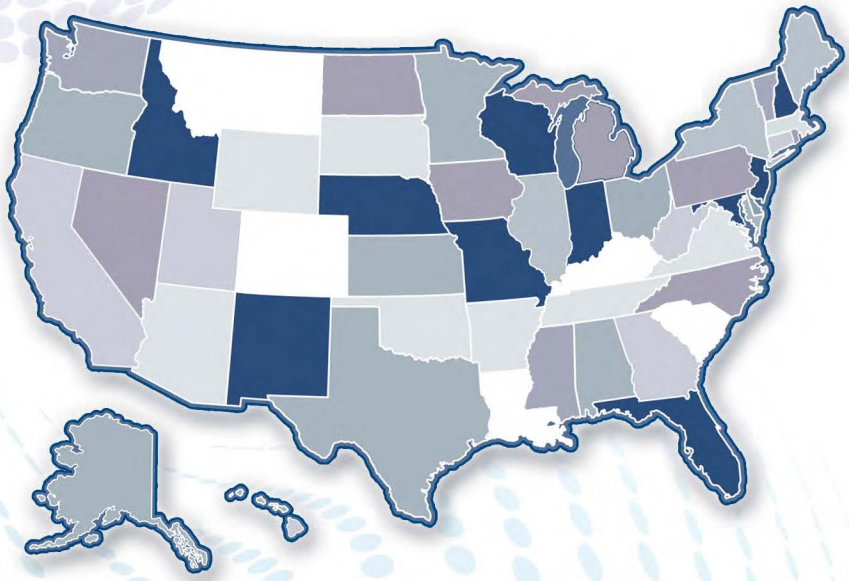
COUNCIL OF STATE AND TERRITORIAL EPIDEMIOLOGISTS

2013 NATIONAL ASSESSMENT OF EPIDEMIOLOGY CAPACITY

Findings and Recommendations



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For more than six decades, CSTE and the US Centers for Disease Control and Prevention (CDC) have worked together to improve the public's health by supporting the efforts of epidemiologists working at the state, territorial, and local levels by promoting the effective use of epidemiologic data to guide public health practice and improve health. CSTE and its members represent two of the basic components of public health—epidemiology and surveillance.

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EXECUTIVE SUMMARY

Background

Beginning in 2001, the Council of State and Territorial Epidemiologists (CSTE) conducted the first of a series of periodic standardized assessments of the epidemiology capacity of state and territorial health departments in the United States. The assessments were structured around the Ten Essential Public Health Services (EPHS) (1), and estimate the epidemiology capacity in states overall and within specific program areas. Although limited by a response rate of 71%, the first assessment showed inadequate capacity in all epidemiology programs except infectious diseases and chronic diseases and insufficient infrastructure to perform the four EPHS that most rely on epidemiology (Box 1).

Box 1. Essential Public Health Services* that most rely on epidemiology

1. Monitor health status to identify and solve community health problems.
2. Diagnose and investigate health problems and health hazards in the community.
9. Evaluate effectiveness, accessibility, and quality of personal and population-based health services.
10. Research for new insights and innovative solutions to health problems.

*(*Source: IOM. The future of public health. Washington, DC: National Academy Press; 1988.)*

After the distribution of nearly $1 billion in federal bioterrorism funds during fiscal year 2002, CSTE conducted follow-up assessments in 2004 and 2006. The 2004 assessment found an overall increase in the number of epidemiologists working in state health departments, but lower capacity in several epidemiology programs than in the 2001 assessment (3,4). The findings from the 2001 and 2004 reports prompted CSTE to focus its workforce priorities and activities on strengthening the public health system around the following four priority areas (5):

- measuring epidemiology capacity and facilitating employment of trained epidemiologists needed within public health systems,
- establishing applied epidemiology competencies and addressing the training gap,
- identifying specific barriers to recruiting and retaining applied epidemiologists, and
- addressing funding gaps and leadership issues.

In addition to measuring epidemiology capacity, the 2006 assessment evaluated the status of state workforce competency and training needs and barriers to recruitment and retention of epidemiologists. The 2006 assessment found that while the number of epidemiologists had dropped 2.5% since 2004, the workforce had a higher level of academic and on-the-job training, and epidemiology capacity in several areas continued to improve (6). However, in many areas, workforce competency was suboptimal, and a need for additional training was clearly recognized.

The 2009 assessment included all objectives in the 2006 assessment and added assessment of overall surveillance system technology capacity and substance abuse epidemiology capacity (a new program area). The 2009 assessment raised some red flags, including 1) a 10% decrease in the overall number of epidemiologists since 2006, 2) decreases in the number of states with at least substantial capacity to conduct EPHS 1 (-19%), 2 (-6%), and 9 (-64%) since 2006 (7,8), 3) decreased epidemiologic capacity in several program areas (chronic disease, bioterrorism/emergency response and oral health), and 4) a low percentage (53%) of states achieving a minimal definition of electronic laboratory reporting. On the positive side, the assessment revealed the epidemiology workforce had the highest levels to date of academic

and on-the-job training (56.4% with at least master's level epidemiology training; 98.1% with any epidemiology training including on-the-job). A supplemental, more precise enumeration of state-level epidemiologists conducted in 2010 revealed that the epidemiology capacity ~~c~~risis" identified in 2009 had stabilized (9).

The 2013 assessment aimed to do the following: continue the periodic enumeration and description of epidemiologists nationwide; measure the current status of core epidemiology capacity, including technology capacity and substance abuse capacity; reassess competency-specific training needs and barriers to recruiting and retaining epidemiologists; and assess mental health epidemiology capacity (for the first time).

Methods

The 2013 state-level assessment used the same core questions from the previous four Epidemiology Capacity Assessments (ECA) to measure changes in epidemiology and surveillance capacity. Questions on technologic capacity were the same as those used for the 2009 ECA. Mental health capacity was added to the list of program areas for which program-specific capacity was assessed. These questions focused on enumerating and describing the state-level public health epidemiology workforce, funding, training, and ability to provide the EPHS to support the community. The 2013 ECA used core workforce competency and training questions from the 2009 ECA and asked each epidemiologist working in state health departments to self-assess their level of competence and training needs.

After pilot testing the 2013 assessment in six states, CSTE distributed it online to all 50 states, the District of Columbia, and six US territories in August 2013. State Epidemiologists or their delegates completed the assessment online, most before the end of September 2013, and final collection was completed in early February 2014. The final results comprise responses for all 50 states and the District of Columbia.

Results and Conclusions

1. National epidemiology capacity has improved since its nadir in 2009 and is now at the highest enumerated level since standard measurement began in 2001.

- The reported number of epidemiologists increased by 11% from 2009 to 2013 to a total of 2,752. The number per 100,000 population is 2% higher than its previous peak in 2004.
- For three of the four EPHS related to surveillance and epidemiology capacity, the percentage of states with at least substantial capacity increased to their highest levels, while the percentage of states with minimal to no capacity decreased to their lowest levels.
- Surveillance and epidemiology capacity increased to their highest levels for all eight program areas monitored by the ECAs since 2004. Overall, 98% of states had at least substantial surveillance and epidemiology capacity in infectious diseases, 82% in bioterrorism/emergency response, 73% in maternal and child health, 66% in chronic disease, 49% in environmental health, 45% in injury, 25% in oral health and 20% in occupational health.
- There were improvements in all measures of technological capacity since 2009. Most notably, the percentage of states achieving a specific level of automated electronic laboratory reporting (Box 2 for definition) increased 25% to 33 states, the percentages using cluster detection software increased 21% to 15 states, the percentage with an outbreak management system increased 45% to 23 states, and the percentages geocoding birth, death and all reportable disease data increased 26% (25 states), 15% (24 states) and 28%

(19 states), respectively. In addition, 71% of states reported actively collaborating with medical groups on making electronic medical records useful for public health purposes.
- The epidemiology workforce, while the largest recorded, also had the highest level of epidemiology-specific training measured during an assessment.
- While respondents estimated that at least 1374 ***additional*** epidemiologists were needed nationwide for optimal epidemiology capacity in all program areas, this was a reduction of 8% in the additional number needed from 2009.

Despite these achievements, there were a number of important gaps identified.

2. A large percentage of states had minimal to no capacity to carry out several EPHS and minimal to no capacity in a number of program areas to carry out basic surveillance and epidemiology functions.
- EPHS #9 (Evaluate effectiveness, accessibility, and quality of personal and population-based health services): 16% of states reported minimal to no capacity—the highest percentage yet—and only 35% reported at least substantial capacity.
- EPHS #10 (Research for new insights and innovative solutions to health problems): 37% of states reported minimal to no capacity, and only 29% reported at least substantial capacity.
- Three long-established program areas continued to have >30% of states with minimal to no surveillance and epidemiology capacity: injury, 33%; oral health, 59%; and occupational health, 55%.
- Two newer program areas for epidemiologists, substance abuse and mental health, remained very poorly developed. Only 12% and 8% of states, respectively, had at least substantial capacity in these areas while 73% and 80% had minimal to no capacity, and few of these had plans to develop it. In all states combined, there were only 14.5 FTE epidemiologists in substance abuse and 5 in mental health.

3. Many states still did not have the technological capacity needed to conduct modern methods of surveillance, a preparedness and public health vulnerability.
- More than a third (34%) of states did not have electronic laboratory reporting.
- Cluster-detection software was only used in 29% of states.
- Most states (55%) did not have an outbreak management system.

4. The need continues for a strong workforce development effort.
- More than 30% of entry and mid-level epidemiologists reported that they had not yet achieved competency in a number of areas and expressed a need for additional training.
- The workforce continued to experience moderate levels of turnover: 10.7% of the public health epidemiology workforce with master‘s or higher level training left during 2012 and another 17.7% of the current epidemiology workforce (16.7% of those with masters or higher degrees) anticipated leaving in the next 5 years. These data indicate the projected need for recruiting efforts and the need to examine retention strategies.

5. The state contribution to funding epidemiologists is stagnant.
- The percentage of epidemiologists funded by state appropriations has steadily decreased to its lowest level yet, dipping to just 21%.
- The increase in epidemiology capacity appears to be mostly due to federal efforts to support epidemiologists in state health departments.
- Despite these challenges, the 2013 ECA provided some insights into what can help achieve higher epidemiology capacity.

- Smaller states tended to have the least functional epidemiology capacity compared to larger ones, despite averaging more epidemiologists per 100,000 population. The percentages of smaller states with at least substantial capacity to carry out EPHSs 1, 2 and 9 compared to larger ones were respectively 59% vs 94%, 82% vs 94%, and 29% vs 38%.
- A much higher percentage of states that have a lead epidemiologist assigned to a program area have substantial surveillance and epidemiology capacity compared with states with no lead epidemiologist in that program area, a relationship that was also found in 2009.
- A range of 33–57 additional epidemiologists are needed nationally in each of the four program areas with the least current capacity to achieve optimal capacity in those areas: occupational health, oral health, substance abuse and mental health.

Recommendations

1. **Develop a strategy to increase epidemiology capacity including involving more states in underdeveloped program areas, particularly substance abuse and mental health.**
   - CDC and CSTE together with relevant officials from SAMHSA and HRSA and national state agency groups should meet to determine the role of public health agencies at the local, state and national levels in minimizing the adverse health effects of substance abuse and mental health conditions. As part of this, CSTE, SAMHSA, and CDC should develop a list of public health objectives and best practices for determining and monitoring the epidemiology of substance abuse and mental health problems with potential for public health intervention.
   - CSTE subcommittees already established for injury, occupational health, oral health, and substance abuse should continue to work with CDC counterparts to develop plans for improving the epidemiology capacity in states with little or no capacity in these areas. One objective to discuss and encourage is for each state to assign a lead epidemiologist for each of these program areas if they have not already done so.

2. **Explore the reasons why state investment in public health epidemiologists is stagnant.**
   - Public health is a core state responsibility. Every state should have a basic core public health infrastructure investment in public health to carry out its mandates independently of federal support. The relatively small state investment overall and nearly total lack of investment in some states is a major concern.
   - CSTE and CDC should discuss this issue and determine whether it is something for further examination. One possible direction would be to conduct an assessment of states to determine more precisely what epidemiologic activities, particularly those mandated by state law, are supported with state funding, what are supported by federal funding and to develop a document with this information for state use in determining future resource needs. Another would be to approach a neutral party (e.g., foundation) to develop a comparative document on state investments in core public health epidemiology.

3. **Continue to assist states to achieve selected surveillance-related technologies**.
   - CDC, potentially using public health preparedness and Epidemiology and Laboratory Capacity funding as well as expanding technical assistance resources, should actively provide assistance to states until all fully achieve ELR. A third of states still lack functional ELR, a national vulnerability. Achieving it should be made a priority. Additionally, CSTE and CDC should develop a strategic map to bring states up to performing all the public health meaningful use functionalities of the electronic health record as guided by the Office of the National Coordinator for Health Information Technology.
   - To make further progress on Healthy People 2020 Public Health Infrastructure Objective 7-3, CDC programs that work with surveillance data from states for which socioeconomic

status is not collected but which have address data on cases should encourage all states to geocode the address data, match it with census or American Community Survey data on selected characteristics of census tract of residence (e.g., percentage of residents in the census tract living below the federal poverty level) and analyze it.

4. **Review and develop new recruitment and retention strategies to supplement current efforts to recruit and retain well-trained epidemiologists in the public health workforce**.
   - With 10% of senior, highly trained epidemiologists having left the public health workforce in 2012, stakeholders including states, CSTE, CDC, ASPPH, ASTHO, NACCHO and others need to work together proactively to enhance recruitment and retention strategies to meet the future needs of states and localities for trained applied epidemiologists including:
     - Increasing the number of applied epidemiology internships at state and local health departments,
     - Increasing fellowship opportunities to attract newly graduated epidemiologists into the public health workforce,
     - Examining barriers to recruitment and retention followed by sharing and recommendations,
     - Consideration of developing a national clearinghouse for positions available and epidemiologists seeking positions.

5. **Maintain efforts to establish training standards for applied public health epidemiologists and to provide training to enable a sustained, qualified public health epidemiology workforce.**
   - Federal, state, territorial, tribal, and local public health agencies should continue to aggressively promote the development and implementation of standards for use in applied epidemiology training using a competence-based model.
   - CSTE and CDC should maintain the current direction in defining, measuring, and refining competencies. As part of this, an effort should be made to examine whether informatics skills should be included in any epidemiology competencies to enable implementation and use of technology advances, including meaningful use of the electronic medical record as well as Health Information Exchanges and Qualified Entities to support surveillance and case investigation activities.
   - State health departments and schools of public health need to continue to support the full integration of recently and newly developed applied epidemiology competencies for public health epidemiologists. They also need to provide or facilitate training for epidemiologists in the workforce around the Applied Epidemiology Competencies, particularly those that have been identified as highest need in the training gaps analysis. To facilitate this CSTE, CDC and ASSPH should assess the job readiness of MPH graduates in epidemiology, particularly schools and programs that offer public health informatics certification.
   - Masters programs with applied epidemiology training programs and opportunities should reflect the full scope of what applied epidemiology can include, e.g., injury, environmental health, maternal/child health, occupational health, oral health, substance abuse and mental health in addition to the more common infectious disease, preparedness and chronic disease programs.

6. **Conduct future assessments**
   - Future assessments should continue to monitor both functional and numeric epidemiology capacity by program area as well as overall. Given the current gaps in selected program areas such as substance abuse and mental health and the potential for efforts to address

them, accurately monitoring both the overall capacity and the number of epidemiologists by program area will be important.

- Future assessments also should continue to monitor key technology capacities because they are essential for public health preparedness-related surveillance and to enable access to a broader range of information for public health action.
- Consideration in the future should be given to monitoring functional and numeric epidemiology capacity in large city and county health departments in a similar fashion as is monitored by this assessment in states. Ideally, this would be done at the same time as it is being done in states to provide a more complete national picture.

Box 2. Automated Electronic Laboratory Reporting (ELR)

ELR is a system that automatically scans laboratory data at the laboratory each day to detect reportable laboratory finding information, packages it in a form that can be received by the state, and automatically enters it into the reportable disease database. Such a system eliminates most of the work of reporting at laboratories and data entry at the state and enables reporting of large-volume laboratory findings that might not otherwise be able to be collected because of the labor involved in completing forms and entering data. A fully functional automated ELR system for purposes of 2013 Epidemiology Capacity Assessment included reporting from at least one private laboratory.

BACKGROUND

A number of forces have driven the need to determine the public health epidemiology capacity of the United States. The Centers for Disease Control and Prevention (CDC) and state and local health departments have long needed data on the public health workforce to enable them to plan how to carry out basic public health functions specified in state law. There are a number of driving questions. How many public health epidemiologists does each state have? How are they distributed by program area and the always changing range of public health problems needing to be addressed? Do they have a sufficient number to conduct basic public health functions? What is the optimal number toward which each health department should aim? What is the makeup of the epidemiology workforce? What should it be? Schools of public health, responsible for much of the training of the epidemiologic workforce, have asked the same questions and what competencies the current public health epidemiology workforce have and which they should have. In 1988 and again in 2002, the Institute of Medicine recognized the need for public health epidemiology capacity and recommended that every health department regularly and systematically collect, assemble, analyze, and make available information about the health of the community, including statistics on health status, community health needs, and epidemiologic and other studies of health problems (10,11). Furthermore, in the fall of 1994, the American Public Health Association adopted the Ten Essential Public Health Services (EPHS) as the national standard for public health (1). Many of these services depend on epidemiology capacity to monitor health status, analyze data, investigate health problems and hazards in the community, develop insights and innovative solutions to limit them, and evaluate the effectiveness of control efforts.

Healthy People 2020 includes an objective relating to epidemiology capacity. Public Health Infrastructure Objective 13 is “increase the proportion of Tribal, State and local public health agencies that provide or assure comprehensive epidemiology services to support essential public health services,” and notes the baseline (55%) source is the 2009 CSTE Epidemiology Capacity Assessment (12). One of the sub-objectives (13.1) is to “increase the proportion of state epidemiologists with formal training in epidemiology in state public health agencies” for which the baseline (87%) source also is the 2009 CSTE ECA.

In November 2001, CSTE conducted the first comprehensive nationwide assessment of core epidemiology capacity in state and territorial health departments. This assessment was conducted in part to collect baseline information for monitoring progress with Healthy People 2010 objective 23-14, which was very similar to the Healthy People 2020 Public Health Infrastructure objective cited above. It also marked the status of national state- and territory-based epidemiology capacity before the distribution of approximately $1 billion in federal funding annually to state health departments for bioterrorism (BT) and public health emergency preparedness, an amount that has decreased in recent years. In this first assessment, the 39 responding states reported employing 1366 epidemiologists, of whom 48% worked in infectious diseases and 62% were supported with federal funding (2).

Building on interest generated by the 2001 Epidemiology Capacity Assessment (ECA) and the need for additional detail, CSTE conducted additional ECAs in 2004, 2006 and 2009. In addition to measuring core capacity, the 2004 ECA focused on the infrastructure of public health surveillance programs and training opportunities for epidemiologists once they were employed in health departments. All states and the District of Columbia (DC) responded. Core capacity, as measured by the number of epidemiologists in the same 39 states responding to the 2001 ECA, jumped 20%, with all additional capacity in bioterrorism/emergency response (BT/ER) and maternal and child health (MCH) program areas. Federal funding was largely responsible for the increase, with 75% of all capacity supported with federal funds. Results also revealed that

28.5% of epidemiologists lacked any formal training or academic coursework in epidemiology at the time they were employed (3,4).

The 2006 ECA built on the training needs identified in 2004 and CSTE and CDC work to develop applied epidemiology competencies (13,14). It measured applied epidemiologic competencies and associated training needs as well as core epidemiology capacity. Again, the response rate of the 50 states and DC was 100%. Key findings included a decrease (2.5%) in the total number of epidemiologists, of whom 75% were still supported with federal funds; an estimated need for a 34% increase in the total number to be able to fully conduct core public health functions, and a reduction in the percentage who lacked any formal epidemiology training to 15% (6,15–17).

The 2009 ECA (7,8) supplemented by a more precise enumeration of state-level epidemiologists in 2010 (9) was done in the context of decreasing federal public health preparedness funding, the national economic recession that began in September 2008, and the appropriation of federal economic stimulus funding. In addition to monitoring core epidemiology capacities and applied epidemiologic competencies and associated training needs, it added substance abuse as a new program area in which to monitor epidemiology capacity and a module to measure overall technologic capacities that directly support disease surveillance and intervention. Key findings of concern included a further drop of 10% since 2006 in the total number of epidemiologists, drops in the percentages of states with substantial or higher capacity to carry out the essential services of public health most dependent on epidemiologists, low overall substance abuse epidemiology capacity and many states lacking in essential technologic capacity. On the positive side, there was a further reduction in the percentage of epidemiologists who lacked any formal epidemiology training to 13%. Additionally, the first enumeration of local (city and county) epidemiologists was undertaken.

The 2013 ECA had several goals: to continue the periodic enumeration and description of epidemiologists nationwide; measure the current status of core epidemiology capacity including technology capacity and substance abuse capacity; reassess competency-specific training needs and barriers to recruiting and retaining epidemiologists; and assess mental health epidemiology capacity for the first time.

METHODS

Instrument Development and Distribution

In July 2012, an ECA workgroup was organized under the charge of the CSTE Executive Board to review and, as needed, modify the 2009 ECA tool. The advisory group comprised 5 persons from academia and state health departments.

The resulting questionnaires were transcribed to an online Web format, piloted in May 2013 in six states (Alaska, Florida, Idaho, Massachusetts, Oregon and Tennessee) and revised on the basis of feedback from those states. There were two final questionnaires. One was intended to be completed by the State Epidemiologist with help as needed from other departmental staff. This core assessment contained three parts: core capacity assessment; workforce training, recruitment and retention; and technical epidemiology capacity (Appendix A). The other was intended to be completed by each epidemiologist working in the state health department and included questions on training, experience, categorization into four tiers based on experience, tier-specific self-assessed competency in each of 30 skill domains and related skill-specific training needed (Appendix B).

On August 26, 2013, CSTE distributed electronic instructions and a link to a secure website for access to the electronic versions of the assessment to the State/City Epidemiologist in all 50 state health departments, Washington, DC, and six US territories. The online assessment also was converted into PDF formatting for printing and attached to the instructional email. CSTE accepted responses by the online software, mail, or fax according to state preference.

To access the secure website, each State Epidemiologist was provided a unique user name and password and asked to complete the online assessment by September 23, 2013. Because not all states had completed responses by then, the deadline was extended for non-respondents so that CSTE staff could work with them to help complete the assessment. In addition, each state and territory was given the e-mail address and telephone number of CSTE staff to contact for questions during business hours. Each respondent state was provided with a copy of their 2010 Epidemiology Enumeration results to assure responses took into account previous staff enumeration methods.

Additional Assessment information and Instructions

Most questions referred to the state health department. The 2013 ECA explained who was considered a state health department epidemiologist.

> **Who should be counted as a STATE Health Department Epidemiologist?**
> Epidemiologists working for the STATE HD. For example, epidemiologists who work at the LOCAL or STATE level who are employed or contracted by the state are considered STATE epidemiologists. Epidemiologists who are paid by an academic institution (or CDC) but who work for state public health should be considered epidemiologists. When considering who should be counted, focus on functions performed by the individual, not job title.

It also used a standard definition of epidemiologist. Neither the definition of an epidemiologist nor who should be counted changed from 2009.

What is an Epidemiologist?
According to Last (18), an Epidemiologist is defined as "an investigator who studies the occurrence of disease or other health-related conditions or events in defined populations. The control of disease in populations is often also considered to be a task for the epidemiologist." The discipline of Epidemiology is defined as the "study of the distribution and determinants of health-related states or events in specified populations, and the application of this study to control of health problems." "Study" includes surveillance, observations, hypothesis testing, analytic research, and experiments. "Distribution" refers to analysis by time, place, and classes of persons affected. "Determinants" are all the physical, biological, social, cultural, and behavioral factors that influence health. "Health-related states and events" include diseases, causes of death, behaviors such as use of tobacco, reactions to preventive regimens, and provisions and use of health services. "Specified populations" are those with identifiable characteristics such as precisely defined numbers. "Applications to control …" makes explicit the aims of epidemiology—"to promote, protect, and restore health."

When indicated, the following scale was used, mostly in the context of describing specific capacities:
Not at all, None: None of the activity, knowledge, or resources described within the question.
Minimal: <25% (but >0%) of the activity, knowledge, or resources described within the question.
Partial: ≥25% (but <50%) of the activity, knowledge, or resources described within the question.
Substantial: ≥50% (but <75%) of the activity, knowledge, or resources described within the question.
Almost Full: ≥75% (but <100%) of the activity, knowledge, or resources described within the question.
Full: 100% of the activity, knowledge, or resources described within the question.

Additional instructions included the following:

- Please contact eca2013@cste.org if you have any questions
- Enter additional text to explain answers when indicated
- Attribute the fraction of time an epidemiologist works in any given program area to the nearest 0.1 FTE
- You will not be able to skip pages unless all responses on that page are filled

Statistical Analysis

Data were analyzed using SAS version 9.4 and Microsoft Excel 2007, and results were tabulated for each question from the 50 states and DC.

States were separated into three categories of 17 states each by population size: small (<2.8 million population based on July 1, 2013, US Census estimates), medium (2.8–<6.1 million population), or large (≥6.1 million population). State population size was used in two ways: to examine whether it factored in the number of epidemiologists per 100,000 population and whether state size was associated with ability to achieve core public health functions.

Trends in key capacity findings were determined using data from the four ECAs in the past 10 years: 2004, 2006, 2009 and 2013.

RESULTS

The final results of the core capacity assessment comprise responses from all 50 states and DC (100% response rate). Of the total 2752 epidemiologists enumerated by the State Epidemiologists, 1590 (57.8%) completed the individual questionnaire. The number of respondents varied slightly by question.

Functional Epidemiology Capacity

Overall Epidemiology Capacity to Address the Essential Public Health Services

In 1994, the American Public Health Association adopted the Ten Essential Public Health Services (EPHS) (Box 1) (3). As in earlier ECAs, in the 2013 assessment, CSTE examined each of the four EPHS that rely heavily on epidemiologic functions: EPHS 1, 2, 9, and 10.

For two of these four EPHS, the large majority of respondents indicated substantial to full capacity: EPHS 1 (82%) and EPHS 2 (90%) (Table 1 and Figure 1). However, only a minority of respondents reported substantial to full capacity for EPHS 9 (35%) and EPHS 10 (29%). While only one state had minimal to no capacity to perform EPHS 1 and no states had such low capacity to perform EPHS 2, 16% of states had minimal to no capacity to perform EPHS 9 and 37% for EPHS10.

When each EPHS was examined by state population size, a smaller percentage of the lowest population states than larger states had at least substantial capacity to perform EPHS 1 (59% vs 94%), EPHS 2 (82% vs 94%), and EPHS 9 (29% vs 38%).

Box 1. The Ten Essential Public Health Services*

1. **Monitor health status to identify and solve community health problems.**
2. **Diagnose and investigate health problems and health hazards in the community.**
3. Inform, educate, and empower people about health issues.
4. Mobilize community partnerships and action to identify and solve health problems.
5. Develop policies and plans that support individual and community health efforts.
6. Enforce laws and regulations that protect health and ensure safety.
7. Link people to needed personal health services and assure the provision of health care when otherwise unavailable.
8. Assure competent public and personal healthcare workforce.
9. **Evaluate effectiveness, accessibility, and quality of personal and population-based health services.**
10. **Research for new insights and innovative solutions to health problems.**

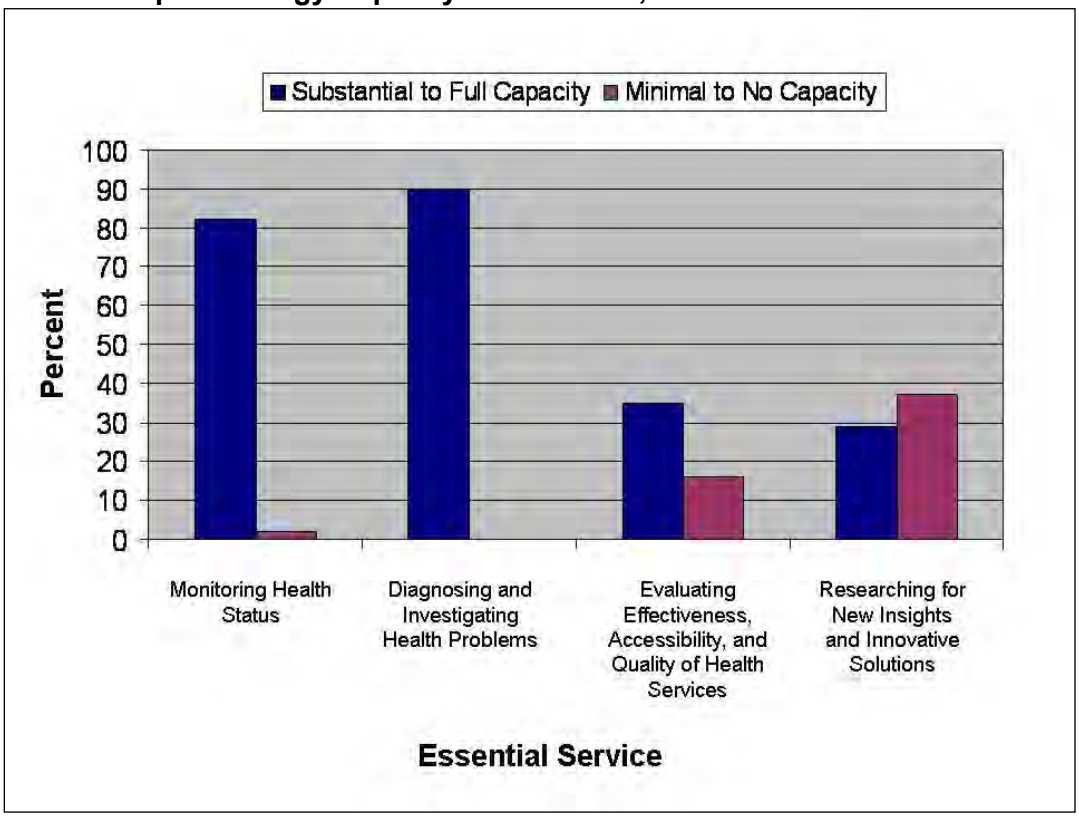
* Source: Institute of Medicine. The future of public health. Washington, DC: National Academy Press; 1988. Bold indicates services related to epidemiology.

Table 1. Epidemiologic capacity to perform the epidemiology-related essential public health services*—2013 Epidemiology Capacity Assessment, 50 states and District of Columbia

Essential service	None		Minimal		Partial		Substantial		Almost full		Full	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
1. Monitor health status to identify and solve community health problems.	0	0	1	1.9	8	15.7	24	47.1	14	27.5	4	7.8
2. Diagnose and investigate health problems and health hazards in the community.	0	0	0	0	5	9.8	23	45.1	20	39.2	3	5.9
9. Evaluate effectiveness, accessibility, and quality of personal and population-based health services.	0	0	8	15.7	25	49.0	13	25.5	4	7.8	1	1.9
10. Research for new insights and innovative solutions to health problems.	2	3.9	17	33.3	17	33.3	10	19.6	4	7.8	1	1.9

* Essential services given are related to epidemiology. Source: Institute of Medicine. The future of public health. Washington, DC: National Academy Press; 1988.

Figure 1. Epidemiology capacity to perform epidemiology-related essential public health services—2013 Epidemiology Capacity Assessment, 50 states and District of Columbia



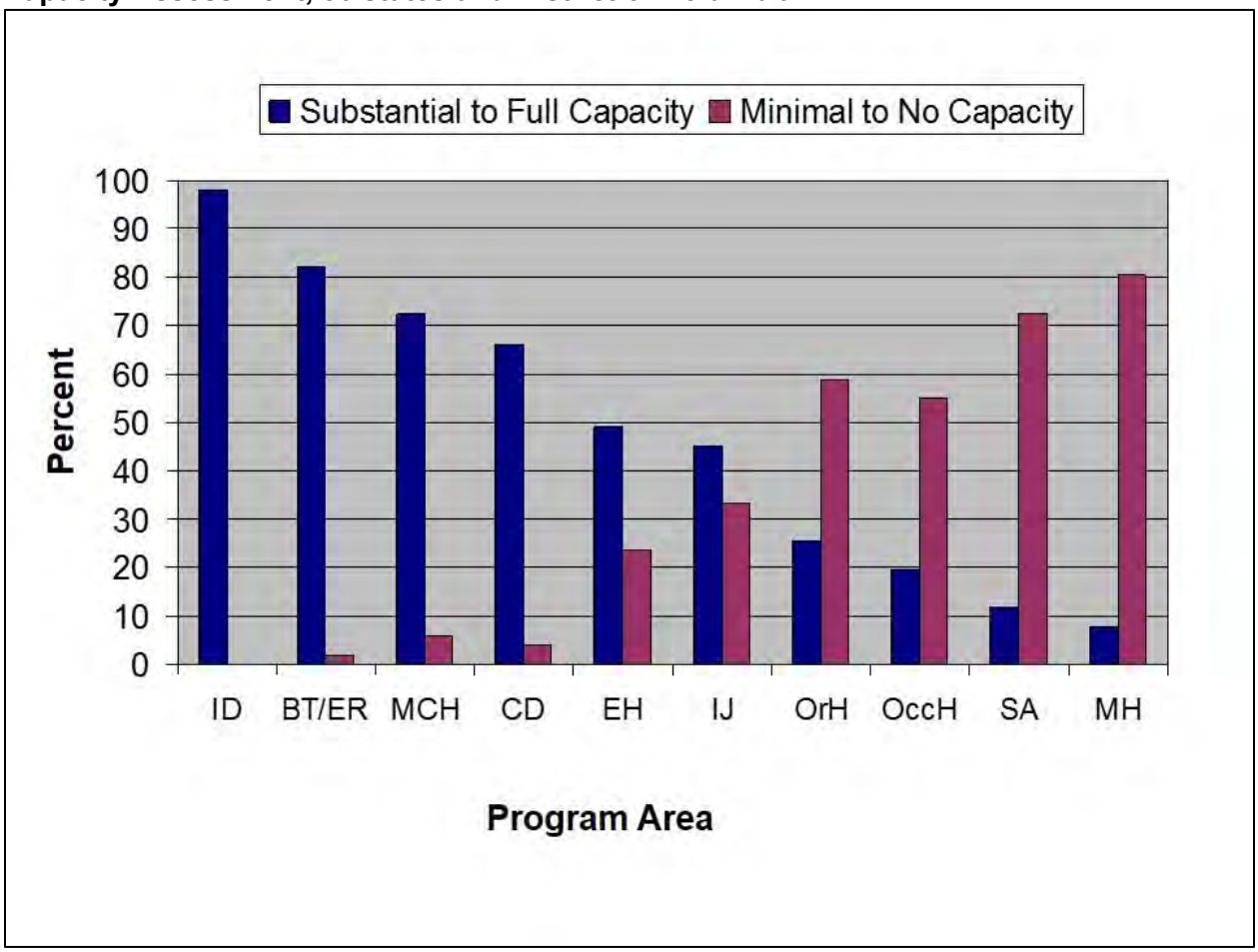
Program-Level Epidemiology and Surveillance Capacity

Health departments' epidemiology and surveillance capacity varied by program area (Table 2 and Figure 2). For four program areas—infectious diseases, BT/ER, MCH, and chronic diseases—most respondents indicated substantial to full capacity. Only for infectious diseases (98%) and BT/ER (82%) did >75% of respondents indicate this level of capacity. More than a quarter of states reported no capacity for four program areas—mental health (55%), substance abuse (43%), oral health (33%) and occupational health (29%). Few of these no capacity states reported they were currently implementing or developing a program in these areas—mental health (0/27), substance abuse (1/21), oral health (4/17), occupational health (1/15).

Table 2. Epidemiology and surveillance capacity, by program area—2013 Epidemiology Capacity Assessment, 50 states and District of Columbia

Program area	None		Minimal		Partial		Substantial		Almost full		Full	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Infectious diseases	0	0	0	0	1	1.9	17	33.3	24	47.1	9	17.6
Bioterrorism/Emergency response	0	0	1	2.0	8	16.0	19	38.0	13	26.0	9	18.0
Maternal and child health	1	1.9	2	3.9	11	21.6	18	35.3	15	29.4	4	7.8
Chronic diseases	0	0	2	4.0	15	30.0	23	46.0	8	16.0	2	4.0
Environmental health	2	3.9	10	19.6	14	27.5	15	29.4	10	19.6	0	0
Injury	6	9.8	11	21.6	11	21.6	14	27.5	8	15.7	1	1.9
Occupational health	15	29.4	13	25.5	13	25.5	7	13.7	2	3.9	1	1.9
Substance abuse	22	43.1	15	29.4	8	15.7	5	9.8	1	1.8	0	0
Oral health	17	33.3	13	25.5	8	15.7	8	15.7	2	2.9	3	1.9
Mental health	28	54.9	13	25.5	6	9.8	3	4.9	0	0	1	1.9

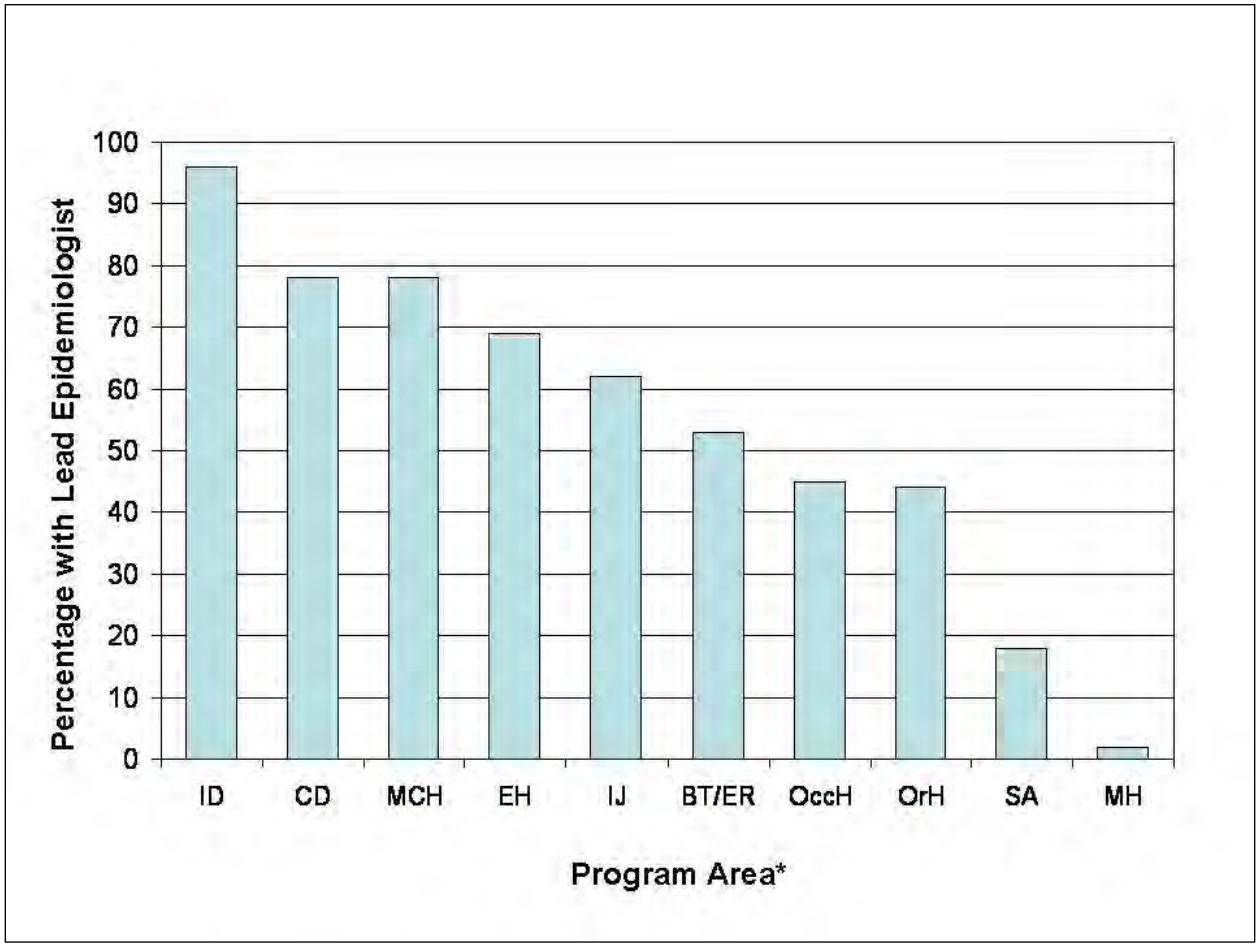
Figure 2. Epidemiology and surveillance capacity, by program area*—2013 Epidemiology Capacity Assessment, 50 states and District of Columbia



*ID: infectious diseases; BT/ER: bioterrorism/emergency response; MCH: maternal and child health; CD: chronic diseases; EH: environmental health; IJ: injury; OrH: oral health; OccH: occupational health; SA: substance abuse; MH: mental health.

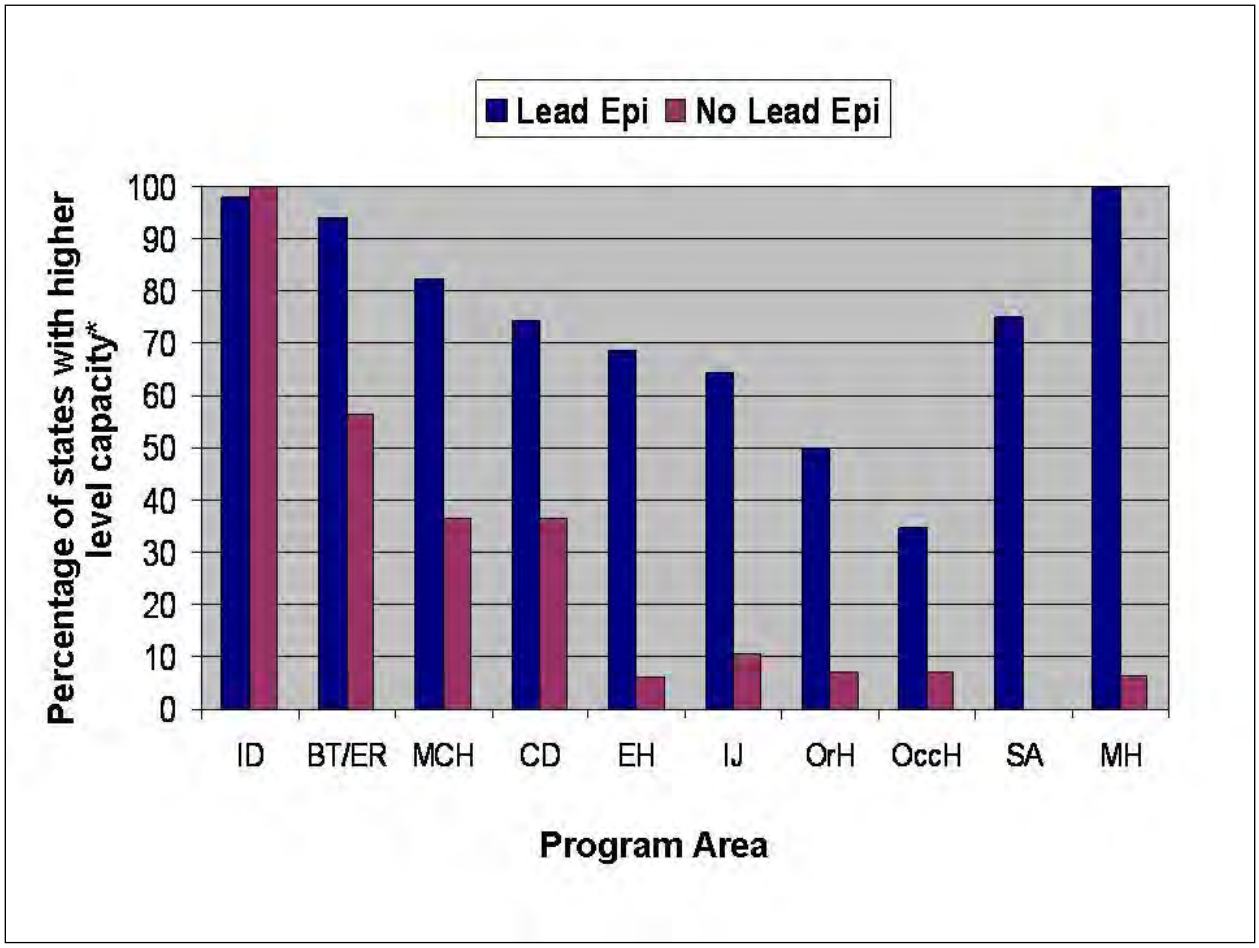
Program areas varied widely in whether states had a lead epidemiologist in that area (Figure 3). Those states with a lead program-level epidemiologist tended to have a higher level of epidemiology capacity (Figure 4).

