CHAPTER

8

Performance Indicators for Foodborne Disease Programs

Surveillance and outbreak response are major components of states' foodborne investigation capacity and are essential for preventing and controlling foodborne illness. Multiple entities—almost 3000 local health departments, more than 50 state and territorial health departments, and several federal agencies—interact in a complex system covering surveillance to detect and respond to enteric and other foodborne diseases.

The occurrence of large and multistate foodborne disease outbreaks and concerns about bioterrorism have increased the need to rapidly detect and distinguish between outbreaks of foodborne disease and possible intentional contamination. Evaluating the timeliness and effectiveness of foodborne disease surveillance is a major step toward assessing and improving U.S. capacity for foodborne disease surveillance and outbreak response. Since the original publication of the Guidelines, there has been a great increase in the evidence base for establishing performance measures. These are reflected in the performance measures included in this chapter, for which target ranges are being developed.

8.0. Introduction

CDC's Public Health Emergency Preparedness Goals established a general framework and a few specific performance measures relevant to foodborne disease surveillance. CDC's

Foodborne Diseases Centers for Outbreak Response Enhancement (FoodCORE) has developed a series of performance metrics that cover a range of outbreak detection and response activities. These are designed to demonstrate successes and identify gaps in the detection, investigation, and control of enteric disease outbreaks. Thus, progress is being made towards the development of comprehensive national performance standards, measures, and models for public health agencies to follow to ensure foodborne illness surveillance and outbreak detection and response systems work at maximum efficiency.

8.1. Purpose and Intended Use

The CIFOR Guidelines for Foodborne Disease Outbreak Response were intended to serve as a comprehensive source of information on foodborne disease investigation and control for state and local health departments. The Guidelines included measurable indicators of effective surveillance for enteric diseases and for response to outbreaks by state and local public health officials. The performance indicators were intended to be used by agencies to evaluate the performance of their foodborne disease surveillance and control programs. However, the Guidelines stopped short of providing specific targets for individual metrics, to avoid their use as a score card that could be compared between agencies.

Since the development of the Guidelines, there has been more emphasis placed on performance, accountability and transparency by public health agencies. Therefore, there is a need for the development of target values that will help state and local public health agencies demonstrate their performance and effectiveness for foodborne disease surveillance and outbreak control activities. Given the distributed public health system with multiple independent jurisdictions, having performance targets will also provide a framework for communicating model practices for surveillance activities and create clear expectations for performance that will increase the likelihood of compliance.

The use of standardized performance criteria and metrics serves several functions:

- They promote a common understanding of the key elements of foodborne disease surveillance and control activities across local, state, and federal public health agencies;
- They facilitate training of food program staff in the use and interpretation of the performance criteria; and
- They allow for the aggregation of data at state, regional, or national levels to evaluate program effectiveness and to identify specific needs for improvement and additional resource investment.

The indicators were not intended as performance standards. Where specific performance standards exist (e.g., PulseNet turnaround times, Draft Voluntary National Retail Food Regulatory Program Standards), meeting the performance standard was adopted as a performance indicator. The development of performance standards depends on the availability of specific indicators such as these to provide a basis for program evaluation. Defining the level of performance expected from foodborne disease surveillance and control programs exceeds the scope of these Guidelines, However, the body of evidence needed to do so is growing, as reflected in the performance measures

8.1. Purpose and Intended Use

included in this chapter for which target ranges are being developed. Thus, this chapter increases the range of performance measures that may be useful for future public health agency evaluation and certification programs.

The aggregation of data at state, regional, or national levels is intended to provide a comprehensive overview of foodborne disease surveillance and control programs, rather than a system for ranking them.

