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CDC's "Flexible" Epidemiologist: A Strategy for Enhancing Health Department Infectious Disease Epidemiology Capacity

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Abstract

Context: CDC's Epidemiology and Laboratory Capacity for Infectious Diseases (ELC) Cooperative Agreement aims to help health departments strengthen core epidemiology capacity needed to respond to a variety of emerging infectious diseases. In fiscal year 2014, \$6 million was awarded to 41 health departments for flexible epidemiologists (FEs). FEs were intended to help meet health departments' unique needs and support unanticipated events that could require the diversion of resources to specific emerging or reemerging diseases.

Objective: Explore multiple perspectives to characterize how FEs are utilized and to understand the perceived value of this strategy from the health department perspective.

Design, Setting, and Participants: We conducted 14 in-depth interviews using a semistructured questionnaire with a heterogeneous sample of 8 state health departments; 2 different instruments were administered to ELC principal investigators (PIs) or supervisors, and FEs. The team produced a codebook consisting of both structural and data-driven codes to prepare for a thematic analysis of the data.

Results: Three major patterns emerged to describe how FEs are being used in health departments; most commonly, FEs were used to support priorities and gaps across a range of infectious diseases, with an emphasis on enteric diseases. Almost all of the health departments utilized FEs to assist in investigating and responding to outbreaks, maintaining and upgrading surveillance systems, and coordinating and collaborating with partners. Both PIs and supervisors highly valued the flexibility it offered to their programs because FEs were cross-trained and could be used to help with situations where additional staff members were needed.

Conclusion: ELC enhances epidemiology capacity in health departments by providing flexible personnel that help sustain areas with losses in capacity, addressing programmatic gaps, and

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supporting unanticipated events. Our findings support the notion that flexible personnel could be an effective model for strengthening epidemiology capacity among health departments.

Implications for Policy & Practice: Our findings have practical implications for addressing the overall decline in the public health workforce, as well as the current context and environment of public health funding at both state and federal levels.

Keywords

capacity building; epidemiology; program evaluation; state health department

Infectious diseases, once thought to have been eradicated because of the advent of modern medicine and technology, continue to be a major threat to the public's health in the United States.¹ The emergence and reemergence of infectious diseases have been attributed to a number of factors, namely, demographics and behavior, travel and commerce, changes in weather and climate, as well as a host of other socioeconomic, environmental, and ecological factors.¹⁻³ The complexity of these factors and the new challenges that these infectious diseases pose to public health require adequate support for the detection, response, and control of infectious disease outbreaks. To meet these demands, maintaining adequate epidemiology capacity is vital.

State and local epidemiologists working in health departments are critical personnel needed to maintain sufficient epidemiology capacity and play an important role in conducting 4 of the 10 essential services of public health.⁴ However, the number of epidemiologists working in health departments has not been stable. From 2006 to 2009, health departments experienced a reduction in the total number of applied epidemiologists by 10%, from 2436 to 2193 epidemiologists.⁵ In the 3 years prior to this drop (2004–2006), the decline was only 2.5%.⁵ Reductions in federal public health preparedness funding in 2006 and the national economic recession in 2008 likely played a role in reducing state budgets for the public health workforce.⁶ Moreover, reductions were not isolated to the epidemiology workforce; since 2008, the overall public health workforce saw a decline by 19%, translating to a loss of more than 51 000 state and local public health jobs.⁷

As of 2015, and as the economy has improved, budget cuts in state and local public health departments have tapered and the number of job losses has decreased.^{7,8} In 2010, the national epidemiology workforce increased slightly and findings from the 2013 Council of State and Territorial Epidemiologists Epidemiology Capacity Assessment suggest that the number of epidemiologists has exceeded levels in 2004.⁵ Federal funding has likely played a role in helping compensate for some of these reductions in state-funded positions.^{5,9} While average state funding for epidemiology activities has progressively declined since 2004, federal funding share of support has steadily increased from an average of 73% in 2004 to 79% in 2013.⁵

Since 2010, a portion of these federal resources has come from the Patient Protection and Affordable Care Act's Prevention and Public Health Funds (PPHF); part of this has been allocated to the Centers for Disease Control and Prevention's (CDC's) Epidemiology and Laboratory Capacity for Infectious Diseases (ELC) Cooperative Agreement. In fiscal year

(FY) 2014, ELC received approximately \$45 million of the \$928 million awarded through PPHF.