Figure 3. Lead epidemiologist oversight, by program area*—2013 Epidemiology Capacity Assessment, 50 states and District of Columbia



*ID: infectious diseases; CD: chronic diseases; MCH: maternal and child health; BT/ER: bioterrorism/emergency response; EH: environmental health; IJ: injury; OccH: occupational health; OrH: oral health; SA: substance abuse; MH: mental health.

Figure 4. Percentage of states with substantial to full epidemiology and surveillance capacity, by program area* and presence of a lead program area epidemiologist—2013 Epidemiology Capacity Assessment, 50 states and District of Columbia



* ID: infectious diseases; CD: chronic disease; MCH: maternal and child health; BT/ER: bioterrorism/emergency response; EH: environmental health; IJ: injury; OccH: occupational health; SA: substance abuse; OrH: oral health; MH: mental health.

For the program areas for which the majority of states had at least substantial capacity, a lower percentage of the 17 smallest states than larger ones had at least substantial capacity —BT (69% vs 88%), chronic disease (56% vs 71%), environmental health (29% vs 59%), MCH (65% vs 76%) and injury (35% vs 50%). However, for the 4 program areas in which nearly a third or more states had no capacity, there was no association of state population size with whether they had achieved at least substantial capacity. The one exception was occupational health, in which none of 17 lowest population states had at least substantial capacity vs. 29% of the 34 larger states.

Publications

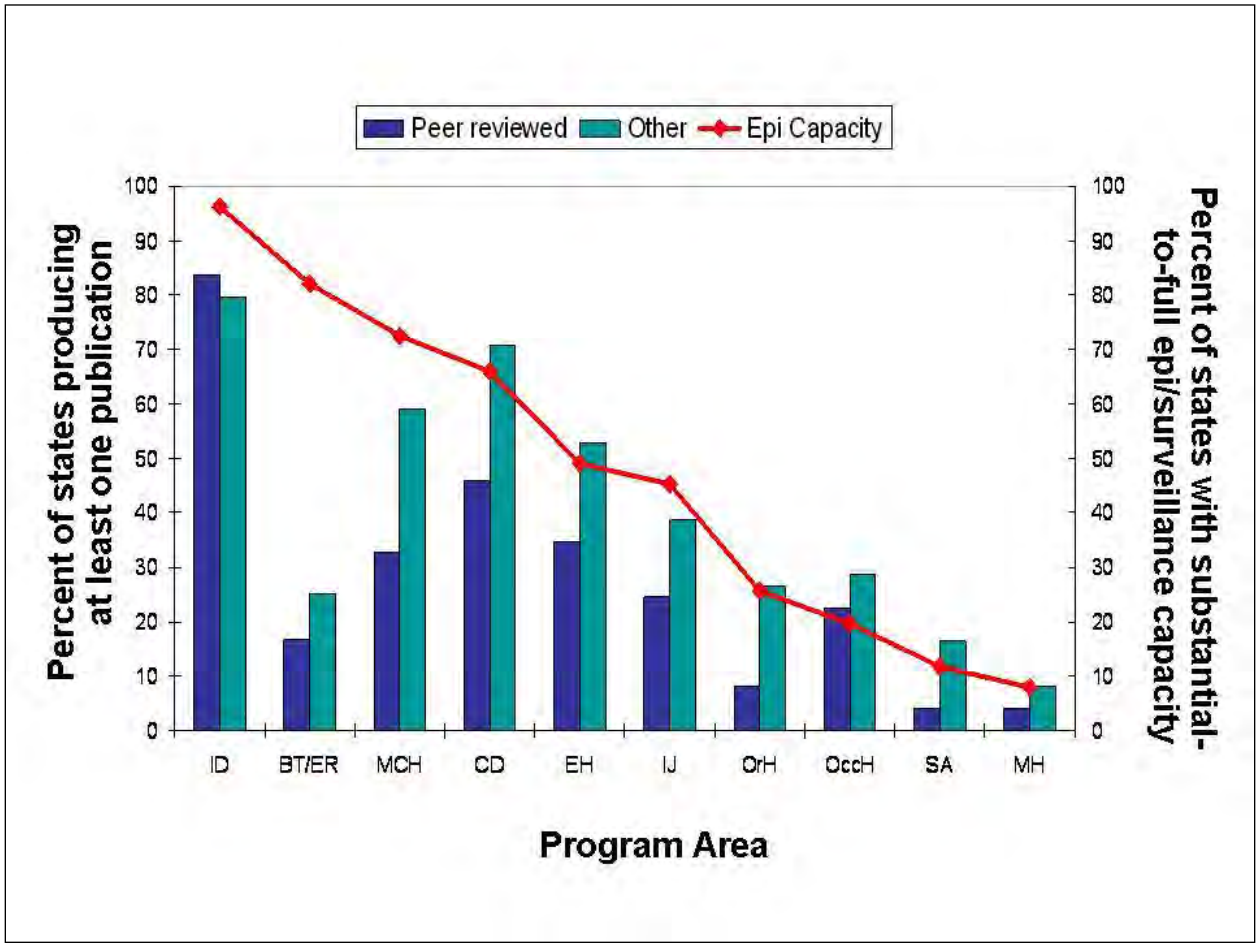
Dissemination of information is another functional epidemiologic capacity. The 2013 ECA examined the number of several types of formal data-containing publications in 2012 overall and by program area (Table 3). Among all states combined, the production and dissemination of data in any formal report format was most common in program areas in which more states had at least substantial epidemiology and surveillance capacity (Figure 5). The total volume of each type of report by program area also tended to correlate with more states having at least substantial epidemiology and surveillance capacity (Figure 6). The one major exception to this was BT/ER in which a high percentage of states have at least substantial capacity but the percentage producing these types of data reports and the total number produced was much smaller than might be expected compared to program areas with similar capacity. Program areas for which <50% of states produced any kind of formal data report included BT/ER, injury, oral health, occupational health, substance abuse and mental health (Figure 5).

Table 3. Formal epidemiology-based publications published during 2012, by program area—2013 Epidemiology Capacity Assessment, 49 responding jurisdictions

Program area	No. responding states	No. peer reviewed published articles in 2012	No. abstracts accepted for presentation at national conferences held in 2012	No. other* reports in 2012
Infectious diseases	49	279	317	906
Chronic diseases	49	61	142	290
Environmental health	49	48	89	205
Maternal and child health	49	93	204	199
Injury	49	35	58	161
Bioterrorism/Emergency response	49	16	52	74
Occupational health	49	14	30	40
Substance abuse	49	4	21	26
Oral health	49	9	10	19
Mental health	49	4	3	13
Other	14	32	22	115
Total	49	595	948	2048

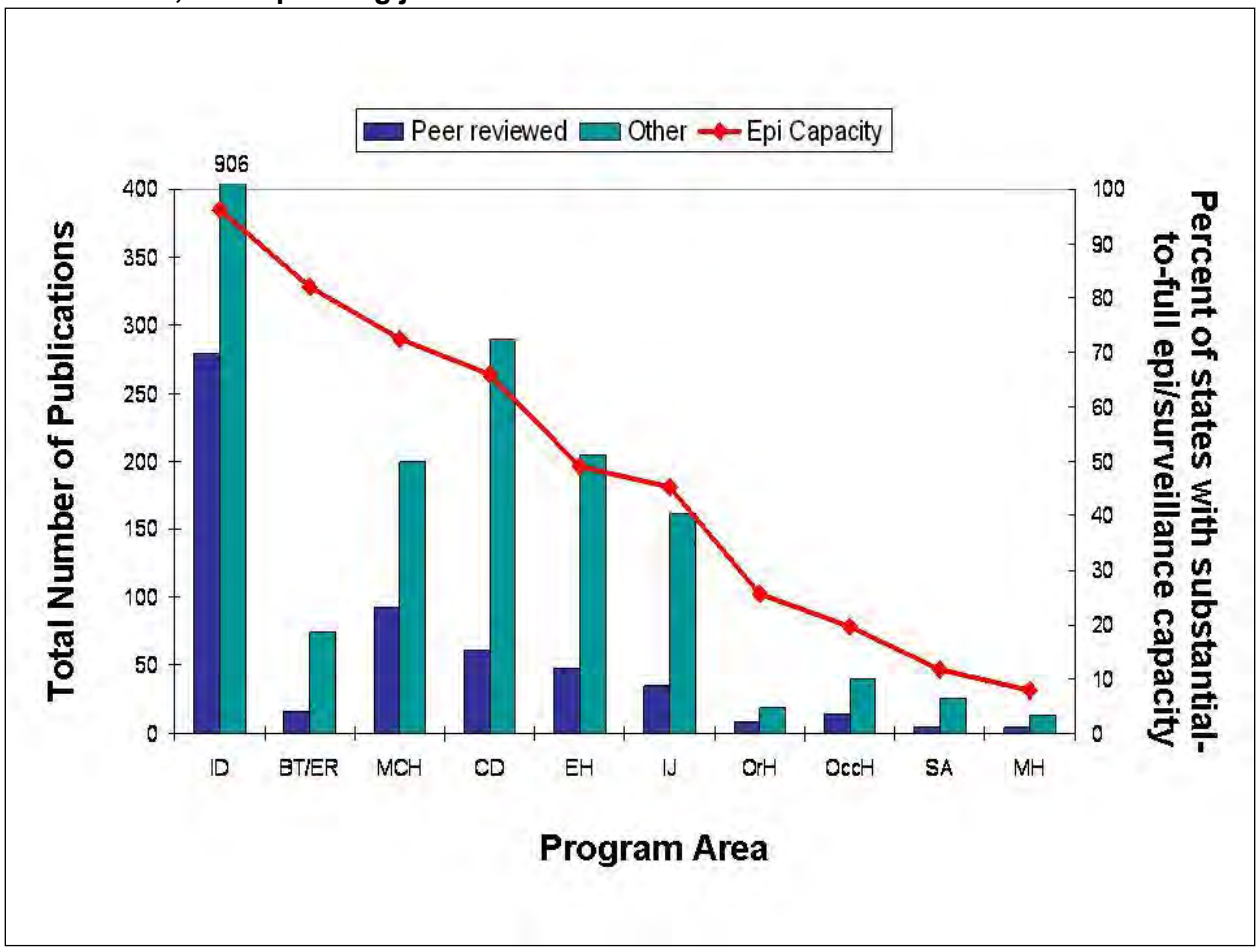
* Reports approved by a state process and published electronically or on paper and/or posted on a website for public consumption.

Figure 5. Percentage of states producing at least one formal epidemiology-based publication in 2012, by program area* and type of publication, and percentage of states reporting substantial to full epidemiology/surveillance capacity, by program area—2013 Epidemiology Capacity Assessment, 49 responding jurisdictions



*ID: infectious diseases; BT/ER: bioterrorism/emergency response; MCH: maternal and child health; CD: chronic disease; EH: environmental health; IJ: injury; OccH: occupational health; SA: substance abuse; OrH: oral health; MH: mental health; Epi Capacity: percentage reporting substantial to full epidemiology and surveillance capacity.

Figure 6. Total number of formal epidemiology-based publications in 2012, by program area* and type of publication, and percentage of states reporting substantial to full epidemiology/surveillance capacity, by program area—2013 Epidemiology Capacity Assessment, 49 responding jurisdictions



*ID: infectious diseases; BT/ER: bioterrorism/emergency response; MCH: maternal and child health; CD: chronic disease; EH: environmental health; IJ: injury; OccH: occupational health; SA: substance abuse; OrH: oral health; MH: mental health; Epi Capacity: percentage reporting substantial to full epidemiology and surveillance capacity

Numeric Epidemiology Capacity

Total Number of Epidemiologists and Number per 100,000 Population

State Epidemiologists enumerated a total of 2752.45 epidemiologists in the 50 states and District of Columbia (DC). The larger the state population, the more epidemiologists the state employed, although the number by state population size overlapped considerably (Table 4). The national population-based estimate for 2013 was 0.87 epidemiologists per 100,000 population with a median of 1.04 per 100,000 (range: 0.19–6.38). Small states had 3.5-fold more epidemiologists per 100,000 population than did large states and 2.1-fold more than medium population states. (Table 4).

Table 4. Number of epidemiologists and number per 100,000 population, by state size—2013 Epidemiology Capacity Assessment, 50 states and District of Columbia

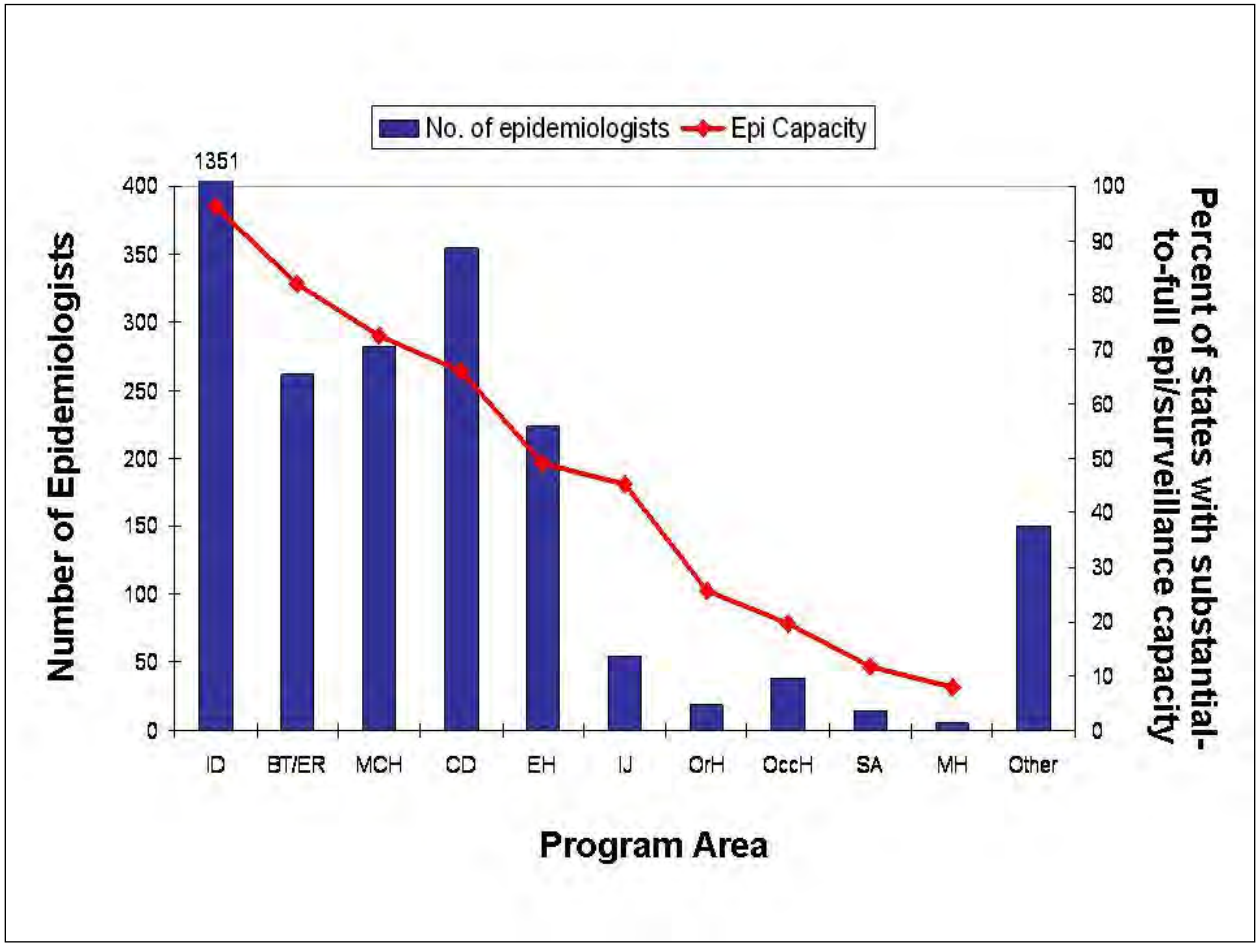
		Epidemiologists			Epidemiologists per 100,000 population		
State population	No. states and DC	No.	Median	Range	No.*	Median†	Range†
Small (<2.8M)	17	457.9	22.5	6-69.0	2.14	2.57	0.53-5.72
Med (2.8 to <6.1M)	17	951.55	44.5	20.9-130.5	1.30	1.04	0.52-2.93
Large (≥6.1M)	17	1343	62.5	25-170.1	0.61	0.59	0.19-2.09
Total U.S.	51	2752.45	41.8	6-170.1	0.87	1.04	0.19-5.72

* Based on sum of all epidemiologists in category and total population of category.
† Based on state-specific numbers of epidemiologists and population.

Number of Epidemiologists by Program Area

Nearly 50% of all epidemiologists worked in infectious diseases (49.1%). The next most common area was chronic diseases (12.9%), followed by MCH (10.2%), BT (9.5%) and environmental health (8.1%). Injury (2.0%), occupational health (1.4%), oral health (0.7%), substance abuse (0.5%) and mental health (0.2%) together accounted for <5% of all epidemiologists. There was a modest correlation between the total number of epidemiologists in states in a program area and the percentage of states reporting substantial or higher epidemiology and surveillance capacity (Figure 7). Notable exceptions were BT and oral health, which needed fewer epidemiologists than other program areas to achieve a relatively higher percentage of states with at least substantial epidemiology capacity, and chronic disease, which, despite having the second highest number of epidemiologists, had only the fourth highest percentage of states with at least substantial epidemiology capacity.

Figure 7. Number of epidemiologists and percentage of states reporting substantial to full epidemiology/surveillance capacity by program area*—2013 Epidemiology Capacity Assessment, 50 states and District of Columbia.



*ID: infectious diseases; BT: bioterrorism/emergency response; MCH: maternal and child health; CD: chronic diseases; EH: environmental health; IJ: injury; OccH: occupational health; SA: substance abuse; OrH: oral health; MH: mental health.

Not surprisingly, states with higher epidemiology/surveillance capacity in any given program area had more epidemiologists on average than those with less capacity, the one exception being chronic disease. (Table 5)

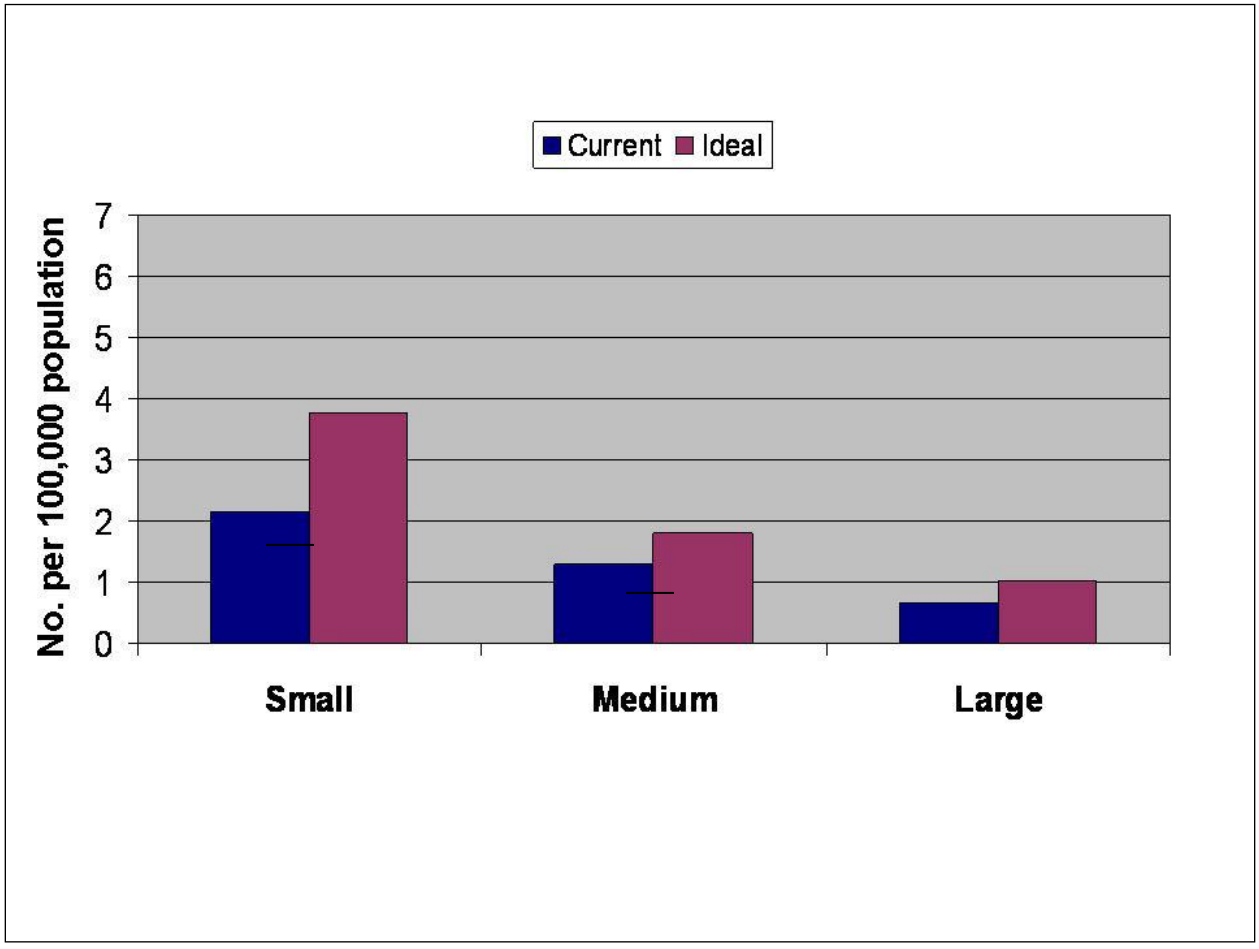
Table 5. Average number of epidemiologists per state program area by level of epidemiology/surveillance capacity in that area—2013 Epidemiology Capacity Assessment, 50 states and District of Columbia

Program area	Epidemiology/Surveillance Capacity			
	None-minimal	Partial	Substantial	Almost full - full
Infectious diseases	-	10.0	26.1	27.2
Bioterrorism/Emergency Response	1.0	3.1	2.3	8.6
Maternal and child health	0.2	2.4	6.0	7.8
Chronic disease	4.0	8.4	5.9	7.8
Environmental health	0.4	3.0	5.5	9.3
Injury	0.4	0.9	1.4	2.0
Oral health	0.2	0.6	0.5	1.0
Occupational health	0.1	0.9	1.7	4.2
Substance abuse	0.1	0.3	1.1	3.0

Estimated Need for Additional Epidemiologists

State epidemiologists were asked to estimate the number of additional epidemiologists they needed in each program area to reach full capacity in that area. The 50 jurisdictions that responded, representing 87.9% of the estimated US population as of July 1, 2013, estimated needing a total of 1374 ***additional*** epidemiologists, fewer than the 1490 additional epidemiologists reported being needed in the 2009 ECA based on only 36 responding states. Overall, this represents an increase in the state epidemiology workforce of at least 50% to achieve full capacity, based on the current number of epidemiologists in all 51 jurisdictions. The need for additional epidemiologists to achieve full epidemiology capacity is greater in the smallest than in larger states (76% increase in small vs. 39% in medium-sized and 55% in large [Figure 8]).

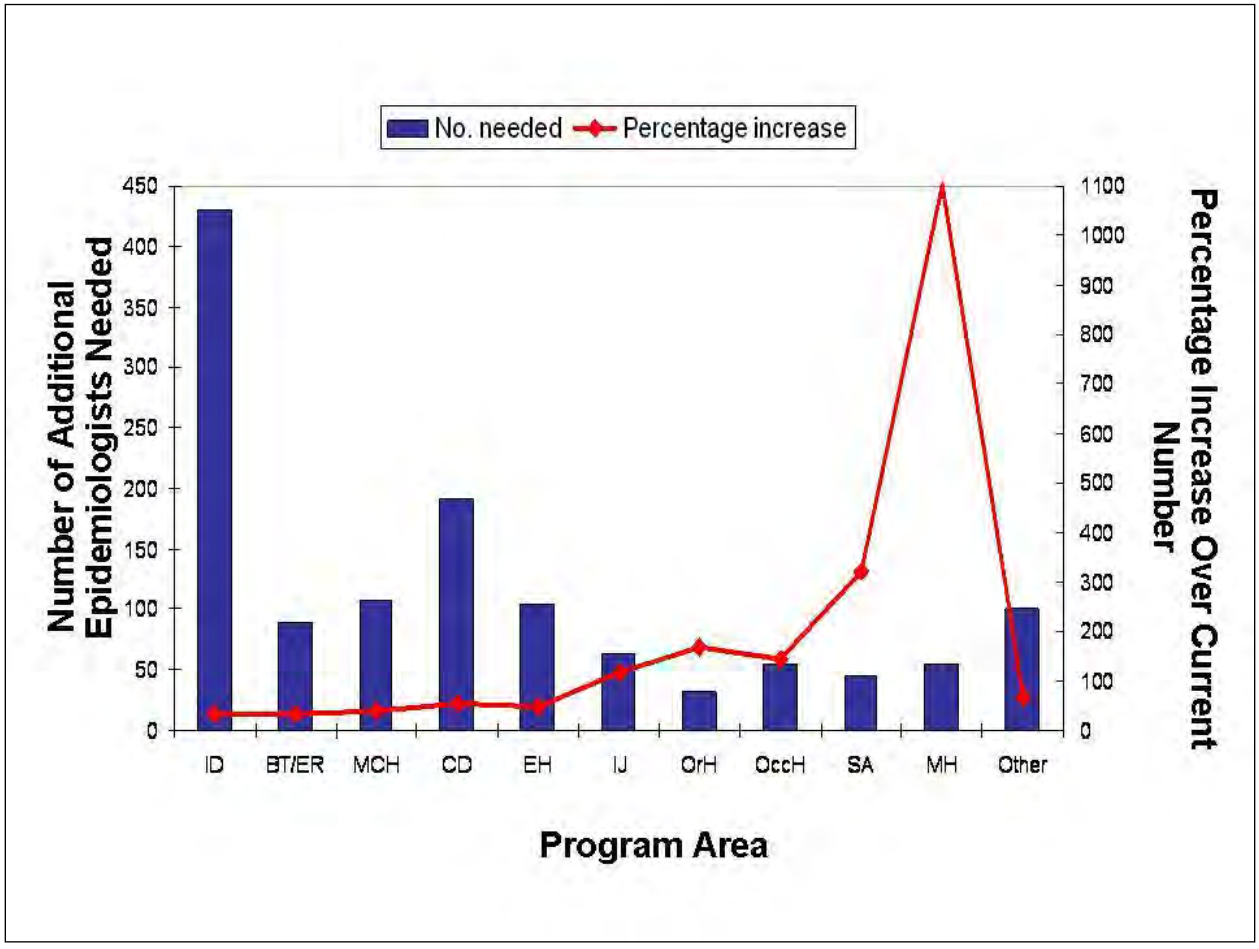
Figure 8. Current and optimal number of epidemiologists per 100,000 population, by state size*—2013 Epidemiology Capacity Assessment, 49 states and District of Columbia



*Small: <2.8 million; medium: ≥2.8 million to <6.1 million; large: ≥6.1 million.

By program area, the number of epidemiologists needed to achieve full capacity was greatest for infectious diseases, accounting for 33% of the total, followed by chronic disease (16%), environmental health and MCH (9% each). However, although the numbers of staff needed were smaller, the percentage increase in epidemiologists needed to achieve full epidemiology capacity was highest for mental health (11-fold increase from 5 to 62 epidemiologists), substance abuse (3.4-fold increase from 14 to 62 epidemiologists), oral health (168% increase from 19 to 52 epidemiologists), occupational health (150% increase from 38 to 95 epidemiologists) and injury (126% increase from 54 to 122 epidemiologists (Figure 9).

Figure 9. Additional number of epidemiologists needed and percentage increase over current number, by program area*—2013 Epidemiology Capacity Assessment, 49 states and District of Columbia



*ID: infectious diseases; BT/ER: bioterrorism/emergency response; MCH: maternal and child health; CD: chronic diseases; EH: environmental health; IJ: injury; OccH: occupational health; SA: substance abuse; OrH: oral health; MH: mental health.

Technologic Epidemiology Capacity

Laboratory and Disease Reporting

The 2013 ECA included questions about technical capacity, specifically about reporting of diseases and laboratory findings. The assessment asked whether the state had fully functional automated electronic laboratory reporting (ELR, Box 2), Web-based provider reporting, and was collaborating to make electronic medical records useful for public health purposes. Overall, 66% of states had ELR and 20% more had a specified year for implementing it in the future (Table 6, Figure 10). By contrast, only 39% of states had Web-based provider reporting and only 8% more had a specific year for future implementation. In 2013, 71% of states were working with local medical groups on making EMRs useful for public health purposes including disease reporting.

States with larger populations were more likely than those with smaller populations to have ELR (81% large vs 65% medium vs 53% small) and Web-based provider reporting (47% vs 41% vs 29%). However, smaller states were more likely to be working with local medical providers to make EMRs useful for public health purposes (94% small vs 53% medium and 65% large states).

Box 2. Automated Electronic Laboratory Reporting (ELR)

ELR is a system that automatically scans laboratory data at the laboratory each day to detect reportable laboratory finding information, packages it in a form that can be received by the state, and automatically enters it into the reportable disease database. Such a system eliminates most of the work of reporting at laboratories and data entry at the state and enables reporting of large-volume laboratory findings that might not otherwise be able to be collected because of the labor involved in completing forms and entering data. A fully functional automated ELR system for purposes of 2013 Epidemiology Capacity Assessment included reporting from at least one private laboratory.

Table 6. Laboratory and disease reporting technical capacity—2013 Epidemiology Capacity Assessment, 50 states and District of Columbia

Capacity	No. respondents	Yes No. (%)	No, but planned No. (%)	No, unknown when No. (%)
Fully functional automated ELR	50	33 (66)	10 (20)	7 (14)
Have you expanded the number of conditions for which you receive due to ELR [among those with ELR]?	33	13 (39)	20 (61)	–
Formal Web-based provider disease reporting system in which providers complete a case report form online, and data are automatically entered into a reportable disease database without re-entry	51	20 (39)	4 (8)	27 (53)
Actively collaborating with medical groups on making electronic medical records useful for public health purposes	51	36 (71)	13 (25)	2 (4)

*ELR: electronic laboratory reporting; NEDSS: National Electronic Disease Surveillance System.

Data Analysis and Response Capacity

The assessment asked whether states routinely used cluster-detection software, had a syndromic surveillance system and routinely used cluster-detection for syndromic data, routinely geocoded selected data, or used an outbreak-management system. Having a syndromic surveillance system (78%), routinely using automated cluster detection software for syndromic data (55%) and having analyzed data by census-tract level SES measures (65%) were the only ones of these data analysis and response advances used by a majority of states (Table 7, Figure 10). For the other advances, less than half had implemented them or had plans to.

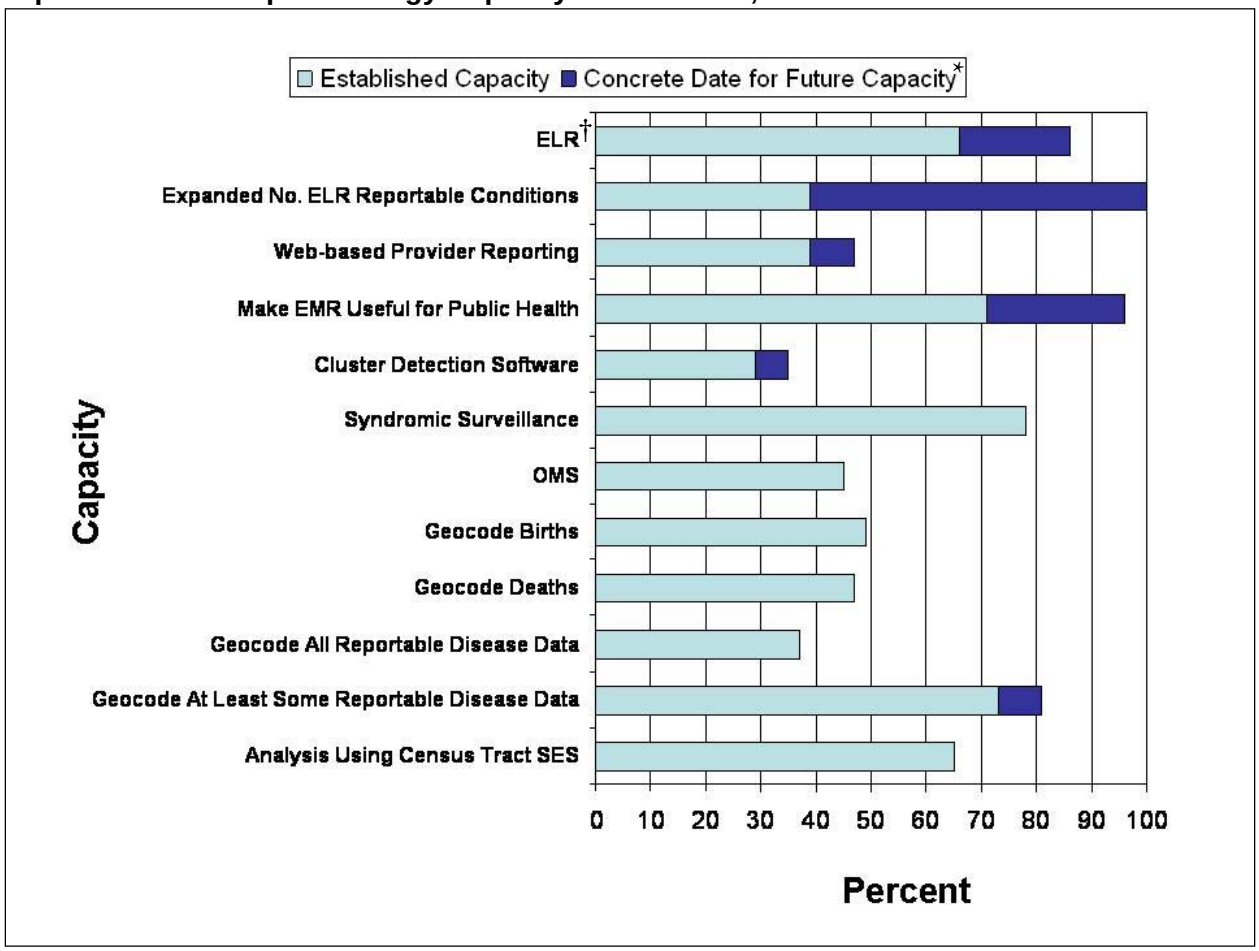
Larger states were more likely than medium-sized and smaller states to use cluster detection software (65% vs 6% and 18%), have syndromic surveillance (88% vs 65% and 82%), use cluster detection software on syndromic data (80% vs 73% and 57%), use an OMS (71% vs 29% and 35%), geocode births (71% vs 53% and 24%), geocode deaths (69% vs 47% and 29%), geocode reportable disease data (47% vs 41% and 24%) and have analyzed data using census tract SES (88% vs 53% each for medium and small states).

Table 7. Technical capacity in data analysis and response—2013 Epidemiology Capacity Assessment, 50 states and District of Columbia

Capacity	No. respondents	Yes No. (%)	No/unk No. (%)	Definite plan No. (%)
Routinely use automated cluster-detection software	51	15 (29)	36 (71)	3 (6)
Have a syndromic surveillance system	51	40 (78)	11 (22)	Na
Routinely use automated cluster detection on syndromic system data	40	28 (70)	12 (30)	Na
Use an outbreak-management-system*	51	23 (45)	28 (55)	Na
Routinely geocode all births	51	25 (49)	26 (51)	Na
Routinely geocode all deaths	51	24 (47)	27 (53)	Na
Routinely geocode all case report data from reportable diseases and laboratory findings	51	19 (37)	32 (63)	Na
Routinely geocode all case data on at least some reportable diseases [among states that do not geocode all]	32	12 (38)	20 (62)	4 (13)
Done analyses of routinely collected data by census tract SES measures	51	33 (65)	18 (35)	Na

* An outbreak-management system supports the initial characterization, investigation, response, and containment of outbreaks through data collection and analysis.

Figure 10. Prevalence of selected surveillance, analysis, and response technology capacities—2013 Epidemiology Capacity Assessment, 50 states and District of Columbia

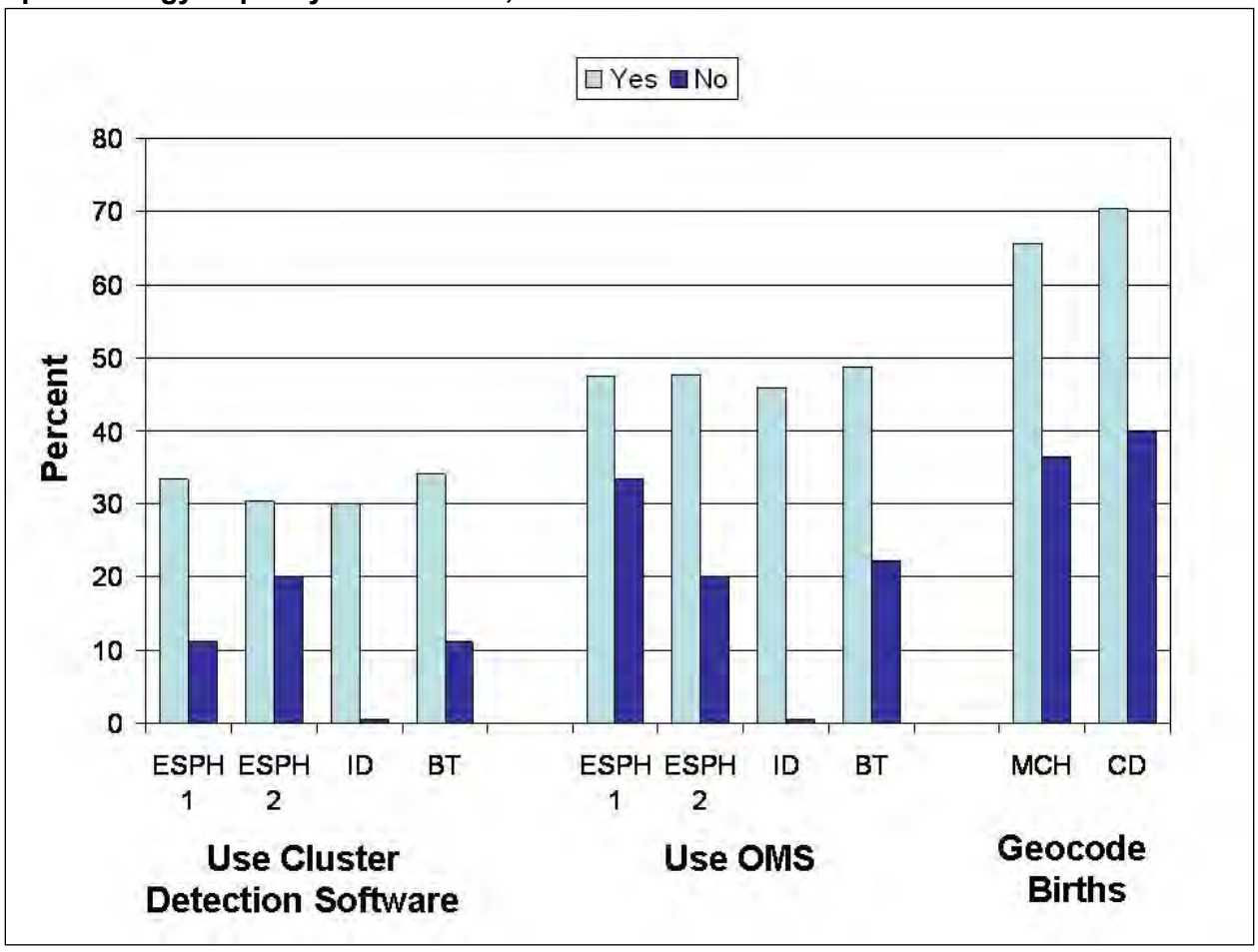


* Concrete data for future capacity not asked for syndromic surveillance, using OMS, geocoding births, deaths or all reportable diseases or analysis using census tract SES. “Expanded No. ELR Reportable Conditions” among the 33 states with ELR. “Geocode At Least Some Reportable Disease Data” among the 32 states that do not routinely geocode all reportable disease data.
† ELR: electronic laboratory reporting; EMR: electronic medical record; OMS: outbreak-management system.

Association between Technical Capacity and Functional Epidemiology Capacities

Each technical capacity was examined to determine if having it was associated with the four EPHS, infectious disease or bioterrorism epidemiology/surveillance capacity and, for geocoding and EMR capacities, chronic disease or MCH epidemiology/surveillance capacity. Only use of cluster detection software, use of OMS and geocoding births had some associations with either EPHS 1 and 2 or program-specific epidemiology/surveillance capacities (Figure 11).

Figure 11. Percentage of states with substantial to full EPHS or program-specific epidemiology/surveillance capacity, by whether have selected technical capacities—2013 Epidemiology Capacity Assessment, 50 states and District of Columbia



EPHS: essential public health service; ID: infectious diseases; BT: bioterrorism/emergency response; MCH: maternal and child health; CD: chronic disease; OMS: outbreak management system

Funding

All 50 of the responding states reported receiving both federal and state funding to support epidemiology activities within the state health department. Other sources of funding were much less common (13 respondents, 26%, reported specific "other" funding sources). They averaged 5% of total funding for these respondents. On average, each state health department received nearly 79% of its funding from the federal government and 19% from the state (Table 8).