8.2. Performance Indicators

This chapter contains tables organized to highlight major performance indicators by program function. The roles and responsibilities of foodborne disease surveillance and control programs vary by state according to state law. **Individual agencies that wish to evaluate their programs using these indicators should select indicators and metrics that best reflect their activities, regardless of where they fall in the document's table structure.**

Foodborne Disease Program Objectives and Indicators

Table 8.1. Objectives of foodborne disease surveillance program

Table 8.2. Short-term objectives, indicators, subindicators, and metrics

Table 8.3. Intermediate objectives, indicators, subindicators, and metrics

Table 8.4. Long-term objectives, indicators, subindicators, and metrics

A total of 16 performance indicators were selected for the development of target ranges based on their importance and feasibility of implementation (Table 8-5). These include metrics for epidemiology, laboratory, and environmental health programs. Most of the selected performance measures focus on the state level. Several are applicable to both state and local programs and a few are primarily focused on local agencies. For each of the performance measures, a description is provided that describes the performance measure, relevant definitions, an assessment of the feasibility of measuring performance of the metric, and detailed methods for measurement.

Target ranges for these performance measures are being developed under direction of the CIFOR Performance Indicators Work Group, and will be maintained separately on the CIFOR website. This will allow for the target ranges to be modified as needed, based on the availability of resources and the performance of the system.

Foodborne Disease Program Objectives and Indicators

Table 8.1. Objectives of foodborne disease surveillance program

SHORT-TERM OBJECTIVES	INTERMEDIATE OBJECTIVES	LONG-TERM OBJECTIVES
Detect foodborne disease events of public health importance. Respond to events in a timely manner. Intervene when appropriate to prevent illness.	Determine etiology, vehicle, and contributing factors of foodborne disease outbreaks. Monitor trends to identify emerging foodborne diseases and food-safety problems. Increase knowledge of foodborne disease causes and abatement strategies.	Prevent future outbreaks. Reduce incidence of foodborne illness. Increase health of the general population.

Foodborne Disease Program Objectives and Indicators

Table 8.2. Short-term objectives, indicators, subindicators, and metrics

SHORT-TERM OBJECTIVES	INDICATOR	SUBINDICATOR	METRICS
Detect foodborne disease events of public health importance.	8.2.1. Foodborne complaints investigated	PROCESS • Program maintains logs or databases for all complaint or referral reports from other sources alleging food-related illness, injury, or intentional food contamination. The final disposition for each complaint is recorded in the log or database and filed in or linked to the establishment record for retrieval purposes (Draft Voluntary National Retail Food Regulatory Program Standards, standard 5, part 1.d). • Demographic information obtained • Food history obtained OUTCOME • Disposition, action, or follow-up on complaint or referral report alleging food-related illness or injury within 24 hours • Outbreak detected	PROCESS • Draft Voluntary National Retail Food Regulatory Program Standard 5, part 1.d, met, yes/no • % of complaints for which complete demographic information was available • % of complaints for which food history was obtained OUTCOME • No. complaints received. Rate of complaints received per 100,000 population in jurisdiction. • No. outbreaks detected as a result of foodborne illness complaints. Rate of outbreaks detected per 100,000 population in jurisdiction, and per 1,000 complaints received.
Detect foodborne disease events of public health importance.	8.2.2. Reported cases with specified foodborne illnesses interviewed	PROCESS • Demographic information obtained • Exposure history obtained • Case onset date obtained • Date of report documented • Case report maintained in searchable database	PROCESS • % of reported cases for which complete demographic information was available • % of reported cases with attempted interview • % of confirmed cases with exposure history obtained% of reported cases for which onset date was available • % of reported cases for which report date was available • Searchable database maintained, yes/no

Detect foodborne disease events of public health importance.	8.2.2. Reported cases with specified foodborne illnesses interviewed	OUTCOME • Interval from receipt of report to interview of case • Need for public health intervention identified (e.g., exclusion of workers, conduct of investigation)	OUTCOME • Median no. days from receipt of report to interview of case • % of cases for which an intervention was identified or ruled out
Detect foodborne disease events of public health importance.	8.2.3. Isolates or culture-independent diagnostic test (CIDT)-positive specimens of specified foodborne pathogens submitted to PHL	PROCESS • Stool collection date obtained • Date of clinical laboratory finding obtained • Date of submission to PHL documented • Date of serotyping documented • Date of subtyping by PFGE documented • Isolate/CIDT-positive specimen report maintained in searchable database OUTCOME • No. reported cases for which isolate or CIDT-positive specimen submitted to PHL • No. days from clinical laboratory finding to submission of isolate or CIDT-positive specimen to PHL • No. days from receipt of isolate by PHL to subtyping results • Subtype-clusters identified • % of pulsed field gel electrophoresis (PFGE) subtyping data results for *E. coli* O157:H7 and *Listeria* submitted to the PulseNet national database within four working days of receiving isolate at the PFGE laboratory (CDC preparedness goal)	PROCESS • % of cases for which stool collection date was available • % of investigated cases for which date of clinical laboratory finding was available • % of cases for which date of sample submission to PHL was available • % of cases for which PFGE subtyping date was available • Searchable database maintained, yes/no OUTCOME • % of cases for which isolates were submitted to PHL • Median no. days from report of clinical findings to receipt of isolate at PHL • Median no. days from receipt of specimen to serotyping or subtyping results • No. subtype clusters identified • CDC preparedness goal met, yes/no

