

# The Practice of the 10 Essential Services and Abilities in the 14 Core Competencies of Alabama Environmental Health Practitioners

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## Abstract

Leading public health agencies have developed guidelines for essential services and core competencies. The study described here was conducted to determine the level of practice of the 10 essential services and abilities in the 14 core competencies among environmental public health practitioners in Alabama. Questionnaires about the practice of the essential services, abilities in the core competencies, and demographics were collected from 255 (88%) practitioners and analyzed by statistical methods. According to the results of this study, these practitioners spent most of their time diagnosing, investigating, enforcing, educating, and linking people to public health services. They had increasing levels of practice as they were promoted to higher-level jobs, and the level of practice was greater in rural counties than in urban. They rated their skill in all of the core competencies to be at least *pretty good*. Practitioners with high school degrees had lower abilities than those with college degrees. Overall, these professionals were better educated, younger, and had better skills than expected.

## Introduction

Environmental concerns are considered among the most important health issues and global threats (Centers for Disease Control and Prevention [CDC], 2003). In the past, regulation of water supply, sewage systems, and food quality contributed to the reduction of risk from infectious diseases and epidemics. The 30-year increase in life expectancy in the U.S. between 1900 and 1998 was attributable largely to environmental interventions, immunizations, and preventative care (CDC, 1999). However, the scope of practice in environmental public

health has expanded to include air and water pollution, noise pollution, radiation, solid and hazardous wastes, disease vectors, and degradation housing. These traditional and new challenges have placed a growing demand on the skills and resources of environmental public health practitioners (EHPs) at a time when the number of practitioners and their support has been diminishing. The Institute of Medicine's *Future of Public Health* (1988) cited these shortcomings, made recommendations for increased support of the public health infrastructure, and defined three core functions of public

health: assessment, policy development, and assurance. Although widely accepted among public health's policy and academic communities, it was realized that these three functions failed to communicate any meaning to the public or policy makers (CDC, 2001). In 1994, the CDC formed the "Public Health Functions Steering Committee" composed of representatives from public health service agencies and other major public health stakeholders, and charged it with developing a consensus list to further define the essential services of public health (U.S. Department of Health and Human Services, 1995). The committee produced the "Essential Services of Public Health." The essential services were tailored to accommodate environmental health practice to connect environmental health with the broader field of public health by replacing the word "public" with "environmental" (Osaki, Hinchey, & Harris, 2007). Therefore, to practice the essential services of environmental health is also to practice the essential services of public health.

The Environmental Health Competency Project (CDC, 2001) was developed as a means of supporting infrastructure development among EHPs. A panel of experts representing a variety of environmental health organizations defined core competencies needed by local-level EHPs to effectively carry out their responsibilities. These competencies became known as the 14 core competencies of public health.

**TABLE 1****Environmental Health Practitioner Job Classifications**

Position	Education/Experience Requirement
Environmental health specialist (EHS)	High school diploma or GED; some environmental health experience preferred.
Environmentalist (ENV)	Bachelor's degree including coursework in biology, chemistry, environmental science, mathematics, or physical science; environmental health experience not required.
Senior environmentalist (SENV)	Bachelor's degree with coursework in biology, chemistry, environmental science, mathematics, or physical science and at least three years of environmental health experience.
Environmental supervisor (ES)	Bachelor's degree with coursework in biology, chemistry, environmental science, mathematics, or physical science and at least five years of environmental health experience.
Environmental manager (EM)	Bachelor's degree with coursework in biology, chemistry, environmental science, mathematics, or physical science and at least seven years of environmental health experience.

**TABLE 2****Demographic Data**

Characteristic	Total Sample (N = 255)	
Mean age (years)	39	
	n	%
<b>Gender</b>		
Male	166	65.0
Female	89	35.0
<b>Race/ethnicity</b>		
African-American	33	13.0
Asian	1	0.5
White	212	83.0
Hispanic	3	1.0
Native American	3	1.0
No response	3	1.0
<b>Position classification</b>		
Environmentalist	131	51.0
Senior environmentalist	66	26.0
Environmental supervisor	38	15.0
Environmental manager	3	1.0
Environmental health specialist	17	6.5
<b>Education</b>		
High school graduate	5	2.0
Bachelor's degree	199	78.0
Master's degree	46	18.0
Doctorate	3	1.0
No response	2	1.0

Many studies have evaluated the effectiveness of public health programs, most notably by use of the National Public Health Performance Standard (Baker et al., 2006; Corso, Wiesner, Halverson, & Brown, 2000; Reid et al., 2001). These studies were output-based and measured performance by determining to what degree the essential services were being met by public health programs. However, a literature review identified only one study in which the authors measured input to essential services. Studnicki and co-authors (1994) determined the percentage of time devoted to each of the essential services within the major divisions of a local public health unit. They found that most workforce resources were allocated to implementing programs. Few resources were devoted to analyzing community health needs and developing plans and policies. Together, primary care and communicable disease programs accounted for 75% of the resources, environmental health for 11% of the resources, and administrative support services for 13% of the resources. Within environmental health they found that 61.4% of the workforce hours were dedicated to investigating health effects, 18.7% to implementing programs, and 13.6% to evaluating programs.

