 (71.0)	14 (73.7)	328 (69.2)		105 (74.5)	88 (65.7)	217 (69.3)	
Ancestry				.103				.07
White	45 (48.4)	9 (47.4)	162 (34.2)		64 (45.4)	56 (41.8)	97 (31.1)	
Black or African American	46 (49.5)	9 (47.4)	292 (61.6)		71 (50.4)	75 (56.0)	202 (64.7)	
Others[b]	2 (2.2)	1 (5.3)	9 (1.9)		3 (2.1)	2 (1.5)	6 (1.9)	
Unknown	0 (0)	0 (0)	11 (2.3)		3 (2.1)	1 (0.7)	7 (2.2)	
Highest level of education				**.007**				**.012**
≤High school diploma	31 (33.3)	7 (36.8)	191 (40.3)		51 (36.2)	51 (38.1)	128 (40.9)	
Associate or bachelor degree	51 (54.8)	5 (26.3)	245 (51.7)		69 (48.9)	65 (48.5)	167 (53.4)	
Graduate degree	11 (11.8)	7 (36.8)	34 (7.2)		21 (14.9)	17 (12.7)	15 (4.8)	
Unknown	0 (0)	0 (0)	4 (0.8)		0 (0)	1 (0.7)	3 (1.0)	
Income (pretax)				.208				.40
<$20,000	16 (17.2)	7 (36.8)	98 (20.7)		29 (20.6)	28 (20.9)	64 (20.4)	
≥$20,000	57 (61.3)	10 (52.6)	254 (53.6)		82 (58.2)	78 (58.2)	161 (51.4)	
Unknown	20 (21.5)	2 (10.5)	122 (25.7)		28 (21.3)	28 (20.9)	88 (28.1)	

RUCA = rural-urban commuting area.

Note. Numbers in bold are significant at the 95% confidence level (≤ .05).

[a]*p*-value is the result of the chi-square test to measure the difference among rural, suburban, and urban groups.

[b]Includes Alaskan Native or American Indian, Asian, Native Hawaiian or other Pacific Islander, Hispanic or Latino, or some other race or mixed race.

Participant response to the question "What is the first environmental health issue in your community that concerns you the most?" was analyzed in this study. We built a categorization framework for responses according to our previous study conducted by Bernhard and coauthors (2013). A detailed list of subcategories within the 14 broader categories is provided in the online supplemental document. Three researchers independently coded a sample of 15% of the responses into these categories. Inter-rater reliability was 91.4%. For categorizations that differed between researchers, the difference was discussed, and a final consensus was reached for the coding of the rest of responses (completed by one of the coders).

We used the chi-square test (with Monte Carlo simulations), with the significance level set at 0.05 in IBM SPSS version 24.0 to examine demographic differences, rural–suburban–urban and resident–professional differences in EH priorities (Bardak, Erhan, & Gündüz, 2012; Bradley & Cutcomb, 1977; Little, 2013). We built an additional model to compare the most isolated rural regions (RUCA codes rural) to the urban core (3rd tertile of population density), as these communities typically have the highest rates of poverty and health disparities within rural and urban regions. Additionally, we conducted a comparison between EH professionals and a subgroup of residents (N = 81) having similar demographic characteristics.

TABLE **2**

Results of Chi-Square Tests for Differences in Environmental Health Priorities Among Rural, Suburban, and Urban Groups in Phone Survey Conducted in Alabama, February 2016