Foodborne Disease Program Objectives and Indicators

Table 8.2. Short-term objectives, indicators, subindicators, and metrics
Continued

SHORT-TERM OBJECTIVES	INDICATOR	SUBINDICATOR	METRICS
Respond to events in a timely manner.	8.2.4. Foodborne outbreaks investigated	PROCESS • Cases interviewed to determine illness and exposure histories • Stool samples obtained from cases • Controls (non-ill persons) interviewed to determine exposure histories • Environmental health assessment of establishment conducted, where appropriate • Food flow documented • Food workers interviewed • Stool samples obtained from food handlers • Food or environmental samples obtained OUTCOME • No. days from onset of symptoms to initiation of outbreak investigation • No. days from collection of stool samples to confirmed culture results • No. days from collection of environmental or food samples to confirmed culture result • Foodborne disease outbreak source identified	PROCESS • % of outbreak investigations with exposure assessments conducted.% of outbreak investigations with clinical specimens collected and submitted to PHL from 2 or more people% of outbreak investigations where specimens were tested for a specified set of potential agents at PHL • % of outbreak investigations with >10 ill people where an analytic study was conducted. % of investigations in which an establishment was investigated, if appropriate • % of environmental investigations that included a food flow, interviews of food workers, collection of stool samples from food handlers, collection of food or environmental samples OUTCOME • No. foodborne outbreaks reported, all agents. Rate of outbreaks reported / 100,000 population. • Median no. days from onset of symptoms of first/index case to outbreak investigation • Median no. days from submission of stool samples to receipt of results • Median no. days from submission of food or environmental samples to receipt of results • % of foodborne disease outbreaks for which a source was identified • % of outbreaks where NORS form completed

Respond to events in a timely manner.	8.2.5. Case clusters investigated	PROCESS • Cases interviewed to determine exposure histories • Analytic epidemiologic study conducted for *Salmonella* and STEC clusters with >5 cases OUTCOME • No. days from cluster recognition to completion of interviews of cases and controls • Cluster source identified	PROCESS • % of investigated clusters with routine interview of cases to determine exposure history • Once a multistate foodborne outbreak has been declared by CDC, state health departments in conjunction with their local health departments complete or closeout 80% of interviews within 48 hours using the 'outbreak designated' questionnaire% of Salmonella and STEC clusters with > 5 cases where an analytic epidemiologic study was conducted. OUTCOME • Median no. days from identification of a cluster to close out of investigation-related interviews % of clusters in which a source was identified
Intervene when appropriate to prevent illness.	8.2.7. Ill or infected food handlers identified and excluded		OUTCOME • % of outbreak investigations with exclusion of an ill person(s) from high risk setting • Median no. days from initiation of investigation to implementation of intervention
	8.2.8. Deficient food-handling practice identified and corrected		OUTCOME • % of outbreak investigations with remediation or closure of an establishment linked to illness • Median no. days from initiation of investigation to implementation of intervention
	8.2.9. Advisory issued about outbreak and implicated source		OUTCOME • Median no. days from initiation of investigation to implementation of intervention

Foodborne Disease Program Objectives and Indicators

Table 8.2. Short-term objectives, indicators, subindicators, and metrics
Continued