Although not a direct measure of the effort dedicated to the essential services, Brothers, Blakely, Quiram, and McLeroy (2006) measured the training needs of public health workers. The authors found that sanitarians indicated the greatest need for training was in enforcing laws and regulations, followed by informing and educating people about public health issues. If it can be assumed that training needs are indicative of the importance of practice in the essential services, they could be considered to be a measure of the level of practice of these services for workers.

As part of CDC's national strategy to revitalize public health services, the National Center for Environmental Health funded projects intended to develop the capacity of state and local public health agencies in providing services. One project at the University of Alabama at Birmingham conducted an assessment of EHP skills and training needs, designed and implemented a community skills training curriculum for those practitioners, and supported them in launching Protocol for Assessing Community Excellence in Environmental Health (PACE EH) projects. The assessment was intended to

**TABLE 3****The Practice of the 10 Essential Services by Job Classification**

Essential Service	Mean Score				p-Value	Significant Differences
	EHS N = 17	ENV N = 117	SENV N = 57	ES <sup>a</sup> N = 38		
Monitor health status	3.3	4.7	5.1	5.3	.131	
Diagnose and investigate	5.9	6.5	6.6	6.5	.613	
Enforce laws and regulations	6.4	6.7	7.0	6.8	.251	
Link people to env. hlth. services	4.3	5.7	5.8	6.6	.001	EHS < ENV, SENV & ES
Assure competent workforce	3.5	4.7	5.2	6.7	>.001	ES > EHS, ENV & SENV
Evaluate effectiveness	2.5	4.0	4.9	5.9	>.001	EHS < SENV & ES and ENV < ES
Develop policies and plans	2.8	3.15	3.9	5.3	>.001	ES > EHS, ENV & SENV
Mobilize community partnerships	2.7	3.0	3.8	4.5	>.001	ES > EHS & ENV
Inform and educate	5.2	6.2	6.3	6.2	.153	
Conduct research	1.9	2.8	2.9	3.3	.051	

<sup>a</sup> Environmental managers were included with environmental supervisors for this analysis.

measure the level of practice in the essential services by EHPs, their abilities in the core competencies, their experiences working with the community, their experiences and attitudes about environmental health work, and their training experiences and needs. This paper reports the results of the assessment of the level of practice of the essential services by EHPs and their abilities in the core competencies.

## Methods

The state of Alabama is divided into 11 public health areas (PHA) with populations ranging from 11,000 to 700,000. The Alabama department of public health's (ADPH) bureau of environmental services employs 289 people working in environmental health practice areas including food, milk, and lodging; vector and animal control; air pollution; and solid waste and septic management. Practitioners are classified in five progressive job titles as shown in Table 1. After the survey was initiated, it was learned that environmental health job classifications in Jefferson (PHA 4) and Mobile (PHA 11) counties were different from those used by the ADPH. These areas are highly populated urban areas and are operated independently of the ADPH. EHPs in these counties were instructed to classify themselves in the state system according to the type of work that they performed and their qualifications.

The project staff, with the assistance of all the area directors, developed the study's survey instrument and participated in its pilot testing. It was approved by the UAB

institutional review board, contained no personal identifiers, and consisted of six sections that addressed the six questions enumerated above (i.e., level of practice in the essential services, abilities in core competencies, experiences working with the community, experiences and attitudes about environmental health work, training experiences and needs, and demographics). Demographic information on the survey included age range, race, gender, current environmental health job classification, the PHA in which the EHP worked, the length of time in their current position, and academic credentials. For each of the essential services the EHPs were asked, "I do this activity at least once." Responses were on a seven-point ordinal scale, i.e., *once a week* (7), *once a month* (6), *once a quarter* (5), *once every 6 months* (4), *once a year* (3), *less than once a year* (2), and *don't do* (1). A five-point ordinal scale was used to assess the EHPs' abilities in the 14 core competencies, i.e., *very good* (5), *pretty good* (4), *OK* (3), *not so good* (2), and *poor* (1).