Table 8. Funding sources for epidemiology activities in state health departments—2013 Epidemiology Capacity Assessment, 50 jurisdictions

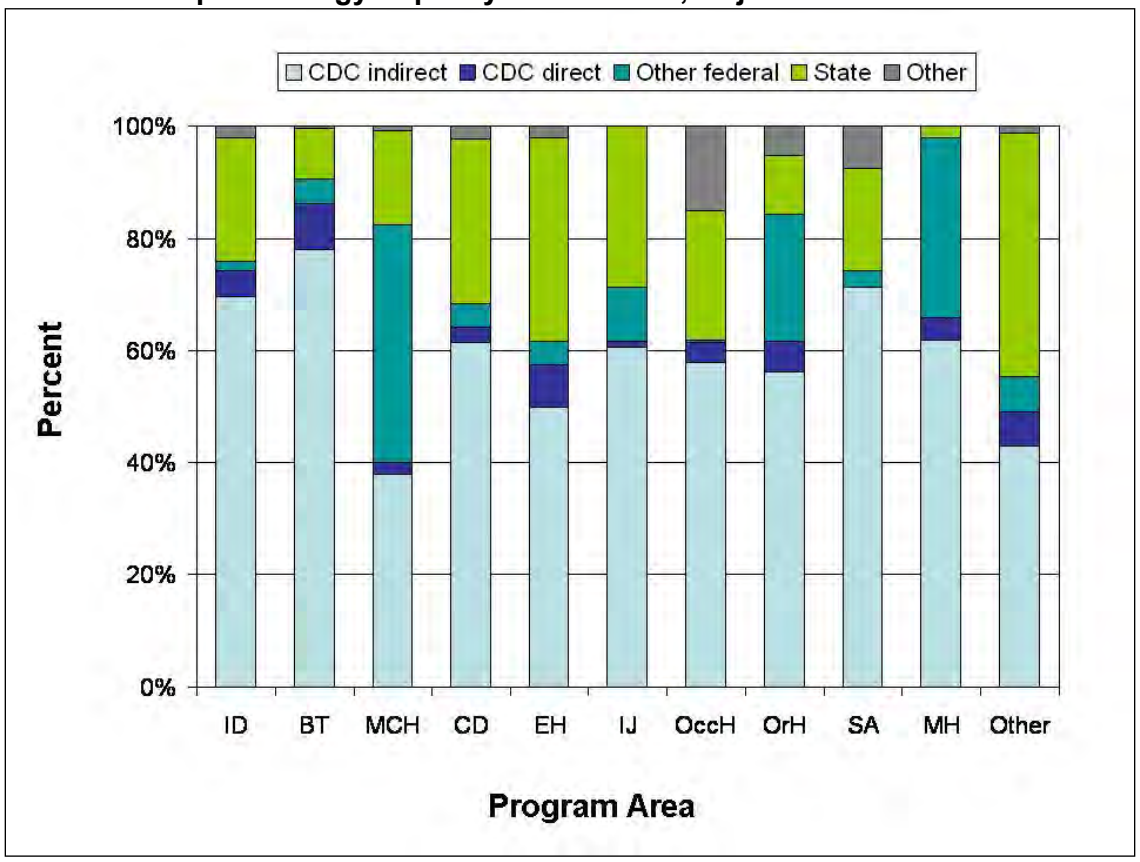
Funding source	Percentage of funding				No. states
	Min	Max	Median	Mean	
Federal	46%	97%	80%	78.7%	50
State	2%	50%	19%	19.0%	50
Other*	0%	25%	2%	5.0%	23

* Other includes: state sources (e.g., fees, Medicaid reimbursement, tobacco taxes) and non-state or special state sources (e.g., foundations, tobacco settlement funds, Mental Health Trust, Biomedical Research Commission).

Sources of Funding by Program Areas

While federal sources accounted for an average of 79% of the funding for state-level epidemiologic activities, the relative importance of federal to state funding varied by program area, ranging from highs of 98% federal funding for mental health and 90.5% for BT/ER to 61.8% federal funding for occupational health and 61.7% for environmental health (Figure 12). States put relatively more funding into environmental health (36.1%), chronic disease (29.4%) and injury (28.7%) than into other areas.

Figure 12. Funding sources for epidemiologists in state health departments, by program area*—2013 Epidemiology Capacity Assessment, 50 jurisdictions



* ID: infectious diseases; CD: chronic disease; BT: bioterrorism/emergency response; MCH: maternal and child health; EH: environmental health; IJ: injury; OccH: occupational health; SA: substance abuse; OrH: oral health; MH: mental health..

Characterization of the Epidemiology Workforce

Information in this section is based mostly on responses from the 1590 full-time equivalent (FTE) epidemiologists who completed the individual worksheet. More than half (57.8%) of all epidemiologists working in state health departments completed the worksheet, with slightly variable numbers responding to each question. The data pertaining to tier-level competencies and training needs comprises solely those individuals who completed the individual assessment during the full launch (excludes pilot state responses) as these questions were changed significantly between the pilot and the full launch.

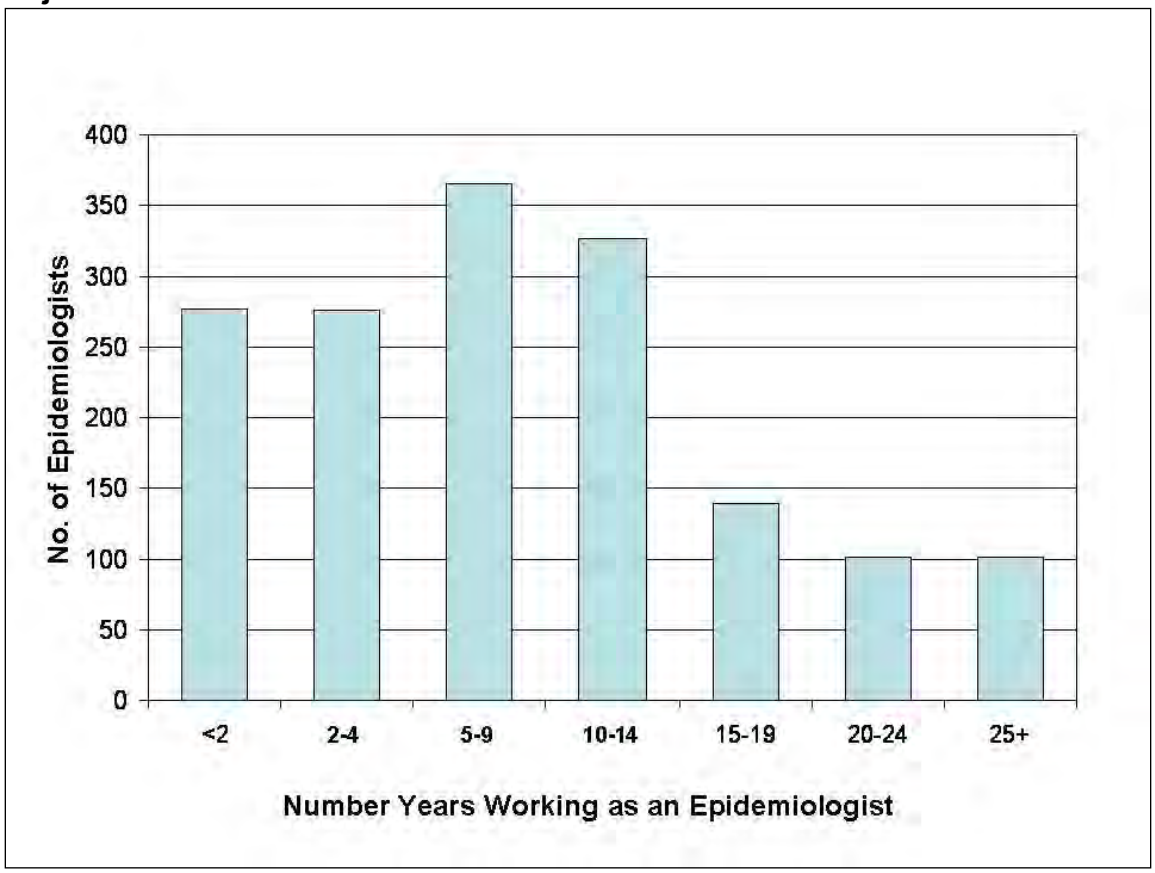
Demographics

Of those who responded, the median age was 40 years (range, 22-88), 71% were female, 95.9% were full time employees and12% were contract employees. Overall, 1,535 (96.5%) provided their race-ethnicity: 75.9% were non-Hispanic white, 9.2% were non-Hispanic Asian, 8.1% were non-Hispanic black; 3.6% were Hispanic, 0.8% were American Indian/Pacific Islander and the rest were ‘mixed’ or ‘other’. A total of 1585 (99.7%) specified their program area: 50.4% were ID, 11.4% were CD, 11.1% were MCH, 7.3% were EH, 5.7% were BT, 2.4% were injury, 0.9% were OccH, 0.8% were oral health, 0.7% were substance abuse, 0.3% were mental health and 9.0% were “other’. By tier level, 25% were entry level epidemiologists, 41% were mid-level epidemiologists, 23% were senior-level epidemiologists with supervisory or managerial responsibilities, and 11% were senior scientist/subject matter expert level epidemiologists.

Experience

Responding epidemiologists were relatively experienced, with a median duration working as an epidemiologist of 5-9 years. While 17.5% of the workforce had been on the job <2 years, 12.8% had worked as epidemiologists for at least 20 years (Figure 13).

Figure 13. Number of years working as an epidemiologist, 1586 responding epidemiologists in state health departments—2013 Epidemiology Capacity Assessment, 51 jurisdictions



Academic and Epidemiology-Specific Training

A total of 1586 epidemiologists described their highest levels of academic and epidemiology training. Overall academically, 10.6% had a high level health professions degree (MD, 7.2%; DMD, 0.3%; DVM, 3.2%), 16.0% had a PhD or DrPH, 61.3% had a master‘s degree, 1.5% had an RN, 9.1% had a bachelor‘s degree and 1.4% had an associate‘s degree or lower level of academic training.

The most common epidemiology-specific training was an MPH, MSPH, or other master‘s degree (44.7%) (Table 9). Another 14.7% had either a PhD or a medical professional degree and a degree in epidemiology. Approximately 87.8% of all epidemiologists had received some formal epidemiology training.

The percentage of respondents from program areas with at least 100 staff with a doctoral degree plus at least masters-level epidemiology training ranged from 12.5% (ID) to 19.7% (CD). Those from program areas with smaller numbers had a higher percentage of such staff, ranging from 16.5% (BT/ER) to 35.8% (SA)(Table 9). On the other end of the spectrum, the percentage of respondents from program areas with at least 100 staff with no formal training tended to be similar to that in smaller program areas (range 9.6-14.2 in larger areas vs. 7.2-25.4 in smaller areas).

Table 9. Epidemiology training of persons* working as epidemiologists in state health departments, by program area† and level of epidemiology training—2013 Epidemiology Capacity Assessment (N = 1586 epidemiologists)

Level of epidemiology training	Program area									
	ID		CD		BT/ER		MCH		EH	
	No.	%	No.	%	No.	%	No.	%	No.	%
1. PhD, DrPH, other doctoral degree in epidemiology	46.6	5.8	25.2	14.0	7.6	8.5	14.7	8.4	13.5	11.9
2. Professional background (e.g., MD, DO, DVM, DDS) with a dual degree in epidemiology	53.7	6.7	10.2	5.7	7.0	7.8	9.4	5.4	8.2	7.2
3. MPH, MSPH, other master's degree in epidemiology	380.9	47.6	85.7	47.6	39.2	43.7	70.0	40.1	43.6	38.0
4. BA, BS, other bachelor's degree in epidemiology	9.0	1.1	0	0.0	0.1	0.1	0	0.0	0	0.0
5. Completed formal training program in epidemiology (e.g., EIS)	37.3	4.7	5.1	2.8	5.2	5.8	7.3	4.2	4.5	3.5
6. Completed some coursework in epidemiology	184.6	23.1	28.3	15.7	24.1	26.9	48.8	27.9	33.8	29.5
7. Received on-the-job training in epidemiology	77.2	10.0	21.5	11.9	5.8	6.5	15.9	9.1	8.6	7.5
8. No formal training in epidemiology (i.e., epidemiologist does not fit in any of the above categories)	9.1	1.1	4.2	2.3	0.9	1.0	8.7	5.0	2.4	2.1
TOTAL	799.5	100	180.2	100	89.7	100	174.6	100	114.6	100

Level of epidemiology training	IJ		OccH		SA		OrH		MH	
	No.	%	No.	%	No.	%	No.	%	No.	%
1. PhD, DrPH, other doctoral degree in epidemiology	5.3	13.9	1.5	10.6	3.5	33.0	0.6	4.6	0.4	8.0
2. Professional background (e.g., MD, DO, DVM, DDS) with a dual degree in epidemiology	2.8	7.3	0.4	2.8	0.3	2.8	2.8	21.5	0.1	2.0
3. MPH, MSPH, other master's degree in epidemiology	16.9	44.2	3.9	27.7	3.9	36.8	3.8	29.3	2.7	54.0
4. BA, BS, other bachelor's degree in epidemiology	0	0.0	0	0.0	0	0.0	0	0	0	0
5. Completed formal training program in	2.2	5.8	0.6	4.3	0	0.0	0	0	0.1	2.0

epidemiology (e.g., EIS)										
6. Completed some coursework in epidemiology	7.6	19.9	7.0	49.6	1.0	9.4	2.6	20.0	0.9	18.0
7. Received-on-the job training in epidemiology	3.3	8.6	0.7	2.3	1.9	17.9	1.3	10.0	0.8	16.0
8. No formal training in epidemiology (i.e., epidemiologist does not fit in any of the above categories)	0.2	0.5	0.1	5.0	0	0.0	2.0	15.4	0	0
TOTAL	38.2	100	14.1	100	10.6	100	13.0	100	5	100

Level of epidemiology training	**Other**		**Combined total***							
	No.	**%**	**No.**	**%**						
1. PhD, DrPH, other doctoral degree in epidemiology	14.2	10.0	134	8.5						
2. Professional background (e.g., MD, DO, DVM, DDS) with a dual degree in epidemiology	4.2	2.9	99	6.3						
3. MPH, MSPH, other master's degree in epidemiology	57.4	40.3	708	44.8						
4. BA, BS, other bachelor's degree in epidemiology	0	0	9	0.6						
5. Completed formal training program in epidemiology (e.g., EIS)	5.8	4.1	68	4.3						
6. Completed some coursework in epidemiology	32.4	22.7	371	23.5						
7. Received-on-the job training in epidemiology	22.1	15.5	159	10.1						
8. No formal training in epidemiology (i.e., epidemiologist does not fit in any of the above categories)	6.4	4.5	34	2.1						
TOTAL	142.5	100	1582	100						

* Persons are expressed as full-time equivalent positions, resulting in fractions of persons whose positions are split between 2 or more program areas.
† Includes 152 "Other" that are not shown. ID: infectious diseases; CD: chronic disease; BT/ER: bioterrorism/emergency response; MCH: maternal and child health; EH: environmental health; IJ: injury; OccH: occupational health; SA: substance abuse; OrH: oral health.

Workforce Competence, Training Needs and Development

Tier-Level Competencies and Training Needs

The 2013 ECA, like the 2009 ECA, provided the opportunity for individual epidemiologists to assess their competency and training needs. Individual epidemiologists were asked to indicate the tier to which they belonged and then to assess themselves according to their tier's specific set of competencies. The four tiers were Tier 1—entry-level; Tier 2—mid-level; Tier 3a—senior-level supervisor or manager; and Tier 3b—senior scientist/subject area expert. The competencies were selected from the Applied Epidemiology Competencies developed by CSTE and CDC (8). Results by tier level are shown in Tables 10-13.

In general, the percentage of respondents reporting at least basic-intermediate competency level for each competency in each tier was high, averaging 90% (range by individual competency 70%-99%) for Tier 1 and over 93% for the other three tiers (ranges 80-100) (Table 14a). The percentages who reported having an advanced-expert competency level were more varied and increased with increasing tier level, from an average of 26% for competencies in Tier 1 to an average of 62% for Tier 3b (Table 14a). Reported need for additional training was indicated on a scale of 1-5 where one indicated less need and 5 indicated the strongest need. The percentage of competencies for which respondents reported a high level of need (4 or 5 on the scale), was highest for those in Tier 1 (30%) and progressively decreased to 15% for those in Tier 3b (Table 14b).

Tier 1 – entry level

There were 16 of 30 competencies for which at least 10% of Tier 1 respondents felt they lacked even basic competency (Table 10). The three of these with at least 20% lacking competency were "apply appropriate fiscal and administrative guidelines to epidemiologic practice (29%)", "describe human subjects research and apply IRB processes, as directed (25%)", and "describe how policy decisions are made within the agency (21%)". Several other notable areas for which >10% of respondents noted a lack of basic competency were "provide epidemiologic input for community planning processes (18%)", "identify the role of laboratory resources in epidemiologic activities (17%)", "assist in conducting a community health status assessment and characterizing investigative processes (19%)", and "use identified informatics tools in support of epidemiologic practice (17%)".

For 70% of the competencies, at least 25% of entry-level epidemiologists said they needed additional training (Table 10). The competencies for which the highest percentage of Tier 1 epidemiologists indicated needing additional training were "assist in conducting a community health status assessment and characterizing investigative processes (46%)", "use identified informatics tools in support of epidemiologic practice (46%)", "apply appropriate fiscal and administrative guidelines to epidemiologic practice (45%)", "describe how policy decisions are made within the agency (42%)", and "support evaluation of surveillance systems (40%)".

Tier 2 – mid-level

There were 5 of 31 competencies for which at least 10% of Tier 2 respondents felt they lacked even basic competency (Table 11). Several of these 5 competencies with the most respondents lacking basic competency were similar to those of entry-level epidemiologists: "apply appropriate fiscal and administrative guidelines to epidemiologic practice (17%)", "use laboratory resources to support epidemiologic processes (14%), and "conduct a community health assessment and recommend priorities of potential public health problems to be

addressed (11%)". Others included "assist in the development of program logic models and theories of action" (15%) and "use leadership and systems thinking in epidemiologic planning and policy development (11%)."

For approximately a third of the competencies (10 of 31) at least 25% of mid-level epidemiologists said they needed additional training (Table 11). Several of the competencies for which the highest percentage of Tier 2 epidemiologists indicated needing additional training were similar to those of Tier 1 epidemiologists: "conduct a community health assessment and recommend priorities of potential public health problems to be addressed (36%)" and "apply appropriate fiscal and administrative guidelines to epidemiologic practice (34%)." Other leading training needs were "assist in the development of program logic models and theories of action (35%)", "use leadership and systems thinking in epidemiologic planning and policy of development (35%)", "assess the need for special analyses (31%)", "establish cultural/social/political framework for recommendations or interventions (29%), and "conduct evaluation of surveillance systems (29%)."

Tier 3a - Senior-level with program management and/or supervisory responsibilities

There were 6 of 32 competencies for which at least 10% of Tier 3a respondents felt they lacked even basic competency (Table 12). Most of these 6 competencies with the most respondents lacking basic competency were similar to those of entry- and mid-level epidemiologists in that they related to fiscal issues, community health assessments or the laboratory: "formulate a fiscally sound budget that will support the activities defined in the operational plan and is consistent with the financial rules of the agency (14%)", "oversee implementation of operational and financial plans (14%)", "lead community public health planning processes (12%)" and "ensure the use of laboratory resources to support epidemiologic activities (11%). Others in these 6 competencies were "lead epidemiology unit in preparing for emergency response (18%)" and develop requests for extramural funding to support additional epidemiologic activities and special projects (12%)."

For more than a quarter (9 of 30) of competencies at least 25% of Tier 3a-level epidemiologists said they needed additional training (Table 12). Five of these were the same as the fiscal and community planning competencies for which the most indicated they lacked even basic competency. The others were "develop and manage information systems to improve effectiveness of surveillance, investigation, and other epidemiologic processes (26%)", "create operational and financial plans for epidemiologic activities (29%)", "ensure application of principles of informatics, including data collection, processing, and analysis in support of epidemiologic practice (26%)", and "ensure evaluation of programs (30%)."

Tier 3b – Senior-level scientists

There were 5 of 30 competencies for which at least 10% of Tier 3b respondents felt they lacked even basic competency (Table 13). Most of these 5 competencies with the most respondents lacking basic competency were similar to those of other epidemiologist tiers: "describe financial and budgetary processes of the agency (18%)", "implement operational and financial plans for assigned projects (11%)", "lead community public health planning processes (10%)", "prepare for emergency response (12%)", and "develop processes for using laboratory resources to support epidemiologic activities (20%)".

There was 1 competency for which at least 25% of Tier 3a-level epidemiologists said they needed additional training: "lead community public health planning processes (25%)". There

were five competencies for which 20-24% said they needed additional training, mostly focusing on financial matters: “develop processes for using laboratory resources to support epidemiologic activities (24%)”, “describe financial and budgetary processes of the agency (24%)”, “implement operational and financial plans for assigned projects (21%)”, “prepare proposals for extramural funding for review and input from managers (21%)”, and “evaluate programs (21%)” (Table 13).

Table 10. Entry-level epidemiologists’ self-assessment of competence in the Tier 1 Applied Epidemiology Competencies and additional training need—2013 Epidemiology Capacity Assessment (n = 327)

Tier 1 competency	Staff are competent in this area				Additional training is needed			
	N	None - Minimal	Basic – Intmed.	Adv - Expert	N	More → Less		
						4-5	3	1-2
		No. (%)	No. (%)	No. (%)		No. (%)	No. (%)	No. (%)
Use effective communication technologies	309	3 (1)	200 (65)	106 (34)	308	62 (20)	100 (32)	146 (47)
Practice professional development	309	7 (2)	208 (67)	94 (30)	308	75 (24)	100 (32)	133 (43)
Demonstrate ability to listen effectively when epidemiologic findings are presented or discussed	309	6 (2)	152 (49)	124 (40)	308	37 (12)	80 (26)	191 (62)
Recognize the existence of a public health problem	315	8 (3)	185 (59)	122 (39)	313	70 (22)	113 (36)	130 (42)
Support the organization’s vision in all programs and activities	309	9 (3)	192 (62)	108 (35)	309	57 (18)	92 (30)	160 (52)
Apply knowledge of privacy laws to protect confidentiality, including HIPAA and applicable state and local privacy laws	310	9 (3)	161 (52)	140 (45)	310	58 (19)	77 (25)	175 (56)
Promote ethical conduct in epidemiologic practice	309	9 (3)	169 (55)	131 (42)	308	52 (17)	83 (27)	173 (56)
Identify key findings from the study	310	11 (4)	188 (61)	111 (36)	310	76 (25)	94 (30)	140 (45)
Collaborate with others inside and outside the agency to identify the problem	315	12 (4)	200 (63)	103 (33)	313	79 (25)	106 (34)	128 (41)
Identify surveillance data needs	315	15 (5)	217 (69)	83 (26)	313	93 (30)	108 (35)	112 (36)
Prepare written and oral reports and presentations that communicate necessary information to agency staff	310	16 (5)	172 (55)	122 (39)	309	62 (20)	93 (30)	154 (50)
Maintain databases	311	17 (5)	175 (56)	119 (38)	311	74 (24)	95 (31)	142 (46)
Use analysis plans, and analyze data	311	17 (5)	207 (67)	87 (28)	311	103 (33)	96 (31)	112 (36)
Follow ethics guidelines and principles when planning studies; conducting research; and collecting, disseminating, and using data	312	22 (7)	182 (58)	108 (35)	312	77 (25)	94 (30)	141 (45)
Know how causes of disease affect epidemiologic practice	311	21 (7)	211 (68)	79 (25)	311	85 (27)	118 (38)	108 (35)
Practice culturally sensitive epidemiologic activities	309	31 (10)	211 (68)	67 (22)	309	88 (28)	101 (33)	120 (39)
Implement new or revise existing surveillance systems, and report key surveillance findings	314	35 (11)	222 (71)	57 (18)	313	119 (38)	115 (37)	79 (25)
Recognize the basic principles of risk communication	309	35 (11)	221 (72)	53 (17)	309	101 (33)	103 (33)	105 (34)

Assist in design of investigation, including creating hypotheses	313	34 (11)	217 (69)	62 (20)		313	102 (33)	112 (36)	99 (32)
Support evaluation of surveillance systems	313	36 (12)	228 (73)	49 (16)		313	124 (40)	100 (32)	89 (28)
Apply understanding of human and environmental biology and behavioral sciences and principles to determine potential biological mechanisms of disease	310	41 (13)	201 (65)	68 (22)		310	103 (33)	113 (36)	94 (30)
Assist in evaluation of programs	311	39 (13)	230 (74)	42 (14)		310	105 (34)	121 (39)	84 (27)
Define cultural/social/political framework for recommended interventions	311	42 (14)	225 (72)	44 (14)		310	109 (35)	109 (35)	92 (30)
Identify the role of laboratory resources in epidemiologic activities	310	53 (17)	187 (60)	70 (23)		309	91 (29)	108 (35)	110 (36)
Use identified informatics tools in support of epidemiologic practice	309	52 (17)	225 (73)	32 (10)		309	141 (46)	98 (32)	70 (23)
Provide epidemiologic input for community planning processes	308	56 (18)	213 (69)	39 (13)		308	112 (36)	108 (35)	88 (29)
Assist in conducting a community health status assessment and characterizing investigative processes	313	59 (19)	206 (66)	48 (15)		313	143 (46)	99 (32)	71 (23)
Describe how policy decisions are made within the agency	309	64 (21)	215 (70)	30 (10)		309	131 (42)	98 (32)	80 (26)
Describe human subjects research and apply IRB* processes, as directed	311	79 (25)	171 (55)	61 (20)		311	121 (39)	77 (25)	113 (36)
Apply appropriate fiscal and administrative guidelines to epidemiology practice	309	90 (29)	196 (63)	23 (7)		309	138 (45)	91 (29)	80 (26)

*IRB: institutional review board; HIPAA: Health Insurance Portability and Accountability Act.

Table 11. Mid-level epidemiologists' self-assessment of competence in the Tier 2 Applied Epidemiology Competencies and additional training need—2013 Epidemiology Capacity Assessment (n = 559)

Tier 2 competency	Staff are competent in this area					Additional training is needed			
		None - Minimal	Basic – Intmed.	Adv - Expert			More → Less		
							4-5	3	1-2
	N	No. (%)	No. (%)	No. (%)		N	No. (%)	No. (%)	No. (%)
Use critical thinking to determine whether a public health problem exists	548	0 (0)	229 (42)	319 (58)		547	58 (11)	166 (30)	323 (59)
Collaborate with others inside and outside the agency to identify the problem and form recommendations	547	1 (0.2)	245 (45)	301 (55)		545	72 (13)	151 (28)	322 (59)
Apply knowledge of epidemiologic principles and methods to make recommendations regarding the validity of epidemiologic data	546	2 (0.4)	320 (59)	224 (41)		546	126 (23)	178 (33)	242 (44)
Promote ethical conduct in epidemiologic practice	543	8 (1)	252 (46)	283 (52)		542	63 (12)	155 (29)	324 (60)
Use effective communication technologies	543	4 (1)	293 (54)	246 (45)		542	107 (20)	155 (29)	280 (52)
Describe differences between	546	5 (1)	295 (54)	246 (45)		545	73 (13)	170 (31)	302 (55)

public health practice and public health research									
Use current knowledge of causes of disease to guide epidemiologic practice	544	3 (1)	255 (47)	286 (53)		543	77 (14)	183 (34)	283 (52)
Apply knowledge of privacy laws to protect confidentiality, including HIPAA and applicable state and local privacy laws	546	6 (1)	212 (39)	328 (60)		545	69 (13)	141 (26)	335 (61)
Assist in the development of measurable and relevant goals and objectives	544	6 (1)	284 (52)	254 (47)		544	87 (16)	173 (32)	284 (52)
Use scientific evidence in preparing recommendations for action or intervention	544	8 (1)	290 (53)	246 (45)		543	87 (16)	188 (35)	268 (49)
Articulate the need for further investigation or other public health action from literature review and assessment of current data	548	3 (1)	234 (43)	311 (57)		546	65 (12)	160 (29)	321 (59)
Assist in the design of an investigation, including hypothesis generation	546	6 (1)	293 (54)	247 (45)		546	112 (21)	177 (32)	257 (47)
Follow ethics guidelines and principles when planning studies; conducting research; and collecting, disseminating, and using data	546	6 (1)	231 (42)	309 (57)		546	78 (14)	139 (25)	329 (60)
Communicate epidemiologic information through giving oral presentations or contributing to the development of written documents to nonprofessional audiences	544	5 (1)	226 (42)	313 (58)		544	77 (14)	146 (27)	321 (59)
Implement new or revise existing surveillance system, and identify key surveillance findings	546	10 (2)	280 (51)	256 (47)		545	107 (20)	190 (35)	248 (46)
Design surveillance for a public health issue, and identify surveillance data needs	546	10 (2)	290 (53)	246 (45)		546	112 (21)	191 (35)	243 (45)
Create analysis plans, and conduct analysis of data	546	10 (2)	274 (50)	262 (48)		546	152 (28)	159 (29)	235 (43)
Define database requirements, and manage a database	546	14 (3)	246 (45)	286 (52)		546	120 (22)	155 (28)	271 (50)
Assess the need for special analyses	545	23 (4)	385 (71)	137 (25)		545	170 (31)	184 (34)	191 (35)
Apply understanding of human and environmental biology and behavioral sciences and principles to determine potential biological mechanisms of disease	544	21 (4)	345 (63)	178 (33)		543	129 (24)	178 (33)	236 (43)
Practice culturally sensitive epidemiologic activities	543	25 (5)	356 (66)	162 (30)		543	114 (21)	179 (33)	250 (46)
Conduct evaluation of surveillance systems	546	25 (5)	361 (66)	160 (29)		546	157 (29)	185 (34)	204 (37)
Establish cultural/social/political framework for recommendations or interventions	544	35 (6)	401 (74)	108 (20)		544	159 (29)	194 (36)	191 (35)
Demonstrate the basic principles of risk communication	544	35 (6)	377 (69)	132 (24)		544	154 (28)	178 (33)	212 (39)
Provide epidemiologic input for community planning processes	542	49 (9)	352 (65)	141 (26)		542	133 (25)	190 (35)	219 (40)
Describe human subjects research,	546	49 (9)	320 (59)	177 (32)		545	133 (24)	153 (28)	259 (48)

and apply IRB* processes, as necessary									
Use leadership and systems thinking in epidemiologic planning and policy development	543	57 (11)	388 (71)	98 (18)		543	190 (35)	163 (30)	190 (35)
Conduct a community health assessment, and recommend priorities of potential public health problems to be addressed	546	61 (11)	368 (67)	117 (21)		546	198 (36)	180 (33)	168 (31)
Use laboratory resources to support epidemiologic activities	544	75 (14)	252 (46)	217 (40)		544	123 (23)	140 (26)	281 (52)
Assist in the development of program logic models and theories of action	544	81 (15)	364 (67)	99 (18)		544	189 (35)	167 (31)	188 (35)
Apply appropriate fiscal and administrative guidelines to epidemiologic practice	543	93 (17)	385 (71)	65 (12)		543	182 (34)	173 (32)	188 (35)

*IRB: institutional review board; HIPAA: Health Insurance Portability and Accountability Act.

Table 12. Senior-level supervisor or manager epidemiologists' self-assessment of competence in the Tier 3a Applied Epidemiology Competencies and additional training need—2013 Epidemiology Capacity Assessment (n = 317)

Tier 3a competency	Staff are competent in this area				Additional training is needed			
	N	None - Minimal	Basic – Intmed	Adv - Expert	N	More → Less		
						4-5	3	1-2
		No. (%)	No. (%)	No. (%)		No. (%)	No. (%)	No. (%)
Oversee surveillance activities	304	0 (0)	53 (17)	251 (83)	302	28 (9)	59 (20)	215 (71)
Evaluate analysis of data from an epidemiologic investigation or study	303	0 (0)	98 (32)	205 (68)	303	47 (16)	90 (30)	166 (55)
Ensure study design and data collection, dissemination, and of use ethical and legal principles	304	0 (0)	93 (31)	211 (69)	302	41 (14)	90 (30)	171 (57)
Ensure management of data from surveillance, investigations, or other sources	304	0 (0)	58 (19)	246 (81)	302	27 (9)	74 (25)	201 (67)
Evaluate conclusions and interpretations from investigations	303	0 (0)	64 (21)	239 (79)	303	33 (11)	63 (21)	207 (68)
Ensure identification of public health problems pertinent to the population	304	0 (0)	53 (17)	251 (83)	303	27 (9)	69 (23)	207 (68)
Ensure preparation of written and oral reports and presentations to professional and nonprofessional audiences, and ensure basic principles of risk communication are followed	303	1 (0.3)	65 (21)	237 (78)	302	38 (13)	64 (21)	200 (66)
Promote collaborations, strong partnerships, and team-building to accomplish epidemiology program objectives	301	1 (0.3)	105 (35)	195 (65)	301	49 (16)	66 (22)	186 (62)
Use management skills	301	2 (1)	114 (38)	185 (61)	301	63 (21)	75 (25)	163 (54)
Use performance measures to evaluate and improve program effectiveness	301	3 (1)	148 (49)	150 (50)	300	55 (18)	79 (26)	166 (55)
Determine evidence-based interventions and control measures in response to epidemiologic findings	303	3 (1)	132 (44)	168 (55)	303	66 (22)	78 (26)	159 (52)
Ensure investigation of acute and chronic conditions or other adverse outcomes in the population	304	3 (1)	88 (29)	213 (70)	302	36 (12)	78 (26)	188 (62)
Ensure evaluation of programs	303	3 (1)	193 (64)	107 (35)	303	91 (30)	74 (24)	138 (46)
Use basic public health sciences in epidemiologic practice	303	3 (1)	66 (22)	234 (77)	303	27 (9)	59 (19)	217 (72)
Enforce policies that address security, privacy, and legal considerations when communicating epidemiologic information	303	4 (1)	90 (30)	209 (69)	302	50 (17)	63 (21)	189 (63)
Promote ethical conduct in epidemiology practice	301	4 (1)	78 (26)	219 (73)	301	34 (11)	58 (19)	209 (69)

Model interpersonal skills in communication with agency personnel, colleagues, and the public	303	2 (1)	68 (22)	233 (77)		302	34 (11)	58 (19)	210 (70)
Ensure application of principles of informatics, including data collection, processing, and analysis in support of epidemiologic practice	303	5 (2)	135 (45)	163 (54)		302	80 (26)	80 (26)	142 (47)
Ensure the application of understanding of human and environmental biology and behavioral sciences and principles to determine biological mechanisms of disease	303	6 (2)	131 (43)	166 (55)		303	47 (16)	86 (28)	170 (56)
Ensure professional development of the epidemiology workforce	301	9 (3)	156 (52)	136 (45)		301	64 (21)	66 (22)	171 (57)
Practice culturally sensitive epidemiologic activities	303	11 (4)	144 (48)	148 (49)		302	62 (21)	64 (21)	176 (58)
Bring epidemiologic perspective in the development and analysis of public health policies	301	13 (4)	140 (47)	148 (49)		301	58 (19)	70 (23)	173 (57)
Develop and manage information systems to improve effectiveness of surveillance, investigation, and other epidemiologic practices	303	11 (4)	159 (52)	133 (44)		302	78 (26)	97 (32)	127 (42)
Promote the epidemiologic perspective in the agency strategic planning process	301	17 (6)	141 (47)	143 (48)		301	55 (18)	78 (26)	168 (56)
Lead the creation of the epidemiologic program's vision in the context of the agency's plan	301	22 (7)	163 (54)	116 (39)		301	65 (22)	75 (25)	161 (53)
Create operational and financial plans for future epidemiologic activities	303	28 (9)	174 (57)	101 (33)		302	88 (29)	77 (26)	137 (45)
Ensure the use of laboratory resources to support epidemiologic activities	303	34 (11)	121 (40)	148 (49)		302	53 (18)	55 (18)	184 (61)
Lead community public health planning processes	303	37 (12)	196 (65)	70 (23)		302	89 (29)	71 (24)	142 (47)
Develop requests for extramural funding to support additional epidemiologic activities and special projects	301	35 (12)	158 (52)	108 (36)		301	96 (32)	70 (23)	135 (45)
Oversee implementation of operational and financial plans	302	41 (14)	153 (51)	108 (36)		302	86 (28)	70 (23)	146 (48)
Formulate a fiscally sound budget that will support the activities defined in the operational plan and is consistent with the financial rules of the agency	302	42 (14)	159 (53)	101 (33)		302	87 (29)	77 (26)	138 (46)
Lead epidemiology unit in preparing for emergency response	301	55 (18)	154 (51)	92 (31)		301	85 (28)	73 (24)	143 (48)

Table 13. Senior scientist/subject matter expert epidemiologists' self-assessment of competence in the Tier 3b Applied Epidemiology Competencies and additional training need—2013 Epidemiology Capacity Assessment (n = 141)

Tier 3b competency	Staff are competent in this area				Additional training is needed			
		None - Minimal	Basic – Intmed.	Adv - Expert		More → Less		
						4-5	3	1-2
	N	No. (%)	No. (%)	No. (%)	N	No. (%)	No. (%)	No. (%)
Organize preparation of written and oral presentations that communicate necessary information to professional audiences, policymakers, and the general public	136	0 (0)	14 (10)	122 (90)	136	16 (12)	21 (15)	99 (73)
Evaluate data from an epidemiologic investigation or study	136	0 (0)	17 (13)	119 (88)	136	17 (13)	20 (15)	99 (73)
Evaluate results of data analysis, and interpret conclusions	136	0 (0)	10 (7)	126 (93)	136	13 (10)	24 (18)	99 (73)
Manage data from surveillance, investigations, or other sources	136	0 (0)	16 (12)	120 (88)	136	9 (7)	29 (21)	98 (72)
Use basic public health sciences in epidemiologic practice	136	0 (0)	30 (22)	106 (78)	136	14 (10)	30 (22)	92 (68)
Synthesize principles of good ethical/legal practice for application to study design and data collections, dissemination, and use	136	0 (0)	35 (26)	101 (74)	136	17 (13)	26 (19)	93 (68)
Model interpersonal skills in communications with agency personnel, colleagues, and the public	136	1 (1)	32 (24)	103 (76)	136	16 (12)	28 (21)	92 (68)
Use skills that foster collaborations, strong partnerships, and team-building to accomplish epidemiology program objectives	136	1 (1)	41 (30)	94 (69)	136	14 (10)	30 (22)	92 (68)
Validate identification of public health problems pertinent to the population	136	1 (1)	23 (17)	112 (82)	136	10 (7)	24 (18)	102 (75)
Promote the organization's vision in all epidemiologic program activities	136	2 (1)	62 (46)	72 (53)	136	14 (10)	40 (29)	82 (60)
Organize surveillance	136	2 (1)	33 (24)	101 (74)	136	11 (8)	33 (24)	92 (68)
Promote ethical conduct in the epidemiology practice	136	2 (1)	33 (24)	101 (74)	136	11 (8)	22 (16)	103 (76)
Apply principles of informatics, including data collection, processing, and analysis, in support of epidemiologic practice	136	3 (2)	48 (35)	85 (63)	136	22 (16)	40 (29)	74 (54)
Develop as-needed policies that address security, privacy, and legal considerations when communicating epidemiologic information	136	3 (2)	68 (50)	65 (48)	136	20 (15)	37 (27)	79 (58)
Formulate new interventions	136	5 (4)	40 (29)	91 (67)	136	18 (13)	36 (26)	82 (60)

on the basis of evidence, when available, and control measures in response to epidemiologic findings									
Evaluate programs	136	5 (4)	62 (46)	69 (51)		136	29 (21)	42 (31)	65 (48)
Design investigation of acute and chronic conditions or other adverse outcomes in the population	136	5 (4)	29 (21)	102 (75)		136	16 (12)	30 (22)	90 (66)
Promote the epidemiologic perspective in the agency strategic planning process	136	5 (4)	58 (43)	73 (54)		136	24 (18)	27 (20)	85 (63)
Bring epidemiologic perspective in the development and analysis of public health policies	136	6 (4)	48 (35)	82 (60)		136	22 (16)	29 (21)	85 (63)
Ensure application of understanding of human and environmental biology and determine biological mechanisms of disease behavioral sciences and principles to	136	6 (4)	56 (41)	74 (54)		136	21 (15)	35 (26)	80 (59)
Practice culturally sensitive epidemiologic activities	136	7 (5)	58 (43)	71 (52)		136	23 (17)	37 (27)	76 (56)
Prepare proposals for extramural funding for review and input from mangers	136	7 (5)	60 (44)	69 (51)		136	29 (21)	41 (30)	66 (49)
Conduct epidemiologic activities within the financial and operational plan of the agency	136	8 (6)	52 (38)	76 (56)		136	21 (15)	25 (18)	90 (66)
Use performance measures to evaluate and improve program effectiveness	136	8 (6)	47 (35)	81 (60)		136	20 (15)	37 (27)	79 (58)
Promote epidemiology workforce development	136	12 (9)	56 (41)	68 (50)		136	23 (17)	34 (25)	80 (59)
Lead community public health planning processes	136	13 (10)	78 (57)	45 (33)		136	34 (25)	41 (30)	61 (45)
Implement operational and financial plans for assigned projects	136	15 (11)	67 (49)	54 (40)		136	29 (21)	40 (29)	67 (49)
Prepare for emergency response	136	16 (12)	61 (45)	59 (43)		136	23 (17)	38 (28)	75 (55)
Describe financial and budgetary processes of the agency	136	24 (18)	70 (51)	42 (31)		136	33 (24)	32 (24)	71 (52)
Develop processes for using laboratory resources to support epidemiologic activities	136	27 (20)	58 (43)	50 (37)		136	32 (24)	32 (24)	72 (53)

Table 14a. Mean* and range in the percentage of competencies for which respondents reported having at least basic-intermediate competency and advanced/expert competency, by epidemiologist tier—2013 Epidemiology Capacity Assessment

Tier	No. competencies	Report at least basic-intermediate competency		Report advanced-expert competency	
		Mean, %	Range, %	Mean, %	Range, %
1	30	90	70–99	26	7-45
2	31	96	83–100	40	12-60
3a	32	93	82-100	56	23-83
3b	30	96	80-100	62	31-93

* The average from adding the percentages who reported at least basic competency (sum of columns 3 and 4 in Tables 10–13) divided by the number of competencies. The range shows the lowest and highest percentages who agreed they were competent or needed training among the 30 or more competencies.

Table 14b. Mean* and range in the percentage of competencies for which respondents reported needing more training, by epidemiologist tier—2013 Epidemiology Capacity Assessment

Tier	No. competencies	Report needing more training	
		Mean, %	Range, %
1	30	30	12–46
2	31	22	11-36
3a	32	19	9-32
3b	30	15	7-25

* The average from adding the percentages who reported clearly needing training (column 6 in Tables 10–13) divided by the number of competencies. The range shows the lowest and highest percentage who agreed they were competent or needed training among the 30 or more competencies.

State Health Department Involvement in Epidemiology and Informatics Training

The 2013 ECA asked state health departments several questions related to their involvement in training in epidemiology and in cross-training of epidemiologists in informatics. A high percentage provided on-site training in epidemiology to staff (90%) and training and education to local-level epidemiologists (80%). While 92% paid for education outside the health department, only 4% required continuing education in epidemiology and surveillance (Table 15).

Cross-training of epidemiologists in informatics has been recognized as being increasingly important in the era of electronic medical records and "big data." While only 12% of state health departments require such cross-training, 67% pay for cross-training outside the health department, 43% provide on-site training, 25% provide it to epidemiologists based in local health departments, and 18% have staff positions responsible for internal informatics cross-training (Table 15).

Responses to most of the training questions did not differ by state size as measured by population with one exception. Large states were most likely to provide epidemiology training to local level epidemiologists (100%), followed by medium-sized states (88%) then small states (53%).