SHORT-TERM OBJECTIVES	INDICATOR	SUBINDICATOR	METRICS
Intervene when appropriate to prevent illness.	8.2.10. Contaminated food recalled and removed from marketplace		OUTCOME • Median no. days from initiation of investigation to implementation of intervention
Respond to events in a timely manner, and intervene when appropriate to prevent illness.	8.2.11. After-action reviews of outbreak investigations conducted within a mean of 60 days after investigation ends (CDC preparedness goal)		PROCESS • CDC preparedness goal met, yes/no
	8.2.12. Staff trained on the agency's outbreak response protocol		PROCESS • % of staff likely to be involved in an outbreak investigation that have received training
	8.2.13. Contact lists of individuals or organizations key to foodborne disease outbreak investigations created and regularly updated		PROCESS • Contact list created, yes/no • Intervals between updates

Table 8.3. Intermediate objectives, indicators, subindicators, and metrics

INTERMEDIATE OBJECTIVE	INDICATOR	SUBINDICATOR	METRICS
Determine etiology, vehicle, and contributing factors of foodborne disease outbreaks.	8.3.1. Etiology of outbreak identified	PROCESS • Clinical characteristics of outbreak characterized • Stool samples collected and tested for likely agents • Food and environmental samples collected and tested for likely agents OUTCOME • Etiology of outbreak identified	PROCESS • % of outbreaks for which clinical characteristics were described • % of outbreaks for which at least 1 stool sample was tested for likely agents • % of outbreaks for which food or environmental samples were tested for likely agents OUTCOME • % of outbreaks for which etiology was identified and reported to NORS

	8.3.2. Vehicle of outbreak identified	PROCESS • Suitable epidemiologic study conducted to identify vehicle • Informational traceback conducted to subtype exposure histories • Regulatory traceback conducted to confirm production source of implicated food vehicle • Isolates from case specimens and potential vehicles subtyped OUTCOME • Vehicle of outbreak identified	PROCESS • % of outbreaks for which epidemiologic study was conducted to identify a vehicle • % of outbreaks for which informational traceback was conducted to help elucidate exposure histories • % of outbreaks for which regulatory traceback was conducted to confirm production source of implicated food vehicle • % of outbreaks for which subtyping of isolates from cases and potential vehicles was conducted OUTCOME • % of outbreaks for which a vehicle was identified and reported to NORS
Determine etiology, vehicle, and contributing factors of foodborne disease outbreaks.	8.3.3. Contributing factors identified	PROCESS • Preparation of implicated food items reviewed • Food-preparation review guided by identification of suspected agent • Possible contributing factors to the illness, injury, or intentional food contamination identified in each on-site investigation report OUTCOME • Contributing factors identified	PROCESS • % of outbreak investigations with link to a restaurant/food establishment where an on-site environmental health assessment was conducted • % of outbreaks for which food-preparation flow was reviewed for implicated food item • % of outbreaks for which food-preparation flow was reviewed, with specific agent suspected • Draft Voluntary National Retail Food Regulatory Program Standard 5, part 2.a, met, yes/no OUTCOME • % of outbreaks for which contributing factors were identified and reported to NORS

Foodborne Disease Program Objectives and Indicators

Table 8.3. Intermediate objectives, indicators, subindicators, and metrics
Continued

INTERMEDIATE OBJECTIVE	INDICATOR	SUBINDICATOR	METRICS
Monitor trends to identify emerging foodborne diseases and food-safety problems.	PROCESS • At least annually, data in complaint log or database and illness and injury investigations reviewed to identify trends and possible contributing factors most likely to cause illness or injury. These reviews may suggest a need for further investigations and steps for illness prevention (Draft Voluntary National Retail Food Regulatory Program Standards, standard 5, part 7.a) • Routine review of cases of reported foodborne diseases for trends in emerging foodborne diseases • Routine review of outbreak investigation findings for trends		PROCESS • Draft Voluntary National Retail Food Regulatory Program Standard 5, part 7.a, met, yes/no • Analysis of foodborne disease case reports, yes/no • Analysis of outbreak reports, yes/no
Increase knowledge of foodborne disease causes and abatement strategies.	Incorporation of results of outbreak investigation summaries into food-safety training activities		• Training activities updated annually, yes/no • % of staff that receive training related to foodborne disease outbreak investigations