Data were coded and entered into a spreadsheet for analyses with SPSS® 12.0 statistical software. Statistical analysis included descriptive statistics and one-way analysis of variance (ANOVA) with a post hoc Bonferroni test for comparing multiple groups (Norusis, 2003). Tests for significance were at an alpha-value of .05. Although the data were not normally distributed, ANOVA was used because it allows for post hoc multiple comparisons and it is considered to be ro-

bust to nonparametric data (Norusis, 2003). As a check on the stability of the analysis, the results of the ANOVA were compared to the results of a Kruskal-Wallis non-parametric test (Norusis, 2003) and found to be very similar. The data were tested for differences in the practice of the essential services and core competencies among job classifications, for differences across PHAs, for differences between rural and urban PHAs, and for differences in abilities in the core competencies among job classifications, PHAs, and academic backgrounds.

## Results

### Demographic Information

Of the 289 surveys distributed, 255 (88%) were returned. Demographic data are reported in Table 2. The most common bachelor's degrees were biology (43%), environmental science (12%), and business administration (8%). The most common master's degrees were biology (18%), public health (16%), and business administration (14%). Only age was significantly different among job classifications; in general, job classification increased with age.

### Level of Practice of the 10 Essential Services

Figure 1 shows the mean scores for level of practice in the 10 essential services for all respondents. As Figure 1 shows, the services practiced most frequently were *enforce laws and regulations*, *diagnose and investigate*, and

**TABLE 4****The Practice of the Essential Services by Public Health Area**

Essential Service	Mean Score											p-Value	Significant Differences
	PHA 1	PHA 2	PHA 3	PHA 4	PHA 5	PHA 6	PHA 7	PHA 8	PHA 9	PHA 10	PHA 11		
Monitor health status	5.7	5.0	4.7	4.5	4.8	4.7	6.2	4.9	5.8	3.6	2.5	.001	PHA 11 < PHA1, PHA 7, and PHA9
Diagnose and investigate	6.9	6.6	6.4	6.3	6.4	6.2	6.6	6.8	6.7	6.7	5.6	.131	
Enforce laws and regulations	6.8	7.0	6.7	6.5	7.0	6.9	7.0	6.8	7.0	6.9	7.0	.125	
Link people to environmental health services	6.0	6.1	5.9	5.7	6.3	5.4	6.6	6.0	6.1	5.2	3.7	.001	PHA 11 < PHA1-PHA 5, PHA 7, and PHA9
Assure competent workforce	5.7	5.0	5.2	4.0	5.8	4.4	5.5	5.1	5.5	4.9	4.8	.281	
Evaluate effectiveness	4.4	5.3	4.8	3.2	5.0	4.1	5.4	4.2	5.4	4.0	2.7	>.001	PHA 2 & PHA 9 > PHA 4 & PHA 11
Develop policies and plans	4.0	4.1	3.6	3.1	3.9	3.8	3.6	3.9	3.8	3.3	2.2	.209	
Mobilize community partnerships	3.5	4.0	2.8	2.7	3.6	3.1	4.2	3.6	4.4	3.5	2.3	.006	PHA 9 > PHA 4 & PHA 11
Inform and educate	6.1	6.4	6.2	6.0	6.1	6.5	6.7	6.0	6.3	6.3	5.4	.510	
Conduct research	2.6	3.3	2.7	2.2	2.8	2.0	4.6	3.6	3.4	1.2	2.4	>.001	PHA 7 > PHA 4, PHA 6, & PHA 10

inform and educate. The services practiced the least were *conduct research*, *mobilize community partnerships*, and *develop policies and plans*.

Responses by job classification are summarized in Table 3. Since there were only three environmental managers, they were included with environmental supervisors for this analysis. The ANOVA of these data found significant differences for *link people to environmental health services*, *assure a competent workforce*, *evaluate effectiveness*, *develop policies*, and *mobilize community partnerships*. In general, the level of practice increased as job classification increased. This trend was especially distinct for administrative functions of assuring a competent work force, evaluating effectiveness, and developing policies.

Differences in the level of practice among the public health areas are shown in Table 4. *Diagnose and investigate*, *enforce laws and regulations*, and *inform and educate* had the highest mean scores, and were consistently high across all of the PHAs. ANOVA found significant differences for *monitor health sta-*

*tus*, *link people to environmental health services*, *evaluate effectiveness*, *mobilize community partnerships*, and *conduct research*. PHA 11 was significantly lower in all of these services except *conduct research*, and PHA 4 was significantly different in all but *monitor health status*. It was noted that PHAs 4 and 11 consistently had scores below the overall mean. PHA 11 had the lowest score for seven services, and PHA 4 had the lowest score for two services.