With an overall goal to strengthen state, local, and territorial infrastructure to detect, respond to, and control infectious diseases, ELC awarded approximately \$6 million of these PPHF funds in FY 2014 to 41 state and local health departments for flexible epidemiologists' (FEs') salaries, fringe, and indirect costs. This support was designed to help meet health departments' unique needs in infectious diseases and support unanticipated events that could require the diversion of resources to specific emerging or reemerging diseases. Applicants who sought these positions provided justifications for how FEs would be used to build and/or maintain epidemiology capacity in their jurisdiction. Thus, the backgrounds of FEs varied on the basis of these needs.

This assessment was designed to characterize how FEs were used in health departments to strengthen epidemiology capacity for infectious diseases and to understand the perceived value of this strategy from the health department perspective.

We focused on 3 major questions:

1. How are health departments using FEs?
2. What major gaps in health departments are FEs being used to address?
3. Are FEs an effective programmatic strategy for enhancing epidemiology capacity?

Methods

We used qualitative methods to understand and capture differences in how FEs were utilized at the state level from the perspectives of 2 groups: (1) ELC principal investigators (PIs) or supervisors who had a role in overseeing the ELC cooperative agreement and/or the (2) FEs.

We used nonprobability purposive sampling to draw a sample of 8 health departments. A heterogeneous sample with respect to specific characteristics was selected; we included health departments in the sample that were as different from each other as possible with respect to region, funding amount awarded in FY 2013, and population size of jurisdiction.

Data were collected through open-ended, semistructured interviews from February 2014 through April 2014 via telephone. The US Office of Management and Budget (OMB) approved data collection (OMB Control No. 0920-0879). ELC PIs in each health department were notified by e-mail that they and their FEs were selected to participate in the assessment. If they agreed to participate, they were contacted to schedule a time and date to conduct the interview. Where possible, both the PI or supervisor and an FE from the same health department were included and interviews were conducted separately. Interviews ranged from 22 to 64 minutes, averaging 33 minutes.

We administered 2 different versions of a semistructured interview guide—one for PIs and program supervisors, and one for FEs. The guides consisted of 11 to 14 open-ended questions; respondents were asked to describe the role, activities, and impact of having

an FE. They were also invited to offer suggestions for improving the program. Prior to data collection, interview guides were pilot tested with 2 PIs and 2 FEs from 2 health departments not included in our final sample. Revisions focused on improving clarity and brevity of questions.

The interviews were audio recorded and transcribed. Transcripts were uploaded to a qualitative research software tool (MAXQDA version 10), which was used to organize and analyze the data. Through an iterative process, the author developed a codebook consisting of both structural and data-driven codes to prepare for thematic analysis.¹⁰ Structural codes were developed on the basis of the study's objectives, and data-driven codes were developed on the basis of a preliminary analysis of the interview transcripts from a sample of respondents.¹⁰ Four team members tested the codebook by applying the codebook to the interview transcripts from another sample of respondents. Unclear and discrepant interpretations and code application among team members were discussed and clarified through several meetings. The authors analyzed the data by applying the final version of the codebook across all transcripts. Results are presented here as major themes and categorized by specific research questions of interest.

Results

Participant characteristics

A total of 15 (5 PIs, 3 supervisors, and 7 FEs) participated in 14 interviews, representing 8 health departments. Three health departments did not respond to a request for an interview, and 1 declined because of competing priorities. The median length of work experience as FEs in the sample was 2 years 2 months. Six of 10 US Health and Human Services regions were represented.

Use of FEs in Health Departments

Three major patterns emerged to describe how FEs are being used in health departments that received funding for the FE position.