Table 8.4. Long-term objectives, indicators, subindicators, and metrics

LONG-TERM OBJECTIVE	INDICATOR	SUBINDICATOR	METRICS
Prevent future outbreaks.	8.4.1. Decrease in no. outbreaks attributable to previously identified sources and contributing factors		Change in no. and % of outbreaks with specific sources and contributing factors, from baseline
Reduce incidence of foodborne illness.	8.4.2. Trends in no. confirmed foodborne outbreaks	OUTCOME • No. outbreaks reported to individual state health departments • Outbreaks per million population • Outbreaks per 1000 reported cases of specified foodborne disease agents • Outbreaks in restaurants per 1000 restaurants • No. outbreaks reported to eFORS	OUTCOME • % of outbreaks reported to state health department by year and type of agent, compared over time
Reduce incidence of foodborne illness.	8.4.3. Trends in incidence of specified foodborne illnesses	OUTCOME • Statewide annual summaries of reported foodborne diseases with trend analysis • FoodNet trend analyses	
Increase health of population.	Beyond scope of project		

8.2. Performance Indicators

Performance Measures for Program Evaluation

A total of 16 performance indicators were selected for the development of target ranges based on their importance and feasibility of implementation (Table 8-5). These include metrics for epidemiology, laboratory, and environmental health programs. Most of the selected performance measures focus on the state level. Several are applicable to both state and local programs and a few are primarily focused on local agencies. For each of the performance measures, a description is provided that describes the performance measure, relevant definitions, an assessment of the feasibility of measuring performance of the metric, and detailed methods for measurement.

Target ranges for these performance measures are being developed under direction of the CIFOR Performance Indicators Work Group, and will be maintained separately on the CIFOR website. This will allow for the target ranges to be modified as needed, based on the availability of resources and the performance of the system.

8.2. Performance Indicators

Table 8.5. CIFOR performance measures chosen for target range development

CIFOR PERFORMANCE MEASURE	MEASUREMENT METHODS	PERFORMANCE
1. Foodborne illness complaint reporting system: Metric: Agency maintains logs or databases for all complaints or referral reports from other sources alleging food-related illness, food-related injury or intentional food contamination, and routinely reviews data to identify clusters of illnesses requiring investigation. Definitions: Foodborne illness complaint: A report of illness experienced by one or more persons following exposure to a specific event or establishment. Foodborne illness complaint log: A paper registry of complaints that records information about the complaint and specific establishment. Foodborne illness complaint database: An electronic database that records information about the complaint and specific establishment in a searchable format. Feasibility: This metric is associated with CIFOR Indicator 8.2.1 "Foodborne complaints investigated." FDA's Draft Voluntary National Retail Food Regulatory Program Standards, Standard 5, Part 1.d calls for programs to maintain logs or databases for all complaint or referral reports from other sources alleging food-related illness, injury, or intentional food contamination.	Determine if an agency has any complaint system in place and if it is used to review foodborne illness complaints. Determine if an agency has an electronic database that can be systematically reviewed to link complaints.	Complaint system is: *(select one)* Electronic database: System to log complaints: Not applicable:

8.2. Performance Indicators

Table 8.5. CIFOR performance measures chosen for target range development
Continued

CIFOR PERFORMANCE MEASURE	MEASUREMENT METHODS	PERFORMANCE
2. Outbreaks detected from complaints: Metric: Outbreaks detected from complaints: Number outbreaks detected as a result of foodborne illness complaints. Rate of outbreaks detected per 1,000 complaints received. Definitions: Outbreak detected from a complaint: A foodborne illness outbreak that was detected as a result of a foodborne illness complaint investigation. Foodborne illness outbreak: The occurrence of two or more similar illnesses resulting from ingestion of a common food. Foodborne illness complaint: A report of illness experienced by one or more persons following exposure to a specific event or establishment. Feasibility: This metric is associated with CIFOR Indicator 8.2.1 "Foodborne complaints investigated." It provides a consistent expectation for the use of complaint data system. Reporting numbers will allow simple comparisons from year to year for the agency, and reporting rates will allow for comparisons across agencies.	Determine the number of foodborne illness complaints that were received during the year. This will be the denominator for the metric. Determine the number of foodborne illness outbreaks that were detected as a result of a foodborne illness complaint investigation during the year. This will be the numerator for the metric. Divide the numerator by the denominator and multiply by 1,000. This will convert the observed numbers into a standardized rate.	Denominator (No. complaints) = _____ Numerator (No. outbreaks detected from complaints) = _____ Rate (Num./Denom. x 1000)= _____