Category	Model 1 (RUCA Codes)			Model 2 (Population Density)			Model 3 (Isolated Rural Compared With Urban Core)	
	Rural # (%)	Suburban # (%)	Urban # (%)	Rural # (%)	Suburban # (%)	Urban # (%)	Rural (RUCA Codes) # (%)	Urban (Population Density) # (%)
Pests	1 (1.1)	0 (0)	7 (1.5)	1 (0.7)	2 (1.5)	5 (1.6)	1 (1.1)	5 (1.6)
Weather and geology	1 (1.1)	0 (0)	5 (1.1)	1 (0.7)	0 (0)	5 (1.6)	1 (1.1)	5 (1.6)
Built environment	2 (2.2)	1 (5.3)	40 (8.4)	**3 (2.1)**	**2 (1.5)**	**38 (12.1)**	**2 (2.2)**	38 (12.1)
Sewage systems	4 (4.3)	2 (10.5)	22 (4.6)	**17 (12.1)**	7 (5.2)	**4 (1.3)**	4 (4.3)	4 (1.3)
General pollution	3 (3.2)	0 (0)	19 (4.0)	1 (0.7)	7 (5.2)	14 (4.5)	3 (3.2)	14 (4.5)
Soil contamination and waste	**7 (7.5)**	4 (21.1)	91 (19.2)	16 (11.3)	27 (20.1)	61 (19.5)	**7 (7.5)**	61 (19.5)
Water pollution	**33 (35.5)**	8 (42.1)	90 (19.0)	**50 (35.5)**	33 (24.6)	**48 (15.3)**	**33 (35.5)**	48 (15.3)
Air pollution	16 (17.2)	2 (10.5)	119 (25.1)	**19 (13.5)**	**20 (14.9)**	**98 (31.3)**	**16 (17.2)**	98 (31.3)
Paper mill-related pollution	**8 (8.6)**	0 (0)	6 (1.3)	**9 (6.4)**	4 (3.0)	**1 (0.3)**	**8 (8.6)**	**1 (0.3)**
Transportation and noise	0 (0)	0 (0)	10 (2.1)	1 (0.7)	1 (0.7)	8 (2.6)	0 (0)	8 (2.6)
Food safety	8 (8.6)	0 (0)	21 (4.4)	7 (5.0)	10 (7.5)	12 (3.8)	8 (8.6)	12 (3.8)
Health outcomes	2 (2.2)	0 (0)	10 (2.1)	3 (2.1)	**7 (5.2)**	2 (0.6)	2 (2.2)	2 (0.6)
Crime and community services	7 (7.5)	2 (10.5)	28 (5.9)	12 (8.5)	13 (9.7)	12 (3.8)	7 (7.5)	12 (3.8)
Natural resources	1 (1.1)	0 (0)	6 (1.3)	1 (0.7)	1 (0.7)	5 (1.6)	1 (1.1)	5 (1.6)
Total	93 (100)	19 (100)	474 (100)	141 (100)	134 (100)	313 (100)	93 (100)	313 (100)
Sig.[a]	**.005**			**>.001**			**>.001**	

RUCA = rural-urban commuting area.
Note. Bolded numbers are significant at $p \leq .05$.
[a]Sig. (2-sided) using chi-square test (with Monte Carlo method when needed).

Results

Comparing Environmental Health Priorities for Rural Versus Urban Respondents

We used RUCA codes and population density metrics to classify Alabama ZIP codes into rural (small towns in RUCA codes or areas with the first tertile of population density: between 0.3–13.0 people/km^2), suburban (large towns in RUCA codes or areas with the second tertile of population density: between 13.1–56.0 people/km^2), and urban areas (in RUCA codes or areas with the third tertile of population density: between 56.1–3,139.0 people/km^2) in Alabama (Figures 1 and 2). Using both of these categorization schemes allows for identification of very isolated rural areas (rural as defined by RUCA codes) and highly urban areas (urban as defined by third tertile of population density) (Figure 2). This distinction is important because health disparities are exacerbated in both very isolated rural areas and in urban core areas, and the types of environmental exposures are likely different.

Table 1 shows demographic information of rural, suburban, and urban participants in the phone survey. Results show that, using the RUCA code characterization, 93 respondents were from rural areas, 19 from suburban areas, and 474 from urban areas, while the numbers in rural, suburban, and urban using population density tertiles were 141, 134, and 313, respectively (Table 1). Rural, suburban, and urban respondents were similar with respect to age, sex, ancestry, and income, but more rural and suburban participants compared with urban participants obtained a higher level of education.

We summarized categorization of participant responses to the question "What is the environmental health issue in your community that concerns you the most?" into 14 categories (see online supplemental document). Table 2 shows results of chi-square tests (with the Monte Carlo method) on significant differences in EH priority categories among rural, suburban, and urban areas. To simplify test results, we present the number of responses in each category, its percentage in each population group, the significant cat-

TABLE **3**

Demographic Information of Participants in Phone and Online Surveys Conducted in Alabama, February and March 2016