The Crosscutting disease epidemiologist

FEs were most commonly employed to conduct activities that spanned across various disease areas rather than 1 disease or category of diseases. ELC PIs and supervisors said that FEs most often assisted their program in multiple disease areas and crossed over program areas when needed:

I guess we kind of took [the flexible epidemiologist] definition to mean someone who would work on a wide variety of outbreaks....Someone who needs to respond to essentially like all hazards or all potential sources of outbreaks.

(ELC PI/Supervisor)

Respondents reported they structured job duties and responsibilities by assessing their program's gaps, current priorities, and skills and background of the FE. These FEs were predominantly involved in supporting the response and investigation of infectious

diseases, supporting the maintenance and enhancements of disease surveillance systems, and providing consultation and technical assistance to local health departments or agencies.

When participants were asked to estimate how much time they spent in any one disease or programmatic area, a majority of the respondents said that foodborne and other enteric pathogens comprised more than half of their work. However, several noted that efforts could also vary on the basis of the seasonality and outbreaks occurring. FEs also commonly worked with vector-borne and health care–associated infections.

Among most of the respondents who employed this type of model, PIs and supervisors noted that the FE role was different from other epidemiology roles in their health department. FEs covered broader disease areas and had more general responsibilities. FEs interviewed echoed this statement, saying their roles differed in their ability to work across diseases and were less constricted compared with epidemiologists who focused on only 1 program area:

Epidemiologists feel constricted in terms of if there's something big or urgent or unexpected happening....I think they are a little bit more rigid and held back in terms of what they can do. And I feel like the flexible epi is not always constrained by that.

(FE)

The disease-specific epidemiologist

Less often, ELC PIs and supervisors utilized the FE position by assigning FEs to work in a specific disease area where major gaps had been identified. Disease areas mentioned included foodborne diseases and health care–associated infections.

Although these FEs worked predominantly in 1 program or disease area, they also helped support other activities and types of outbreak investigations as needed. Under this model, PIs and supervisors said their FE role did not differ considerably from roles of other epidemiologists in their health department. They were available and on-call to respond to any type of outbreak while maintaining their areas of expertise.

The epidemiologist for foundational capabilities

One health department used the FE position in a distinctly different way; the FE position helped support the integration of its state's notifiable disease surveillance system. As the supervisor stated, they were “trying to specifically look at things which [were] crosscutting and [were] going to affect multiple programs.” The nature of these responsibilities differed from other epidemiologists in their health department and focused on surveillance informatics; it required that the FE work across various program areas.

Gaps That FEs Are Addressing

Four important functions emerged as gaps that FEs helped address in their health department; these functions are described here in order by those themes that were most to least dominant.

Outbreak identification and response

The majority of FEs interviewed said they spent most of their time conducting outbreak investigations, often in an assistant or consultative role to county health departments or local public health agencies. This was the most prevalent gap in health departments that FEs helped address. The extent of the assistance provided generally depended on the size and resources of the local public health agency.

Most participants agreed that having an FE contributed to improvements in their program's ability to identify and respond to outbreaks. Specifically, this included improvements made in outbreak management and tracking, and thoroughness of investigations:

In terms of outbreak tracking, we are so much better now than we used to be as far as tracking outbreaks and recording key pieces of information.... Our data is [sic] so much cleaner.... And then just the thoroughness of outbreak investigation has really improved, as well.... That's probably the main ... benefit that the position provides us.

(ELC PI/supervisor)

Disease surveillance systems' maintenance and upgrade

FEs were also used to help address gaps in electronic disease surveillance systems. FEs helped maintain and upgrade systems by updating questionnaire forms, creating user guides, and adding new conditions to the list of state notifiable diseases. Most of the FEs also provided support in transitioning reporting from paper-based to electronic format.

Participants indicated that this assistance resulted in multiple quality improvements in their surveillance systems, including timelier reporting, more standardized surveillance practices, and more complete and accurate surveillance data: “[The FE has] ... really streamlined some of these reporting tools.... So that's been very helpful for surveillance.... And in fact, improving the accuracy of the data that's getting reported, as well.”