8.2. Performance Indicators

Table 8.5. CIFOR performance measures chosen for target range development
Continued

CIFOR PERFORMANCE MEASURE	MEASUREMENT METHODS	PERFORMANCE
3. Foodborne illness outbreak rate: Metric: Number foodborne outbreaks reported, all agents. Rate of outbreaks reported / 1,000,000 population. Definitions: Foodborne illness outbreak: The occurrence of two or more similar illnesses resulting from ingestion of a common food. Foodborne illness outbreak rate: The number of confirmed foodborne illness outbreaks within a jurisdiction during a year, divided by the population of the jurisdiction x 1,000,000. Feasibility: This metric is associated with CIFOR Indicator 8.2.4 "Foodborne outbreaks investigated." It aggregates FoodCORE metrics for outbreak investigations across all pathogens. Reporting foodborne outbreaks is part of PHEP Performance Measure 13.3 Outbreak Investigation Reports. Reporting numbers will allow simple comparisons from year to year for the agency, and reporting rates will allow for comparisons across agencies.	Determine the population of the jurisdiction. This will be the denominator for the metric. Determine the number of foodborne illness outbreaks that were reported during the year. This will be the numerator for the metric. Divide the numerator by the denominator and multiply by 1,000,000. This will convert the observed numbers into a standardized rate.	Denominator (Population) = _____ Numerator (No. foodborne outbreaks reported) = _____ Rate (Num./Denom. x 1,000,000) = _____

8.2. Performance Indicators

Table 8.5. CIFOR performance measures chosen for target range development
Continued

CIFOR PERFORMANCE MEASURE	MEASUREMENT METHODS	PERFORMANCE
4. Confirmed cases with exposure history obtained: Metric: Number and % of confirmed cases with exposure history obtained. Definitions: Confirmed case: Case reported to local or state health department by clinical laboratory with confirmed *Salmonella*, Shiga toxin-producing *E. coli* (STEC) or *Listeria* infection. Exposure history: An interview (of any format) that assesses exposures prior to onset of illness. The assessment should go beyond assessment of high risk settings and prevention education to ascertain food consumption/preference or other exposure data. For STEC this should include disease-specific data elements identified by CSTE and for Listeria it should include completing the *Listeria* case form. Feasibility: This metric is associated with CIFOR Indicator 8.2.2 "Reported cases with specified foodborne illness interviewed." It is consistent with FoodCORE common metrics for *Salmonella*, STEC, and *Listeria*. Reporting numbers will allow simple comparisons from year to year for the agency, and reporting rates will allow for comparisons across agencies.	Determine the number of confirmed cases reported. This will be the denominator for the metric. Determine the number of confirmed cases with exposure history obtained. This will be the numerator for the metric. Divide the numerator by the denominator and multiply by 100. This will convert the observed numbers into a standardized rate. Measure and report separately for confirmed *Salmonella*, *E. coli* (STEC) and Listeria cases.	Denominator (No. confirmed cases) = A. *Salmonella* B. *E. coli* (STEC) C. *Listeria* Numerator (No. cases with exposure history) = A. *Salmonella* B. *E. coli* (STEC) C. *Listeria* Rate (Num./Denom. x 100) = A. *Salmonella* B. *E. coli* (STEC) C. *Listeria*

8.2. Performance Indicators

Table 8.5. CIFOR performance measures chosen for target range development
Continued

