In 2002, the Council of State and Territorial Epidemiologists (CSTE) conducted its first national food safety epidemiology capacity assessment (1), which provided the basis for development of minimum performance standards to guide state and local foodborne disease control programs. During April 2010, CSTE sent states a follow-up, web-based questionnaire to gather information about food safety–related workforce training and education, epidemiology and laboratory capacity, and information technology (IT) to support surveillance. This report summarizes the results of the assessment, which found that in 2010, states reported a need for 304 more full-time equivalent (FTE) employees working in food safety to reach full program capacity, with the greatest demand for master’s degree–level epidemiologists (50% of demand). Barriers to investigating foodborne outbreaks reported most often by states included delayed notification of the outbreak (reported by 41 states), lack of a sufficient number of foodborne safety staff members (29 states), lower prioritization of investigations (27 states), lack of ability to pay overtime (20 states), and lack of adequate epidemiology expertise (12 states). Strategies should be developed to increase the number of food safety staff members and enhance their training opportunities, address gaps in IT, and improve the relationship between state and local health departments and federal agencies collaborating on responses to foodborne disease outbreaks.

The main objectives of the food safety epidemiology capacity assessment were to count and characterize the food safety workforce in local, regional, and state health departments and to measure and evaluate core capacity to detect, investigate, and respond to foodborne diseases and outbreaks. After pilot testing, CSTE made the assessment available online to all states during April 2010. The assessment was sent to the state epidemiologist and the lead foodborne disease epidemiologist in each state, with a suggestion for the latter to serve as respondent. All 50 states participated, but not every state answered all questions. Capacity was defined for participants using a qualitative scale,* as validated in previous CSTE assessments (2–4).

In 2010, a total of 787 FTEs were working as foodborne disease epidemiologists in state, regional, and local health departments in the United States. Of these, 616.5 (78%) had an epidemiology-related degree or had completed some coursework in epidemiology; 170.5 (22%) had only on-the-job training or no formal epidemiology training (Table). Formal education in epidemiology was highest at the state level, where most (73%) foodborne disease epidemiologists had an epidemiology degree. The proportion of personnel working as foodborne epidemiologists who had a nursing degree was substantially higher at the local level (19%) than at the regional (5%) or state (4%) level. States reported the need for an additional 304 FTEs to reach full program capacity, with the greatest demand (50% of need) for master’s-level epidemiologists.

The number of respondents with substantial-to-full capacity to use electronic laboratory reporting for foodborne diseases by laboratory type was highest for public health laboratories and lower for other laboratory types (i.e., hospital-based, reference, and other clinical). Forty-three states reported using a National Electronic Diseases Surveillance System–compliant database for maintaining enteric illness cases. Forty-two states reported using an electronic database housed at the state health department for outbreak investigations; 13 states used an electronic database at the local level. All respondents used CDC’s electronic Foodborne Outbreak Reporting System and National Outbreak Reporting System for reporting. Most states electronically recorded multiple variables related to cases of enteric illness, including laboratory results (49 states), epidemiologic risk factors (44), clinical symptoms (42), travel history (42), environmental exposures (42), food history (35), and food purchasing locales (30), as separate elements of their enteric illness case files.

State capacity for completing tasks related to the investigation of sporadic cases of enteric illness caused by Salmonella and Escherichia coli O157 varied. Nearly all (49) states entered case aggregate data electronically for both pathogens; other tasks were generally more likely to be completed for E. coli O157 than for Salmonella, including collection of isolates (48 and 46 states, respectively), pulsed-field gel electrophoresis analysis (48 and 42), analysis of aggregate data (46 and 45), comparison of case classification to standard case definition (49 and 44), interview of patients (47 and 39), and more intensive questionnaire review (42 and 38).