Because PHAs 4 and 11 were consistently different, the data were grouped according to urban (PHAs 4 & 11) and rural (all other) areas, and Kruskal-Wallis tests were performed to determine if a significant difference existed between the level of practice between these groups. All services were higher in rural areas, and all services except *enforce laws* and *inform and educate* were significantly higher.

#### Abilities in the 14 Core Competencies

When evaluating their competencies, all EHPs felt that their abilities were *OK* to *pretty good*. All of the mean scores ranged from 3.3 to 4.1,

and they had very low standard deviations, indicating the responses were very consistent.

When responses were sorted by job classification, they were very similar, as shown in Table 5. Environmental health specialists (EHSs) had lower abilities in evaluation, collaboration, and communication than the other classifications, but only collaboration was significantly lower.

The responses on abilities were very similar across PHAs, and no significant differences were observed. These results are very different from the outcome of the assessment of level of practice of the essential services, where PHAs 4 and 11 were significantly different than other PHAs.

Since there were only three respondents who had Ph.D. degrees, they were combined with Master's-level respondents to form a graduate degree category for analysis by education level. Results of the comparison among these categories are shown in Table 6. High school graduates had lower abilities in all but project management. They were significantly lower in data analysis, evaluation, and communication.

## Discussion

About 90% of EHPs in Alabama were in the age range of 30 to 59 years, with only 2% at age 60 or above. This result indicates that only a small percentage of this group was within five years of retirement at age 62. While males comprise only 48% of the population in Alabama, they constituted nearly two-thirds of the EHPs. About 13% of EHPs were African-Americans, while about 25% of the population of Alabama is African-American. EHPs were well educated, with 97% having at least an undergraduate degree. Although only 3% of all EHPs had master of public health degrees, about 36% had degrees in biology and another 10% had degrees in environmental science. These disciplines are relevant to environmental health, therefore almost 50% of the EHPs could be considered to have training applicable to their profession.

Substantial variation occurred in the level of practice of essential services (Figure 1). EHPs spent most of their time enforcing laws and regulations; diagnosing and investigating; and informing, educating, and empowering. All of these services could be considered to be part of the enforcement process. The first step would be to determine if a violation existed (investigation), the second step would be to issue appropriate citations or notices (enforcement), and the third step would be to educate the recipient on correcting or abating the cited condition (informing). These results are similar to those reported by Studnicki and co-authors (1994), who found that EHPs dedicated 61.4% of their time to investigating the occurrence of health effects. Also, Brothers and co-authors (2006) found that sanitarians indicated that the greatest need for training was in enforcing laws and regulations, followed by informing and educating people about public health issues. The level of practice was very similar for enforcing laws and regulations, diagnosing and investigating, and informing, educating, and empowering among the EHP job classifications (Table 3). In addition, it was noted that the level of practice increased as job classification increased, indicating that as a person assumed more administrative and supervisory responsibilities, these services were practiced more frequently.

Although some statistically significant differences occurred in level of practice among PHAs, most areas were consistent across the essential services (Table 4). The exception

### TABLE 5

#### Core Competencies by Job Classification

Core Competencies	Mean Score				p-Value
	EHS N = 17	ENV N = 117	SENV N = 57	ES <sup>a</sup> N = 38	
Information gathering	4.2	3.9	4.0	4.2	.472
Data analysis	3.5	3.8	3.6	3.8	.302
Evaluation	3.5	3.9	4.0	4.2	.157
Problem solving	4.2	4.1	4.0	4.4	.101
Economic and political issues	3.4	3.7	3.9	4.0	.616
Organizational behavior	3.9	3.9	3.9	4.1	.307
Project management	3.4	3.5	3.6	3.7	.759
Computer technology	3.2	3.4	3.1	3.4	.606
Reporting and documentation	3.9	4.0	3.9	4.4	.118
Collaboration	3.3	3.9	3.9	4.0	.302
Education	3.8	3.9	3.9	4.2	.695
Communication	3.2	3.7	3.9	4.3	.012*
Conflict resolution	3.6	3.8	3.8	4.0	.562
Marketing	3.5	3.7	3.62	4.0	.056

<sup>a</sup> Environmental managers were included with environmental supervisors for this analysis.

\* ES > EHS.