Table 15. Number and percentage of state health departments providing continuing training in epidemiology and in informatics to epidemiology staff—2013 Epidemiology Capacity Assessment, 50 states and District of Columbia

Training in epidemiology	Yes		No/Unknown	
	No.	%	No.	%
Provide on-site trainings (epidemiology seminars, etc)	46	90	5	10
Provide epidemiology training or education to epidemiologists at the local level	41	80	10	20
Pay for formal training or education outside your organization (conferences or seminars)	47	92	4	8
Include education and training objectives in performance review	40	78	11	22
Have staff position(s) responsible for internal training	21	41	30	59
Require continuing education in epidemiology and surveillance	2	4	49	96
Cross-training in informatics				
Provide on-site informatics trainings (seminars)	22	43	29	57
Provide informatics cross-training or education to epidemiologists at the local level	13	25	38	75

Pay for formal informatics training/education outside your organization	34	67	17	33
Have staff positions responsible for internal informatics cross-training	9	18	42	82
Require cross-training in informatics	6	12	45	88

Departments providing training in epidemiology did so in collaboration with many partners, the most common being CDC (86%) and schools of public health (70%) (Table 16). There was not a specific question asking about partnerships for cross-training epidemiologists in informatics.

Table 16. State health department training partners—2013 Epidemiology Capacity Assessment, 50 states and District of Columbia

Training partners	States collaborating with training partner		
	Yes	No	Unknown
	No. (%)	No. (%)	No. (%)
Centers for Disease Control and Prevention	42 (82)	9 (18)	0 (0)
Schools of public health	36 (71)	15 (29)	0 (0)
Other healthcare providers	20 (39)	28 (55)	3 (6)
Other academic institutions	20 (39)	30 (59)	1 (2)
Other federal/governmental agencies	18 (35)	29 (57)	4 (8)
Centers for Public Health Preparedness	18 (35)	28 (55)	5 (10)
Public safety first responders	19 (37)	31 (61)	1 (2)
Other healthcare organizations	20 (39)	26 (51)	5 (10)
Schools of veterinary medicine	10 (20)	41 (80)	0 (0)
HRSA* training centers	8 (16)	35 (69)	8 (16)
Other†	4 (8)	N/A	N/A

*HRSA: Health Resources and Services Administration.
†Other external partners (1 each): Association of Infection Control Practitioners, CSTE, state departments of education, local health departments.

State Epidemiologist Longevity, Staff Turnover, Recruitment and Retention

The assessment contained information on several measures of staff longevity or turnover and issues related to staff recruitment and retention.

Forty-seven (47) responding State Epidemiologists reported being in their position a range of <6 months to 35 years. The median time in the position was 5 years, longer than the median of 3 years reported in 2009.

Overall, 260 of an estimated 2,419 staff with master's level or higher training left during 2012, for a 2012 turnover rate of 10.7%. This rate was higher than the estimated 8.1% turnover rate in 2009. The estimation assumed the percentage of staff with master's or higher training was the same as the 87.9% found among respondents to the individual assessment.

Recruitment and Retention Issues

State Epidemiologists reported restrictions on offering competitive pay (88%), opportunities for promotion (76%) and salary scale (71%) as the leading barriers to recruiting epidemiologists (Table 18). Leading barriers to retaining them were similar: restrictions on merit raises (82%), salary scale (78%) and opportunities for promotion (74%) (Table 19).

Table 18. Barriers to recruiting epidemiologists—2013 Epidemiology Capacity Assessment, 50 states and District of Columbia

Barrier*	A problem		Neutral/Not a problem	
	No.	%	No.	%
Restrictions on offering competitive pay	40	88	11	12
Opportunities for promotion	39	76	12	24
Salary scale	36	71	15	29
Restrictions on hiring quickly enough	33	65	18	35
Hiring freezes	27	53	24	47
Enough qualified applicants	26	51	25	49
Personnel policies and procedures	24	47	27	53
Job location	17	33	34	67
Opportunities for training	16	31	35	69
Limitations recruiting outside agency	12	24	39	76
Job security	11	22	40	78
Travel permitted	11	22	40	78
Restrictions on choosing best candidate	11	22	40	78
Job interests fulfillment	6	12	45	88
Job benefits	6	12	45	88
Travel required	0	0	51	100

Table 19. Barriers to retaining epidemiologists—2013 Epidemiology Capacity Assessment, 50 states and District of Columbia

Barrier*	A problem		Neutral/Not a problem	
	No.	%	No.	%
Restrictions on merit raises	42	82	9	18
Salary scale	40	78	11	22
Opportunities for promotion	38	74	13	24
Loss to private or gov't sector	31	61	20	39
Restrictions on travel outside jurisdiction	21	41	30	59
Personnel policies and procedures	19	37	32	63
Travel permitted	14	27	37	73
Job location	14	27	37	73
Job interests/fulfilled	13	25	38	75
Layoffs from budget restrictions	12	24	39	76
Job security	11	22	40	78
Opportunities for training	11	22	40	78
Job benefits	6	12	45	88
Travel required	0	0	51	100

* Respondents identified a number of useful recruiting methods. The most useful methods were state universities and schools of public health (96%), professional organizations (96%), federal programs (92%), and state/local governmental websites (88%) (Table 20).

Table 20. Useful methods for recruiting epidemiologists for state health departments — 2013 Epidemiology Capacity Assessment, 50 states and District of Columbia

Recruitment setting	Yes		No		Don't know	
	No.	%	No.	%	No.	%
Universities or schools of public health	49	96	2	4	0	0
Professional organizations* (e.g., CSTE, APHA, ASPH, ACE)	49	96	2	4	0	0
Federal programs (e.g., EIS, PHPS, CEFO)	47	92	4	8	0	0
State or local government websites	45	88	6	12	0	0
Public health career websites (e.g., Emory Public Health Employment Connection)	32	63	16	31	3	6
Epidemiology Monitor or periodic epidemiology newsletter	16	31	33	65	2	4

Other health agencies within state	15	29	34	67	2	4
Local media	14	27	37	73	0	0
Recruitment job fairs	10	20	39	76	2	4
Other**	8	16	35	69	8	16

* APHA: American Public Health Association; ASPH: Association of Schools of Public Health; ACE: American College of Epidemiology; EIS: Epidemic Intelligence Service; PHPS: Public Health Prevention Service; CEFO: Career Epidemiology Field Officer.
** APHA, word of mouth, internships, professional networks (e.g., Linked In)

Miscellaneous: Epidemiologist Salary Ranges

The 2013 ECA gathered information to assess current salary range by type of epidemiologist position. Salary ranges were reported by functional job classification and region of the country (Table 21) and by training level (Table 22). For all functional categories except the State Epidemiologist, median salaries in the Northeast region tended to be several thousand dollars higher than in other regions.

Table 21. Salary range, by functional job classification and regions—2013 Epidemiology Capacity Assessment

State Epidemiologist	N	Range	Mean	Median
Nationally	45	Lower Limit	$112,392	$110,000
		Upper Limit	$149,574	$150,000
Midwest	12	Lower Limit	$97,413	$102,500
		Upper Limit	$147,196	$133,257
Northeast	6	Lower Limit	$124,006	$125,057
		Upper Limit	$152,280	$151,660
South	15	Lower Limit	$125,297	$134,968
		Upper Limit	$150,062	$152,000
West	12	Lower Limit	$105,430	$102,500
		Upper Limit	$149,989	$150,000

Deputy State Epidemiologist	N	Range	Mean	Median
Nationally	17	Lower Limit	$98,231	$94,000
		Upper Limit	$117,754	$108,555
Midwest	2	Lower Limit	$83,126	$83,126
		Upper Limit	$107,278	$107,278
Northeast	3	Lower Limit	$90,649	$106,329
		Upper Limit	$117,559	$125,462
South	6	Lower Limit	$107,000	$100,000
		Upper Limit	$117,000	$110,000
West	6	Lower Limit	$98,288	$84,500
		Upper Limit	$122,097	$120,000

Senior Level Epidemiologist	N	Range	Mean	Median
Nationally	44	Lower Limit	$61,684	$58,658
		Upper Limit	$93,914	$87,644
Midwest	11	Lower Limit	$56,865	$52,062
		Upper Limit	$90,961	$82,000
Northeast	7	Lower Limit	$69,553	$66,617
		Upper Limit	$98,741	$90,000
South	16	Lower Limit	$58,659	$57,328
		Upper Limit	$91,988	$88,500
West	10	Lower Limit	$66,318	$57,982
		Upper Limit	$96,865	$86,985

Mid Level Epidemiologist	N	Range	Mean	Median
Nationally	44	Lower Limit	$49,309	$47,263
		Upper Limit	$74,426	$73,770
Midwest	12	Lower Limit	$48,721	$45,000
		Upper Limit	$72,218	$70,500
Northeast	6	Lower Limit	$57,853	$58,374
		Upper Limit	$85,132	$75,639
South	16	Lower Limit	$49,272	$47,785
		Upper Limit	$73,993	$73,770
West	10	Lower Limit	$44,984	$44,500
		Upper Limit	$71,346	$71,066

Entry Level Epidemiologist	N	Range	Mean	Median
Nationally	46	Lower Limit	$41,057	$41,293
		Upper Limit	$60,052	$60,000
Midwest	12	Lower Limit	$42,182	$42,070
		Upper Limit	$57,060	$55,000
Northeast	8	Lower Limit	$45,281	$44,825
		Upper Limit	$70,061	$64,637
South	17	Lower Limit	$39,675	$40,000
		Upper Limit	$59,540	$60,135
West	9	Lower Limit	$38,412	$40,000
		Upper Limit	$56,111	$60,000

Table 22. Salary range, by level of professional training—2013 Epidemiology Capacity Assessment, 50 states and District of Columbia

Training	No. responding states	Range (mean)
MD, DO	42	$104,282-$155,972
DDS	14	$86,999- $121,252
DVM	29	$76,737- $105,759
PhD, DrPH, other doctoral	44	$59,300 - $94,851
MPH, MSPH, other master's	45	$44,845- $77,944
BA, BS, BSN, other bachelor's	32	$38,842 - $59,978
Associate or no post-high school degrees	8	$35,055- $46,173

TRENDS

Four assessments of epidemiology capacity have been carried out in the past 10 years: 2004, 2006, 2009 supplemented by a more thorough enumeration of staff in 2010, and 2013. For each, all states and the District of Columbia (DC) responded. Because territories have inconsistently responded to the ECAs, they are not included except in some 2004 measurements. Where included, they represent a very small percentage of the total.

The following trend analyses use data from previous ECA reports or publications. Where fewer than all 51 jurisdictions responded to an item, the underlying assumption is that that the responding states are similar to those that did not respond.

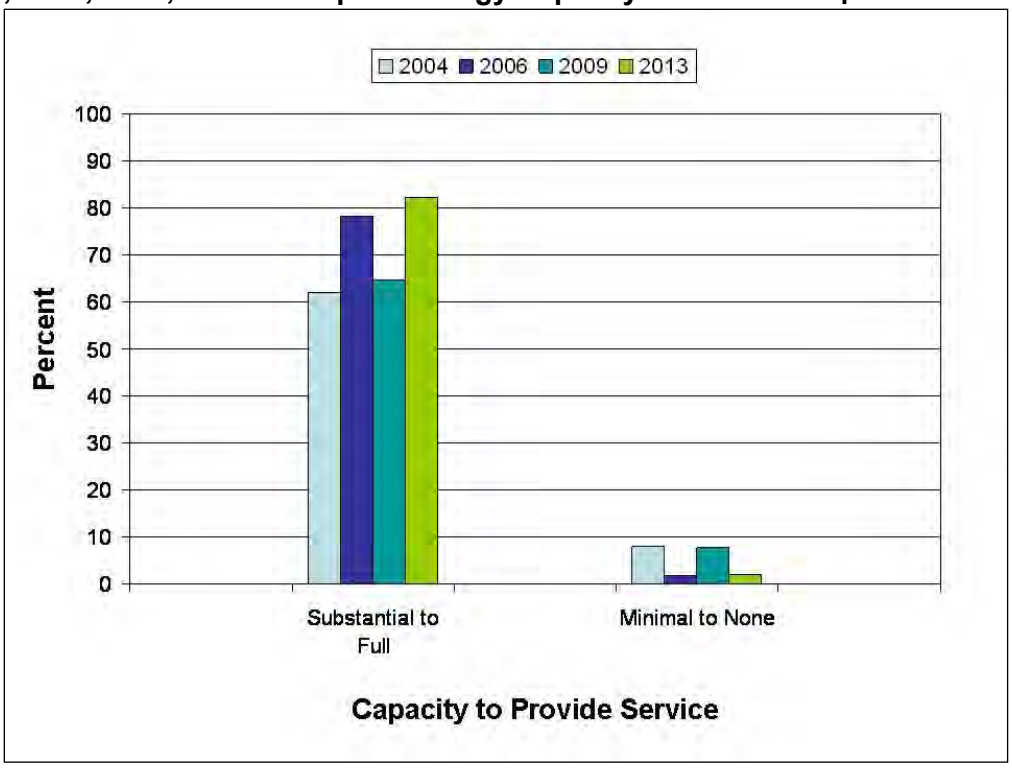
Functional Epidemiology Capacity

Overall Epidemiology Capacity to Address the Essential Public Health Services

In all four assessments, agencies were asked about their ability to provide the four epidemiology-related EPHS.

EPHS 1. Monitor health status to identify and solve community health problems.
The percentage of health departments that could provide substantial to full epidemiology capacity for EPHS 1 was higher in 2013 than in any previous ECA, an increase of 27% from 2009 and 5% higher than 2006, the previous high. In each assessment, from 1-4 states reported minimal to no capacity to meet EPHS 1, with only one state reporting minimal capacity in 2013 (Figure 14).

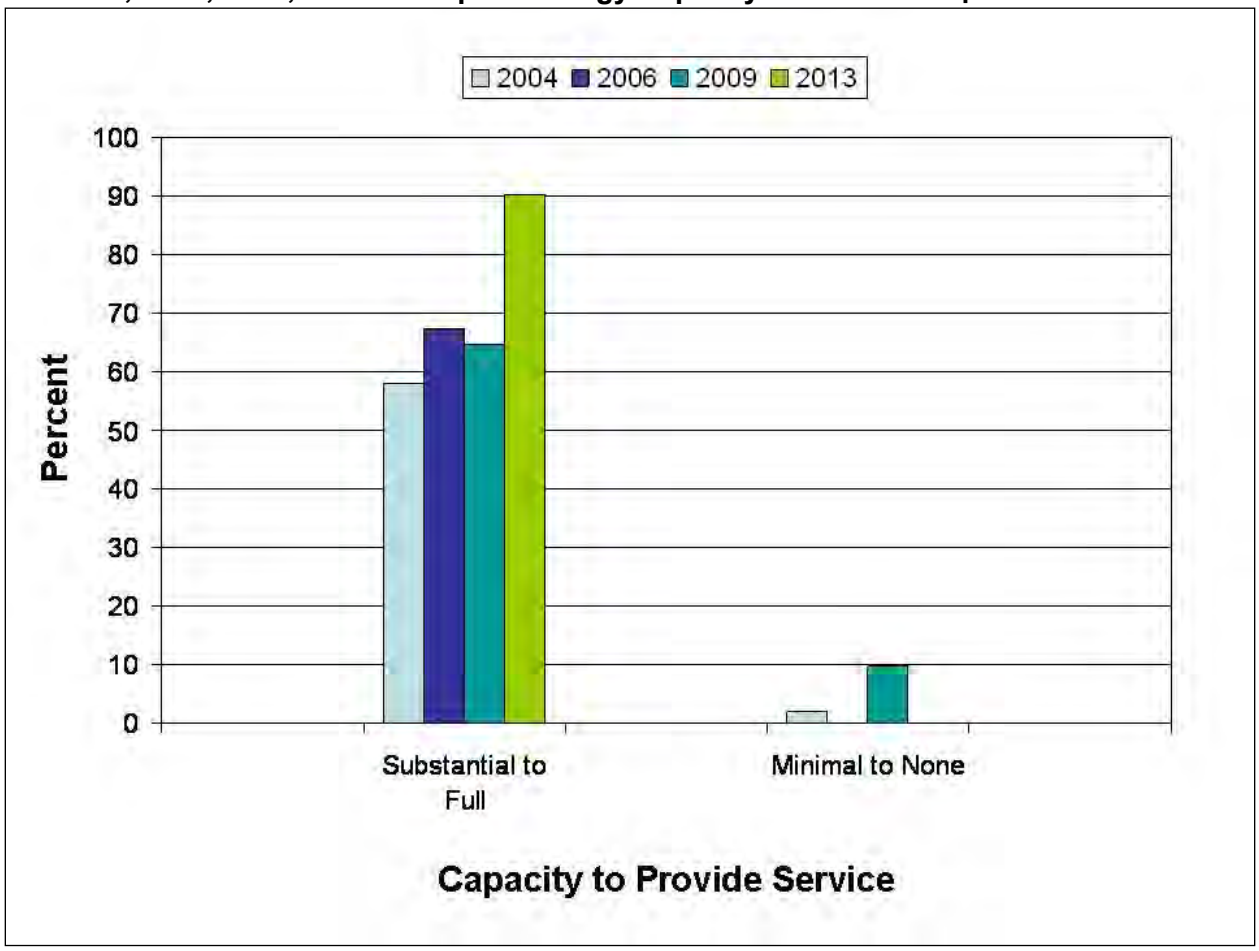
Figure 14. State health departments' ability to provide Essential Public Health Service 1*—2004, 2006, 2009, and 2013 Epidemiology Capacity Assessments†



* Monitor health status to identify and solve community health problems.
† N = 54 agencies in 2004, 55 in 2006, and 51 each in 2009 and 2013.

EPHS 2. Diagnose and investigate health problems and health hazards in the community.
The percentage of health departments that could provide substantial to full epidemiology capacity in this area increased to by far its highest level in 2013 to 90%. This is a 39% increase since 2009 and 34% increase since 2006. The 5 states that dropped from having at least partial capacity to having to minimal to none between 2006 to 2009 all recovered by 2013. (Figure 15).

Figure 15. State health departments' ability to provide Essential Public Health Service 2*—2004, 2006, 2009, and 2013 Epidemiology Capacity Assessments†

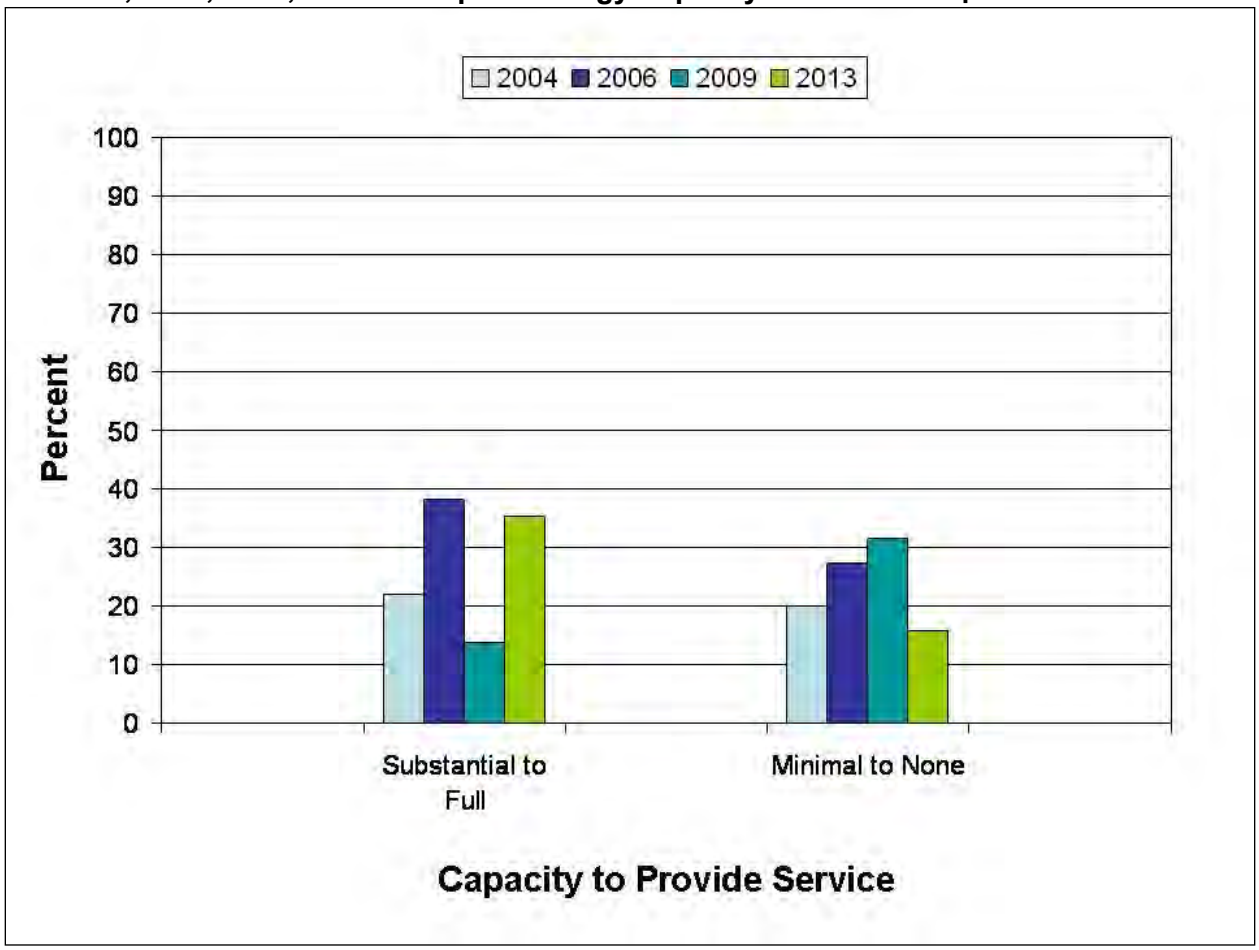


* Diagnose and investigate health problems and health hazards in the community.
† N = 54 agencies in 2004, 55 in 2006, and 51 each in 2009 and 2013.

EPHS 9. Evaluate effectiveness, accessibility, and quality of personal and population-based health services.

The percentage of health departments that could provide substantial to full epidemiology capacity in this area increased from 14% from 2009 to 35% in 2004 almost reaching the peak period of this EPHS measured in 2006, 38%. After rising in 2009, the number of states with minimal to no capacity in this area decreased to its lowest level, 16% (Figure 16).

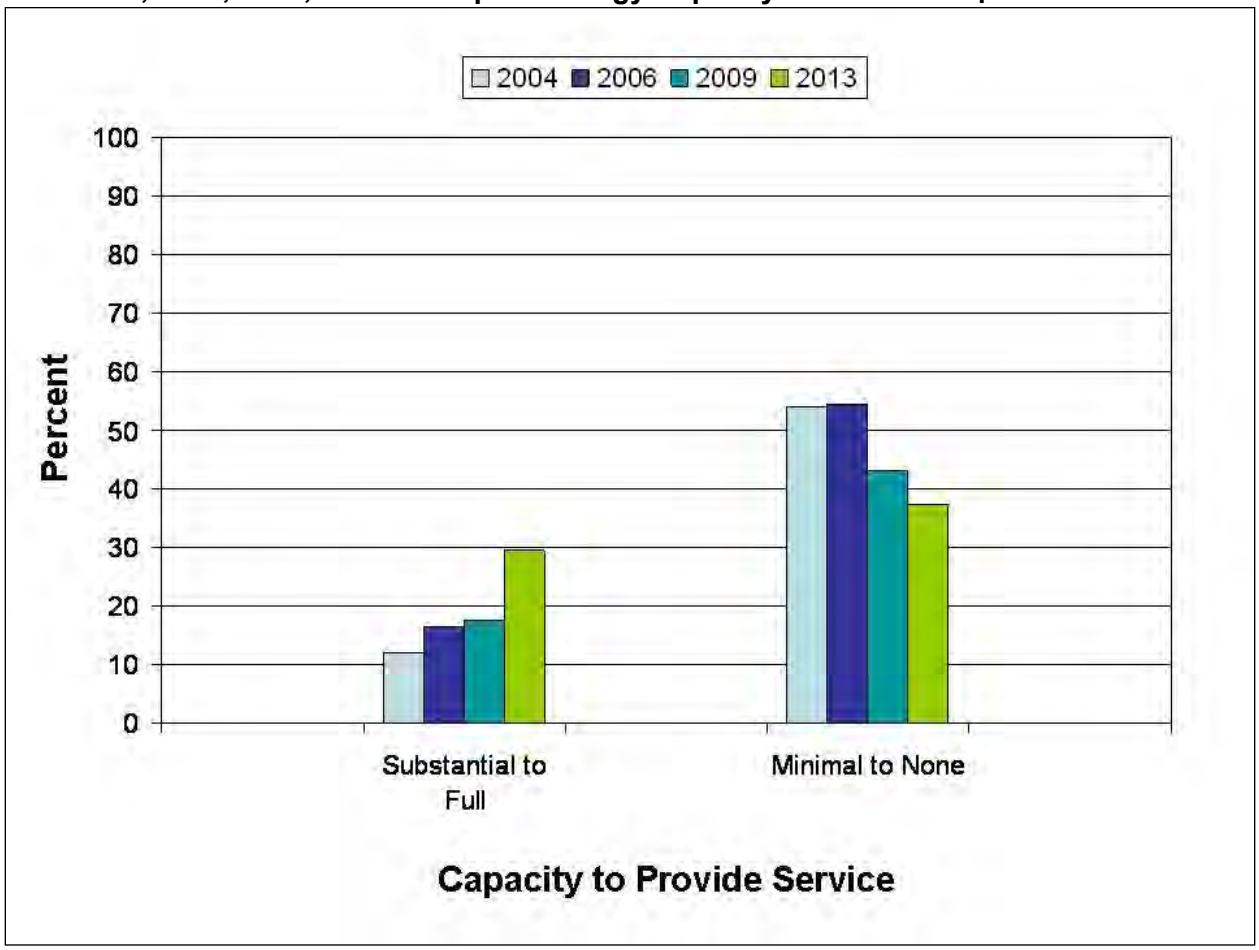
Figure 16. State health departments' ability to provide Essential Public Health Service 9*—2004, 2006, 2009, and 2013 Epidemiology Capacity Assessments†



* Evaluate effectiveness, accessibility, and quality of personal and population-based health services.
† N = 54 agencies in 2004, 55 in 2006, and 51 each in 2009 and 2013.

EPHS 10. Research for new insights and innovative solutions to health problems.
Only a small percentage of health departments have had substantial to full capacity for EPHS 10. However, EPHS 10, like EPHS 1 and 2, increased to its highest level in 2013. Overall, 29% of states reported at least substantial capacity compared to the next highest reported level, 18% in 2009. Although a high percentage of states had minimal to no capacity for EPHS 10, this percentage continually decreased, from 54% in 2006, to 43% in 2009, to 37% in 2013 (Figure 17).

Figure 17. State health departments' ability to provide Essential Public Health Service 10*—2004, 2006, 2009, and 2013 Epidemiology Capacity Assessments†



* Research for new insights and innovative solutions to health problems.
† N = 54 agencies in 2004, 55 in 2006, and 51 each in 2009 and 2013.

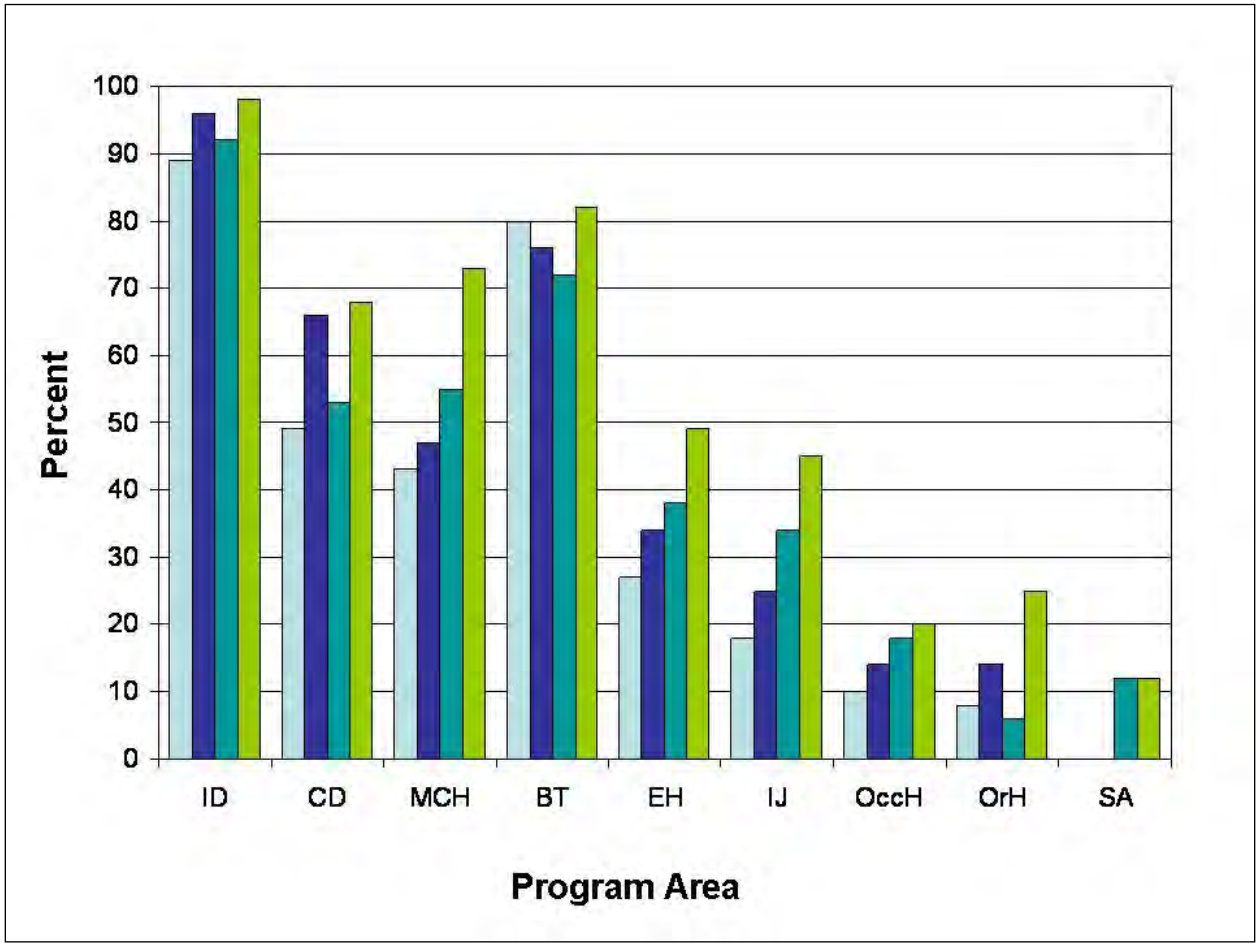
Program-Level Epidemiology and Surveillance Capacity

Surveillance and epidemiology capacity has increased in most program areas during the past 10 years (Table 23, Figure 18) except for substance abuse, which only has data beginning in 2009. The program areas with some of the highest capacity have had a fluctuating increase (infectious diseases, chronic disease and bioterrorism/emergency response, while most other program areas have had progressive increases over time. The biggest net increases in percentages of states with at least substantial capacity from 2004 to 2013 were in MCH (43% to 73%), injury (18% to 45%), environmental health (27% to 49%), chronic diseases (49% to 66%) and oral health (8% to 25%). Bioterrorism/emergency response has had the least change (80% to 82%), but it increased for the first time since 2004.

Table 23. Epidemiology and surveillance capacity in eight key program areas in state health departments—2001, 2004, 2006, and 2009 Epidemiology Capacity Assessments

Program	Year	No. agencies	None or minimal (%)	Partial (%)	Substantial to full (%)
Bioterrorism/ Emergency response	2013	50	2	16	82
	2009	51	8	20	72
	2006	54	6	18	76
	2004	54	6	15	80
Chronic diseases	2013	50	4	30	66
	2009	51	18	30	53
	2006	53	15	21	64
	2004	52	15	37	49
Environmental health	2013	51	24	27	49
	2009	51	35	27	38
	2006	52	46	21	34
	2004	54	43	10	27
Infectious diseases	2013	51	0	2	98
	2009	51	2	6	92
	2006	54	0	4	96
	2004	53	2	9	89
Injury	2013	51	33	22	45
	2009	51	32	35	34
	2006	54	43	33	25
	2004	54	50	32	18
Maternal and child health	2013	51	6	22	73
	2009	51	12	33	55
	2006	54	23	30	47
	2004	52	25	33	43
Occupational health	2013	51	55	25	20
	2009	51	68	14	18
	2006	53	82	5	14
	2004	53	77	13	10
Oral health	2013	51	59	16	25
	2009	51	61	33	6
	2006	53	77	9	14
	2004	53	75	17	8
Substance abuse	2013	51	73	16	12
	2009	51	76	12	12

Figure 18. Percentage of states with at least substantial epidemiology/surveillance capacity, by program area*—2004, 2006, 2009, and 2013 Epidemiology Capacity Assessments†



* ID: infectious diseases; CD: chronic disease; MCH: maternal and child health; BT/ER: bioterrorism/emergency response; EH: environmental health; IJ: injury; OccH: occupational health; OrH: oral health; SA: substance abuse.
† N = 52-4 agencies in 2004; 52-4 agencies in 2006; and 51 agencies in 2009 and 50-51 agencies in 2013.

Numeric Epidemiology Capacity

The total number of epidemiologists and the number of epidemiologists per 100,000 population continued an increasing trend beginning in 2010 and rose to the highest levels thus far (Table 24). The increased total and number per 100,000 from 2010 to 2013 were 11% and 9%, respectively, following reductions from 2004 to 2009.

Estimated additional need was smaller than in 2009 when it reached its peak, consistent with the lower actual number of epidemiologists employed at the time of the 2009 ECA. While the optimal number of epidemiologists in 2013 was higher than any previous ECA year at 1.31 per 100,000 nationally, it was not much higher than in 2004 when it was 1.25 per 100,000.

Table 24. Number of epidemiologists, additional number needed and optimal

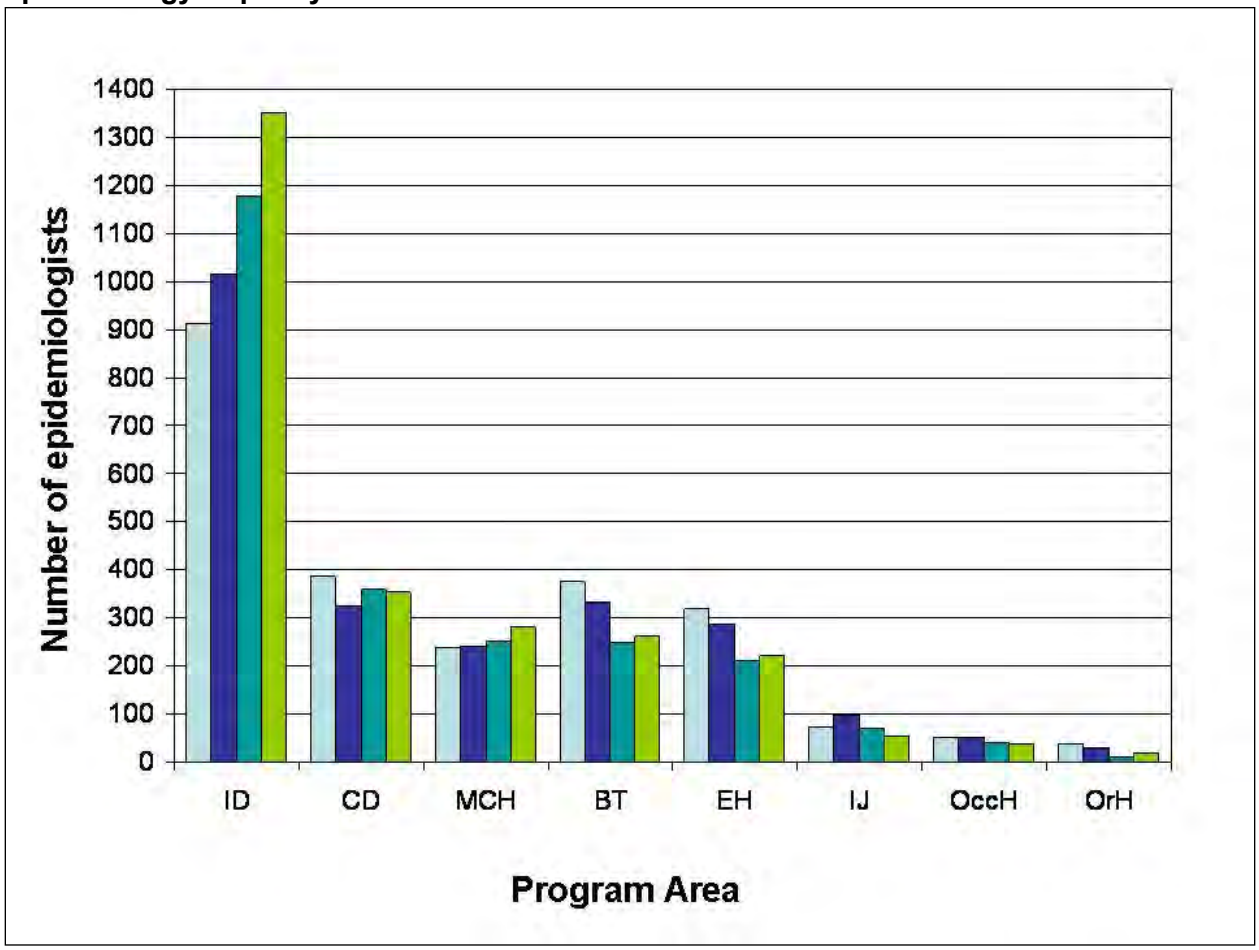
Year	No. agencies	No. epidemiologists	No. epidemiologists per 100,000*	Estimated additional need	Optimal no. epidemiologists†	Optimal no. per 100,000
2004	51	2498	0.85	1172	3670	1.25
2006	51	2436	0.82	736	3172	1.06
2009	51	2193	0.71	1490	3683	1.20
2010	51	2476	0.80	-	-	-
2013	51	2752	0.87	1374	4126	1.31

* Based on US Census national population estimates for July 1, 2004, 2006, 2009, 2010 and 2013.
† Optimal = sum of number of epidemiologists plus estimated additional need.

Program Area Numeric Capacity

Despite the increases in epidemiology and surveillance capacity in all program areas to their highest levels yet, the number of epidemiologists increased from 2010 in only 5 of 8 program areas: infectious diseases, MCH, bioterrorism/emergency response, environmental health and oral health. Only two program areas reached their highest totals yet - infectious diseases and MCH (Figure 19).

Figure 19. Number of epidemiologists by program area*—2004, 2006, 2010 and 2013 Epidemiology Capacity Assessments

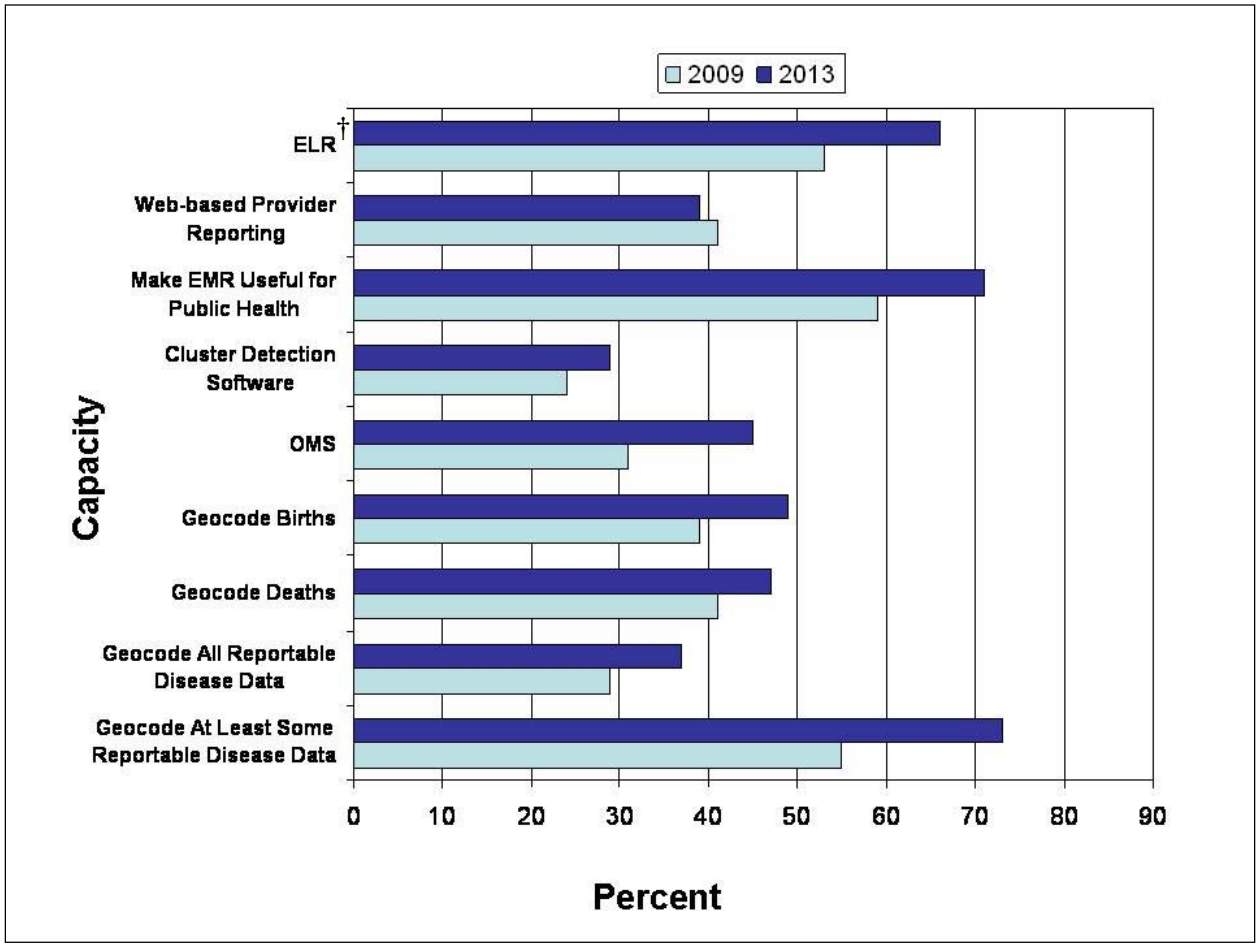


* ID: infectious diseases; CD: chronic disease; MCH: maternal and child health; BT/ER: bioterrorism/emergency response; EH: environmental health; IJ: injury; OccH: occupational health; OrH: oral health; SA: substance abuse.
† N = 52-4 agencies in 2004; 52-4 agencies in 2006; and 51 agencies in 2010 and 50-51 agencies in 2013.

Technologic Epidemiology Capacity

All technological measures of epidemiology capacity improved by 5-15 percentage points from 2009 to 2013 except prevalence of Web-based provider reporting (Figure 20). Technologic epidemiology capacity questions were not asked in the ECA before the 2009 ECA.