Although states investigate foodborne disease outbreaks caused by numerous pathogens, they were more likely to investigate outbreaks associated with some pathogens than others. For specific pathogens, a history of investigating >75% of outbreaks was reported by the highest proportion of states for E. coli (86% of states), followed by Listeria (81%), Salmonella (78%), Campylobacter (73%), other foodborne pathogens (68%), and norovirus (55%). Conversely, a small but substantial proportion of states reported investigating <25% of outbreaks caused by these same pathogens: Campylobacter

* None means that none of the activity, knowledge, or resources described within the question were met; minimal capacity = 1%–24%, partial capacity = 25%–49%, substantial capacity = 50%–74%, almost full capacity = 75%–99%, and full capacity = 100% of the activity, knowledge, or resources described within the question were met.
(16% of states), *Listeria* (13%), *E. coli* (10%), norovirus (7%) and *Salmonella* (4%) (Figure 1).

States were more likely to obtain stool specimens than food samples as part of foodborne outbreak investigations. Relatively few states reported always collecting either stool specimens (five states) or food (one state) samples associated with foodborne disease outbreaks; 33 states collected stool specimens in 50%–99% of outbreaks, and 36 states collected food samples in <50% of outbreaks. Thirty-nine states reported having performed 1–10 tracebacks of commercial products during the past 3 years; relatively few (seven states) had conducted ≥11 tracebacks, and three states completed no tracebacks of commercial products during that period.

All respondents reported barriers to investigating foodborne or enteric outbreaks. Barriers reported as either moderate or substantial by states included delayed notification of the outbreak (reported by 41 states), lack of sufficient number of foodborne safety staff members (29), lower prioritization of investigations (27), lack of ability to pay overtime (20), lack of adequate epidemiology expertise (12), difficulties working with in-state agencies (eight), constraints related to administrative support (eight), and difficulties working with other state or federal agencies (five) (Figure 2).

In 2009, the Council to Improve Foodborne Outbreak Response (CIFOR) distributed to all states its *Guidelines for Foodborne Disease Outbreak Response* (5), which was intended to improve outbreak response. Among the states, 47 plan to read the document, 39 plan to distribute it, and 29 plan to review their practices against the recommendations in the *Guidelines* and the performance indicators therein. Few states reported plans to implement or incorporate the *Guidelines* into practice in the immediate future (27%).

---

**TABLE. Level of education or training of food safety epidemiologists, by level of government — United States, 2010**

<table>
<thead>
<tr>
<th>Level of education/training†</th>
<th>State (%)</th>
<th>Region/District (%)</th>
<th>Local (%)</th>
<th>Total (%)</th>
<th>FTEs needed to reach full capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Doctoral degree</td>
<td>14.0 (6)</td>
<td>7.5 (4)</td>
<td>8.5 (2)</td>
<td>30.0 (4)</td>
<td>25.5 (85)</td>
</tr>
<tr>
<td>Professional background</td>
<td>25.5 (11)</td>
<td>9.0 (5)</td>
<td>18.0 (5)</td>
<td>52.5 (7)</td>
<td>28.0 (53)</td>
</tr>
<tr>
<td>Master’s degree</td>
<td>93.5 (39)</td>
<td>54.0 (32)</td>
<td>60.5 (16)</td>
<td>208.0 (26)</td>
<td>152.5 (73)</td>
</tr>
<tr>
<td>Bachelor’s degree</td>
<td>15.5 (6)</td>
<td>11.0 (7)</td>
<td>13.0 (3)</td>
<td>39.5 (5)</td>
<td>26.0 (66)</td>
</tr>
<tr>
<td>Nursing degree</td>
<td>29.0 (12)</td>
<td>37.0 (22)</td>
<td>151.0 (40)</td>
<td>217.0 (28)</td>
<td>47.5 (22)</td>
</tr>
<tr>
<td>Some coursework</td>
<td>25.0 (10)</td>
<td>11.5 (7)</td>
<td>33.0 (9)</td>
<td>69.5 (9)</td>
<td>14.0 (20)</td>
</tr>
<tr>
<td>On-the-job training</td>
<td>23.5 (10)</td>
<td>29.0 (17)</td>
<td>44.0 (12)</td>
<td>96.5 (12)</td>
<td>10.5 (11)</td>
</tr>
<tr>
<td>No formal training in epidemiology</td>
<td>14.0 (6)</td>
<td>10.0 (6)</td>
<td>50.0 (13)</td>
<td>74.0 (9)</td>
<td>0.0 —</td>
</tr>
<tr>
<td>Total</td>
<td>240.0 (100)</td>
<td>169.0 (100)</td>
<td>378.0 (100)</td>
<td>787.0 (100)</td>
<td>304.0 (38)</td>
</tr>
</tbody>
</table>

Abbreviation: FTE = full-time equivalent employee.