Participants	Phone Survey	Online Survey	*p*-Value	Phone Survey	*p*-Value
	Residents # (%)	Environmental Health Professionals # (%)		Subgroup of Residents # (%)	
Number	588	63		81	
Age			**.00**		.64
Maximum	96	66		74	
Minimum	9	29		21	
Median	63	50		57	
Unknown	0	10		0	
Sex			**.02**		.69
Male	178 (30.3)	25 (39.7)		34 (42.0)	
Female	410 (69.7)	30 (47.6)		47 (58.0)	
Unknown	0 (0)	8 (12.7)		0 (0)	
Ancestry			**.00**		.17
White	217 (36.9)	39 (61.9)		56 (69.1)	
Black or African American	347 (59.0)	10 (15.9)		23 (28.4)	
Others[a]	17 (2.9)	5 (7.9)		2 (2.4)	
Unknown	7 (1.2)	9 (14.3)		0 (0)	
Highest level of education			**.00**		.48
≤High school diploma	230 (39.1)	0 (0)		0 (0)	
Associate or bachelor degree	301 (51.2)	37 (58.7)		59 (71.7)	
Graduate degree	53 (9.0)	18 (28.6)		22 (28.3)	
Unknown	4 (0.7)	8 (12.7)		0 (0)	
Income (pretax)			**.00**		N/A[b]
<$20,000	121 (20.6)	0 (0)		0 (0)	
≥$20,000	321 (54.6)	48 (76.2)		60 (74.1)	
Unknown	146 (24.8)	15 (23.8)		21 (25.9)	

Note. Numbers in bold are significant at .05.

[a]Includes Alaskan Native or American Indian, Asian, Native Hawaiian or other Pacific Islander, Hispanic or Latino, or some other race or mixed race.

[b]All individuals in the environmental health professional and subgroup of resident groups had an income ≥ $20,000, thus there is no test here and these two groups had no difference on this aspect.

egory with the higher/lower expected count (highlighted in bolded numbers), and the *p*-value.

Results of the three models show that consistent EH priority differences existed among rural, suburban, and urban respondents. For instance, all three models show water pollution and paper mill-related pollution were high priorities for rural participants. Model 2 shows that sewage systems, in addition to water and paper mill-related issues, were higher priorities in rural areas, and urban residents placed a higher priority on the built environment (including abandoned housing) and air pollution. Taking paper mill-related pollution as an example, rural participants reported, "Area I live in has a paper mill and dumping in the water," "Pollution from paper mills," and "Possible effects from the paper mill plant close to river." In comparison, urban participants reported, "Abandoned houses," "Old building left empty," "Roads have many holes," "Smoking in public places," and "Car emissions."

When compared with our previous results using nonprobability convenience sampling in these same regions of Alabama, focus groups (Bernhard et al., 2013) and a more recent written survey conducted at a workshop (see online supplemental document) show similar rural–urban differences. Specifically, rural residents prioritized sewage and septic, water pollution, and paper mill-related issues, while urban residents prioritized built environment issues (particularly abandoned housing) and air pollution.

Comparing Environmental Health Priorities of Residents Versus Environmental Health Professionals

EH professional respondents were younger, more educated, and more likely to be male and white compared with resident respondents; therefore, we created a subsample from the resident respondents with similar demographic characteristics (Table 3).

Results in Table 4 show that EH priorities of residents were significantly different from EH professional respondent priorities, even when using a demographically matched subsample of the resident respondents. In particular, EH professionals considered food safety as a high priority, but residents did not. For instance, professionals reported, "Safe food at restaurants," "Safe food handling at restaurants," and "Quality of restaurant inspections due to time/budget restraints." Moreover, EH professionals were more likely than residents to respond that sewage systems are a high priority. Residents were more likely than EH professionals to consider soil and air pollution as important priorities; however, this difference was not significant in the demographically matched subsample of residents (Table 4).

Discussion

This study used a large, representative phone survey to distinguish between EH priori-

ties of residents living in urban versus rural areas of Alabama and also compared resident responses to those of EH professionals. Our study indicates that perceptions of important EH issues are different across the rural–urban landscape, particularly on the aspects of the built environment, sewage systems, industry-related pollution, water pollution, and air pollution. Consistent with previous research (Butterfield et al., 2011; Israel et al., 2006; Smith et al., 2008), this result suggests characterization of the differing needs of urban and rural communities is needed to tailor EH communication strategies and services provided at the local level.

As part of a community-engaged research program, focus groups were conducted in the same urban and rural regions of Alabama in 2012 that were composed of residents recruited via referral sampling by local community partner organizations (N = 40, N = 33 in West Central Alabama and Birmingham, respectively) (Bernhard et al., 2013). This community-research partnership has continued, and a more recent written survey was conducted in fall 2015 (N = 34, N = 48 in West Central Alabama and Birmingham, respectively) (see online supplemental document).

Comparing our study results with the 2012 focus group and workshop results, it is interesting that several of the priorities identified from the analysis of a representative sample are similar to those identified in focus groups and workshops, including abandoned houses in urban areas and sewage systems and water pollution in rural areas. This finding suggests that, while it is always preferable to have randomly drawn and larger sample sizes for statistical analysis, the results from minimal-cost, small sample size-focus groups or surveys using referral sampling likely have important and meaningful results that can help us to gain a better understanding of differences in urban and rural EH priorities. Our findings suggest that quick and inexpensive focus group or survey methods would be an appropriate method for EH professionals to identify low-cost intervention options and implementation strategies that more closely align with community level realities.