Figure 20. Prevalence of selected surveillance, analysis, and response technology capacities—2009 and 2013 Epidemiology Capacity Assessments, 50 states and District of Columbia

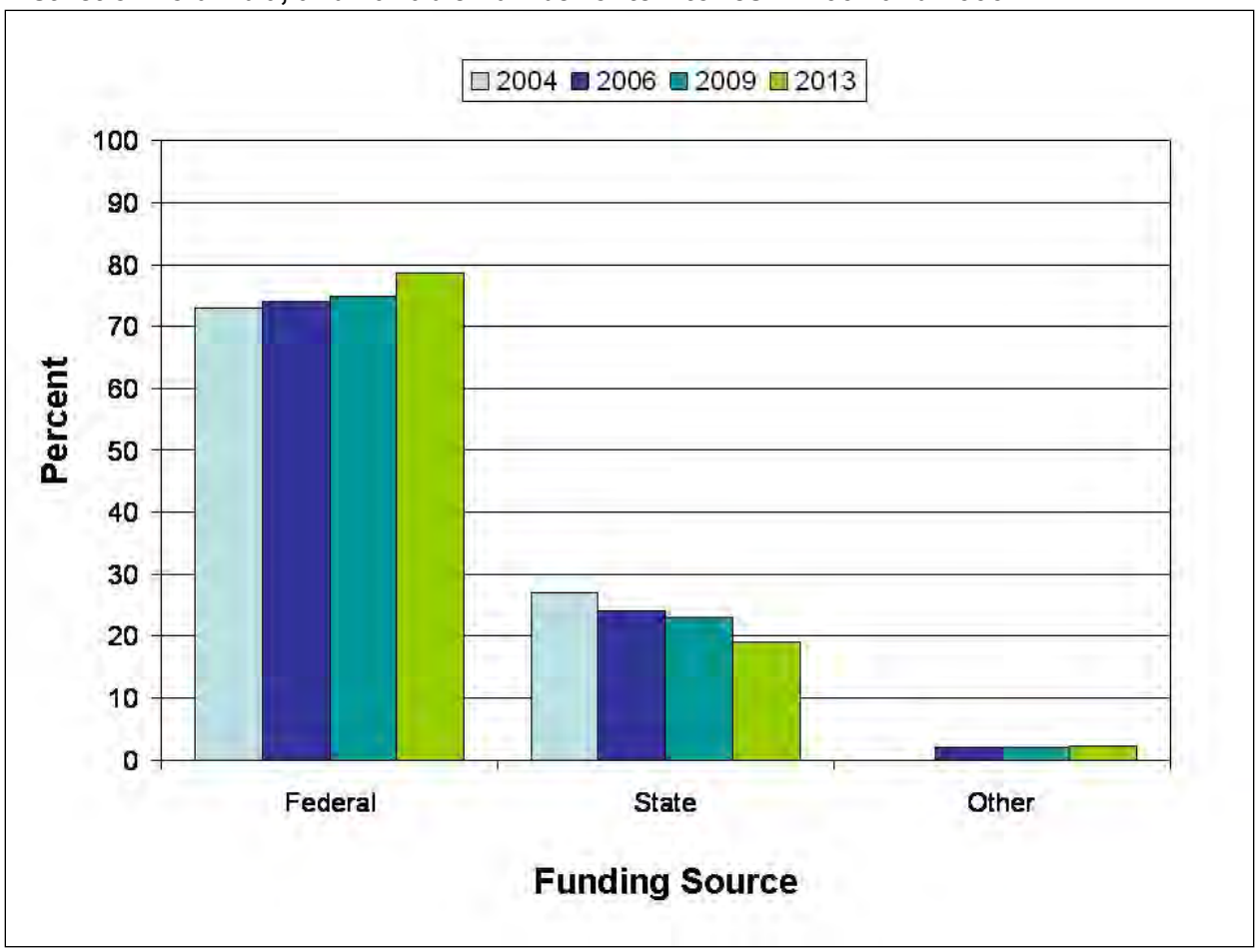


† ELR: electronic laboratory reporting; EMR: electronic medical record; OMS: outbreak-management system.

Funding

Federal funding currently makes up an average of 79% of resources for epidemiology activities in states. This funding has increased progressively from 73% in 2004 to 75% in 2009 ECA to 79% in 2013 (Figure 21).

Figure 21. Percentages of funding sources for all epidemiology activities in state health departments—2004, 2006, 2009 and 2013 Epidemiology Capacity Assessments, 50 states, District of Columbia, and variable number of territories in 2004 and 2006



Workforce Makeup and Competency

The 2004, 2006, 2009 and 2013 ECAs asked identical questions about workforce makeup by level of academic achievement. The 2006, 2009 and 2013 ECAs asked identical questions about workforce competency, training needs, and state involvement in training and collaboration with training partners. The 2004, 2009 and 2013 ECAs asked the same questions about salary levels.

Epidemiologists with Academic Training in Epidemiology

The ECA data suggest that the epidemiology workforce is becoming increasingly well trained (Table 25). The percentage of epidemiologists who had master's-level or doctoral-level training in epidemiology progressively increased from 49.5% in 2004 to 59.4% in 2013, and the percentage who had no formal training or had only on-the-job training progressively decreased from 28.6% to 12.2%. Most of the increase was due to an increase in persons with MPH-level epidemiology training.

Table 25. Makeup of epidemiology workforce, by level of academic training in epidemiology—2004, 2006, 2009 and 2013 Epidemiology Capacity Assessments,* 50 states, District of Columbia, and varying number of territories in 2004 and 2006

Level of epidemiology training	2004 N = 1897	2006 N = 2339.5	2009 N = 1544	2013 N = 1586
1. PhD, DrPH, other doctoral degree in Epidemiology	7.0%	8.5%	7.8%	8.5%
2. Professional background (e.g,. MD, DO, DVM, DDS) with a dual degree in Epidemiology	8.2%	8.7%	10.6%	6.2%
3. MPH, MSPH, other master's degree in Epidemiology	34.3%	38.0%	38.0%	44.7%
4. BA, BS, other bachelor's degree in Epidemiology	2.5%	2.2%	0.9%	0.6%
5. Completed formal training program in Epidemiology (e.g., EIS†)	5.4%	6.7%	6.7%	4.3%
6. Completed some coursework in Epidemiology	14.0%	19.1%	22.6%	23.5%
7. Received on-the-job training in Epidemiology	24.5%	14.1%	11.5%	10.1%
8. No formal training in Epidemiology (i.e., epidemiologist does not fit in any of the above categories)	4.1%	2.7%	1.9%	2.1%

* Data on 74% of epidemiologists in 2004, 94% in 2006, 70% in 2009, and 58% in 2013.
†EIS: Epidemic Intelligence Service.

Applied Epidemiology Competencies and Training Needs

The 2009 and 2013 ECAs each collected information from individual epidemiologists about their self-assessment of each competency in a list of 30-32 competencies and related training needs based on the level and nature of responsibility of their job as categorized into four tiers. Since the scales used changed from 2009 to 2013, the answers are not directly comparable. However, for each tier the competencies for which the lowest percentage of respondents said they were not competent and the competencies for which the highest percentage reported needing additional training can be ranked and compared for 2009 and 2013.

For Tier 1 (entry-level) epidemiologists, among the top 10 competencies needing attention in 2013, nine were the same as in 2009 (Table 26). The one competency making the top 10 list in 2013 was "Describe human subjects research and apply IRB processes, as directed" which ranked 4th in 2013 but only 13th in 2009. The competency that dropped out of the top 10 list was "Assist in design of investigation, including creating hypotheses" which was 7th in 2009 but only 12th in 2013.

For Tier 2 (mid-level) epidemiologists, seven of the top 10 competencies needing attention were the same in 2013 as in 2009 (Table 27). The two making the top 10 list in 2013 not on it in 2009 were "Demonstrate the basic principles of risk communication ", rising from 16th in 2009 to 8th in 2013, and "Assess the need for special analyses, rising from 13th in 2009 to 10th in 2013. Two competencies dropped out of the top 10 list: "Apply understanding of human and environmental biology and behavioral sciences and principles to determine potential biological mechanisms of disease" and "Practice culturally sensitive epidemiologic activities" which were 7th and 10th in 2009 but dropped to 13th and 11th, respectively, in 2013. "Use leadership and systems thinking in epidemiologic planning and policy development" which was fourth in 2013, was not assessed in 2009.

For Tier 3a (senior-level supervisor or manager), nine of the top 10 competencies needing attention remained the same as in 2009 (Table 28). The one new one making the top 10 list was "Lead the creation of the epidemiologic program's vision in the context of the agency's plan," which rose from 14th to 7th. The one that dropped out was "Ensure professional development of the epidemiology workforce," which dropped from 10th to 12th.

For Tier 3b (senior scientist/subject matter expert), eight of the top 10 competencies needing attention remained the same as in 2009 (Table 29). The two new ones making the top 10 list were "Practice culturally sensitive epidemiologic activity," which rose from 14th to 9th, and "Promote the epidemiologic perspective in the agency," which rose from 13th to 10th. The two that dropped out were "Develop as-needed policies that address security, privacy, and legal considerations when communicating epidemiologic information," falling from 6th to 17th, and "Apply principles of informatics, including data collection, processing, and analysis in support of epidemiologic practice," which fell from 10th to 15th.

Table 26. Top Ten Ranking* Applied Epidemiology Competencies (AEC) in 2009 and 2013 for which the lowest percentage of Tier 1 Epidemiologists report at least basic competence, and the highest percentage report needing training and their relative rank in 2009 compared to 2013— 2009 and 2013 Epidemiology Capacity Assessments, 50 states and District of Columbia

Competency	Ranking by combined lowest competency and highest training need*	
	2009	2013
Apply appropriate fiscal and administrative guidelines to epidemiology practice	4	1
Assist in conducting a community health status assessment and characterizing investigative processes	3	2
Describe how policy decisions are made within the agency	8	3
Describe human subjects research and apply IRB processes, as directed	13	4
Use identified informatics tools in support of epidemiologic practice	2	5
Provide epidemiologic input for community planning processes	10	6
Support evaluation of surveillance systems	1	7
Define cultural/social/political framework for recommended interventions	6	8
Assist in the evaluation of programs	9	9
Implement new or revise existing surveillance systems and report key surveillance findings	5	10
Assist in design of investigation, including creating hypotheses	7	12

* Ranking based on sum of ranking among 30 competencies for the lowest percentage reporting competency plus the ranking among the 30 competencies for the highest percentage reporting strongly needing more training.

Table 27. Top Ten Ranking Applied Epidemiology Competencies (AEC) in 2009 and 2013 for which the lowest percentage of Tier 2 Epidemiologists report at least basic competence, and the highest percentage report needing training and their relative rank in 2009 compared to 2013— 2009 and 2013 Epidemiology Capacity Assessments, 50 states and District of Columbia

Competency	Ranking by combined lowest competency and highest training need	
	2009	2013
Assist in the development of program logic models and theories of action	1	1
Apply appropriate fiscal and	2	2

administrative guidelines to epidemiology practice		
Conduct a community health assessment, and recommend priorities of potential public health problems to be addressed	3	3
Use leadership and systems thinking in epidemiologic planning and policy development	NA	4
Establish cultural/social/political framework for recommendations and interventions	4	5
Use laboratory resources to support epidemiologic activities	6	6
Provide epidemiologic input for community planning processes	8	7
Demonstrate the basic principles of risk communication	16	8
Conduct evaluation of surveillance systems	5	9
Assess the need for special analyses	13	10
Practice culturally sensitive epidemiologic activities	10	11
Describe human subjects research and apply IRB processes, as necessary	9	12
Apply understanding of human and environmental biology and behavioral sciences and principles to determine potential biological mechanisms of disease	7	13

* Ranking based on sum of ranking among 31 competencies for the lowest percentage reporting competency plus the ranking among the 31 competencies for the highest percentage reporting strongly needing more training.

Table 28. Top Ten Ranking Applied Epidemiology Competencies (AEC) in 2009 and 2013 for which the lowest percentage of Tier 3a Epidemiologists report at least basic competence, and the highest percentage report needing training and their relative rank in 2009 compared to 2013— 2009 and 2013 Epidemiology Capacity Assessments, 50 states and District of Columbia

Competency	Ranking by combined lowest competency and highest training need	
	2009	2013
Develop requests for extramural funding to support additional epidemiologic activities and special projects	1	1
Formulate a fiscally sound budget that will support the activities defined in the operational plan and is consistent with the financial rules of the agency	6	2
Lead epidemiology unit in preparing for emergency response	5	3
Lead community public health planning processes	3	4
Oversee implementation of	7	5

operational and financial plans		
Create operational and financial plans for future epidemiologic activities	4	6
Lead the creation of the epidemiologic program's vision in the context of the agency's plan	14	7
Develop and manage information systems to improve effectiveness of surveillance investigation, and other epidemiologic processes	2	8
Ensure evaluation of programs	8	9
Ensure application of principles of informatics including data collection, processing, and analysis in support of epidemiologic practice	9	10
Ensure professional development of epidemiology workforce	10	12

* Ranking based on sum of ranking among 32 competencies for the lowest percentage reporting competency plus the ranking among the 32 competencies for the highest percentage reporting strongly needing more training.

Table 29. Top Ten Ranking Applied Epidemiology Competencies (AEC) in 2009 and 2013 for which the lowest percentage of Tier 3b Epidemiologists report at least basic competence, and the highest percentage report needing training and their relative rank in 2009 compared to 2013— 2009 and 2013 Epidemiology Capacity Assessments, 50 states and District of Columbia

Competency	Ranking by combined lowest competency and highest training need	
	2009	2013
Develop processes for using laboratory resources to support epidemiologic activities	9	1
Describe financial and budgetary processes of the agency	1	2
Lead community public health planning processes	2	3
Implement operational and financial plans for assigned projects	3	4
Prepare for emergency response	8	5
Prepare proposals for extramural funding for review and input from managers	5	6
Promote epidemiology workforce development	7	7
Evaluate programs	4	8
Practice culturally sensitive epidemiologic activity	14	9
Promote the epidemiologic perspective in the agency	13	10
Develop as-needed policies that address security, privacy and legal considerations when communicating epidemiologic information	6	17
Apply principles of informatics including data collection, processing, and analysis in support of epidemiologic practice	10	15

* Ranking based on sum of ranking among 30 competencies for the lowest percentage reporting competency plus the ranking among the 30 competencies for the highest percentage reporting strongly needing more training.

Training Involvement and Collaboration

The same questions were asked regarding assuring training for state and local-level epidemiologists and collaborating with outside partners for the 2006, 2009 and 2013 ECAs. There was no progressive pattern in state involvement in assuring training except for including epidemiology education and training objectives in performance review, which increased from 60% in 2006 to 78% in 2013 (Table 30). In 2013 more states paid for training outside the agency than provided onsite training (92% vs 80%), similar to 2006 but different than in 2009. As in the past, the CDC and schools of public health were most often collaborating partners in 2013 (82% and 70%, respectively), with other partners each used by <40% of states. There were notable drops of 30% or more in the percentage of states collaborating with the Centers for Public Health Preparedness, public safety/first responders and other federal government agencies. After an upsurge in the percentage of states requiring continuing education in epidemiology from 2006 to 2009, only 2 states currently require it.

Table 30. Percentage of state health departments providing continuing training in epidemiology to epidemiology staff and training collaboration with outside partners—2006, 2009 and 2013 Epidemiology Capacity Assessments

Training in epidemiology	Percentage responding yes		
	2006 N = 55 agencies	2009 N = 51 agencies	2013 N = 51 agencies
Pay for formal training or education outside your organization (conferences or seminars)	90%	75%	92%
Provide on-site training (epidemiology seminars, etc.)	81%	86%	80%
Provide epidemiology training or education to epidemiologists at the local level	75%	80%	80%
Include education & training objectives in performance review	60%	59%	78%
Have staff position(s) responsible for training	46%	43%	41%
Require continuing education in epidemiology and surveillance	6%	22%	4%
Provide training in collaboration with any of the following organizations/groups:			
Centers for Disease Control and Prevention	81%	86%	82%
Schools of public health	75%	80%	71%
Other healthcare providers	37%	76%	39%
Other academic institutions	45%	71%	39%
Other healthcare organizations	38%	63%	39%

Public safety/First responders	53%	67%	37%
Centers for Public Health Preparedness	60%	67%	35%
Other federal/governmental agencies	55%	69%	35%
Schools of veterinary medicine	26%	49%	20%
HRSA* training centers	11%	35%	16%

* HRSA: Health Resources and Services Administration.

Barriers to Recruitment and Retention

Both the 2009 and 2013 ECAs asked a series of questions about barriers to recruitment and retention. In 2013, the percentage of states saying each recruitment barrier was a problem was much higher than in 2009. In addition, the top barriers in 2013 included salary scale and hiring freezes, neither of which was identified as a barrier in 2009 (Table 31).

Similarly, in 2013, the percentage of states saying each retention barrier was a problem was much higher than 2009. Although the leading barriers were similar, salary scale was a leading barrier in 2013 and not a problem at all in 2009 (Table 32).

Table 31. Percentage of states reporting specific barriers to recruiting epidemiologists—2009 and 2013 Epidemiology Capacity Assessments, 50 states and District of Columbia

Barrier	2009		2013	
	No.	%	No.	%
Restrictions on offering competitive pay	25	49	40	88
Opportunities for promotion	17	33	39	76
Salary scale	0	0	36	71
Restrictions on hiring quickly enough	21	41	33	65
Hiring freezes	0	0	27	53
Enough qualified applicants	19	37	26	51
Personnel policies and procedures	15	29	24	47
Job location	8	16	17	33
Opportunities for training	4	8	16	31
Limitations recruiting outside agency	6	12	12	24
Job security	4	8	11	22
Travel permitted	3	6	11	22
Restrictions on choosing best candidate	5	10	11	22
Job interests fulfillment	2	4	6	12
Job benefits	3	6	6	12
Travel required	0	0	0	0

Table 32. Percentage of states reporting specific barriers to retaining epidemiologists—2009 and 2013 Epidemiology Capacity Assessments, 50 states and District of Columbia

Barrier	2009		2013	
	No.	%	No.	%
Restrictions on merit raises	18	35	42	82
Salary scale	0	0	40	78
Opportunities for promotion	14	27	38	74
Loss to private or gov't sector	12	24	31	61
Restrictions on travel outside jurisdiction	7	14	21	41
Personnel policies and procedures	9	18	19	37
Travel permitted	5	10	14	27
Job location	3	6	14	27
Job interests/fulfilled	1	2	13	25
Layoffs from budget restrictions	8	16	12	24
Job security	2	4	11	22
Opportunities for training	3	6	11	22
Job benefits	2	4	6	12
Travel required	0	0	0	0

Trends in Salaries

The 2004, 2009 and 2013 ECAs asked about salary ranges for five functional levels of epidemiologist positions. For all five levels, average lower and upper limit salaries increased, usually in the range of inflation that occurred during each phase of the 10 year period (13.6% and 8.6%, respectively), except for entry level positions, which did not increase as fast as inflation over the 10 years (Table 33).

Table 33. Increases in epidemiologist salary levels from 2004 to 2009—Epidemiology Capacity Assessment

Epidemiologist level	Range	2004 Mean	2009 Mean	2013 Mean
State Epidemiologist	Lower Limit	$85,454	$101,480	$112,392
	Upper Limit	$129,702	$141,420	$149,574
Deputy State Epidemiologist	Lower Limit	$71,553	$91,609	$98,231
	Upper Limit	$98,944	$122,735	$117,754
Senior level	Lower Limit	$49,190	$59,197	$61,684
	Upper Limit	$73,263	$87,679	$93,914
Mid-level	Lower Limit	$41,772	$47,341	$49,309
	Upper Limit	$59,574	$69,422	$74,426
Entry level	Lower Limit	$36,798	$39,845	$41,057
	Upper Limit	$51,902	$59,719	$60,052

DISCUSSION

The 2013 ECA had important findings from several perspectives. It documented the highest level of epidemiology capacity in multiple areas in state health departments since 2004 and further improvement in the training level of the epidemiology workforce, but also found continuing large gaps in epidemiology capacity in several of the essential public health services and in a number of program areas. The 2013 ECA also had several findings that may help direct efforts to begin to meet some of these gaps.

Most importantly, after reaching a nadir in 2009, epidemiology capacity as measured by the total number of epidemiologists and the capacity to carry out the four epidemiology-related essential public health services (EPHS) reached its highest level in the past 10 years, surpassing the previous highs, mostly in 2004. These higher levels of capacity were accompanied by higher levels of technical capacity to carry out surveillance than had been achieved when first measured four years ago and by a higher level of dissemination of information as measured by the number of reports and publications.

Not only was overall capacity to carry out the EPHS higher, but surveillance and epidemiology capacity in all well-established public health program areas improved to the highest levels measured since standardized assessments to which all states responded began in 2004. This happened despite slight decreases since 2010 in the reported number of epidemiologists in several program areas: chronic disease, injury and occupational health. Further, two program areas reached a level in which more than 80% of states had at least substantial capacity: ID and BT/ER with MCH (73%) and CD (66%) coming close to the 75% level. In addition, there were no states with no surveillance and epidemiology capacity for ID, BT/ER and CD, only one for MCH and only 2 for EH.

It is not entirely clear why epidemiology capacity improved so broadly from 2009-10 to 2013. However, the increased size of the workforce and increased training level were both likely factors. The increased size of the workforce appears to have been driven in part by federal funding, as the percentage of all funding for epidemiology that was federal funding increased from 2009 to 2013. Most of the increase in the number of epidemiologists was in ID, for which new federal funding for healthcare-associated infections and, through the Affordable Care Act, for epidemiology and laboratory capacity became available. This time period was also accompanied by an improving economy in many states. Although it is not clear that direct state investment in epidemiologists increased, the achievement of financial stability could have resulted in more forward-thinking and, correspondingly, positive assessment of capacity in multiple areas.

At the same time the number of epidemiologists was increasing, the workforce became better trained. Only 12% of epidemiologists had either no specific epidemiology training or only on-the-job training, the lowest percentage in the 10 years training levels have been assessed. There has been a progressive trend toward a higher percentage with formal training regardless of whether the epidemiology workforce has expanded or contracted. This likely is a reflection of the expanded efforts in the last 10 years on the parts of CDC, CSTE and schools of public health to increase the available workforce that is competent and experienced in public health practice through development of competencies, epidemiologist certification, and CDC and CSTE-initiated training programs (5,13-16). In addition, grants to schools of public health for training the public health workforce and attention to assuring quality in public health practice experiences of students during certification of schools of public health have likely played a role. The effect of having not just a larger but more highly trained workforce likely contributed directly to the higher assessments of capacity in nearly all program areas.

Despite the improvements in epidemiology capacity, there remain major gaps that need to be addressed if public health is to have the data it needs to shape efforts to improve the public's health.

- The least populous states are lagging behind the larger ones to carry out the two critical EPHS: monitor health status to identify and solve community health problems (EPHS 1) and diagnose and investigate health problems and health hazards in the community (EPHS 2). Although less populous states have more epidemiologists per 100,000 population than larger states, some may lack a critical threshold to cover all epidemiology-related bases.

- Fewer than 40% of states have at least substantial capacity and more than 15% have no capacity to carry out two of the EPHS: evaluate effectiveness, accessibility, and quality of personal and population-based health services (EPHS 9) and research for new insights and innovative solutions for public health problems (EPHS 10). While it is not clear that all states need to have the capacity to be public health innovators and testers of new ideas, all states need the capacity to evaluate access to and quality of population-based health services in their jurisdictions.

- Capacity in some long-established program areas continues to be poorly developed (less than substantial) in the majority of states. These program areas include environmental health, injury, occupational health and oral health. Nearly a third of states have no surveillance and epidemiology capacity for occupational health and oral health, and no plans to develop it. These are program areas that are common to all states and for which public health action can reduce serious morbidity and death. Without data on the local magnitude of the problem and its epidemiology, it is hard to know whether there is an unusual problem, what local efforts are needed and whether they are having an impact.

- Capacity in substance abuse and mental health, two program areas only recently included in ECAs, is very low: <12% of states have substantial capacity for substance abuse with no change from 2009, and only 6% have it for mental health, while 43% and 55% of states, respectively, have no capacity. Despite the facts that substance abuse and mental health problems contribute directly to the 10 leading causes of death in the U.S. and most states (e.g., suicide, homicide, overdoses, chronic liver disease), there are <15 FTE substance abuse epidemiologists and <6 mental health epidemiologists in all states combined, and most states have no plans to develop capacity in these areas in the foreseeable future. Part of the reason for such low capacity and willingness to stay uninvolved may be that most states have separate state agencies that deal with substance abuse treatment and mental health treatment. Even though most such agencies have neither epidemiologists nor a strong prevention focus, there may be turf issues that prevent public health agencies in many states from being more directly involved and/or a perception among politicians that the efforts focused on treatment are enough. Nonetheless, substance abuse and mental health are areas where state and local health departments that have invested in them have been able to shed new light on the problems, adding a focus of primary and secondary prevention from a population perspective, and pilot as well as monitor the effectiveness of new prevention efforts. More effort to publicize the successes and expand the role of epidemiology in the substance abuse and mental health program areas is needed.

- A third of states are still without the ability to receive reports of significant laboratory findings electronically without having to manually enter the data. This is a national as well as state vulnerability. Lack of ELR slows the rate at which reports of findings of immediate importance are received and acted upon (e.g., cases of specific foodborne pathogens

cannot be interviewed and analyzed for possible outbreaks until they are received), and inhibits making large volume data reportable - data that can be critical to identifying gaps and initiating prevention efforts (e.g., viral loads and CD4 counts for persons who are HIV infected). Some states have had ELR since before 2000: it is not impossible to achieve.

- More than half of states do not routinely geocode vital statistics and reportable disease data, limiting the availability of information on socioeconomic status (SES). Healthy People 2020 Public Health Infrastructure Objective 7.3 is to "increase the proportion of population-based HP 2020 objectives for which national data are available by socioeconomic status."(12). The only types of SES analyses that can be done on birth, death and reportable disease data are those taking advantage of street address of residence information to determine census tract-level SES. Use of area-based SES has been shown repeatedly to identify health disparities independently of those identified by race and ethnicity and to be of value in forming prevention strategies (19). Without geocoding, these types of analyses of surveillance data cannot be done.

- Although a higher percentage of the workforce has had formal training outside their job, as many as 45% of entry level epidemiologists and a quarter to a third of high level epidemiologists report the need for additional competency-specific training. In addition, 10.7% of the master's or higher trained workforce left during 2012 and another 16.7% anticipate leaving in the next five years. The efforts that have raised the training level of the workforce need to be maintained, given both outstanding needs and staff turnover. These efforts need to be certain to include training in the areas where epidemiologists currently feel the least competent and/or a high percentage have identified a need for more training.

- States are increasingly dependent on federal funding. The percentage of funding for state-based epidemiologists that comes from state health departments has steadily decreased. While federal funding is critical to achieve national as well as state surveillance and prevention objectives and is often less subject to state politics, state funding is also important. State-funded epidemiologists often have more flexibility in what they can do, not being tied down by specific grant requirements. This can allow for innovation in data analysis and pilot prevention projects derived from local conditions and thinking outside the box. Such pilot projects can lead to new best practices and their subsequent adoption by other states and at the national level. There is a lot of somewhat flexible state-based epidemiologic expertise that should not be allowed to atrophy. States have the constitutional authority for public health and should be making a continued investment.

There were several findings that may help with narrowing some of the gaps identified above. First, as noted earlier, smaller states were less likely to have achieved substantial capacity to conduct EPHS 1, 2 and 9 despite having more epidemiologists per capita than larger states. It is possible that these states could achieve higher levels of capacity by collaborating with neighboring states in areas in which they are deficient. Alternatively, they could examine the structures and staffing of states of similar population size to determine what they are missing and work to develop the necessary staffing and structure, including the way staff are allocated by program area.

Second, as was found in the 2009 ECA, program areas with lead epidemiologists tended to have higher surveillance and epidemiology capacity than those without lead epidemiologists. Having a lead means having a person who is responsible for a program area, even if they only work part time at it or have no one to supervise. Almost by definition, the level of personal investment is higher and scope of job broader than for a person who carries out specific

activities within a program area. When chronic disease and MCH became priority areas for CSTE and CDC in the 1990s, one strategy for building both of them in addition to supplying funding was to establish lead positions (20,21). This strategy appears to have been successful, as both areas now have substantial capacity in most states. There may be lessons in this for program areas needing development in more states.

Finally, respondents identified a need for 1374 additional epidemiologists, a 50% increase, to achieve full capacity in all program areas. Small population states needed more of an increase than larger ones (76% increase vs <50% increase), and smaller, less well established program areas, i.e., injury, occupational health, oral health, substance abuse and mental health, needed more of a percentage increase than bigger and better established areas. Numerically, however, the additional investment for these areas to achieve full capacity would be much smaller: for example, 57 more epidemiologists for mental health (4.1% of total need), 48 for substance abuse (3.5% of total need), 33 for oral health (2.4% of need) and 57 for occupational health (4.1% of total). These could be priority areas for expansion: a relatively small investment could rapidly develop these program areas across the US.

The information in this report is subject to some important limitations. First, as in past ECAs, information collected regarding perceived capacity, strengths and barriers was self-assessed. Methods used by respondents to estimate this information, including determining who was an epidemiologist, most likely varied between states, from assessment to assessment within states and across program areas. Second, the response rate to the individual worksheets was only about 58%. Responding epidemiologists might have differed from non-respondents. Third, comparisons with past ECAs are not always exact. Where possible, only the responses from the 50 states and the District of Columbia have been used. However, the 2004 and 2006 ECAs both included some responses from the U.S. Territories and even for the 2009 and 2013 ECAs, sometimes a different number of states responded to a given question. Finally, this assessment was solely of state epidemiology capacity; it did not include local (e.g., city and county health departments). Based on the 2010 enumeration, including local jurisdictions would have increased the total number of epidemiologists by approximately 50%. We do not know how their numeric capacity changed from 2010 to 2013. However, they play an important role in national epidemiology capacity and in the capacity of the state in which they are located.

RECOMMENDATIONS

1. **Develop a strategy to increase epidemiology capacity including involving more states in underdeveloped program areas, particularly substance abuse and mental health.**
   - CDC and CSTE together with relevant officials from SAMHSA and HRSA and national state agency groups should meet to determine the role of public health agencies at the local, state and national levels in minimizing the adverse health effects of substance abuse and mental health conditions. As part of this, CSTE, SAMHSA, and CDC should develop a list of public health objectives and best practices for determining and monitoring the epidemiology of substance abuse and mental health problems with potential for public health intervention.
   - CSTE subcommittees already established for injury, occupational health, oral health, and substance abuse should continue to work with CDC counterparts to develop plans for improving the epidemiology capacity in states with little or no capacity in these areas. One objective to discuss and encourage is for each state to assign a lead epidemiologist for each of these program areas if they have not already done so.

2. **Explore the reasons why state investment in public health epidemiologists is stagnant.**
   - Public health is a core state responsibility. Every state should have a basic core public health infrastructure investment in public health to carry out its mandates independently of federal support. The relatively small state investment overall and nearly total lack of investment in some states is a major concern.
   - CSTE and CDC should discuss this issue and determine whether it is something for further examination. One possible direction would be to conduct an assessment of states to determine more precisely what epidemiologic activities, particularly those mandated by state law, are supported with state funding, what are supported by federal funding and to develop a document with this information for state use in determining future resource needs. Another would be to approach a neutral party (e.g., foundation) to develop a comparative document on state investments in core public health epidemiology.

3. **Continue to assist states to achieve selected surveillance-related technologies**.
   - CDC, potentially using public health preparedness and Epidemiology and Laboratory Capacity funding as well as expanding technical assistance resources, should actively provide assistance to states until all fully achieve ELR. A third of states still lack functional ELR, a national vulnerability. Achieving it should be made a priority. Additionally, CSTE and CDC should develop a strategic map to bring states up to performing all the public health meaningful use functionalities of the electronic health record as guided by the Office of the National Coordinator for Health Information Technology.
   - To make further progress on Healthy People 2020 Public Health Infrastructure Objective 7-3, CDC programs that work with surveillance data from states for which socioeconomic status is not collected but which have address data on cases should encourage all states to geocode the address data, match it with census or American Community Survey data on selected characteristics of census tract of residence (e.g., percentage of residents in the census tract living below the federal poverty level) and analyze it.

4. **Review and develop new recruitment and retention strategies to supplement current efforts to recruit and retain well-trained epidemiologists in the public health workforce**.
   - With 10% of senior, highly trained epidemiologists having left the public health workforce in 2012, stakeholders including states, CSTE, CDC, ASPPH, ASTHO, NACCHO and others need to work together proactively to enhance recruitment and retention strategies to meet the future needs of states and localities for trained applied epidemiologists including:
     - Increasing the number of applied epidemiology internships at state and local health departments,
     - Increasing fellowship opportunities to attract newly graduated epidemiologists into the public health workforce,
     - Examining barriers to recruitment and retention followed by sharing and recommendations,
     - Consideration of developing a national clearinghouse for positions available and epidemiologists seeking positions.

5. **Maintain efforts to establish training standards for applied public health epidemiologists and to provide training to enable a sustained, qualified public health epidemiology workforce.**
   - Federal, state, territorial, tribal, and local public health agencies should continue to aggressively promote the development and implementation of standards for use in applied epidemiology training using a competence-based model.
   - CSTE and CDC should maintain the current direction in defining, measuring, and refining competencies. As part of this, an effort should be made to examine whether informatics skills should be included in any epidemiology competencies to enable implementation and use of technology advances, including meaningful use of the electronic medical record as well as Health Information Exchanges and Qualified Entities to support surveillance and case investigation activities.
   - State health departments and schools of public health need to continue to support the full integration of recently and newly developed applied epidemiology competencies for public health epidemiologists. They also need to provide or facilitate training for epidemiologists in the workforce around the Applied Epidemiology Competencies, particularly those that have been identified as highest need in the training gaps analysis. To facilitate this CSTE, CDC and ASSPH should assess the job readiness of MPH graduates in epidemiology, particularly schools and programs that offer public health informatics certification.
   - Masters programs with applied epidemiology training programs and opportunities should reflect the full scope of what applied epidemiology can include, e.g., injury, environmental health, maternal/child health, occupational health, oral health, substance abuse and mental health in addition to the more common infectious disease, preparedness and chronic disease programs.

6. **Conduct future assessments**
   - Future assessments should continue to monitor both functional and numeric epidemiology capacity by program area as well as overall. Given the current gaps in selected program areas such as substance abuse and mental health and the potential for efforts to address them, accurately monitoring both the overall capacity and the number of epidemiologists by program area will be important.

- Future assessments also should continue to monitor key technology capacities because they are essential for public health preparedness-related surveillance and to enable access to a broader range of information for public health action.
- Consideration in the future should be given to monitoring functional and numeric epidemiology capacity in large city and county health departments in a similar fashion as is monitored by this assessment in states. Ideally, this would be done at the same time as it is being done in states to provide a more complete national picture.

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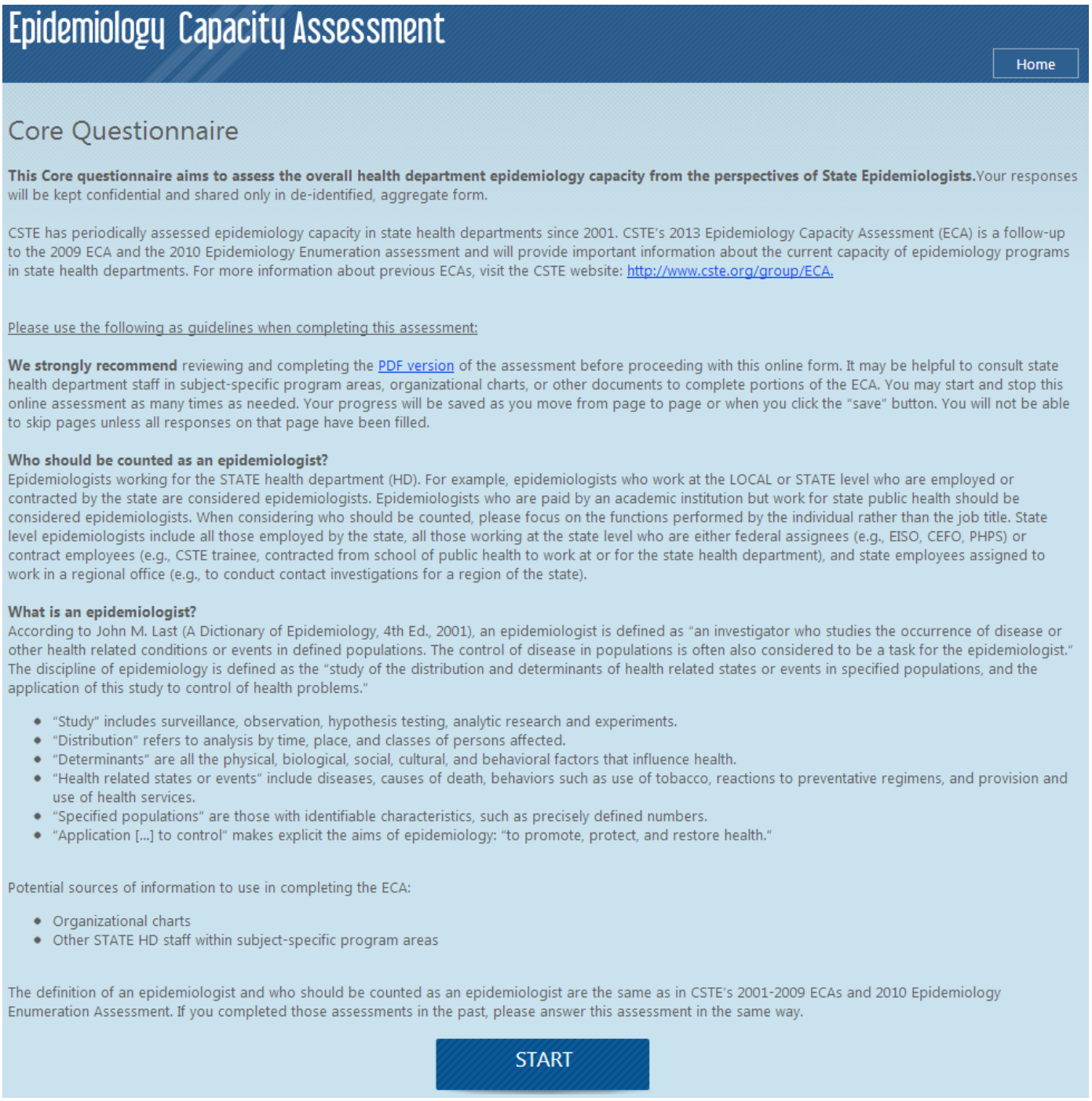
APPENDIX A

APPENDIX A: 2013 ECA CORE ASSESSMENT TOOL



Epidemiology Capacity Assessment

Home

Core Questionnaire

This Core questionnaire aims to assess the overall health department epidemiology capacity from the perspectives of State Epidemiologists. Your responses will be kept confidential and shared only in de-identified, aggregate form.

CSTE has periodically assessed epidemiology capacity in state health departments since 2001. CSTE's 2013 Epidemiology Capacity Assessment (ECA) is a follow-up to the 2009 ECA and the 2010 Epidemiology Enumeration assessment and will provide important information about the current capacity of epidemiology programs in state health departments. For more information about previous ECAs, visit the CSTE website: http://www.cste.org/group/ECA.

Please use the following as guidelines when completing this assessment:

We strongly recommend reviewing and completing the PDF version of the assessment before proceeding with this online form. It may be helpful to consult state health department staff in subject-specific program areas, organizational charts, or other documents to complete portions of the ECA. You may start and stop this online assessment as many times as needed. Your progress will be saved as you move from page to page or when you click the "save" button. You will not be able to skip pages unless all responses on that page have been filled.

Who should be counted as an epidemiologist?
Epidemiologists working for the STATE health department (HD). For example, epidemiologists who work at the LOCAL or STATE level who are employed or contracted by the state are considered epidemiologists. Epidemiologists who are paid by an academic institution but work for state public health should be considered epidemiologists. When considering who should be counted, please focus on the functions performed by the individual rather than the job title. State level epidemiologists include all those employed by the state, all those working at the state level who are either federal assignees (e.g., EISO, CEFO, PHPS) or contract employees (e.g., CSTE trainee, contracted from school of public health to work at or for the state health department), and state employees assigned to work in a regional office (e.g., to conduct contact investigations for a region of the state).

What is an epidemiologist?
According to John M. Last (A Dictionary of Epidemiology, 4th Ed., 2001), an epidemiologist is defined as "an investigator who studies the occurrence of disease or other health related conditions or events in defined populations. The control of disease in populations is often also considered to be a task for the epidemiologist." The discipline of epidemiology is defined as the "study of the distribution and determinants of health related states or events in specified populations, and the application of this study to control of health problems."

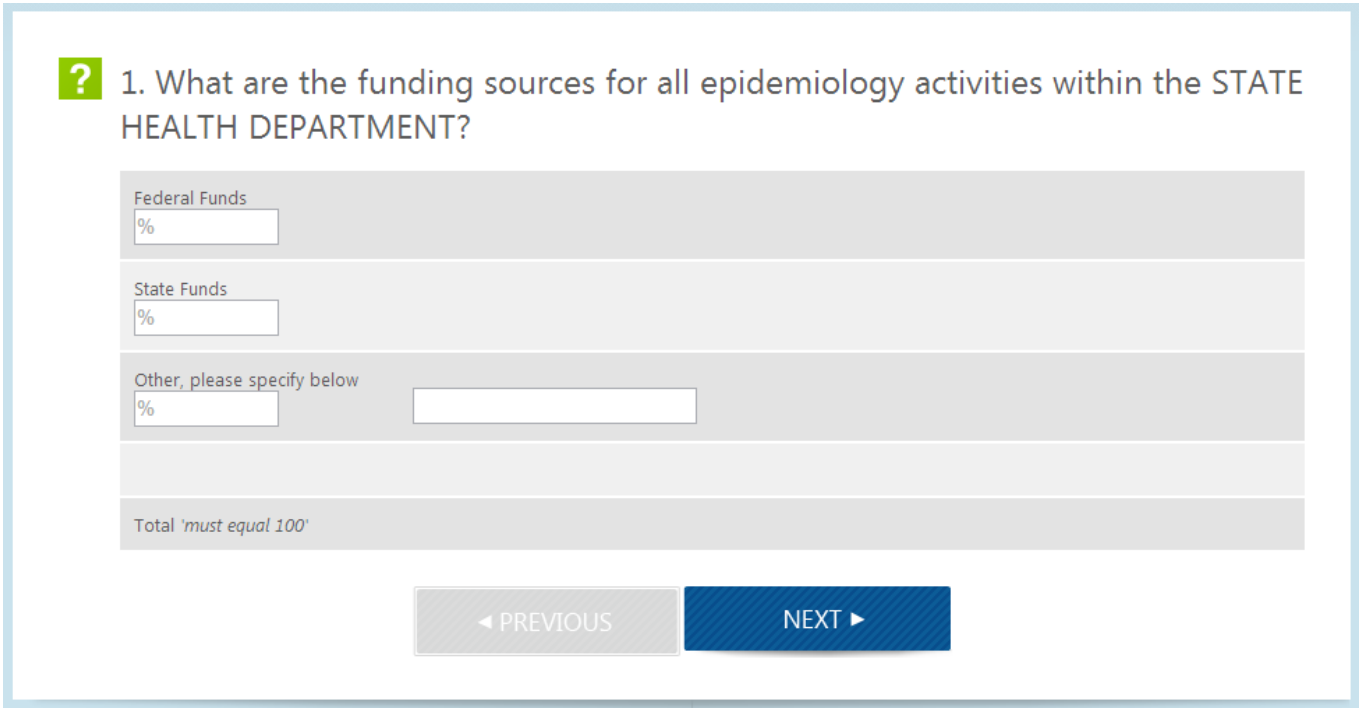
- "Study" includes surveillance, observation, hypothesis testing, analytic research and experiments.
- "Distribution" refers to analysis by time, place, and classes of persons affected.
- "Determinants" are all the physical, biological, social, cultural, and behavioral factors that influence health.
- "Health related states or events" include diseases, causes of death, behaviors such as use of tobacco, reactions to preventative regimens, and provision and use of health services.
- "Specified populations" are those with identifiable characteristics, such as precisely defined numbers.
- "Application [...] to control" makes explicit the aims of epidemiology: "to promote, protect, and restore health."