* Based on responses to an April 2010 web-based survey of state health departments by the Council of State and Territorial Epidemiologists.
† Doctoral degree = PhD, DrPH, or other doctoral degree in epidemiology; professional background = MD, DO, DVM, or DDS with a dual degree in epidemiology; master’s degree = MPH, MSPH, MS, or other master’s degree in epidemiology; bachelor’s degree = BA, BS, or other bachelor’s degree in epidemiology; nursing degree = RN, BSN, or other nursing designation; some coursework = completion of some coursework in epidemiology; on-the-job training = receipt of any type of on-the-job training in epidemiology.

---

**FIGURE 1. Number of states investigating outbreaks of specific pathogens by proportion of outbreaks investigated — United States, 2010**

* Based on responses to an April 2010 web-based survey of state health departments by the Council of State and Territorial Epidemiologists.

---

**Reported by**

Matthew L. Boulton, MD, Univ of Michigan, School of Public Health and School of Medicine, Ann Arbor, Michigan. Lauren D. Rosenberg, MPA, Council of State and Territorial Epidemiologists, Atlanta, Georgia.

**Corresponding contributor:** Matthew L. Boulton, mboulton@umich.edu, 734-936-1623.

**Editorial Note**

Ensuring adequate epidemiology capacity in foodborne disease programs is essential for the timely detection, investigation, control, and prevention of foodborne disease outbreaks. Although national foodborne disease
epidemiology and surveillance capacity has increased since the previous CSTE assessment (1), critical gaps remain. Levels of formal epidemiology education among foodborne disease epidemiologists, especially at the local level, were lower than those of the national epidemiology workforce. Foodborne diseases personnel at the local level, compared with those at state and regional/district levels, were less likely to have an epidemiology degree and more likely to have only on-the-job-training or no formal training in epidemiology (6,7); previous assessments show this to be particularly true of nurses working as epidemiologists (8). States have a substantial need for additional FTEs, especially those with a master’s degree in epidemiology, to reach full capacity in foodborne diseases program capacity at the state, local, and regional/district levels. Many of the specific activities assessed in this study directly rely on having enough trained or competent personnel on hand to perform them (e.g., conducting commercial tracebacks and collection of stool and food specimens). Insufficient workforce capacity hinders the ability to conduct these activities and, therefore, reduces the quality and quantity of foodborne investigations carried out by states.

Widespread use of electronic surveillance systems by states has increased the desirability and feasibility of electronic laboratory-based reporting and the potential for improving the timeliness of infectious disease reporting and response. However, improvement and investment in public health IT infrastructure is needed to respond adequately to foodborne disease outbreaks. Improvements have resulted from several years of federal preparedness funding targeting states’ development of electronic surveillance and reporting systems. Despite these improvements, many states report that they lack core capacity, which has directly affected their ability to investigate and control outbreaks of foodborne diseases and enteric illnesses. Data elements considered essential to routine surveillance for foodborne diseases are collected inconsistently across states and some, such as food purchasing locale, are collected by few. States also lack adequate IT infrastructure, based on their reported lack of timely notification as the single most common barrier to completion of foodborne disease investigations.

The findings in this report are subject to at least two limitations. First, state-level epidemiologists estimated current epidemiology capacity at regional/district and local levels. The methods used by responding states to estimate their own capacity were subjective and likely varied. Second, not all responding states answered every question. However, these findings still provide useful insight into foodborne disease epidemiology capacity at state and local levels.

FIGURE 2. Number of states reporting selected barriers to investigation of enteric illness outbreaks during the past 3 years — United States, 2010*
CSTE recommends an increase in the number of personnel working in foodborne disease epidemiology and surveillance in state and local health departments, and enhanced training opportunities, including use of the CSTE/CDC applied epidemiology competencies (6) and the CIFOR Guidelines for Foodborne Disease Outbreak Response (5). Increased investment in IT also is needed to realize greater improvements in foodborne disease outbreak capacity.

**Acknowledgments**


**References**