CIFOR PERFORMANCE MEASURE	MEASUREMENT METHODS	PERFORMANCE
5. Isolate/CIDT-positive clinical specimen submissions to PHL: Metric: Isolate/CIDT-positive clinical specimen submissions to public health laboratory (PHL): Number and % of isolates from confirmed cases and clinical specimens from patients diagnosed by culture independent diagnostic test (CIDT), submitted to PHL. Definitions: Isolate: Primary isolates of *Salmonella*, Shiga toxin-producing *E. coli* (STEC) or Listeria, limited to first or representative isolate or sample for each case. PHL: State or local public health laboratory designated to serve as a reference laboratory for confirmation and subtyping of isolates for jurisdiction. Feasibility: This metric is associated with CIFOR Indicator 8.2.3 "Isolates of specified foodborne pathogens submitted to PHL." It is consistent with FoodCORE common metrics for *Salmonella*, STEC, and *Listeria*. Reporting numbers will allow simple comparisons from year to year for the agency, and reporting rates will allow for comparisons across agencies.	Determine the number of confirmed cases reported. This will be the denominator for the metric. Determine the number of isolates and clinical specimens from patients diagnosed by culture independent diagnostic test (CIDT), submitted to the PHL. This will be the numerator for the metric. Divide the numerator by the denominator and multiply by 100. This will convert the observed numbers into a standardized rate. Measure and report separately for confirmed *Salmonella*, *E. coli* (STEC), and Listeria cases.	Denominator (No. confirmed cases) = A. *Salmonella* B. *E. coli* (STEC) C. *Listeria* Numerator (No. isolates/ CIDT-positive clinical specimens submitted) = A. *Salmonella* B. *E. coli* (STEC) C. *Listeria* Rate (Num./Denom. x 100) = A. *Salmonella* B. *E. coli* (STEC) C. *Listeria*

8.2. Performance Indicators

Table 8.5. CIFOR performance measures chosen for target range development
Continued

CIFOR PERFORMANCE MEASURE	MEASUREMENT METHODS	PERFORMANCE
6. PFGE subtyping of isolates: Metric: Number and % of isolates with PFGE information. Definitions: Isolate: Primary isolates of *Salmonella*, Shiga toxin-producing *E. coli* (STEC), or *Listeria*, limited to first or representative isolate or sample for each case. PFGE: Pulsed-field gel electrophoresis. Feasibility: This metric is associated with CIFOR Indicator 8.2.3 "Isolates of specified foodborne pathogens submitted to PHL." It is consistent with FoodCORE common metrics for *Salmonella*, STEC, and *Listeria*. Reporting numbers will allow simple comparisons from year to year for the agency, and reporting rates will allow for comparisons across agencies.	Determine the number of isolates submitted to the PHL. This will be the denominator for the metric. Determine the number of isolates with PFGE information. This will be the numerator for the metric. Divide the numerator by the denominator and multiply by 100. This will convert the observed numbers into a standardized rate. Measure and report separately for confirmed *Salmonella*, *E. coli* (STEC), and *Listeria* cases.	Denominator (No. isolates submitted) = A. *Salmonella* B. *E. coli* (STEC) C. *Listeria* Numerator (No. isolates with PFGE information) = A. *Salmonella* B. *E. coli* (STEC) C. *Listeria* Rate (Num./Denom. x 100)= A. *Salmonella* B. *E. coli* (STEC) C. *Listeria*

8.2. Performance Indicators

Table 8.5. CIFOR performance measures chosen for target range development
Continued