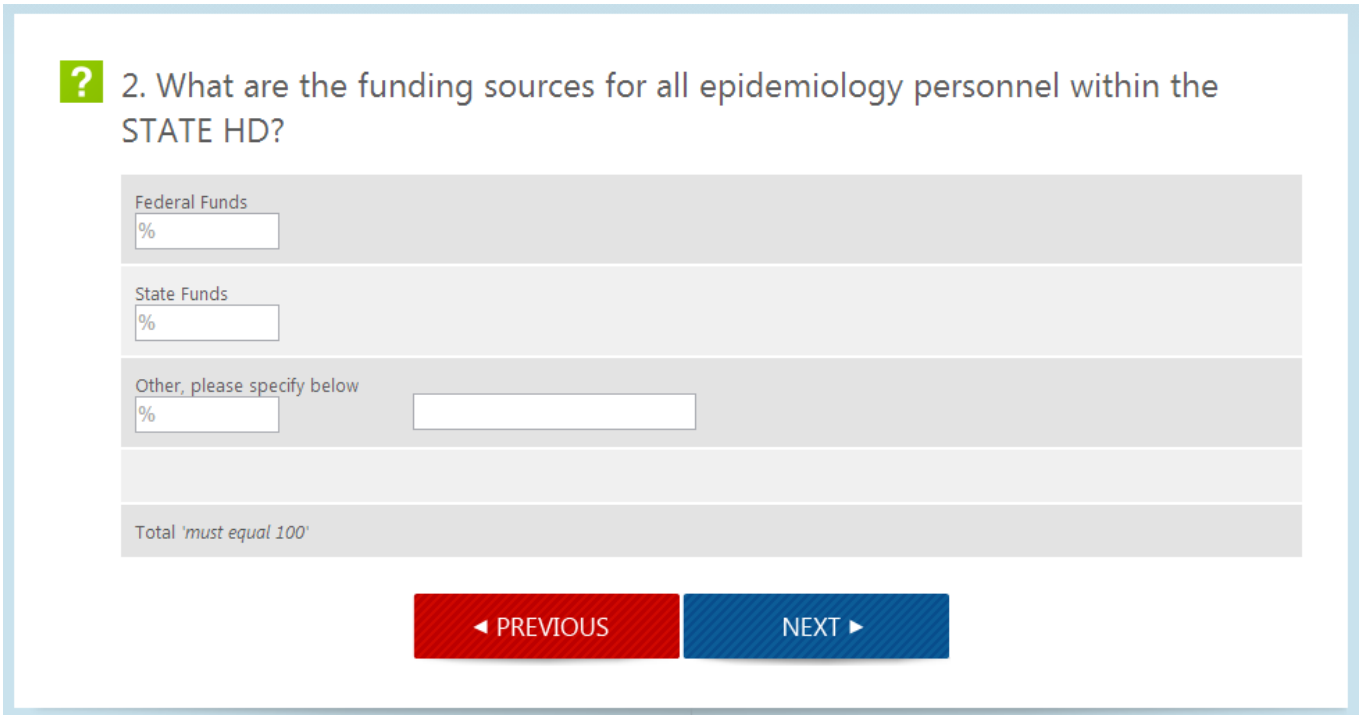
Potential sources of information to use in completing the ECA:

- Organizational charts
- Other STATE HD staff within subject-specific program areas

The definition of an epidemiologist and who should be counted as an epidemiologist are the same as in CSTE's 2001-2009 ECAs and 2010 Epidemiology Enumeration Assessment. If you completed those assessments in the past, please answer this assessment in the same way.

START


1. What are the funding sources for all epidemiology activities within the STATE HEALTH DEPARTMENT?
Federal Funds
%
State Funds
%
Other, please specify below
%
Total 'must equal 100'
◄ PREVIOUS
NEXT ►


2. What are the funding sources for all epidemiology personnel within the STATE HD?
Federal Funds
%
State Funds
%
Other, please specify below
%
Total 'must equal 100'
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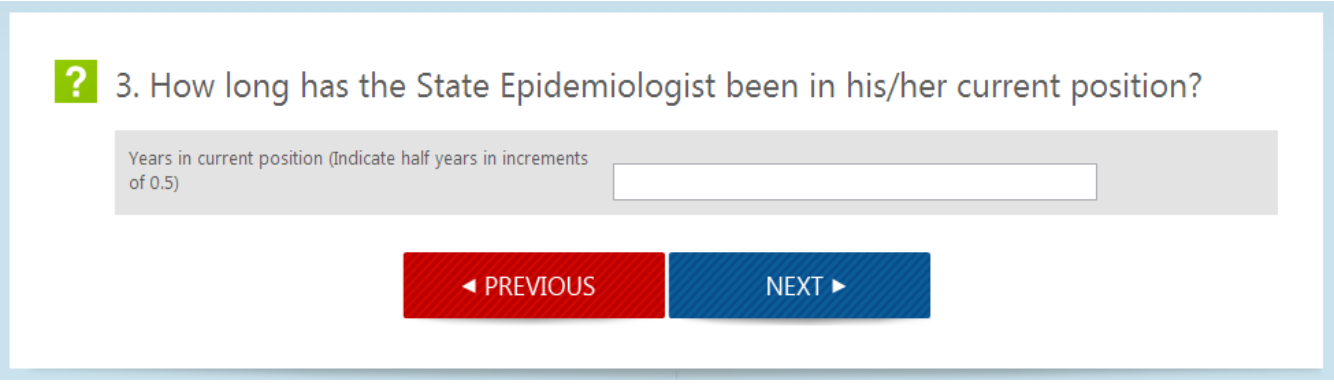
3. How long has the State Epidemiologist been in his/her current position?
Years in current position (Indicate half years in increments of 0.5)
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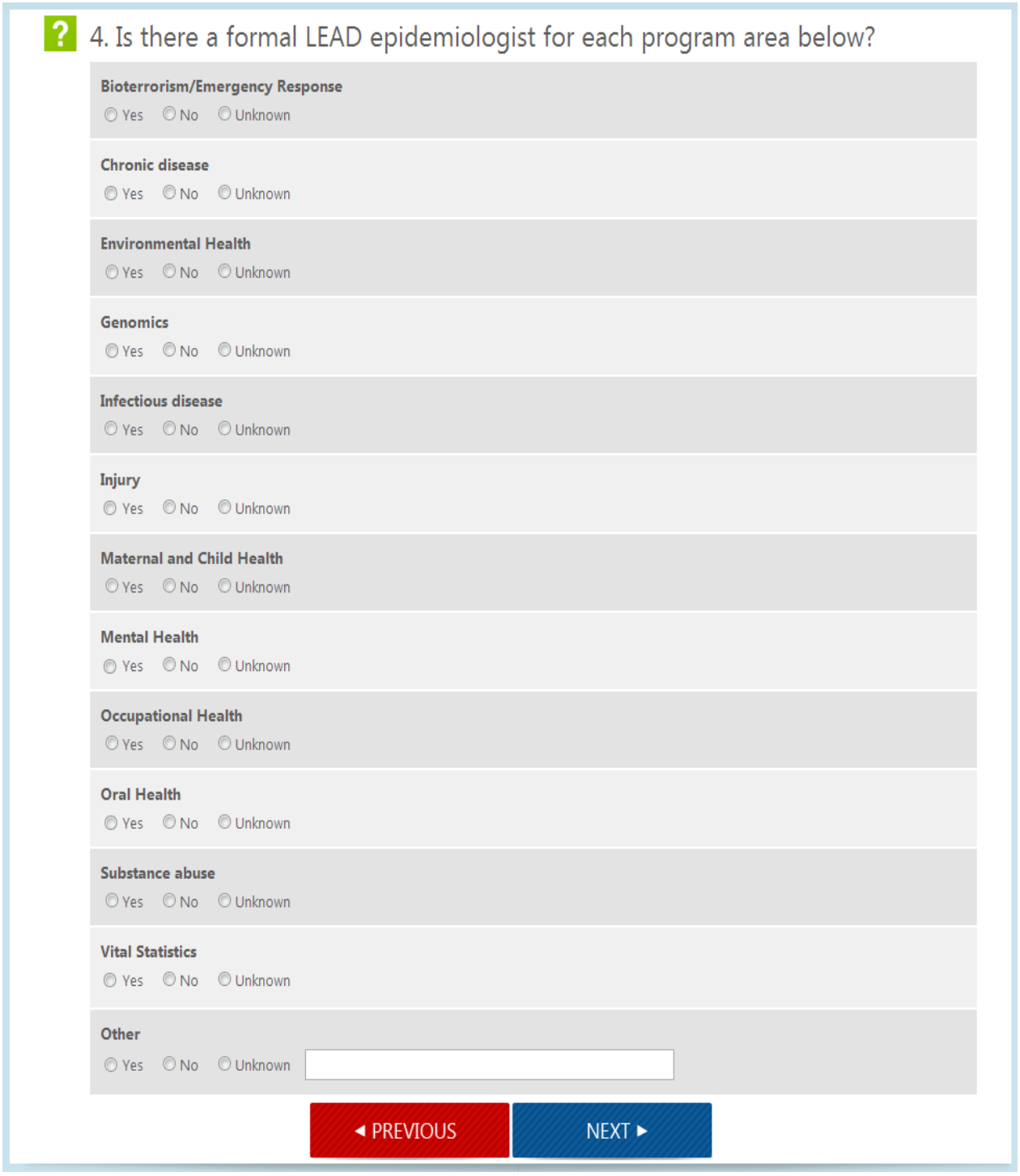
NEXT ►



4. Is there a formal LEAD epidemiologist for each program area below?

Bioterrorism/Emergency Response
Yes No Unknown

Chronic disease
Yes No Unknown

Environmental Health
Yes No Unknown

Genomics
Yes No Unknown

Infectious disease
Yes No Unknown

Injury
Yes No Unknown

Maternal and Child Health
Yes No Unknown

Mental Health
Yes No Unknown

Occupational Health
Yes No Unknown

Oral Health
Yes No Unknown

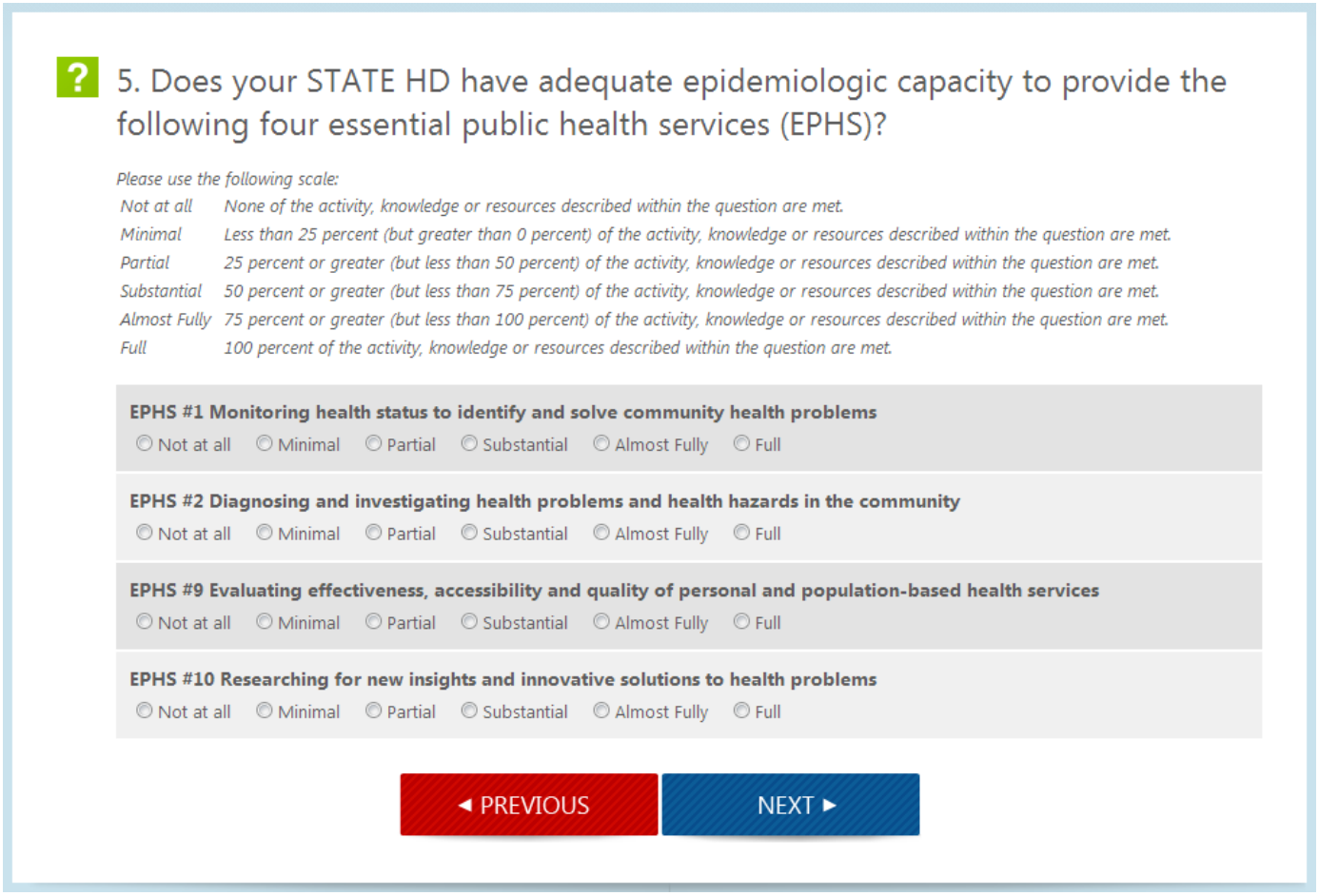
Substance abuse
Yes No Unknown

Vital Statistics
Yes No Unknown

Other
Yes No Unknown

◄ PREVIOUS NEXT ►

APPENDIX A: 2013 ECA CORE ASSESSMENT TOOL



5. Does your STATE HD have adequate epidemiologic capacity to provide the following four essential public health services (EPHS)?

Please use the following scale:

Not at all	*None of the activity, knowledge or resources described within the question are met.*
Minimal	*Less than 25 percent (but greater than 0 percent) of the activity, knowledge or resources described within the question are met.*
Partial	*25 percent or greater (but less than 50 percent) of the activity, knowledge or resources described within the question are met.*
Substantial	*50 percent or greater (but less than 75 percent) of the activity, knowledge or resources described within the question are met.*
Almost Fully	*75 percent or greater (but less than 100 percent) of the activity, knowledge or resources described within the question are met.*
Full	*100 percent of the activity, knowledge or resources described within the question are met.*

EPHS #1 Monitoring health status to identify and solve community health problems

○ Not at all ○ Minimal ○ Partial ○ Substantial ○ Almost Fully ○ Full

EPHS #2 Diagnosing and investigating health problems and health hazards in the community

○ Not at all ○ Minimal ○ Partial ○ Substantial ○ Almost Fully ○ Full

EPHS #9 Evaluating effectiveness, accessibility and quality of personal and population-based health services

○ Not at all ○ Minimal ○ Partial ○ Substantial ○ Almost Fully ○ Full

EPHS #10 Researching for new insights and innovative solutions to health problems

○ Not at all ○ Minimal ○ Partial ○ Substantial ○ Almost Fully ○ Full

◄ PREVIOUS NEXT ►

6. What is the extent of the epidemiology and surveillance capacity in the following program areas in your STATE HD? If needed, please seek the guidance of other STATE HD staff within program specific areas when completing this question.

Please use the following scale:

Not at all	*None of the activity, knowledge or resources described within the question are met.*
Minimal	*Less than 25 percent (but greater than 0 percent) of the activity, knowledge or resources described within the question are met.*
Partial	*25 percent or greater (but less than 50 percent) of the activity, knowledge or resources described within the question are met.*
Substantial	*50 percent or greater (but less than 75 percent) of the activity, knowledge or resources described within the question are met.*
Almost Fully	*75 percent or greater (but less than 100 percent) of the activity, knowledge or resources described within the question are met.*
Full	*100 percent of the activity, knowledge or resources described within the question are met.*

Bioterrorism / Emergency Response

○ None* ○ Minimal ○ Partial ○ Substantial ○ Almost Fully ○ Full

***If none, are you currently developing a program or have plans to implement one?**

○ Yes ○ No

Chronic Disease

○ None* ○ Minimal ○ Partial ○ Substantial ○ Almost Fully ○ Full

***If none, are you currently developing a program or have plans to implement one?**

○ Yes ○ No

Environmental Health

○ None* ○ Minimal ○ Partial ○ Substantial ○ Almost Fully ○ Full

***If none, are you currently developing a program or have plans to implement one?**

○ Yes ○ No

Infectious Disease

○ None* ○ Minimal ○ Partial ○ Substantial ○ Almost Fully ○ Full

***If none, are you currently developing a program or have plans to implement one?**

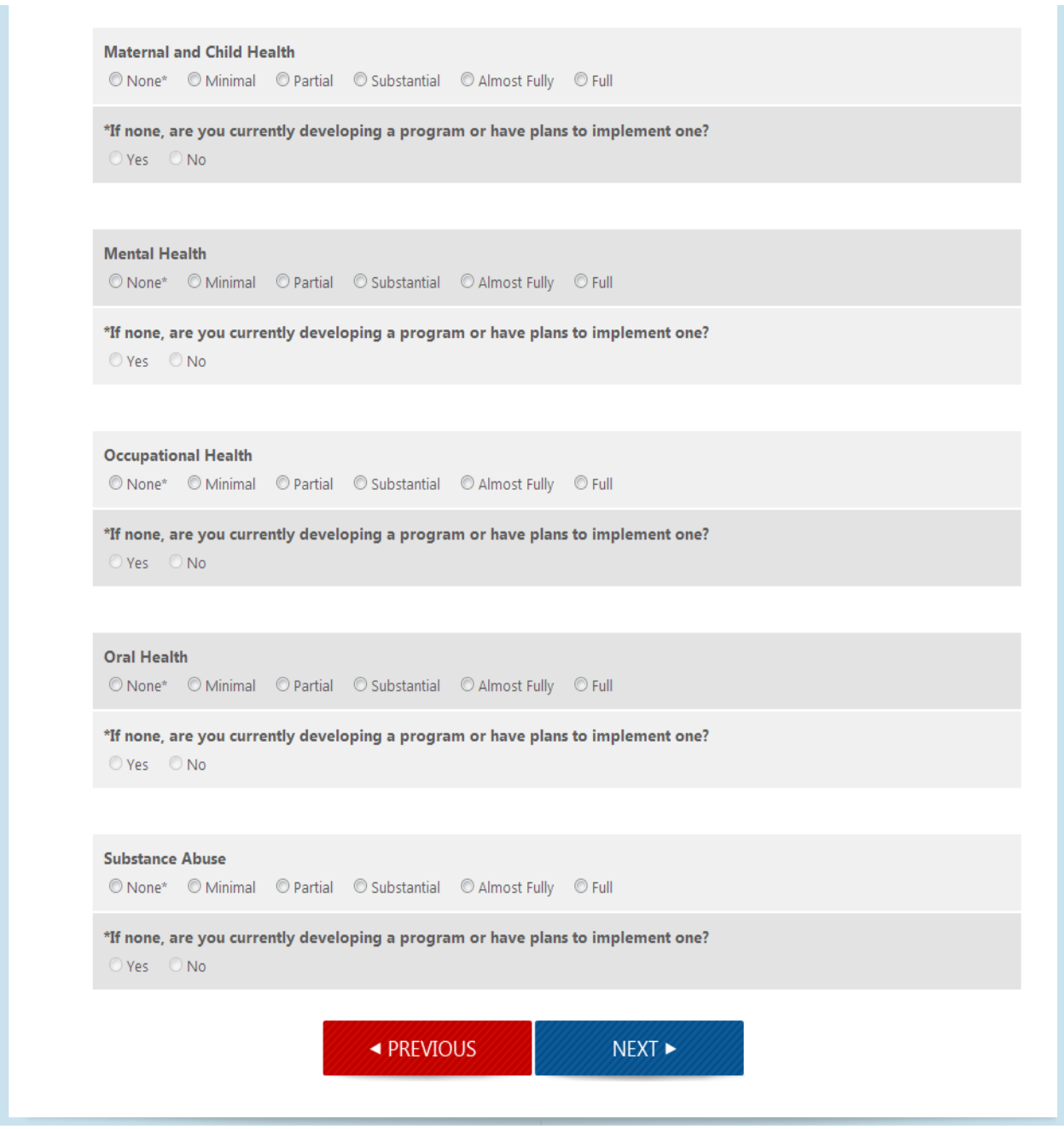
○ Yes ○ No

Injury

○ None* ○ Minimal ○ Partial ○ Substantial ○ Almost Fully ○ Full

***If none, are you currently developing a program or have plans to implement one?**

○ Yes ○ No


Maternal and Child Health
None* Minimal Partial Substantial Almost Fully Full
*If none, are you currently developing a program or have plans to implement one?
Yes No
Mental Health
None* Minimal Partial Substantial Almost Fully Full
*If none, are you currently developing a program or have plans to implement one?
Yes No
Occupational Health
None* Minimal Partial Substantial Almost Fully Full
*If none, are you currently developing a program or have plans to implement one?
Yes No
Oral Health
None* Minimal Partial Substantial Almost Fully Full
*If none, are you currently developing a program or have plans to implement one?
Yes No
Substance Abuse
None* Minimal Partial Substantial Almost Fully Full
*If none, are you currently developing a program or have plans to implement one?
Yes No
◄ PREVIOUS
NEXT ►

7. Please indicate the total number of epidemiologists currently working for your state health department by Program Area and funding source. If an epidemiologist has responsibilities divided over more than one program area, please attribute the fraction of time the epidemiologist works in any given program area to the nearest 0.1 FTE (e.g., 0.2 ID, 0.4 BT/ER, 0.4 EH). State level epidemiologists include all those employed by the state, all those working at the state level who are either federal assignees (e.g., EISO, CEFO, PHPS) or contract employees (e.g., CSTE trainee, contracted from school of public health to work at or for the state health department), and state employees assigned to work in a regional office (e.g., to conduct contact investigations for a region of the state).

When counting epidemiologists, please use the definition found here

BT/Emergency Response

Total number of epidemiologists (this total will sum from the answers below)	
No. supported with federal funds from CDC	
No. directly funded by CDC (e.g., CEFO, EIS, PHPS, etc.)	
No. supported with federal funds from other agencies	
No. supported with state funds	
No. supported with funds from other sources (e.g., foundations)	
Estimate of ideal number of additional epidemiologists needed to reach full capacity (the number of epidemiologists in addition to the current number regardless of resources).	

Chronic Diseases

Total number of epidemiologists (this total will sum from the answers below)	
No. supported with federal funds from CDC	
No. directly funded by CDC (e.g., CEFO, EIS, PHPS, etc.)	
No. supported with federal funds from other agencies	
No. supported with state funds	
No. supported with funds from other sources (e.g., foundations)	
Estimate of ideal number of additional epidemiologists needed to reach full capacity (the number of epidemiologists in addition to the current number regardless of resources).	

Environmental Health

Total number of epidemiologists (this total will sum from the answers below)	
No. supported with federal funds from CDC	
No. directly funded by CDC (e.g., CEFO, EIS, PHPS, etc.)	
No. supported with federal funds from other agencies	
No. supported with state funds	
No. supported with funds from other sources (e.g., foundations)	
Estimate of ideal number of additional epidemiologists needed to reach full capacity (the number of epidemiologists in addition to the current number regardless of resources).	

Infectious Diseases

Total number of epidemiologists (this total will sum from the answers below)	
No. supported with federal funds from CDC	
No. directly funded by CDC (e.g., CEFO, EIS, PHPS, etc.)	
No. supported with federal funds from other agencies	
No. supported with state funds	
No. supported with funds from other sources (e.g., foundations)	
Estimate of ideal number of additional epidemiologists needed to reach full capacity (the number of epidemiologists in addition to the current number regardless of resources).	

Injury

Total number of epidemiologists (this total will sum from the answers below)	
No. supported with federal funds from CDC	
No. directly funded by CDC (e.g., CEFO, EIS, PHPS, etc.)	
No. supported with federal funds from other agencies	
No. supported with state funds	
No. supported with funds from other sources (e.g., foundations)	
Estimate of ideal number of additional epidemiologists needed to reach full capacity (the number of epidemiologists in addition to the current number regardless of resources).	

Maternal and Child Health

Total number of epidemiologists (this total will sum from the answers below)	
No. supported with federal funds from CDC	
No. directly funded by CDC (e.g., CEFO, EIS, PHPS, etc.)	
No. supported with federal funds from other agencies	
No. supported with state funds	
No. supported with funds from other sources (e.g., foundations)	
Estimate of ideal number of additional epidemiologists needed to reach full capacity (the number of epidemiologists in addition to the current number regardless of resources).	

Mental Health

Total number of epidemiologists (this total will sum from the answers below)	
No. supported with federal funds from CDC	
No. directly funded by CDC (e.g., CEFO, EIS, PHPS, etc.)	
No. supported with federal funds from other agencies	
No. supported with state funds	
No. supported with funds from other sources (e.g., foundations)	
Estimate of ideal number of additional epidemiologists needed to reach full capacity (the number of epidemiologists in addition to the current number regardless of resources).	

Occupational Health

Total number of epidemiologists (this total will sum from the answers below)	
No. supported with federal funds from CDC	
No. directly funded by CDC (e.g., CEFO, EIS, PHPS, etc.)	
No. supported with federal funds from other agencies	
No. supported with state funds	
No. supported with funds from other sources (e.g., foundations)	
Estimate of ideal number of additional epidemiologists needed to reach full capacity (the number of epidemiologists in addition to the current number regardless of resources).	

Oral Health

Total number of epidemiologists (this total will sum from the answers below)	**0.00**
No. supported with federal funds from CDC	0
No. directly funded by CDC (e.g., CEFO, EIS, PHPS, etc.)	0
No. supported with federal funds from other agencies	0
No. supported with state funds	0
No. supported with funds from other sources (e.g., foundations)	0
Estimate of ideal number of additional epidemiologists needed to reach full capacity (the number of epidemiologists in addition to the current number regardless of resources).	1

Substance Abuse

Total number of epidemiologists (this total will sum from the answers below)	**10.00**
No. supported with federal funds from CDC	0
No. directly funded by CDC (e.g., CEFO, EIS, PHPS, etc.)	0
No. supported with federal funds from other agencies	0
No. supported with state funds	0
No. supported with funds from other sources (e.g., foundations)	10
Estimate of ideal number of additional epidemiologists needed to reach full capacity (the number of epidemiologists in addition to the current number regardless of resources).	0

Other

Total number of epidemiologists (this total will sum from the answers below)	**0.00**
No. supported with federal funds from CDC	0
No. directly funded by CDC (e.g., CEFO, EIS, PHPS, etc.)	0
No. supported with federal funds from other agencies	0
No. supported with state funds	0
No. supported with funds from other sources (e.g., foundations)	0
Estimate of ideal number of additional epidemiologists needed to reach full capacity (the number of epidemiologists in addition to the current number regardless of resources).	0

◄ PREVIOUS NEXT ►

8. How many written articles about an epidemiology area were published in 2012 that included any of the epidemiologists (as any author) listed in Question 7, in each program area?

Question 7 asked you to enumerate the total number of epidemiologists (FTEs) currently employed or contracted by your STATE HD by program area and funding source.
"Other reports" are approved by a state process and published electronically, on paper and/or posted on a website for public consumption.

Bioterrorism/Emergency Response

No. of peer reviewed published articles in 2012	
No. of abstracts accepted for presentation at national conferences held in 2012	
No. of "Other Reports" in 2012 as defined above	

Chronic Disease

No. of peer reviewed published articles in 2012	
No. of abstracts accepted for presentation at national conferences held in 2012	
No. of "Other Reports" in 2012 as defined above	

Environmental Health

No. of peer reviewed published articles in 2012	
No. of abstracts accepted for presentation at national conferences held in 2012	
No. of "Other Reports" in 2012 as defined above	

Infectious Disease

No. of peer reviewed published articles in 2012	
No. of abstracts accepted for presentation at national conferences held in 2012	
No. of "Other Reports" in 2012 as defined above	

Injury

No. of peer reviewed published articles in 2012	
No. of abstracts accepted for presentation at national conferences held in 2012	
No. of "Other Reports" in 2012 as defined above	

Maternal and Child Health

No. of peer reviewed published articles in 2012	
No. of abstracts accepted for presentation at national conferences held in 2012	
No. of "Other Reports" in 2012 as defined above	

Mental Health

No. of peer reviewed published articles in 2012	
No. of abstracts accepted for presentation at national conferences held in 2012	
No. of "Other Reports" in 2012 as defined above	

Occupational Health

No. of peer reviewed published articles in 2012	
No. of abstracts accepted for presentation at national conferences held in 2012	
No. of "Other Reports" in 2012 as defined above	

Oral Health

No. of peer reviewed published articles in 2012	
No. of abstracts accepted for presentation at national conferences held in 2012	
No. of "Other Reports" in 2012 as defined above	

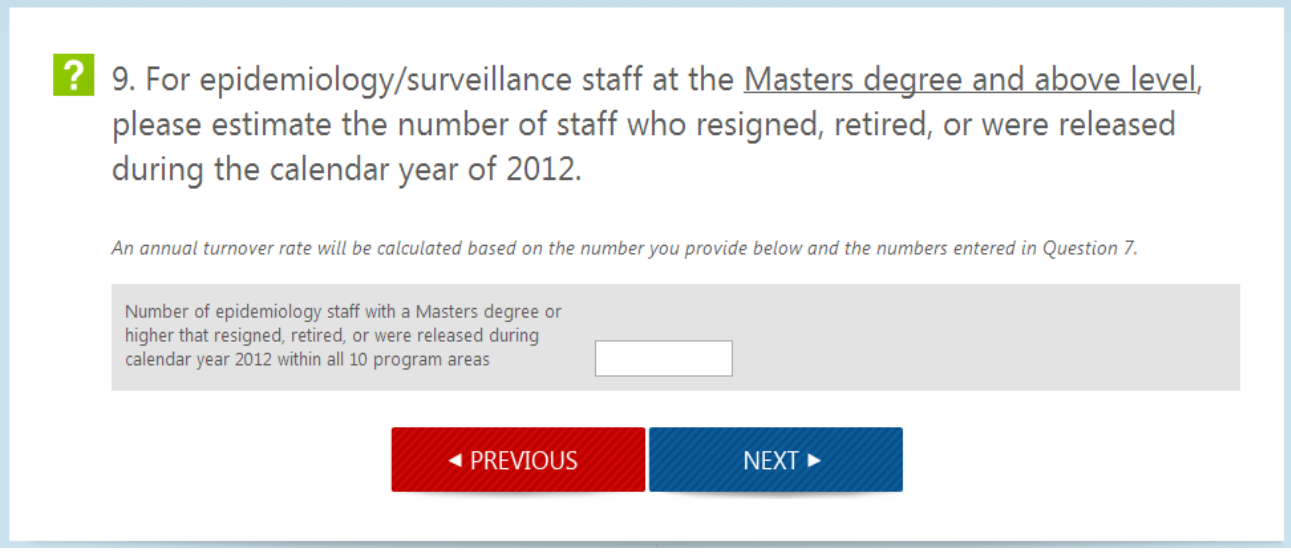
Substance Abuse

No. of peer reviewed published articles in 2012	
No. of abstracts accepted for presentation at national conferences held in 2012	
No. of "Other Reports" in 2012 as defined above	

Other

○ Yes ○ No	
No. of peer reviewed published articles in 2012	
No. of abstracts accepted for presentation at national conferences held in 2012	
No. of "Other Reports" in 2012 as defined above	

◄ PREVIOUS NEXT ►


9. For epidemiology/surveillance staff at the Masters degree and above level, please estimate the number of staff who resigned, retired, or were released during the calendar year of 2012.
An annual turnover rate will be calculated based on the number you provide below and the numbers entered in Question 7.
Number of epidemiology staff with a Masters degree or higher that resigned, retired, or were released during calendar year 2012 within all 10 program areas
◄ PREVIOUS
NEXT ►

10. Describe the civil service annual salary range for epidemiologists working in your STATE HD by *degree*.

If you have more than one position for a given degree below, please use the low end of the lowest position in that level to the high end of the highest position in that level.
Example: If an entry level epidemiologist with an MD makes $75,000 to $100,000 and a senior level epidemiologist with an MD makes $125,000 to $150,000 the salary scale is: $75,000-150,000.
**Commas are not allowed in numerical text boxes.*

MD, DO

From	
To	
☐ Check if position doesn't exist	

DDS

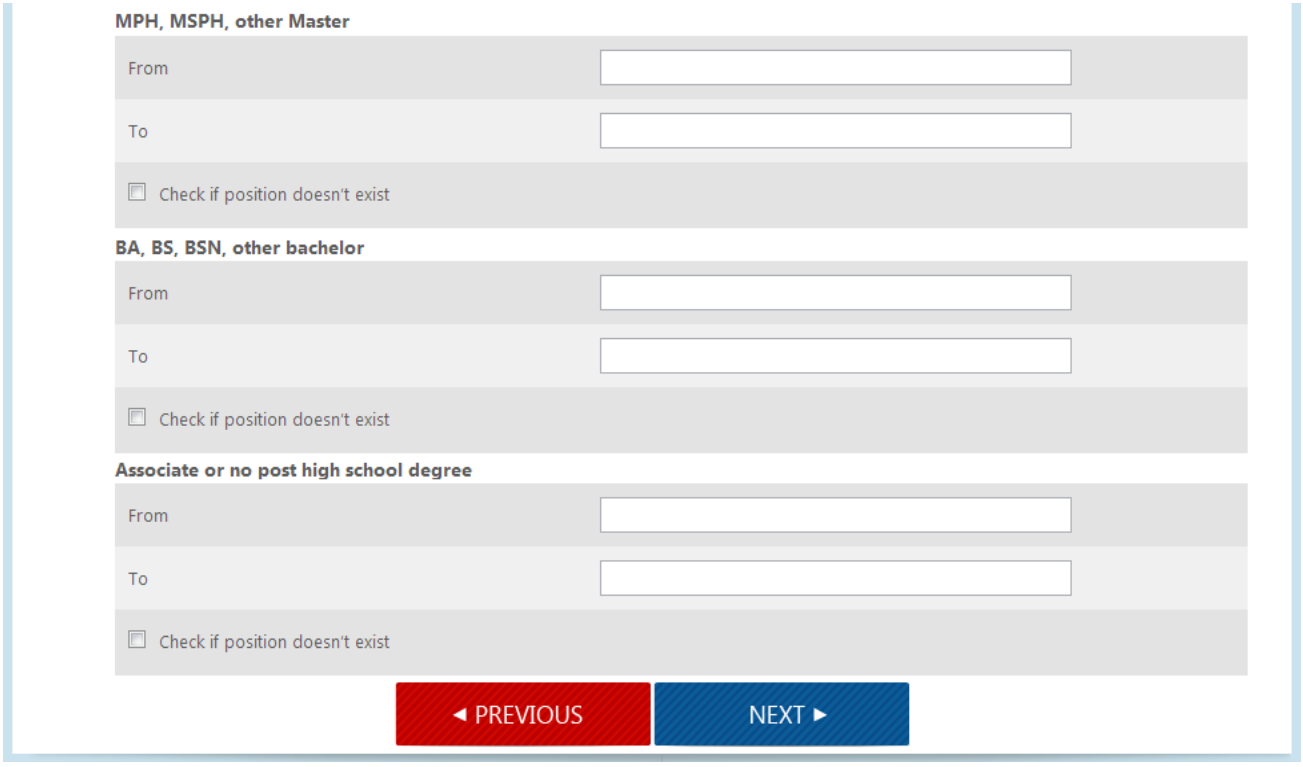
From	
To	
☐ Check if position doesn't exist	

DVM

From	
To	
☐ Check if position doesn't exist	

PhD, DrPH, other doctoral

From	
To	
☐ Check if position doesn't exist	


MPH, MSPH, other Master
From
To
Check if position doesn't exist
BA, BS, BSN, other bachelor
From
To
Check if position doesn't exist
Associate or no post high school degree
From
To
Check if position doesn't exist
◄ PREVIOUS
NEXT ►

11. Describe the civil service annual salary range for epidemiologists working in your STATE HD by *career level*.

If you have more than one position in a given career level below, please use the low end of the lowest position in that level to the high end of the highest position in that level.
**Commas are not allowed in numerical text boxes.*

State Epidemiologist

From	
To	
☐ Check if position doesn't exist	

Deputy State Epidemiologist

From	
To	
☐ Check if position doesn't exist	

Senior Level Epidemiologist

From	
To	
☐ Check if position doesn't exist	

Mid Level Epidemiologist

From	
To	
☐ Check if position doesn't exist	

Entry Level Epidemiologist

From	
To	
☐ Check if position doesn't exist	

◄ PREVIOUS NEXT ►

Part II – Workforce Training, Recruitment, and Retention

Part A – Workforce Training

12. Does your public health agency do the following in order to provide access to training in epidemiology?

Important - Please consult other HD program epidemiologists for questions pertaining to domains not under your area of responsibility. Please click here for a definition of a STATE epidemiologist. If you have any questions, please contact ECA@cste.org

Training in Epidemiology

Include education and training objectives in performance review?
Yes No Unknown

Pay for formal training or education outside your organization (conferences or seminars)?
Yes No Unknown

Provide on-site trainings (epidemiology seminars, etc)?
Yes No Unknown

Provide epidemiology training or education to epidemiologists at the local level?
Yes No Unknown

Have staff position(s) responsible for internal training?
Yes No Unknown

Require continuing education in epidemiology and surveillance?*
Yes No Unknown *If yes, please explain:

Cross-Training in Informatics

Require cross-training in informatics?
Yes No Unknown

Pay for formal informatics training or education outside your organization (conferences or seminars)?
Yes No Unknown

Provide on-site informatics trainings (seminars, etc)?
Yes No Unknown

Provide informatics cross-training or education to epidemiologists at the local level?
Yes No Unknown

Have staff position(s) responsible for internal informatics cross-training?
Yes No Unknown

Provide epidemiology training in collaboration with any of the following organizations/groups:

Centers for Disease Control and Prevention (CDC)
○ Yes ○ No ○ Unknown

Schools of Public Health
○ Yes ○ No ○ Unknown

Schools of Veterinary Medicine
○ Yes ○ No ○ Unknown

Other Academic Institutions
○ Yes ○ No ○ Unknown

Centers for Public Health Preparedness
○ Yes ○ No ○ Unknown

HRSA Training Centers
○ Yes ○ No ○ Unknown

Other Healthcare Organizations
○ Yes ○ No ○ Unknown

Other Federal/Governmental Agencies
○ Yes ○ No ○ Unknown

Public Safety/First Responders
○ Yes ○ No ○ Unknown

Other Healthcare Providers
○ Yes ○ No ○ Unknown

Other (specify)
○ Yes ○ No ○ Unknown

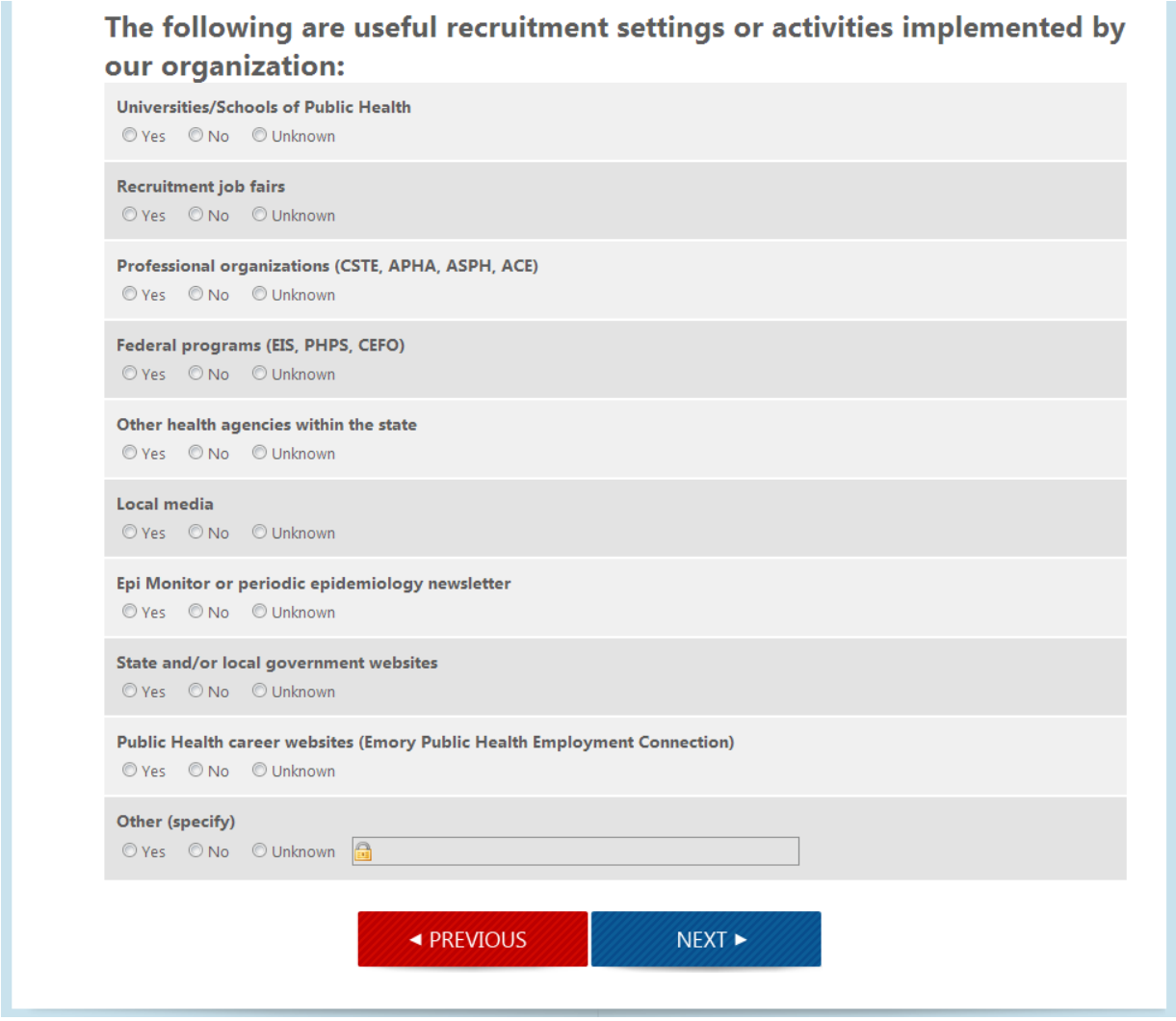
Part B. This section is intended to focus on existing practices, incentives and barriers aimed at strengthening the epidemiology workforce at the state and local level. All questions within this section should be based on the perspective of the State Epidemiologist or a senior level health official within this agency.