Coordination and collaboration

Strengthening coordination and collaboration with partners was also an essential part of all the FEs' work. Participants said that coordination and collaboration played the largest role in conducting outbreak investigations with local health departments, the public health laboratory, and environmental health staff within their health department. The relationships that FEs helped cultivate between these different partners played an important role in improving the efficiency of investigations.

...If I have certain requests when we have an outbreak or if there's a cluster of people that I'm investigating and I need some information, there's a lot of communication happening between me and the laboratory to get that information out quickly.

(FE)

Trainings

To a lesser extent, FEs also helped develop and coordinate trainings and presentations for local public health partners such as epidemiologists and environmental health staff. Topics typically focused on communicable diseases, disease surveillance, and outbreak investigations and also concentrated on specific disease areas when FEs were more specialized.

Effectiveness of FEs as a Programmatic Strategy for Enhancing Epidemiology Capacity

The FE strategy enhanced epidemiology capacity in a number of important ways; it provided flexibility to the health departments and provided staff who were cross-trained and could be used to help with situations where additional staff members were needed.

Enhanced flexibility

Most of the PIs and supervisors said flexibility in establishing the responsibilities and role of the FE was of greatest value, allowing them to utilize the FE to “cross silos,” target “crucial gaps,” and “plug” the person where they needed them. This was especially important, as one ELC supervisor explained, because specific needs for infectious diseases cannot always be predicted:

I think that flexibility in funding, allowing us to cross some of those silos has been very, very helpful.... If it's a huge influenza year, you might not have all of the funding you wanted just from influenza but [you have the capability] to be able to be a little bit flexible on some of those other bodies.... And that I think is the ideal thing about the epi...capacity....We can really meet the needs that we have.

(ELC PI/Supervisor)

Cross-trained position

Another benefit that participants said they enjoyed about having flexible FEs was that they become cross-trained in the process. By having a wider variety of experiences compared with more specialized epidemiologists, FEs can apply the skills and knowledge they gain to other programs when necessary, more quickly, and efficiently. This is especially important when there is an urgent need for help in other areas, as well as in health departments where there may be frequent turnover. As one participant stated, having an FE who was cross-trained to fill in was essential “just to keep regular business going.”

Additional staff to respond to unforeseen circumstances

ELC supervisors said that opportunities to use FEs to help fill temporary staffing gaps and provide surge capacity were also valuable, especially once they were trained across programs and disease areas. Supervisors said that when additional support is needed because of staff leave, emergency situations, or loss of full-time employees, using the FE position to cover the temporary need is an added benefit:

I think the ability to have this person available for surge capacity—first to cross train them and have them available in surge capacity to plug them in as needed because of emergent situations or because of staff absenteeism is really, really important.

Challenges

Participants were also asked to discuss challenges and negative aspects related to the FE position. The main challenge reported about the position was primarily related to workplace turf issues; as one ELC PI/supervisor stated, “You can get a little pushback when a flexible epidemiologist comes in to help or support.” One ELC PI/supervisor said the main challenge with the position was finding a suitable candidate with the appropriate skills and experience to fill the FE position, whereas another FE discussed challenges with balancing a heavy workload associated in a position with crosscutting responsibilities.

Limitations

This assessment is subject to several limitations. Data are self-reported, and responses from participants may be subject to reporting bias due to our granteefunder relationship. Four health departments declined a request for an interview; thus, participants who agreed to participate and those who did not may also reflect important self-selection biases.

Discussion

Flexible resources for personnel, those not necessarily limited to a specific disease or program area, can be effective at enhancing core infectious disease epidemiology capacity. FE positions allow health departments to meet the unique needs, gaps, and priorities of their jurisdiction. Results provided insight into how capacity-building programs that focus on providing flexible resources, such as the ELC, can help make important contributions toward improvements in the quality and management of investigations and infectious disease surveillance, including advancements in surveillance-related technology.