### TABLE 6

#### Core Competencies by Education Level

Core Competencies	Education Level			p-Value	Significant Differences
	High School* (N = 5)	Bachelors* (N = 197)	Graduate* (N = 49)		
Information gathering	3.5	4.0	4.2	.086	
Data analysis	3.0	3.7	3.9	.021	HS < Grad
Evaluation	3.0	3.9	3.9	.004	HS < Bachelor & Grad
Problem solving	3.5	4.1	4.2	.562	
Economic and political issues	2.5	3.7	3.9	.132	
Organizational behavior	3.5	3.9	4.0	.972	
Project management	3.5	3.6	3.5	.442	
Computer technology	2.5	3.3	3.2	.357	
Reporting and documentation	3.5	4.1	4.0	.188	
Collaboration	3.0	3.9	4.0	.284	
Education	3.5	4.0	3.9	.092	
Communication	2.5	3.9	3.8	.012	HS < Bachelor & Grad
Conflict resolution	3.5	3.9	3.7	.208	
Marketing	3.0	3.7	3.9	.390	

\* Mean score.

# FIGURE 1

## Practice of the Ten Essential Services by All Respondents

Essential Services	Mean Score
Enforce Laws & Regulations	6.8
Diagnose & Investigate	6.5
Inform & Educate	6.2
Link People to Env. Hlth. Services	5.8
Assure Competent EHP Workforce	5.0
Monitor Health Status	4.7
Evaluate Effectiveness	4.4
Develop Policies & Plans	3.6
Mobilize Community Partnerships	3.4
Conduct Research	2.8

to this was that the level of practice in PHAs 4 and 11 was lower in all of the services. These are single county, urban areas, while all of the others consisted of multiple rural counties. Also, PHAs 4 and 11 were administered independently of the state health department, whereas all of the others were administered through the state health department. It is not known if the observed differences were related to these factors or could be attributable to different environmental health activities between urban and rural areas.

All of the EHPs consistently rated their abilities in all of the core competencies as *very good* to *OK*. This consistency was essentially the same across all of the PHAs, and the areas had no significant differences among them. Apparently, even though the EHP practitioners in the urban areas had lower levels of practice than their rural counterparts, they had the same level of confidence in their abilities as those in the other areas.

Computer technology was rated as *OK*, but was the lowest of all the competencies. This result may be because in the past, EHPs had limited access to computers and only recently have software programs been available for recordkeeping. When sorted by job classification, it was found that EHPs had lower abilities only in evaluation, collaboration, and communication compared to the other classifications (Table 5). These results would be expected, since experience would tend to improve one's confidence in these competencies, and EHPs have the least amount of job experience. When the data were sorted by educational background,

it was found that EHPs with only a high school degree had lower abilities in all of the competencies except organizational behavior and project management (Table 6). This result is surprising because these skills are expected to be enhanced by college and graduate training.

### Conclusions

According to our study, EHPs in Alabama are middle-aged with about 40% being less than 40 and 70% being less than 50. They are well educated, with 97% holding at least a bachelor's degree and 19% having master's degrees. About 50% of these degrees are in public health or related disciplines. EHPs spend most of their time diagnosing and investigating, enforcing, educating, and linking people to public health services. Their level of practice of the essential services increases as they are promoted to higher level jobs. The level of practice of essential services is greater in rural counties than in urban counties. EHPs rated their skill in all of the core competencies to be at least pretty good except in computer technology. Overall, EHPs in Alabama are better educated, younger, and have better skills than expected. This result appears to differ from nationwide trends. It would be instructive if the effort and skills of these EHPs could be compared to outputs such as how well the environmental public health needs of the state of Alabama are being met.

### Limitations

Limitations to this study include using a self-assessment instrument, the design of

the instrument, differences in job descriptions in urban and rural areas, and being cross-sectional. The EHPs' level of practice and abilities may have been influenced by their desire to provide responses that would appease or perhaps contradict their supervisors. However, the high response rate (88%) would tend to reduce this form of bias (Babie, 1998). Because the survey was self-administered, the way in which the participants interpreted the question may have varied based on experiences and job classifications. The design of the survey instrument did not give the option of not having any abilities in a specific core competency. Also, it may have been difficult for respondents to distinguish between the response categories for measuring abilities in the core competencies such as the difference between *not too well* and *OK*. This study may be limited by differences between PHAs because job classifications in two urban areas were different from those in other PHAs. This is important because 23% of all respondents were in the two urban areas. This was a cross-sectional study, therefore it would not identify factors that influence the EHPs' level of practice and skills. These results only describe the level of practice and abilities among EHPs in Alabama, and may not represent these characteristics in other states. 🐼

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