To what extent is each of these factors a problem in recruiting epidemiologists? Please answer on a scale of 0-3 where 0=Not a problem, 3=Major problem

Salary scale	
Enough qualified applicants	
Personnel policies and procedures	
Job benefits	
Job security	
Job location	
Opportunity for promotion	
Travel required	
Travel permitted	
Job interests/fulfillment	
Opportunities for training	
Limitations recruiting outside your organization	
Restrictions on choosing best candidate	
Restrictions on hiring quickly enough	
Restrictions on offering competitive pay	
Hiring freezes	
Other factor? (Specify)	

To what extent is each of these factors a problem in retaining epidemiologists? Not a problem (0-3) Major Problem

Salary scale	
Personnel policies and procedures	
Job benefits	
Job security	
Job location	
Opportunity for promotion	
Travel required	
Travel permitted	
Job interests/fulfillment	
Opportunities for training	
Loss to private or government sector	
Restrictions on merit raises	
Restrictions on travel outside jurisdiction	
Layoffs from budget restrictions	
Other factor? (Specify)	



The following are useful recruitment settings or activities implemented by our organization:

Universities/Schools of Public Health
Yes No Unknown

Recruitment job fairs
Yes No Unknown

Professional organizations (CSTE, APHA, ASPH, ACE)
Yes No Unknown

Federal programs (EIS, PHPS, CEFO)
Yes No Unknown

Other health agencies within the state
Yes No Unknown

Local media
Yes No Unknown

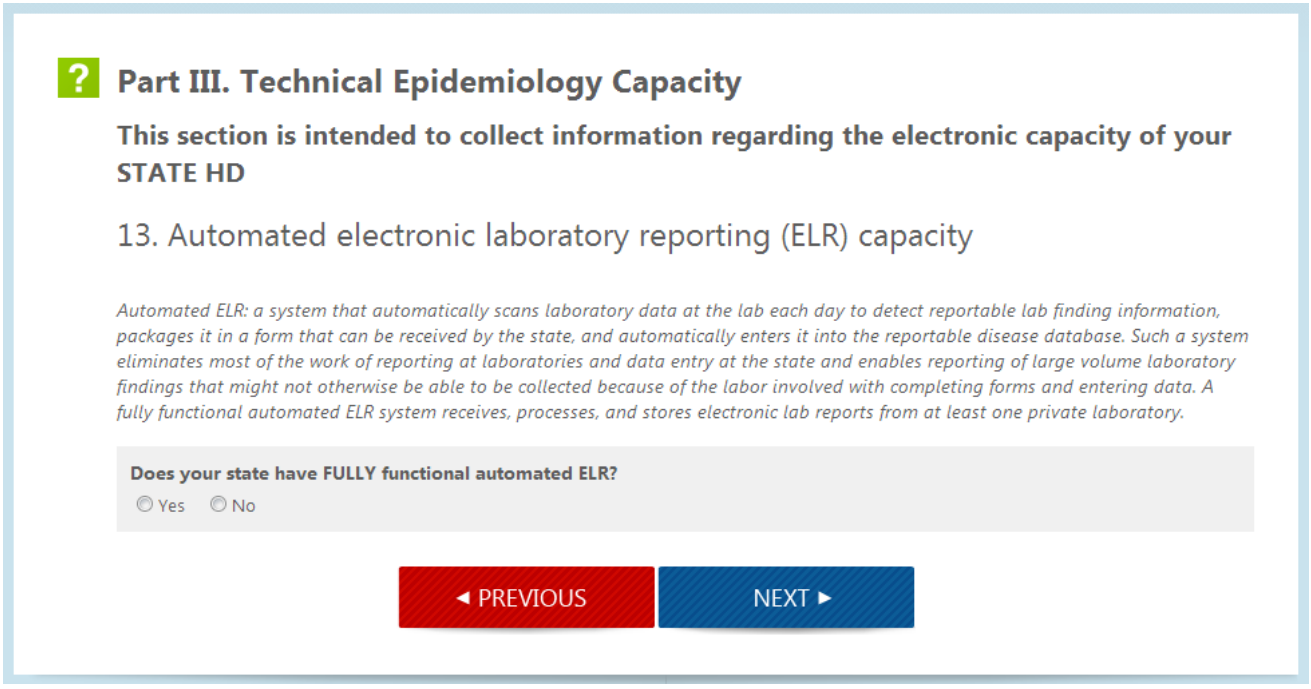
Epi Monitor or periodic epidemiology newsletter
Yes No Unknown

State and/or local government websites
Yes No Unknown

Public Health career websites (Emory Public Health Employment Connection)
Yes No Unknown

Other (specify)
Yes No Unknown

◄ PREVIOUS NEXT ►



Part III. Technical Epidemiology Capacity

This section is intended to collect information regarding the electronic capacity of your STATE HD

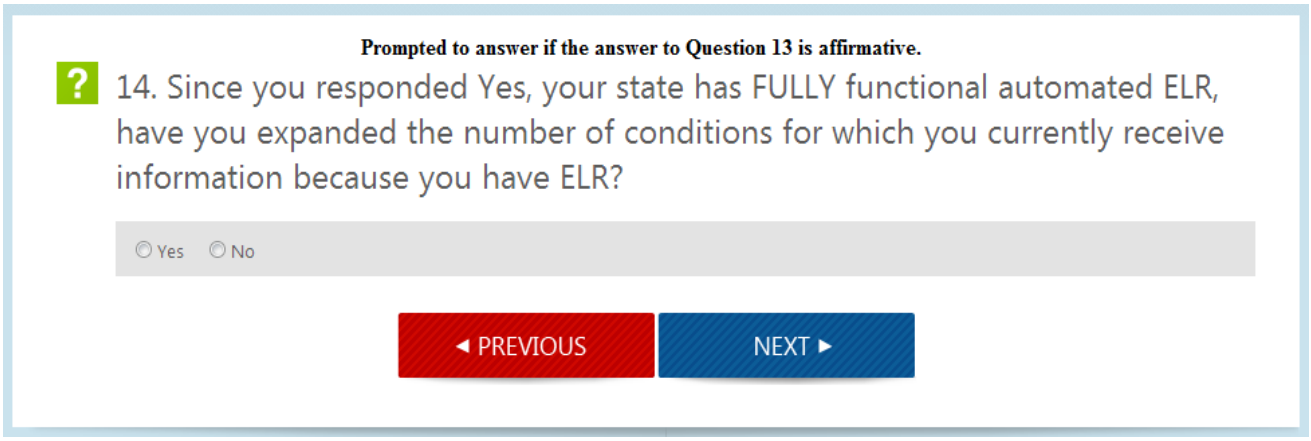
13. Automated electronic laboratory reporting (ELR) capacity

Automated ELR: a system that automatically scans laboratory data at the lab each day to detect reportable lab finding information, packages it in a form that can be received by the state, and automatically enters it into the reportable disease database. Such a system eliminates most of the work of reporting at laboratories and data entry at the state and enables reporting of large volume laboratory findings that might not otherwise be able to be collected because of the labor involved with completing forms and entering data. A fully functional automated ELR system receives, processes, and stores electronic lab reports from at least one private laboratory.

Does your state have FULLY functional automated ELR?

○ Yes ○ No

◄ PREVIOUS NEXT ►

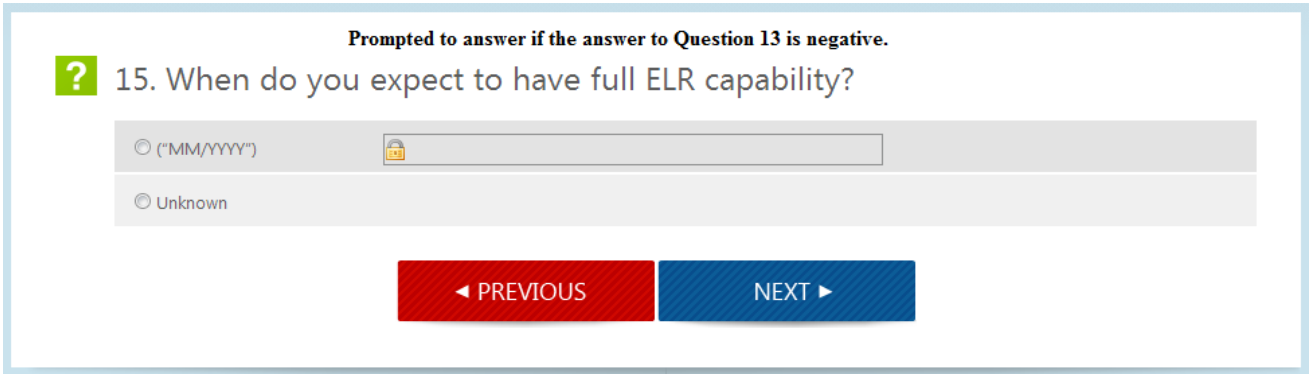


Prompted to answer if the answer to Question 13 is affirmative.

14. Since you responded Yes, your state has FULLY functional automated ELR, have you expanded the number of conditions for which you currently receive information because you have ELR?

○ Yes ○ No

◄ PREVIOUS NEXT ►



Prompted to answer if the answer to Question 13 is negative.

15. When do you expect to have full ELR capability?

○ ("MM/YYYY")

○ Unknown

◄ PREVIOUS NEXT ►

16. Does your state have a formal web-based provider disease reporting system in which providers complete a case report form on line and the data is automatically entered into the reportable disease database without re-entering the data?

○ Yes ○ No

◄ PREVIOUS NEXT ►

Prompted to answer if answer to Question 16 is affirmative.

17. How long has that reporting system been in place?

○ Less than 1 year ○ 1-3 years ○ 4-6 years ○ Greater than 6 years ○ Unknown

◄ PREVIOUS NEXT ►

Prompted to answer if answer to Question 16 is negative.

18. When do you expect to have full web-based provider reporting?

○ ("MM/YYYY")

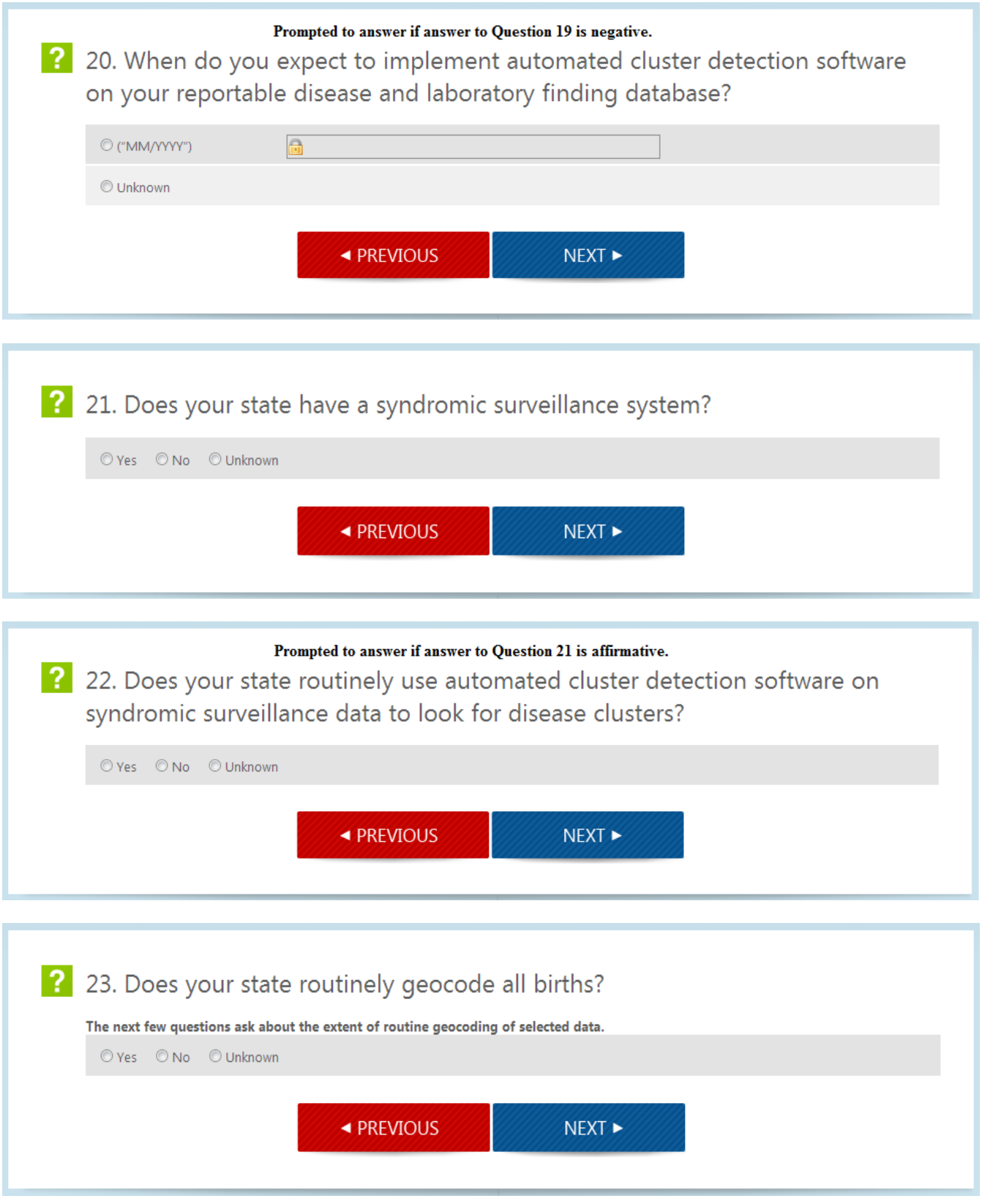
○ Unknown

◄ PREVIOUS NEXT ►

19. Does your state routinely use automated cluster detection software on reportable disease and laboratory finding case report data (not syndromic surveillance data) to look for disease clusters?

○ Yes ○ No ○ Unknown

◄ PREVIOUS NEXT ►



Prompted to answer if answer to Question 19 is negative.

20. When do you expect to implement automated cluster detection software on your reportable disease and laboratory finding database?

("MM/YYYY")

Unknown

◄ PREVIOUS NEXT ►

21. Does your state have a syndromic surveillance system?

Yes No Unknown

◄ PREVIOUS NEXT ►

Prompted to answer if answer to Question 21 is affirmative.

22. Does your state routinely use automated cluster detection software on syndromic surveillance data to look for disease clusters?

Yes No Unknown

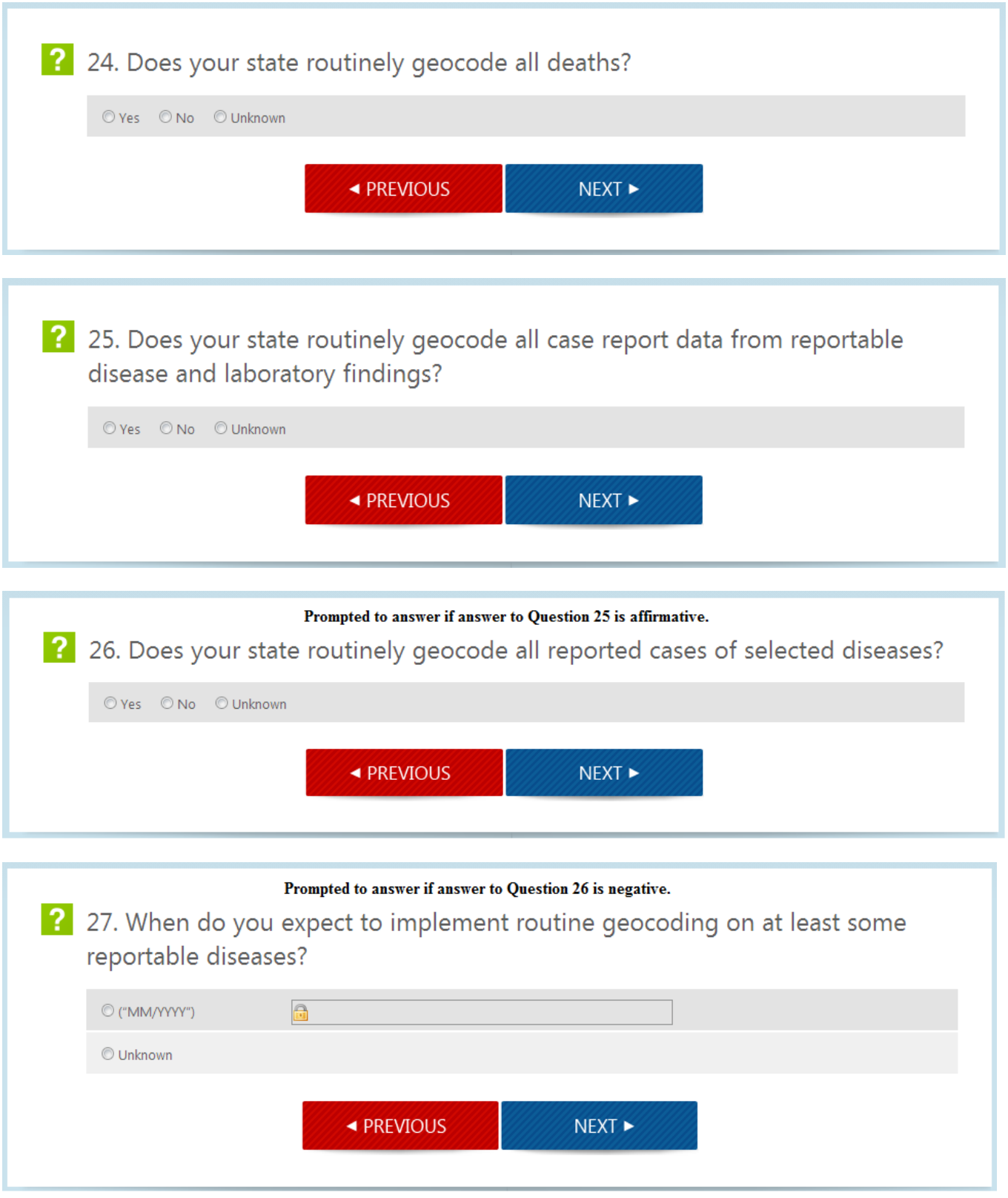
◄ PREVIOUS NEXT ►

23. Does your state routinely geocode all births?

The next few questions ask about the extent of routine geocoding of selected data.

Yes No Unknown

◄ PREVIOUS NEXT ►


24. Does your state routinely geocode all deaths?
Yes
No
Unknown
◄ PREVIOUS
NEXT ►
25. Does your state routinely geocode all case report data from reportable disease and laboratory findings?
Yes
No
Unknown
◄ PREVIOUS
NEXT ►
Prompted to answer if answer to Question 25 is affirmative.
26. Does your state routinely geocode all reported cases of selected diseases?
Yes
No
Unknown
◄ PREVIOUS
NEXT ►
Prompted to answer if answer to Question 26 is negative.
27. When do you expect to implement routine geocoding on at least some reportable diseases?
("MM/YYYY")
Unknown
◄ PREVIOUS
NEXT ►

28. Has your state done any analyses of routinely collected surveillance data using census tract level socio-economic status measures? (e.g., percent in census tract living below federal poverty level)

Yes No Unknown

◄ PREVIOUS NEXT ►

Involvement in work to make the electronic medical report a source of public health data in the future

29. Is your state actively involved in work with local medical groups to collaborate on making electronic medical records useful for public health purposes (e.g., working on automated reporting from them; working to get public health messages inserted whenever a keyword is entered)?

Yes No Unknown

◄ PREVIOUS NEXT ►

30. Preparedness: Do you utilize an Outbreak Management System?

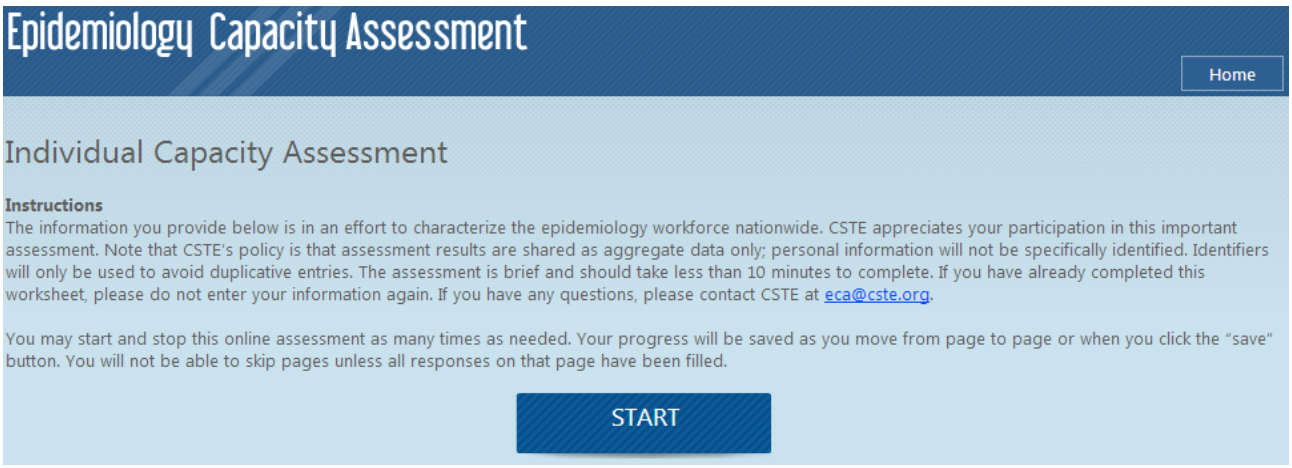
An outbreak management system supports the initial characterization, investigation, response, and containment of outbreaks through the collection and analysis of data.

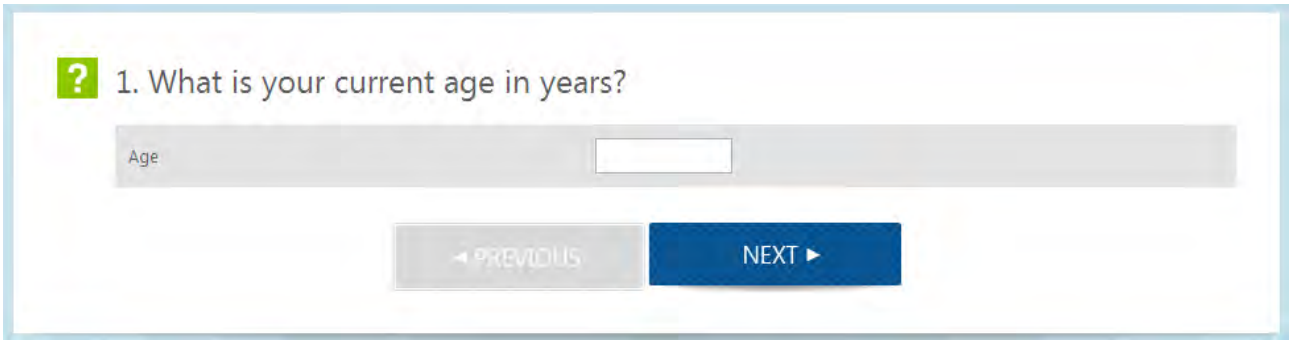
Yes No Unknown

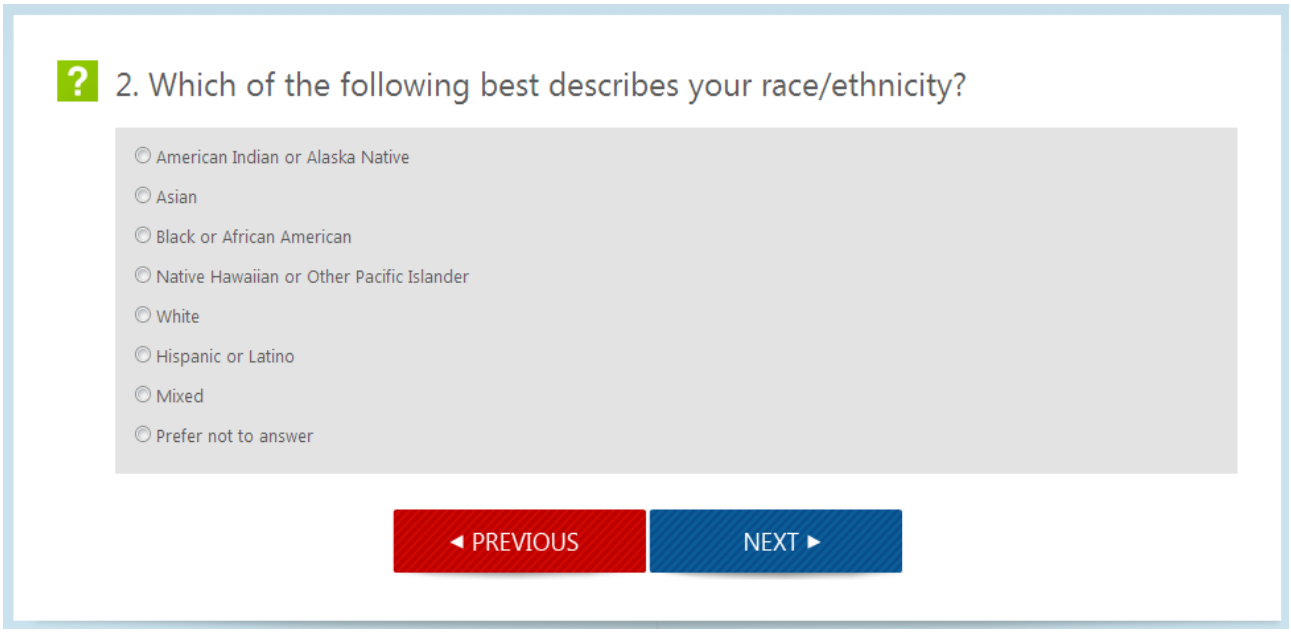
◄ PREVIOUS FINISH

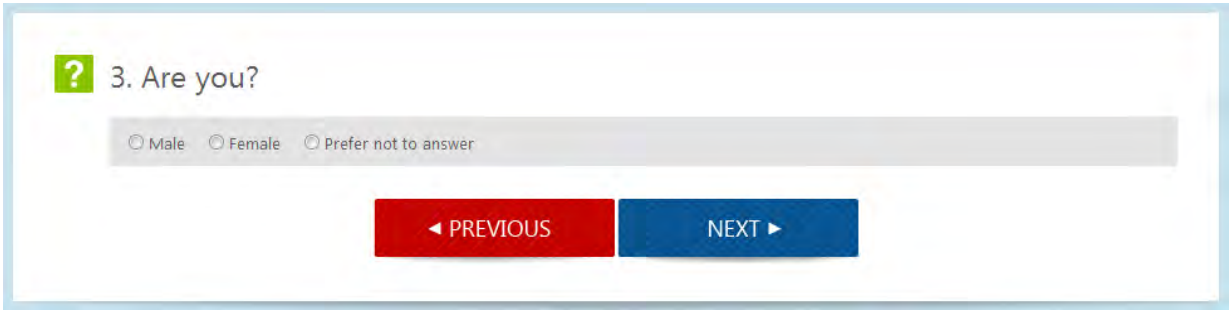
APPENDIX B

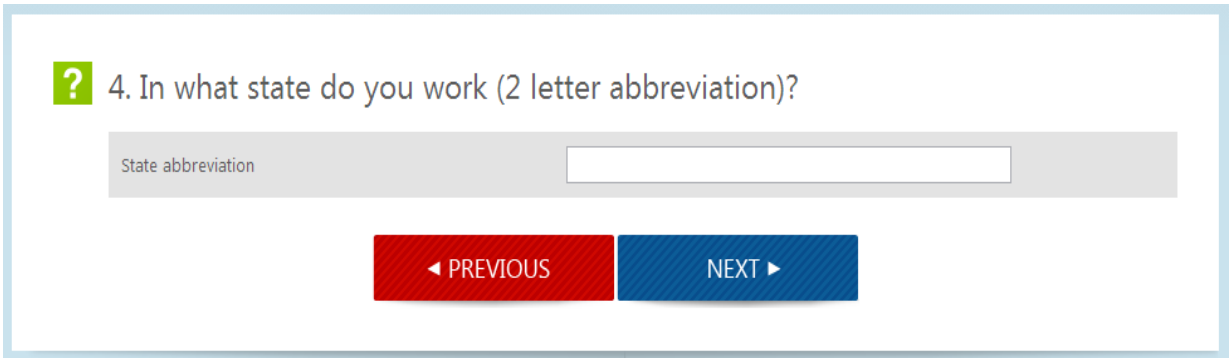
APPENDIX B: 2013 ECA INDIVIDUAL ASSESSMENT TOOL



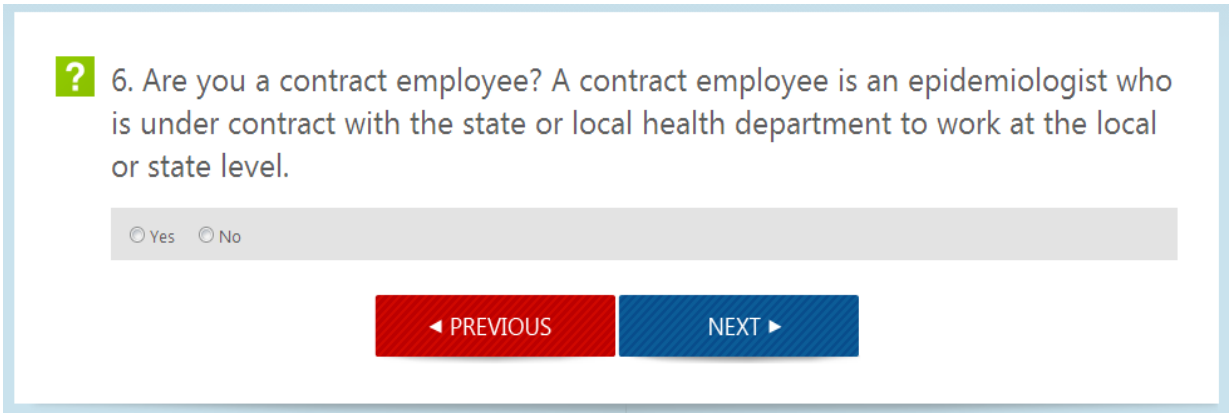





3. Are you?
Male
Female
Prefer not to answer
◄ PREVIOUS
NEXT ►


4. In what state do you work (2 letter abbreviation)?
State abbreviation
◄ PREVIOUS
NEXT ►


5. Are you a full time or part time employee?
Full time
Part time
◄ PREVIOUS
NEXT ►


6. Are you a contract employee? A contract employee is an epidemiologist who is under contract with the state or local health department to work at the local or state level.
Yes
No
◄ PREVIOUS
NEXT ►

7. In what program area(s) do you work? Please indicate the percentage of time you spend working in each program area to the nearest 10%.

Bioterrorism/Emergency Response
%

Environmental Health
%

Injury
%

Occupational Health
%

Substance Abuse
%

Chronic Disease
%

Infectious Disease
%

Maternal and Child Health
%

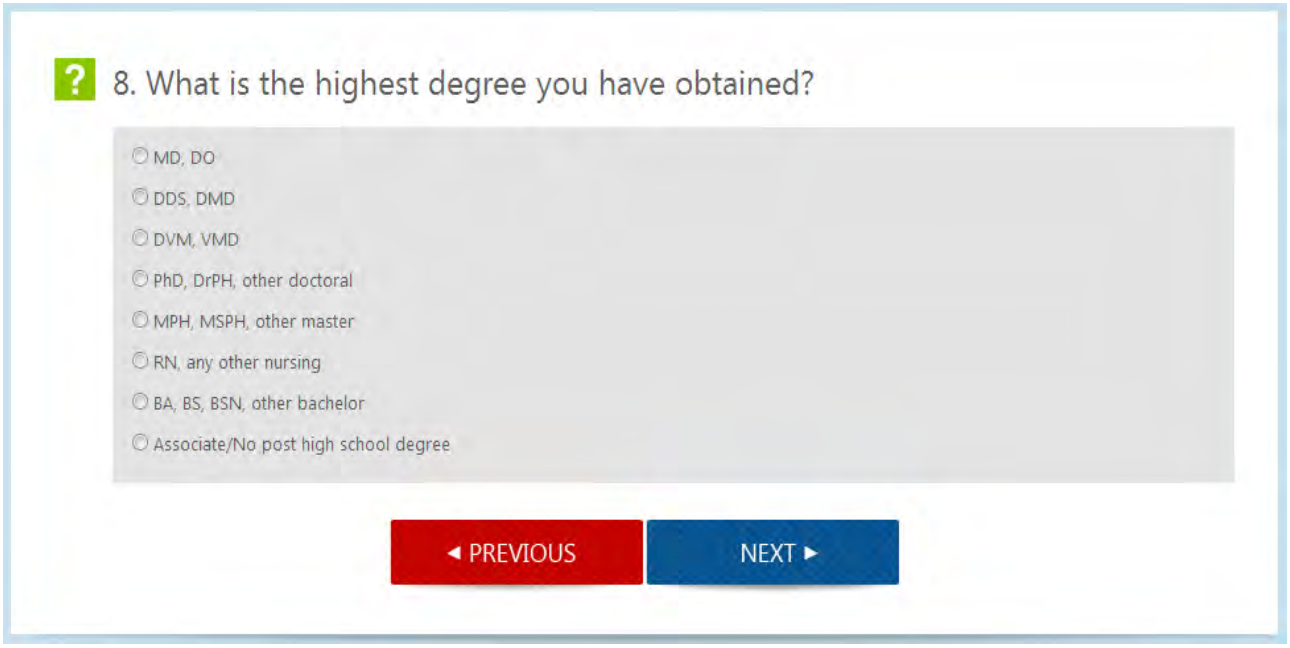
Oral Health
%

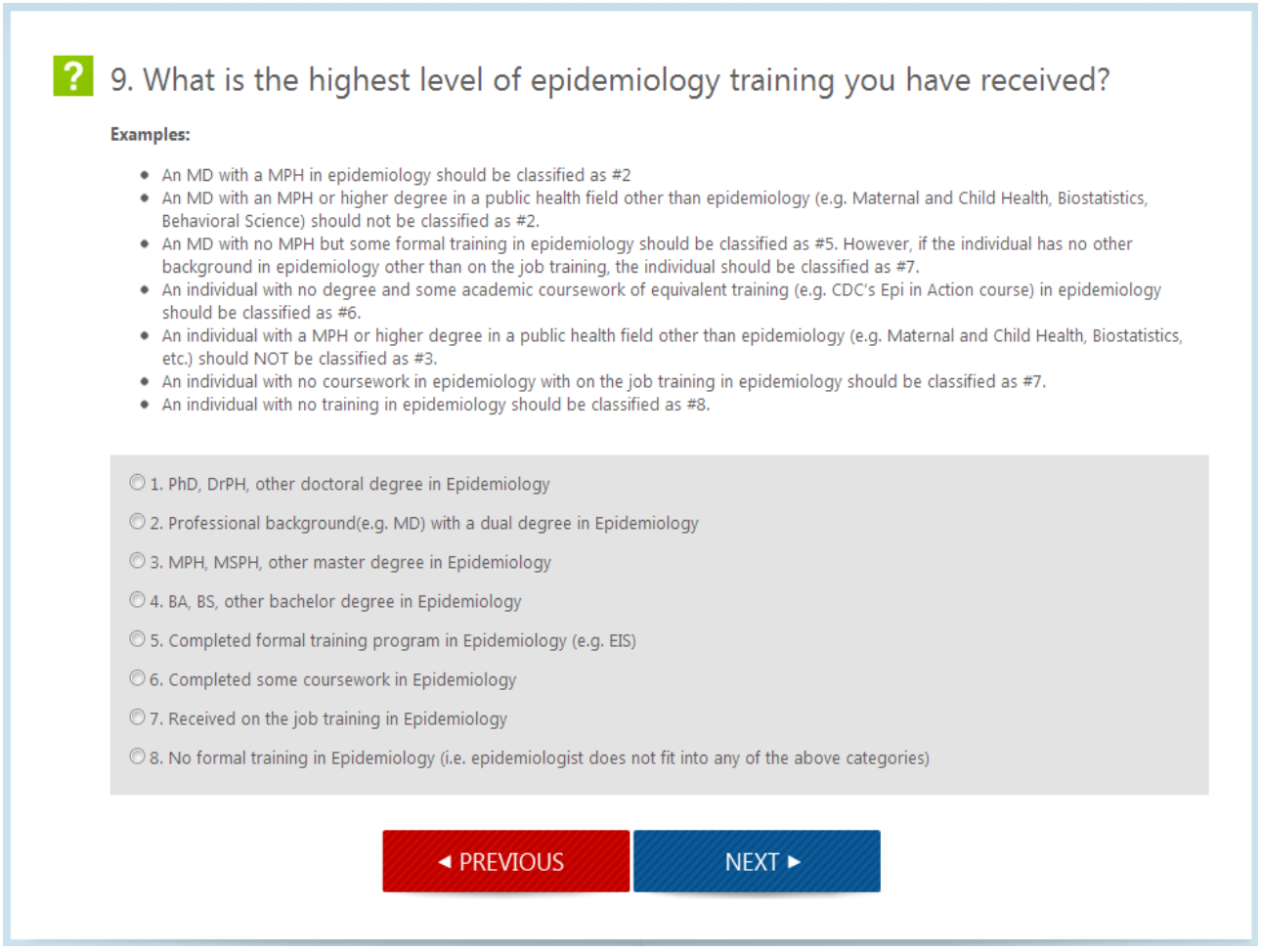
Mental Health
%

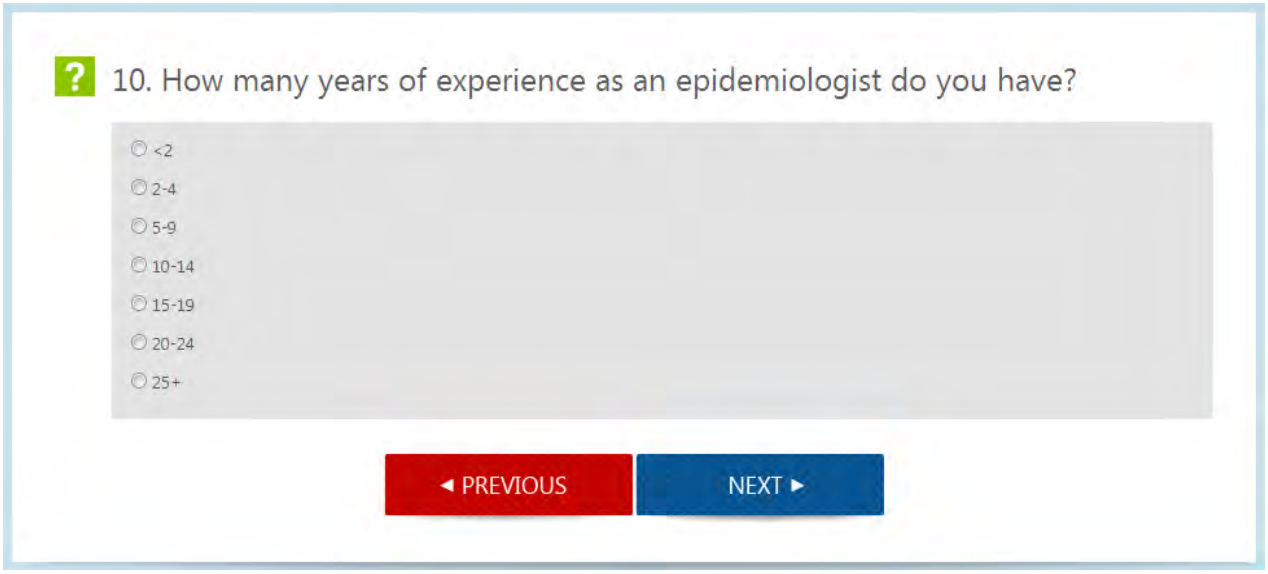
Other, please specify
%

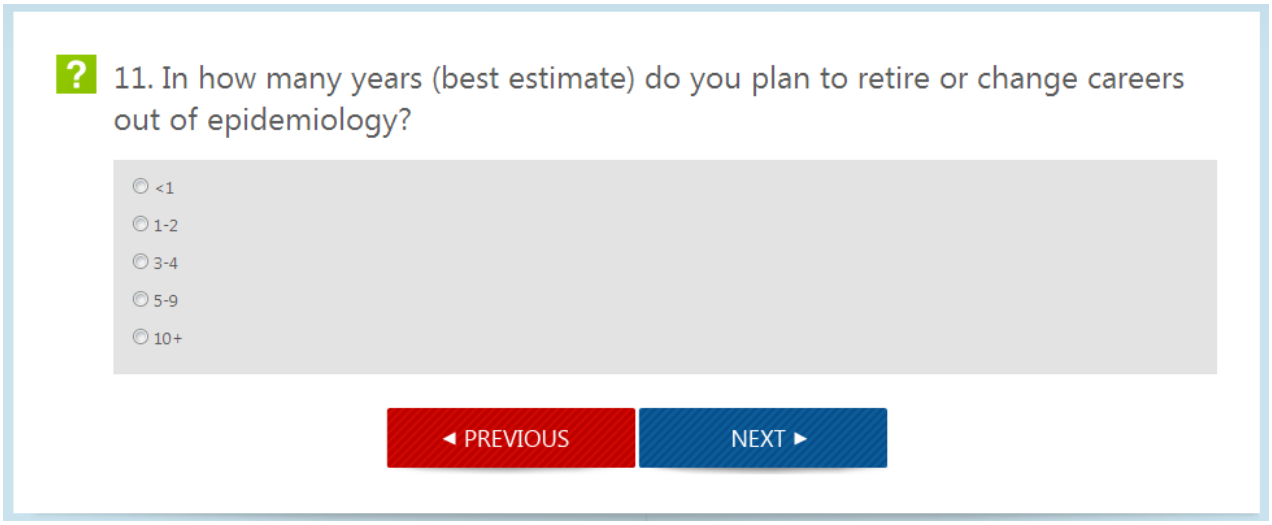
Total *'must equal 100'*

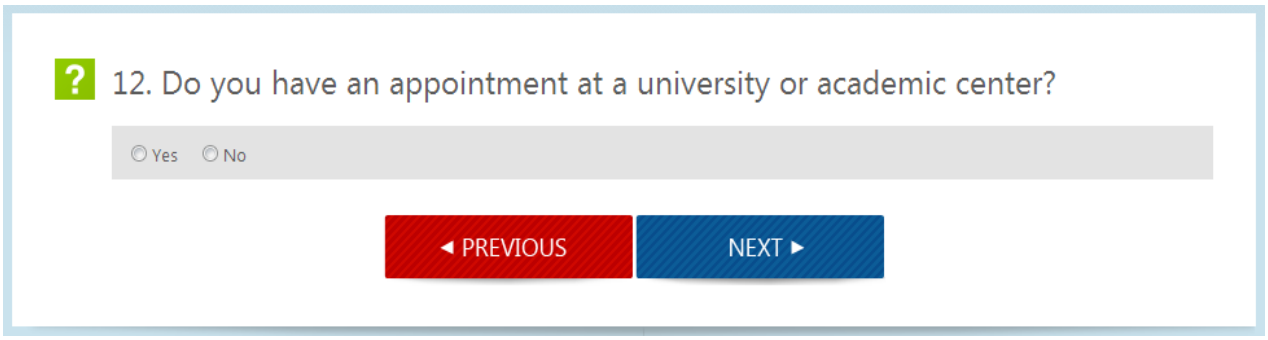
◄ PREVIOUS NEXT ►

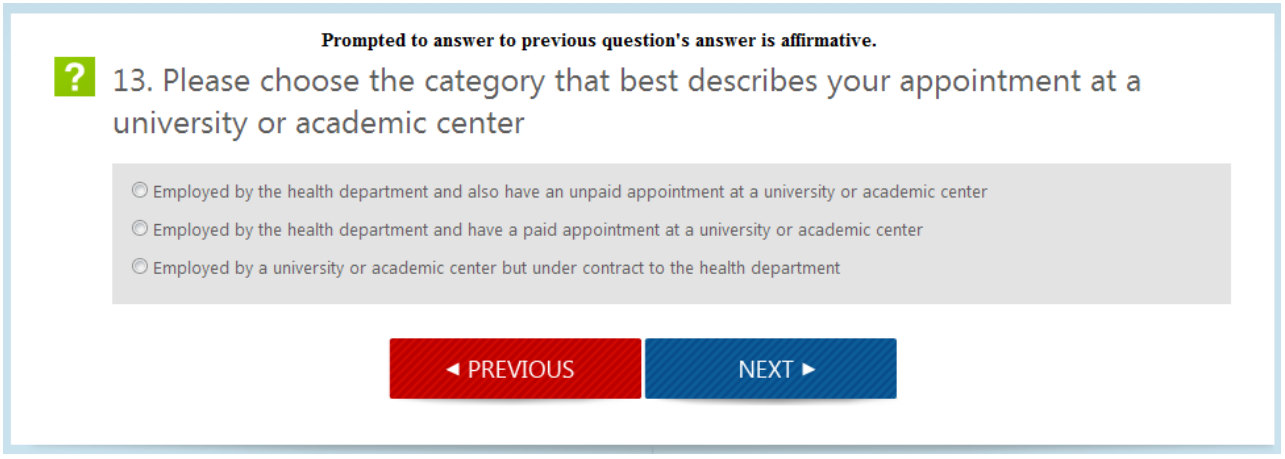

8. What is the highest degree you have obtained?
MD, DO
DDS, DMD
DVM, VMD
PhD, DrPH, other doctoral
MPH, MSPH, other master
RN, any other nursing
BA, BS, BSN, other bachelor
Associate/No post high school degree
◄ PREVIOUS
NEXT ►


9. What is the highest level of epidemiology training you have received?
Examples:
An MD with a MPH in epidemiology should be classified as #2
An MD with an MPH or higher degree in a public health field other than epidemiology (e.g. Maternal and Child Health, Biostatistics, Behavioral Science) should not be classified as #2.
An MD with no MPH but some formal training in epidemiology should be classified as #5. However, if the individual has no other background in epidemiology other than on the job training, the individual should be classified as #7.
An individual with no degree and some academic coursework of equivalent training (e.g. CDC's Epi in Action course) in epidemiology should be classified as #6.
An individual with a MPH or higher degree in a public health field other than epidemiology (e.g. Maternal and Child Health, Biostatistics, etc.) should NOT be classified as #3.
An individual with no coursework in epidemiology with on the job training in epidemiology should be classified as #7.
An individual with no training in epidemiology should be classified as #8.
1. PhD, DrPH, other doctoral degree in Epidemiology
2. Professional background(e.g. MD) with a dual degree in Epidemiology
3. MPH, MSPH, other master degree in Epidemiology
4. BA, BS, other bachelor degree in Epidemiology
5. Completed formal training program in Epidemiology (e.g. EIS)
6. Completed some coursework in Epidemiology
7. Received on the job training in Epidemiology
8. No formal training in Epidemiology (i.e. epidemiologist does not fit into any of the above categories)
◄ PREVIOUS
NEXT ►


10. How many years of experience as an epidemiologist do you have?
<2
2-4
5-9
10-14
15-19
20-24
25+
◄ PREVIOUS
NEXT ►


11. In how many years (best estimate) do you plan to retire or change careers out of epidemiology?
<1
1-2
3-4
5-9
10+
◄ PREVIOUS
NEXT ►


12. Do you have an appointment at a university or academic center?
Yes
No
◄ PREVIOUS
NEXT ►

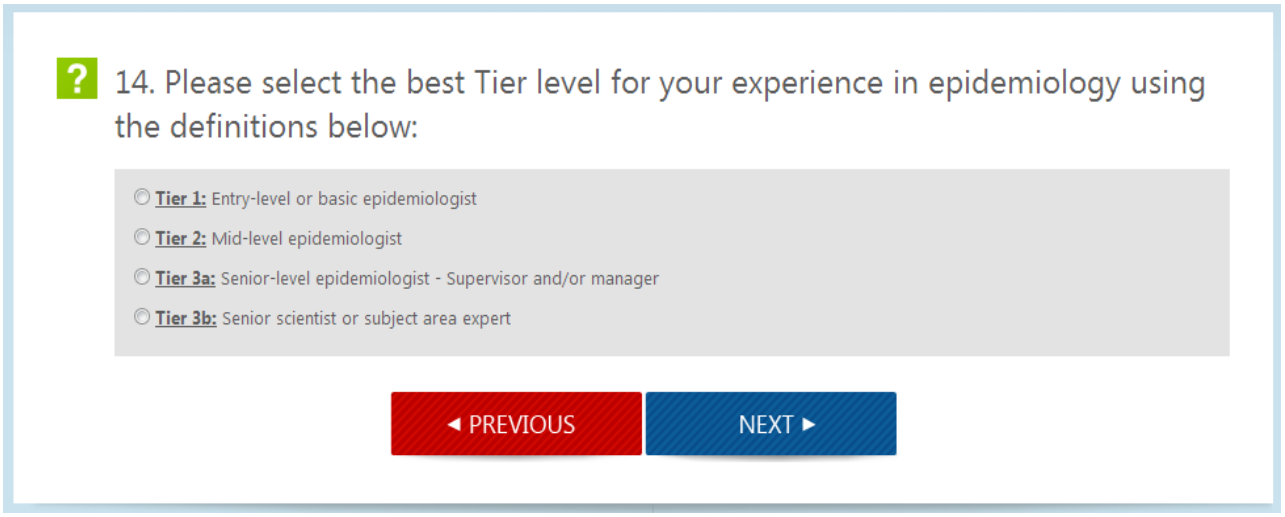


Prompted to answer to previous question's answer is affirmative.