Differences in EH priorities between residents and EH professionals are consistent with previous research (Lindland & Kendall-Taylor, 2011) and suggest communication strategies could be improved by linking EH services provided to concrete issues residents face regularly (Lindland et al., 2014; O'Neil et al., 2012; Simon et al., 2013). For instance, many professionals considered food safety as a higher priority than other EH issues. Many residents, however, considered soil and air pollution as important priorities.

These differences between EH professional priorities and those of residents might be explained in part by differences in risk perception, with unknown, uncertain, and unseen risks invoking fear among residents (Slovic, 1987; Slovic & Weber, 2002). Policy makers, administrators, and city planners often are left to decide what course of action to take when they need to prioritize specific issues to address. Evidence-based approaches, which take into account estimates of acceptance of a proposed intervention based on perceived threats, should be a component of the communication and decision-making process (O'Fallon & Dearry, 2002). Additionally, EH intervention efforts are likely to fail unless they are structured from a risk perception knowledge base (Slovic, 1987), and therefore, interventions that include efforts to minimize priority disparities between residents and professionals and understand the differences between urban and rural communities via participatory practices will likely be more effective (Butterfield et al., 2011; Israel et al., 2006; Wallerstein & Duran, 2010).

TABLE **4**

Results of Chi-Square Test for Differences in Environmental Health Priorities Between Residents and Environmental Health Professionals in Phone and Online Surveys Conducted in Alabama, February and March 2016

Category	Model 1		Model 2	
	Residents # (%)	Environmental Health Professionals # (%)	Subgroup of Residents # (%)	Environmental Health Professionals # (%)
Pests	8 (1.4)	**4 (6.3)**	1 (1.2)	4 (6.3)
Weather and geology	6 (1.0)	2 (3.2)	2 (2.5)	2 (3.2)
Built environment	43 (7.3)	**0 (0)**	3 (3.7)	0 (0)
Sewage systems	28 (4.8)	**14 (22.2)**	4 (4.9)	**14 (22.2)**
General pollution	22 (3.7)	1 (1.6)	3 (3.7)	1 (1.6)
Soil contamination and waste	104 (17.7)	**2 (3.2)**	10 (12.3)	2 (3.2)
Water pollution	131 (22.3)	13 (20.6)	23 (28.4)	13 (20.6)
Air pollution	137 (23.3)	**3 (4.8)**	15 (18.5)	3 (4.8)
Paper mill-related pollution	14 (2.4)	0 (0)	4 (4.9)	0 (0)
Transportation and noise	10 (1.7)	0 (0)	1 (1.2)	0 (0)
Food safety	**29 (4.9)**	**21 (33.3)**	**3 (3.7)**	**21 (33.3)**
Health outcomes	12 (2.0)	3 (4.8)	7 (8.6)	3 (4.8)
Crime and community services	37 (6.3)	0 (0)	2 (2.5)	0 (0)
Natural resources	7 (1.2)	0 (0)	3 (3.7)	0 (0)
Total	588 (100)	63 (100)	81 (100)	63 (100)
Sig.[a]	**>.001**		**>.001**	

Note. Bolded numbers are significant at $p \leq .05$.
[a]Sig. (2-sided) using chi-square test (with Monte Carlo method when needed).

Conclusion

This study was conducted in the Deep South, therefore generalizability of urban/rural and

resident/EH professional differences may be limited. For instance, Arcury and Christianson (1993) did not identify urban/rural differences in EH priorities in Kentucky, which could be due to survey design differences or differences in how urban and rural areas are defined (Hart, Larson, & Lishner, 2005). We have previously shown that methods for defining urban and rural areas are important for characterizing differences in adverse birth outcomes and mortality in Alabama (Kent et al., 2013; Kent, McClure, Zaitchik, Smith, & Gohlke, 2014). This study serves as an example to investigate EH priority differences and helps planners and professionals to choose an appropriate approach to identify and confirm the EH priority differences in their regions.

In summary, our results suggest that tailored approaches should be designed to address EH priorities in urban versus rural environments, and that greater community engagement with local and state EH professionals and policy makers, with minimal costs, could create a common understanding between residents and EH professionals on environmental priorities, eventually leading to increased effectiveness of intervention strategies designed to address common priorities.

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