The most valued aspect of this funding was the ability to use the position to cross programmatic siloes. Typical of many public health agencies that receive federal dollars, funding funneled through a categorical funding line is often limited to supporting one program area for a narrowly defined set of program activities, rather than building crosscutting, core, and foundational capabilities across programs.¹¹ The discrete nature of this funding has been criticized for hindering capacity development and promoting silos in public health activities, leading to reduced abilities to develop a public health workforce that can address crosscutting and emerging needs.^{11,12} Our findings support the notion that a strategy where management has more flexibility on deciding how to use and where to assign personnel to support their jurisdiction’s specific needs may be an effective way to help build core epidemiology capacity, particularly in the context of infectious diseases. Accordingly, this strategy helps meet ELC’s goal to strengthen state, local, and territorial infrastructure to detect and respond to infectious diseases and support health departments’ unique infectious disease public health needs and priorities.

Ideally, funding should provide opportunities for both building foundational capability for crosscutting areas as well as enhancing specific programmatic areas. Categorical funding alone may hinder the development of stronger and more sophisticated epidemiology capacity because it can limit the program-funded epidemiologist's activities to a specific program area.^{11,13} Building capacity, especially capacity that helps meet crosscutting programmatic needs, may require some flexibility from the funder in determining how to allocate resources. Results of an evaluation of a federal program designed to enhance epidemiology capacity in state chronic disease programs revealed that one barrier to building epidemiology capacity in state health departments was a lack of autonomy over state and federal funds because categorical grants were not able to support and address all the necessary epidemiology functions at the state level.¹⁴ Boulton et al¹⁵ also suggest a need for revisiting the current model of state-level epidemiology capacity that is currently supported through a number of distinct federal categorical cooperative agreements. They suggest that to better secure and strengthen epidemiology, the current model should be revisited to add greater flexibility in use of funds.¹⁵

With reductions in state funding, substantial understaffing, and continued levels of staff turnover in the national epidemiology workforce capacity, it is not surprising that having additional staff members who were cross-trained and could be deployed to other roles was also cited as some of the most valuable aspects of the funding.⁵ FEs can effectively serve as surge support during emergencies or fill temporary positions when staffing gaps arise. A CDC workforce summit also identified cross-training personnel as a strategy to help address increasing rates of job turnover and mobility among the public health workforce.¹⁶ The Ohio Department of Health demonstrated how cross-training personnel was used to help enhance epidemiology capacity for chronic diseases.¹³ With limited resources for hiring staff and an increased need for epidemiology capacity, Ohio implemented a policy where epidemiologists were required to learn to manage and analyze additional data sets in other areas while sustaining primary responsibilities for their own program.¹³ To address recruitment and retention challenges in the national epidemiology workforce, Beck et al¹⁷ recommend training more generalists to assist with epidemiology functions. Our findings also suggest that funding for personnel who can be cross-trained and available for unforeseen circumstances may be an effective way to increase epidemiology capacity under resource constraints.

Conclusion

The public health workforce is an important component in addressing today's public health threats and emergent needs.¹⁸ Recent public health emergencies have highlighted gaps in the US public health workforce, lacking full capacity to deal with public health emergencies and meet unanticipated needs. Infectious disease threats to public health can occur at all levels of government in state and local health departments; thus, it is vital that state and local health departments maintain adequate epidemiology capacity to meet these demands. Yet, despite recent increases in federal funding, the current national epidemiology workforce is still significantly understaffed by 50%.⁵ Furthermore, state funding for epidemiologists is at its lowest level and moderate levels of staff turnover are further projected.⁵ As such, it is critical to have an understanding of strategies or approaches that can help develop

and, more importantly, sustain an effective and efficient public health workforce despite projected reductions in workforce capacity in the future. Our findings suggest that a flexible approach from funders in utilizing personnel could be an effective strategy for infectious diseases. Further monitoring could illuminate applications of this strategy to other core areas of public health and how a more flexible, crosscutting approach to public health resources can strengthen our ability to achieve better public health outcomes.

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Implications for Policy & Practice

- Research on implementation and effectiveness of program strategies or policies executed to help maintain and sustain declining public health epidemiology workforce has been limited.
- Our findings provide evidence that resources for flexible personnel, those not necessarily limited to a specific disease or program area, can be effective in helping enhance core infectious disease epidemiology capacity.
- This has practical implications for addressing the overall decline in the public health workforce, as well as the current context and environment of public health funding at both state and federal levels.