13. Please choose the category that best describes your appointment at a university or academic center

- Employed by the health department and also have an unpaid appointment at a university or academic center
- Employed by the health department and have a paid appointment at a university or academic center
- Employed by a university or academic center but under contract to the health department

◄ PREVIOUS NEXT ►



14. Please select the best Tier level for your experience in epidemiology using the definitions below:

- **Tier 1:** Entry-level or basic epidemiologist
- **Tier 2:** Mid-level epidemiologist
- **Tier 3a:** Senior-level epidemiologist - Supervisor and/or manager
- **Tier 3b:** Senior scientist or subject area expert

◄ PREVIOUS NEXT ►

APPENDIX B: 2013 ECA INDIVIDUAL ASSESSMENT TOOL

Prompted to answer if you indicated that you are a Tier 1 Epidemiologist in the previous question.

15. Tier 1 Epidemiologist: Please use this form to indicate your level of understanding and ability to perform each of the following competencies. Again, this information is confidential and will be shared in aggregate form only. Please indicate the appropriate level of competency for each skill domain listed below and the amount of additional training needed.

Epidemiology Competency: *The competency statements below are abbreviated from the comprehensive competency statements in the Applied Epidemiology Competencies document*
When answering each competency, please use the following as references:

Competency:

- *1 = Minimal or none: You have no training or experience.*
- *2 = Basic: You have received basic training.*
- *3 = Intermediate: You have had repeated successful experiences.*
- *4 = Advanced: You can perform the actions associated with this skill without assistance.*
- *5 = Expert: You are known inside or outside the organization as an expert.*

Training:

- *1-5 scale, where 1 = less training needed, 5 = more training needed*

1, A-1 Recognize the existence of a public health problem

Competency
○ Minimal or none ○ Basic ○ Intermediate ○ Advanced ○ Expert

Additional Training Needed
○ 1 ○ 2 ○ 3 ○ 4 ○ 5

1, A-3 Collaborate with others inside and outside the agency to identify the problem

Competency
○ Minimal or none ○ Basic ○ Intermediate ○ Advanced ○ Expert

Additional Training Needed
○ 1 ○ 2 ○ 3 ○ 4 ○ 5

1, B-2 Identify surveillance data needs

Competency
○ Minimal or none ○ Basic ○ Intermediate ○ Advanced ○ Expert

Additional Training Needed
○ 1 ○ 2 ○ 3 ○ 4 ○ 5

1, B-3,4 Implement new or revise existing surveillance systems and report key surveillance findings

Competency
○ Minimal or none ○ Basic ○ Intermediate ○ Advanced ○ Expert

Additional Training Needed
○ 1 ○ 2 ○ 3 ○ 4 ○ 5

1, B-5 Support evaluation of surveillance systems

Competency
○ Minimal or none ○ Basic ○ Intermediate ○ Advanced ○ Expert

Additional Training Needed
○ 1 ○ 2 ○ 3 ○ 4 ○ 5

1, C-1,3 Assist in conducting a community health status assessment and characterizing investigative processes

Competency
○ Minimal or none ○ Basic ○ Intermediate ○ Advanced ○ Expert

Additional Training Needed
○ 1 ○ 2 ○ 3 ○ 4 ○ 5

1, C-4,5 Assist in design of investigation, including creating hypothesis

Competency
○ Minimal or none ○ Basic ○ Intermediate ○ Advanced ○ Expert

Additional Training Needed
○ 1 ○ 2 ○ 3 ○ 4 ○ 5

1, D-1 Follow ethics guidelines and principles when planning studies; conducting research; and collecting, disseminating, and using data

Competency
○ Minimal or none ○ Basic ○ Intermediate ○ Advanced ○ Expert

Additional Training Needed
○ 1 ○ 2 ○ 3 ○ 4 ○ 5

1, D-4,5 Describe human subjects research and apply Institutional Review Board (IRB) processes, as directed

Competency
○ Minimal or none ○ Basic ○ Intermediate ○ Advanced ○ Expert

Additional Training Needed
○ 1 ○ 2 ○ 3 ○ 4 ○ 5

1, D-7 Apply knowledge of privacy laws to protect confidentiality, including Health Insurance Portability and Accountability Act (HIPAA) and applicable state and local privacy laws

Competency
○ Minimal or none ○ Basic ○ Intermediate ○ Advanced ○ Expert

Additional Training Needed
○ 1 ○ 2 ○ 3 ○ 4 ○ 5

1, E-2 Maintain databases

Competency
○ Minimal or none ○ Basic ○ Intermediate ○ Advanced ○ Expert

Additional Training Needed
○ 1 ○ 2 ○ 3 ○ 4 ○ 5

1, F-1,2 Use analysis plans and analyze data

Competency
○ Minimal or none ○ Basic ○ Intermediate ○ Advanced ○ Expert

Additional Training Needed
○ 1 ○ 2 ○ 3 ○ 4 ○ 5

1, G-3 Identify key findings from the study

Competency
○ Minimal or none ○ Basic ○ Intermediate ○ Advanced ○ Expert

Additional Training Needed
○ 1 ○ 2 ○ 3 ○ 4 ○ 5

1, H-1 Define cultural/social/political framework for recommended interventions

Competency
○ Minimal or none ○ Basic ○ Intermediate ○ Advanced ○ Expert

Additional Training Needed
○ 1 ○ 2 ○ 3 ○ 4 ○ 5

1, I Assist in evaluation of programs

Competency
○ Minimal or none ○ Basic ○ Intermediate ○ Advanced ○ Expert

Additional Training Needed
○ 1 ○ 2 ○ 3 ○ 4 ○ 5

2, A Know how causes of disease affect epidemiologic practice

Competency
○ Minimal or none ○ Basic ○ Intermediate ○ Advanced ○ Expert

Additional Training Needed
○ 1 ○ 2 ○ 3 ○ 4 ○ 5

2, A-2 Apply understanding of human and environmental biology and behavioral sciences and principles to determine potential biological mechanisms of disease

Competency
○ Minimal or none ○ Basic ○ Intermediate ○ Advanced ○ Expert

Additional Training Needed
○ 1 ○ 2 ○ 3 ○ 4 ○ 5

2, B Identify the role of laboratory resources in epidemiologic activities

Competency
○ Minimal or none ○ Basic ○ Intermediate ○ Advanced ○ Expert

Additional Training Needed
○ 1 ○ 2 ○ 3 ○ 4 ○ 5

2, C Use identified informatics tools in support of epidemiologic practice

Competency
○ Minimal or none ○ Basic ○ Intermediate ○ Advanced ○ Expert

Additional Training Needed
○ 1 ○ 2 ○ 3 ○ 4 ○ 5

3. A **Prepare written and oral reports and presentations that communicate necessary information to agency staff**

Competency
○ Minimal or none ○ Basic ○ Intermediate ○ Advanced ○ Expert

Additional Training Needed
○ 1 ○ 2 ○ 3 ○ 4 ○ 5

3. B **Recognize the basic principles of risk communication**

Competency
○ Minimal or none ○ Basic ○ Intermediate ○ Advanced ○ Expert

Additional Training Needed
○ 1 ○ 2 ○ 3 ○ 4 ○ 5

3. C-1 **Demonstrate ability to listen effectively when epidemiologic finding are presented or discussed**

Competency
○ Minimal or none ○ Basic ○ Intermediate ○ Advanced ○ Expert

Additional Training Needed
○ 1 ○ 2 ○ 3 ○ 4 ○ 5

3. D **Use effective communication technologies**

Competency
○ Minimal or none ○ Basic ○ Intermediate ○ Advanced ○ Expert

Additional Training Needed
○ 1 ○ 2 ○ 3 ○ 4 ○ 5

4 **Provide epidemiologic input for community planning processes**

Competency
○ Minimal or none ○ Basic ○ Intermediate ○ Advanced ○ Expert

Additional Training Needed
○ 1 ○ 2 ○ 3 ○ 4 ○ 5

5 **Practice culturally sensitive epidemiologic activities**

Competency
○ Minimal or none ○ Basic ○ Intermediate ○ Advanced ○ Expert

Additional Training Needed
○ 1 ○ 2 ○ 3 ○ 4 ○ 5

6 **Apply appropriate fiscal and administrative guidelines to epidemiology practice**

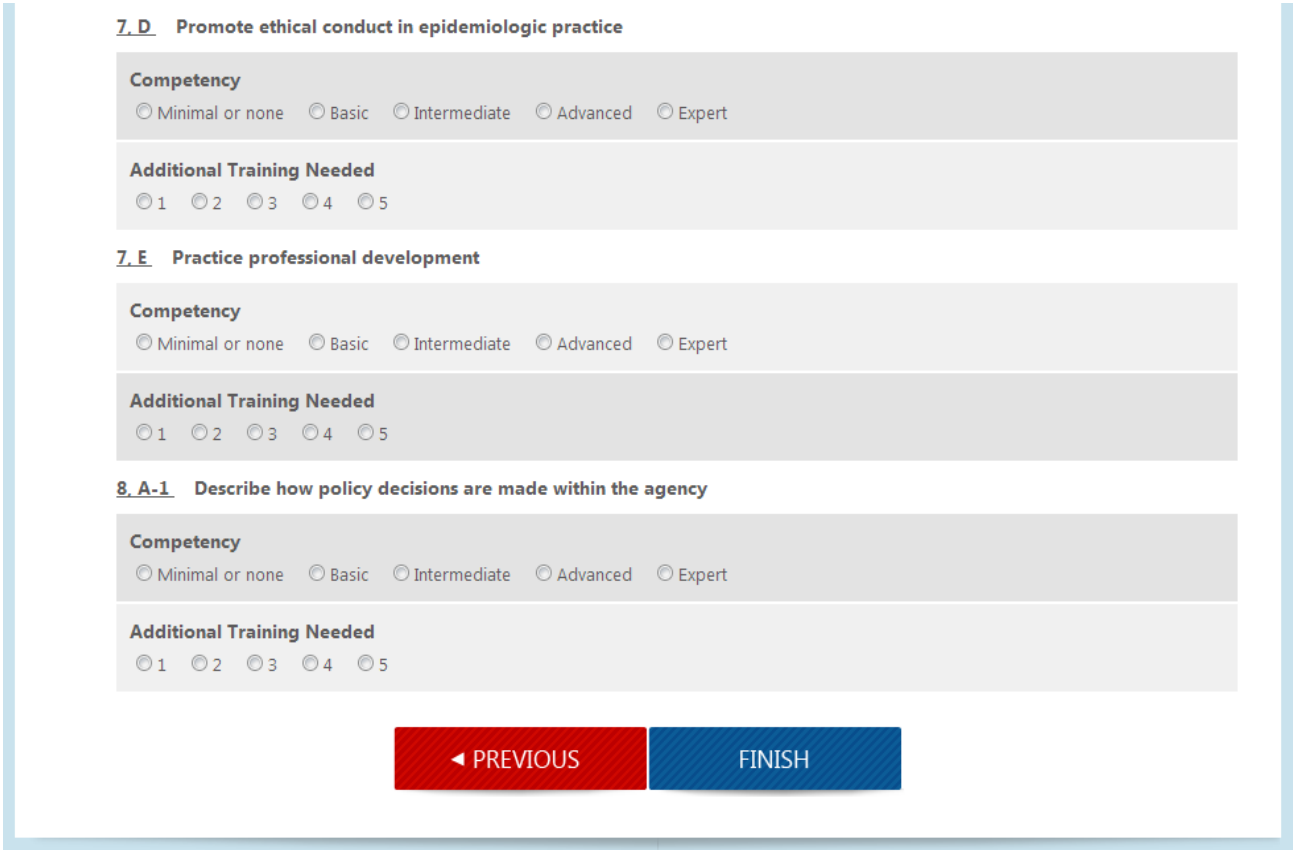
Competency
○ Minimal or none ○ Basic ○ Intermediate ○ Advanced ○ Expert

Additional Training Needed
○ 1 ○ 2 ○ 3 ○ 4 ○ 5

7. B **Support the organization's vision in all programs and activities**

Competency
○ Minimal or none ○ Basic ○ Intermediate ○ Advanced ○ Expert

Additional Training Needed
○ 1 ○ 2 ○ 3 ○ 4 ○ 5


7. D Promote ethical conduct in epidemiologic practice
Competency
Minimal or none Basic Intermediate Advanced Expert
Additional Training Needed
1 2 3 4 5
7. E Practice professional development
Competency
Minimal or none Basic Intermediate Advanced Expert
Additional Training Needed
1 2 3 4 5
8. A-1 Describe how policy decisions are made within the agency
Competency
Minimal or none Basic Intermediate Advanced Expert
Additional Training Needed
1 2 3 4 5
◄ PREVIOUS
FINISH

Prompted to answer if you indicated that you are a Tier 2 Epidemiologist in the previous Question.

16. Tier 2 Epidemiologist: Please use this form to indicate your level of understanding and ability to perform each of the following competencies. Again, this information is confidential and will be shared in aggregate form only. Please indicate the appropriate level of competency for each skill domain listed below and the amount of additional training needed.

Epidemiology Competency: *The competency statements below are abbreviated from the comprehensive competency statements in the Applied Epidemiology Competencies document*
When answering each competency, please use the following as references:

Competency:

- *1 = Minimal or none: You have no training or experience.*
- *2 = Basic: You have received basic training.*
- *3 = Intermediate: You have had repeated successful experiences.*
- *4 = Advanced: You can perform the actions associated with this skill without assistance.*
- *5 = Expert: You are known inside or outside the organization as an expert.*

Training:

- *1-5 scale, where 1 = less training needed, 5 = more training needed*

1, A-1 Use critical thinking to determine whether a public health problem exists

Competency
○ Minimal or none ○ Basic ○ Intermediate ○ Advanced ○ Expert

Additional Training Needed
○ 1 ○ 2 ○ 3 ○ 4 ○ 5

1, A-2 Articulate the need for further investigation or other public health action from literature review and assessment of current data

Competency
○ Minimal or none ○ Basic ○ Intermediate ○ Advanced ○ Expert

Additional Training Needed
○ 1 ○ 2 ○ 3 ○ 4 ○ 5

1, A-3 Collaborate with others inside and outside the agency to identify the problem and form recommendations

Competency
○ Minimal or none ○ Basic ○ Intermediate ○ Advanced ○ Expert

Additional Training Needed
○ 1 ○ 2 ○ 3 ○ 4 ○ 5

1, B-1,2 Design surveillance for a public health issue and identify surveillance data needs

Competency
○ Minimal or none ○ Basic ○ Intermediate ○ Advanced ○ Expert

Additional Training Needed
○ 1 ○ 2 ○ 3 ○ 4 ○ 5

1, B-3,4 Implement new or revise existing surveillance system and identify key surveillance findings

Competency
Minimal or none | Basic | Intermediate | Advanced | Expert

Additional Training Needed
1 | 2 | 3 | 4 | 5

1, B-5 Conduct evaluation of surveillance systems

Competency
Minimal or none | Basic | Intermediate | Advanced | Expert

Additional Training Needed
1 | 2 | 3 | 4 | 5

1, C-1,2 Conduct a community health assessment and recommend priorities of potential public health problems to be addressed

Competency
Minimal or none | Basic | Intermediate | Advanced | Expert

Additional Training Needed
1 | 2 | 3 | 4 | 5

1, C-4,5 Assist in design of an investigation, including hypothesis generation

Competency
Minimal or none | Basic | Intermediate | Advanced | Expert

Additional Training Needed
1 | 2 | 3 | 4 | 5

1, D-1 Follow ethics guidelines and principles when planning studies; conducting research; and collecting, disseminating, and using data

Competency
Minimal or none | Basic | Intermediate | Advanced | Expert

Additional Training Needed
1 | 2 | 3 | 4 | 5

1, D-3 Describe differences between public health practice and public health research

Competency
Minimal or none | Basic | Intermediate | Advanced | Expert

Additional Training Needed
1 | 2 | 3 | 4 | 5

1, D-4,5 Describe human subjects research, and apply Institutional Review Board (IRB) processes, as necessary

Competency
Minimal or none | Basic | Intermediate | Advanced | Expert

Additional Training Needed
1 | 2 | 3 | 4 | 5

1, D-7 Apply knowledge of privacy laws to protect confidentiality, including Health Insurance Portability and Accountability Act (HIPAA) and applicable state and local privacy laws

Competency
○ Minimal or none ○ Basic ○ Intermediate ○ Advanced ○ Expert

Additional Training Needed
○ 1 ○ 2 ○ 3 ○ 4 ○ 5

1, E-1,2 Define database requirements, and manage a database

Competency
○ Minimal or none ○ Basic ○ Intermediate ○ Advanced ○ Expert

Additional Training Needed
○ 1 ○ 2 ○ 3 ○ 4 ○ 5

1, F-1,2 Create analysis plans and conduct analysis of data

Competency
○ Minimal or none ○ Basic ○ Intermediate ○ Advanced ○ Expert

Additional Training Needed
○ 1 ○ 2 ○ 3 ○ 4 ○ 5

1, G-1 Apply knowledge of epidemiologic principles and methods to make recommendations regarding the validity of epidemiologic data

Competency
○ Minimal or none ○ Basic ○ Intermediate ○ Advanced ○ Expert

Additional Training Needed
○ 1 ○ 2 ○ 3 ○ 4 ○ 5

1, G-2 Assess the need for special analyses

Competency
○ Minimal or none ○ Basic ○ Intermediate ○ Advanced ○ Expert

Additional Training Needed
○ 1 ○ 2 ○ 3 ○ 4 ○ 5

1, H-1 Establish cultural/social/political framework for recommendations or interventions

Competency
○ Minimal or none ○ Basic ○ Intermediate ○ Advanced ○ Expert

Additional Training Needed
○ 1 ○ 2 ○ 3 ○ 4 ○ 5

1, H-2 Use scientific evidence in preparing recommendations for action or interventions

Competency
○ Minimal or none ○ Basic ○ Intermediate ○ Advanced ○ Expert

Additional Training Needed
○ 1 ○ 2 ○ 3 ○ 4 ○ 5

1, I-1 Assist in the development of measurable and relevant goals and objectives

Competency
○ Minimal or none ○ Basic ○ Intermediate ○ Advanced ○ Expert

Additional Training Needed
○ 1 ○ 2 ○ 3 ○ 4 ○ 5

1, I-2 Assist in the development of program logic models and theories of action

Competency
○ Minimal or none ○ Basic ○ Intermediate ○ Advanced ○ Expert

Additional Training Needed
○ 1 ○ 2 ○ 3 ○ 4 ○ 5

2, A Use current knowledge of causes of disease to guide epidemiologic practice

Competency
○ Minimal or none ○ Basic ○ Intermediate ○ Advanced ○ Expert

Additional Training Needed
○ 1 ○ 2 ○ 3 ○ 4 ○ 5

2, A-2 Apply understanding of human and environmental biology and behavioral sciences and principles to determine potential biological mechanisms of disease

Competency
○ Minimal or none ○ Basic ○ Intermediate ○ Advanced ○ Expert

Additional Training Needed
○ 1 ○ 2 ○ 3 ○ 4 ○ 5

2, B Use laboratory resources to support epidemiologic activities

Competency
○ Minimal or none ○ Basic ○ Intermediate ○ Advanced ○ Expert

Additional Training Needed
○ 1 ○ 2 ○ 3 ○ 4 ○ 5

3, A-3 Communicate epidemiologic information through giving oral presentations or contributing to the development of written documents to nonprofessional audiences

Competency
○ Minimal or none ○ Basic ○ Intermediate ○ Advanced ○ Expert

Additional Training Needed
○ 1 ○ 2 ○ 3 ○ 4 ○ 5

3, B Demonstrate the basic principles of risk communication

Competency
○ Minimal or none ○ Basic ○ Intermediate ○ Advanced ○ Expert

Additional Training Needed
○ 1 ○ 2 ○ 3 ○ 4 ○ 5

3. D Use effective communication technologies

Competency
○ Minimal or none ○ Basic ○ Intermediate ○ Advanced ○ Expert

Additional Training Needed
○ 1 ○ 2 ○ 3 ○ 4 ○ 5

4. Provide epidemiologic input for community planning processes

Competency
○ Minimal or none ○ Basic ○ Intermediate ○ Advanced ○ Expert

Additional Training Needed
○ 1 ○ 2 ○ 3 ○ 4 ○ 5

5. Practice culturally sensitive epidemiologic activities

Competency
○ Minimal or none ○ Basic ○ Intermediate ○ Advanced ○ Expert

Additional Training Needed
○ 1 ○ 2 ○ 3 ○ 4 ○ 5

6. Apply appropriate fiscal and administrative guidelines to epidemiology practice

Competency
○ Minimal or none ○ Basic ○ Intermediate ○ Advanced ○ Expert

Additional Training Needed
○ 1 ○ 2 ○ 3 ○ 4 ○ 5

7. D Promote ethical conduct in epidemiologic practice

Competency
○ Minimal or none ○ Basic ○ Intermediate ○ Advanced ○ Expert

Additional Training Needed
○ 1 ○ 2 ○ 3 ○ 4 ○ 5

7 & 8. Use leadership and systems thinking in epidemiologic planning and policy development

Competency
○ Minimal or none ○ Basic ○ Intermediate ○ Advanced ○ Expert

Additional Training Needed
○ 1 ○ 2 ○ 3 ○ 4 ○ 5

◄ PREVIOUS FINISH

Prompted to answer if you indicated that you are a Tier 3a Epidemiologist in the previous question.

17. Tier 3a Epidemiologist: Please use this form to indicate your level of understanding and ability to perform each of the following competencies. Again, this information is confidential and will be shared in aggregate form only. Please indicate the appropriate level of competency for each skill domain listed below and the amount of additional training needed.

Epidemiology Competency: *The competency statements below are abbreviated from the comprehensive competency statements in the Applied Epidemiology Competencies document*
When answering each competency, please use the following as references:

Competency:

- *1 = Minimal or none: You have no training or experience.*
- *2 = Basic: You have received basic training.*
- *3 = Intermediate: You have had repeated successful experiences.*
- *4 = Advanced: You can perform the actions associated with this skill without assistance.*
- *5 = Expert: You are known inside or outside the organization as an expert.*

Training:

- *1-5 scale, where 1 = less training needed, 5 = more training needed*

1. A Ensure identification of public health problems pertinent to the population

Competency
○ Minimal or none ○ Basic ○ Intermediate ○ Advanced ○ Expert

Additional Training Needed
○ 1 ○ 2 ○ 3 ○ 4 ○ 5

1. B Oversee surveillance activities

Competency
○ Minimal or none ○ Basic ○ Intermediate ○ Advanced ○ Expert

Additional Training Needed
○ 1 ○ 2 ○ 3 ○ 4 ○ 5

1. C Ensure investigation of acute and chronic conditions or other adverse outcomes in the population

Competency
○ Minimal or none ○ Basic ○ Intermediate ○ Advanced ○ Expert

Additional Training Needed
○ 1 ○ 2 ○ 3 ○ 4 ○ 5

1. D Ensure study design and data collection, dissemination, and of use ethical and legal principles

Competency
○ Minimal or none ○ Basic ○ Intermediate ○ Advanced ○ Expert

Additional Training Needed
○ 1 ○ 2 ○ 3 ○ 4 ○ 5

1, E Ensure management of data from surveillance, investigations, or other sources

Competency
○ Minimal or none ○ Basic ○ Intermediate ○ Advanced ○ Expert

Additional Training Needed
○ 1 ○ 2 ○ 3 ○ 4 ○ 5

1, F Evaluate analysis of data from an epidemiologic investigation or study

Competency
○ Minimal or none ○ Basic ○ Intermediate ○ Advanced ○ Expert

Additional Training Needed
○ 1 ○ 2 ○ 3 ○ 4 ○ 5

1, G Evaluate conclusions and interpretations from investigations

Competency
○ Minimal or none ○ Basic ○ Intermediate ○ Advanced ○ Expert

Additional Training Needed
○ 1 ○ 2 ○ 3 ○ 4 ○ 5

1, H Determine evidence-based interventions and control measures in response to epidemiologic findings

Competency
○ Minimal or none ○ Basic ○ Intermediate ○ Advanced ○ Expert

Additional Training Needed
○ 1 ○ 2 ○ 3 ○ 4 ○ 5

1, I Ensure evaluation of programs

Competency
○ Minimal or none ○ Basic ○ Intermediate ○ Advanced ○ Expert

Additional Training Needed
○ 1 ○ 2 ○ 3 ○ 4 ○ 5

2, Use basic public health sciences in epidemiologic practice

Competency
○ Minimal or none ○ Basic ○ Intermediate ○ Advanced ○ Expert

Additional Training Needed
○ 1 ○ 2 ○ 3 ○ 4 ○ 5

2, A-2 Ensure the application of understanding of human and environmental biology and behavioral sciences and principles to determine biological mechanisms of disease

Competency
○ Minimal or none ○ Basic ○ Intermediate ○ Advanced ○ Expert

Additional Training Needed
○ 1 ○ 2 ○ 3 ○ 4 ○ 5

2. B Ensure the use of laboratory resources to support epidemiologic activities

Competency
○ Minimal or none ○ Basic ○ Intermediate ○ Advanced ○ Expert

Additional Training Needed
○ 1 ○ 2 ○ 3 ○ 4 ○ 5

2. C Ensure application of principles of informatics, including data collection, processing, and analysis, in support of epidemiologic practice

Competency
○ Minimal or none ○ Basic ○ Intermediate ○ Advanced ○ Expert

Additional Training Needed
○ 1 ○ 2 ○ 3 ○ 4 ○ 5

2. D Develop and manage information systems to improve effectiveness of surveillance, investigation, and other epidemiologic practices

Competency
○ Minimal or none ○ Basic ○ Intermediate ○ Advanced ○ Expert

Additional Training Needed
○ 1 ○ 2 ○ 3 ○ 4 ○ 5

3. A,B Ensure preparation of written and oral reports and presentations to professional and nonprofessional audiences and ensure basic principles of risk communications are followed

Competency
○ Minimal or none ○ Basic ○ Intermediate ○ Advanced ○ Expert

Additional Training Needed
○ 1 ○ 2 ○ 3 ○ 4 ○ 5

3. C Model interpersonal skills in communication with agency personnel, colleagues, and the public

Competency
○ Minimal or none ○ Basic ○ Intermediate ○ Advanced ○ Expert

Additional Training Needed
○ 1 ○ 2 ○ 3 ○ 4 ○ 5

3. D-2 Enforce policies that address security, privacy, and legal considerations when communicating epidemiologic information

Competency
○ Minimal or none ○ Basic ○ Intermediate ○ Advanced ○ Expert

Additional Training Needed
○ 1 ○ 2 ○ 3 ○ 4 ○ 5

4. Lead community public health planning processes

Competency
○ Minimal or none ○ Basic ○ Intermediate ○ Advanced ○ Expert

Additional Training Needed
○ 1 ○ 2 ○ 3 ○ 4 ○ 5

5. Practice culturally sensitive epidemiologic activities

Competency
○ Minimal or none ○ Basic ○ Intermediate ○ Advanced ○ Expert

Additional Training Needed
○ 1 ○ 2 ○ 3 ○ 4 ○ 5

6. A Create operational and financial plans for future epidemiologic activities

Competency
○ Minimal or none ○ Basic ○ Intermediate ○ Advanced ○ Expert

Additional Training Needed
○ 1 ○ 2 ○ 3 ○ 4 ○ 5

6. B Formulate a fiscally sound budget that will support the activities defined in the operational plan and is consistent with the financial rules of the agency

Competency
○ Minimal or none ○ Basic ○ Intermediate ○ Advanced ○ Expert

Additional Training Needed
○ 1 ○ 2 ○ 3 ○ 4 ○ 5

6. C Oversee implementation of operational and financial plans

Competency
○ Minimal or none ○ Basic ○ Intermediate ○ Advanced ○ Expert

Additional Training Needed
○ 1 ○ 2 ○ 3 ○ 4 ○ 5

6. D Develop requests for extramural funding to support additional epidemiologic activities and special projects

Competency
○ Minimal or none ○ Basic ○ Intermediate ○ Advanced ○ Expert

Additional Training Needed
○ 1 ○ 2 ○ 3 ○ 4 ○ 5

6. E Use management skills

Competency
○ Minimal or none ○ Basic ○ Intermediate ○ Advanced ○ Expert

Additional Training Needed
○ 1 ○ 2 ○ 3 ○ 4 ○ 5

6. F Promote collaborations, strong partnerships, and team-building to accomplish epidemiology program objectives

Competency
○ Minimal or none ○ Basic ○ Intermediate ○ Advanced ○ Expert

Additional Training Needed
○ 1 ○ 2 ○ 3 ○ 4 ○ 5

7. A **Promote the epidemiologic perspective in the agency strategic planning process**

Competency
○ Minimal or none ○ Basic ○ Intermediate ○ Advanced ○ Expert

Additional Training Needed
○ 1 ○ 2 ○ 3 ○ 4 ○ 5

7. B **Lead the creation of the epidemiologic program's vision in the context of the agency's plan**

Competency
○ Minimal or none ○ Basic ○ Intermediate ○ Advanced ○ Expert

Additional Training Needed
○ 1 ○ 2 ○ 3 ○ 4 ○ 5

7. C **Use performance measures to evaluate and improve program effectiveness**

Competency
○ Minimal or none ○ Basic ○ Intermediate ○ Advanced ○ Expert

Additional Training Needed
○ 1 ○ 2 ○ 3 ○ 4 ○ 5

7. D **Promote ethical conduct in epidemiology practice**

Competency
○ Minimal or none ○ Basic ○ Intermediate ○ Advanced ○ Expert

Additional Training Needed
○ 1 ○ 2 ○ 3 ○ 4 ○ 5

7. E **Ensure professional development of epidemiology workforce**

Competency
○ Minimal or none ○ Basic ○ Intermediate ○ Advanced ○ Expert

Additional Training Needed
○ 1 ○ 2 ○ 3 ○ 4 ○ 5

7. F **Lead epidemiology unit in preparing for emergency response**

Competency
○ Minimal or none ○ Basic ○ Intermediate ○ Advanced ○ Expert

Additional Training Needed
○ 1 ○ 2 ○ 3 ○ 4 ○ 5

8. A **Bring epidemiologic perspective in the development and analysis of public health policies**

Competency
○ Minimal or none ○ Basic ○ Intermediate ○ Advanced ○ Expert

Additional Training Needed
○ 1 ○ 2 ○ 3 ○ 4 ○ 5

◄ PREVIOUS FINISH

Prompted to answer if you indicated that you are a Tier 3b Epidemiologist in the previous question.

18. Tier 3b Epidemiologist: Please use this form to indicate your level of understanding and ability to perform each of the following competencies. Again, this information is confidential and will be shared in aggregate form only. Please indicate the appropriate level of competency for each skill domain listed below and the amount of additional training needed.

Epidemiology Competency: *The competency statements below are abbreviated from the comprehensive competency statements in the Applied Epidemiology Competencies document*
When answering each competency, please use the following as references:

Competency:

- *1 = Minimal or none: You have no training or experience.*
- *2 = Basic: You have received basic training.*
- *3 = Intermediate: You have had repeated successful experiences.*
- *4 = Advanced: You can perform the actions associated with this skill without assistance.*
- *5 = Expert: You are known inside or outside the organization as an expert.*

Training:

- *1-5 scale, where 1 = less training needed, 5 = more training needed*

1. A Validate identification of public health problems pertinent to the population

Competency
○ Minimal or none ○ Basic ○ Intermediate ○ Advanced ○ Expert

Additional Training Needed
○ 1 ○ 2 ○ 3 ○ 4 ○ 5

1. B Organize surveillance

Competency
○ Minimal or none ○ Basic ○ Intermediate ○ Advanced ○ Expert

Additional Training Needed
○ 1 ○ 2 ○ 3 ○ 4 ○ 5

1. C Design investigation of acute and chronic conditions or other adverse outcomes in the population

Competency
○ Minimal or none ○ Basic ○ Intermediate ○ Advanced ○ Expert

Additional Training Needed
○ 1 ○ 2 ○ 3 ○ 4 ○ 5

1. D Synthesize principles of good ethical/legal practice for application to study design and data collection, dissemination, and use

Competency
○ Minimal or none ○ Basic ○ Intermediate ○ Advanced ○ Expert

Additional Training Needed
○ 1 ○ 2 ○ 3 ○ 4 ○ 5

1. E Manage data from surveillance, investigations, or other sources

Competency
○ Minimal or none ○ Basic ○ Intermediate ○ Advanced ○ Expert

Additional Training Needed
○ 1 ○ 2 ○ 3 ○ 4 ○ 5

1. F Evaluate data from an epidemiologic investigation or study

Competency
○ Minimal or none ○ Basic ○ Intermediate ○ Advanced ○ Expert

Additional Training Needed
○ 1 ○ 2 ○ 3 ○ 4 ○ 5

1. G Evaluate results of data analysis and interpret conclusions

Competency
○ Minimal or none ○ Basic ○ Intermediate ○ Advanced ○ Expert

Additional Training Needed
○ 1 ○ 2 ○ 3 ○ 4 ○ 5

1. H Formulate new interventions on the basis of evidence, when available, and control measures in response to epidemiologic findings

Competency
○ Minimal or none ○ Basic ○ Intermediate ○ Advanced ○ Expert

Additional Training Needed
○ 1 ○ 2 ○ 3 ○ 4 ○ 5

1. I Evaluate programs

Competency
○ Minimal or none ○ Basic ○ Intermediate ○ Advanced ○ Expert

Additional Training Needed
○ 1 ○ 2 ○ 3 ○ 4 ○ 5

2. Use basic public health sciences in epidemiologic practice

Competency
○ Minimal or none ○ Basic ○ Intermediate ○ Advanced ○ Expert

Additional Training Needed
○ 1 ○ 2 ○ 3 ○ 4 ○ 5

2. A-2 Ensure application of understanding of human and environmental biology and behavioral sciences and principles to determine biological mechanisms of disease

Competency
○ Minimal or none ○ Basic ○ Intermediate ○ Advanced ○ Expert

Additional Training Needed
○ 1 ○ 2 ○ 3 ○ 4 ○ 5

2. B Develop processes for using laboratory resources to support epidemiologic activities

Competency
○ Minimal or none ○ Basic ○ Intermediate ○ Advanced ○ Expert

Additional Training Needed
○ 1 ○ 2 ○ 3 ○ 4 ○ 5

2. C Apply principles of informatics, including data collection, processing, and analysis, in support of epidemiologic practice

Competency
○ Minimal or none ○ Basic ○ Intermediate ○ Advanced ○ Expert

Additional Training Needed
○ 1 ○ 2 ○ 3 ○ 4 ○ 5

3. A Organize preparation of written and oral presentations that communicate necessary information to professional audiences, policymakers, and the general public

Competency
○ Minimal or none ○ Basic ○ Intermediate ○ Advanced ○ Expert

Additional Training Needed
○ 1 ○ 2 ○ 3 ○ 4 ○ 5

3. C Model interpersonal skills in communications with agency personnel, colleagues, and the public

Competency
○ Minimal or none ○ Basic ○ Intermediate ○ Advanced ○ Expert

Additional Training Needed
○ 1 ○ 2 ○ 3 ○ 4 ○ 5

3. D-2 Develop as-needed policies that address security, privacy, and legal considerations when communicating epidemiologic information

Competency
○ Minimal or none ○ Basic ○ Intermediate ○ Advanced ○ Expert

Additional Training Needed
○ 1 ○ 2 ○ 3 ○ 4 ○ 5

4. Lead community public health planning processes

Competency
○ Minimal or none ○ Basic ○ Intermediate ○ Advanced ○ Expert

Additional Training Needed
○ 1 ○ 2 ○ 3 ○ 4 ○ 5

5. Practice culturally sensitive epidemiologic activities

Competency
○ Minimal or none ○ Basic ○ Intermediate ○ Advanced ○ Expert

Additional Training Needed
○ 1 ○ 2 ○ 3 ○ 4 ○ 5

6. A **Conduct epidemiologic activities within the financial and operational plan of the agency**

Competency
○ Minimal or none ○ Basic ○ Intermediate ○ Advanced ○ Expert

Additional Training Needed
○ 1 ○ 2 ○ 3 ○ 4 ○ 5

6. B **Describe financial and budgetary processes of the agency**

Competency
○ Minimal or none ○ Basic ○ Intermediate ○ Advanced ○ Expert

Additional Training Needed
○ 1 ○ 2 ○ 3 ○ 4 ○ 5

6. C **Implement operational and financial plans for assigned projects**

Competency
○ Minimal or none ○ Basic ○ Intermediate ○ Advanced ○ Expert

Additional Training Needed
○ 1 ○ 2 ○ 3 ○ 4 ○ 5

6. D **Prepare proposals for extramural funding for review and input from managers**

Competency
○ Minimal or none ○ Basic ○ Intermediate ○ Advanced ○ Expert

Additional Training Needed
○ 1 ○ 2 ○ 3 ○ 4 ○ 5

6. F **Use skills that foster collaborations, strong partnerships, and team-building to accomplish epidemiology program objectives**

Competency
○ Minimal or none ○ Basic ○ Intermediate ○ Advanced ○ Expert

Additional Training Needed
○ 1 ○ 2 ○ 3 ○ 4 ○ 5

7. A **Promote the epidemiologic perspective in the agency strategic planning process**

Competency
○ Minimal or none ○ Basic ○ Intermediate ○ Advanced ○ Expert

Additional Training Needed
○ 1 ○ 2 ○ 3 ○ 4 ○ 5

7. B **Promote the organization's vision in all epidemiologic program activities**

Competency
○ Minimal or none ○ Basic ○ Intermediate ○ Advanced ○ Expert

Additional Training Needed
○ 1 ○ 2 ○ 3 ○ 4 ○ 5

7. C **Use performance measures to evaluate and improve program effectiveness**

Competency

○ Minimal or none ○ Basic ○ Intermediate ○ Advanced ○ Expert

Additional Training Needed

○ 1 ○ 2 ○ 3 ○ 4 ○ 5

7. D **Promote ethical conduct in the epidemiology practice**

Competency

○ Minimal or none ○ Basic ○ Intermediate ○ Advanced ○ Expert

Additional Training Needed

○ 1 ○ 2 ○ 3 ○ 4 ○ 5

7. E **Promote epidemiology workforce development**

Competency

○ Minimal or none ○ Basic ○ Intermediate ○ Advanced ○ Expert

Additional Training Needed

○ 1 ○ 2 ○ 3 ○ 4 ○ 5

7. F **Prepare for emergency response**

Competency

○ Minimal or none ○ Basic ○ Intermediate ○ Advanced ○ Expert

Additional Training Needed

○ 1 ○ 2 ○ 3 ○ 4 ○ 5

8. A **Bring epidemiologic perspective in the development and analysis of public health policies**

Competency

○ Minimal or none ○ Basic ○ Intermediate ○ Advanced ○ Expert

Additional Training Needed

○ 1 ○ 2 ○ 3 ○ 4 ○ 5

◄ PREVIOUS FINISH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