CIFOR PERFORMANCE MEASURE	MEASUREMENT METHODS	PERFORMANCE
7. Isolate/CIDT-positive clinical specimen submission interval: Metric: Median number days from collection of clinical specimen to receipt of isolate or clinical specimen from a patient diagnosed by CIDT, at PHL. Definitions: Isolate: Primary isolates of Salmonella, Shiga toxin-producing E. coli (STEC), or Listeria, limited to first or representative isolate or sample for each case. CIDT-positive clinical specimen: Clinical specimens forwarded to PHL for confirmation and isolation from patients diagnosed with Salmonella, Shiga toxin-producing E. coli (STEC) or Listeria by culture independent diagnostic test (CIDT). Isolate/CIDT-positive clinical specimen submission interval: The number of days from collection of the clinical specimen to receipt of the isolate or clinical specimen from a patient diagnosed by CIDT, at the PHL. Feasibility: This metric is associated with CIFOR Indicator 8.2.3 "Isolates of specified foodborne pathogens submitted to PHL." It is consistent with FoodCORE common metrics for *Salmonella* and STEC. Median values likely reflect consistent general practices within the jurisdiction. Reporting median values will allow for comparisons across years within the agency and across agencies.	For each isolate or clinical specimen from a patient diagnosed by culture independent diagnostic test (CIDT), determine the date of specimen collection and the date of receipt at the PHL. Determine the number of calendar days between these dates, which is the isolate/CIDT-positive clinical specimen submission interval. Analyze the distribution of all known isolate/CIDT-positive clinical specimen submission intervals for the year. Report the median value for isolates/CIDT-positive clinical specimens with known isolate/CIDT-positive clinical specimen submission intervals. Determine the percentages of isolates/CIDT-positive clinical specimens with missing information for which an isolate submission interval cannot be determined. Measure and report separately for confirmed *Salmonella*, *E. coli* (STEC), and *Listeria* cases.	% of isolates/CIDT-positive clinical specimens with missing information: A. *Salmonella* B. *E. coli* (STEC) C. *Listeria* Median interval for isolates/CIDT-positive clinical specimens with known isolates/CIDT-positive clinical specimen submission intervals: A. *Salmonella* B. *E. coli* (STEC) C. *Listeria*

8.2. Performance Indicators

Table 8.5. CIFOR performance measures chosen for target range development
Continued

CIFOR PERFORMANCE MEASURE	MEASUREMENT METHODS	PERFORMANCE
8. Isolate subtyping interval: Metric: Median number days from receipt of isolate to availability of PFGE subtyping results. Definitions: Isolate: Primary isolates of *Salmonella*, Shiga toxin-producing E. coli (STEC), or *Listeria*, limited to first or representative isolate or sample for each case. Isolate subtyping interval: The number of days from receipt of the isolate at the PFGE laboratory to availability of PFGE subtyping results. Feasibility: This metric is associated with CIFOR Indicator 8.2.3 "Isolates of specified foodborne pathogens submitted to PHL." It is consistent with FoodCORE common metrics for *Salmonella* and STEC. Median values likely reflect consistent general practices within the jurisdiction. Reporting median values will allow for comparisons across years within the agency and across agencies.	For each isolate, determine the date of receipt at the PFGE laboratory and the date of upload to PulseNet. Determine the number of calendar days between these dates, which is the isolate subtyping interval. Analyze the distribution of all known isolate subtyping intervals for the year. Determine the percentages of isolates with missing information for which an isolate subtyping interval cannot be determined. Report the median value for isolates with known isolate subtyping intervals. Measure and report separately for confirmed *Salmonella*, *E. coli* (STEC), and *Listeria* cases.	% of isolates with missing information: A. *Salmonella* B. *E. coli* (STEC) C. *Listeria* Median interval for isolates with known isolate subtyping intervals: A. *Salmonella* B. *E. coli* (STEC) C. *Listeria*

8.2. Performance Indicators

Table 8.5. CIFOR performance measures chosen for target range development
Continued

CIFOR PERFORMANCE MEASURE	MEASUREMENT METHODS	PERFORMANCE
9. PHEP *E. coli* O157 and *Listeria* subtyping interval: Metric: PHEP *E. coli* O157 and *Listeria* subtyping interval: % of PFGE subtyping data results for *E. coli* O157:H7 and *Listeria* submitted to the PulseNet national database within four working days of isolate receipt at the PFGE laboratory. Definitions: PHEP: Public Health Emergency Preparedness Cooperative Agreement. PHEP specifies performance measures regarding public health surveillance and investigation of specified agents. Feasibility: This metric is associated with CIFOR Indicator 8.2.3 "Isolates of specified foodborne pathogens submitted to PHL," but entirely incorporates existing PHEP performance measures for PFGE subtyping of *E. coli* O157:H7 (PHEP 12.14) and *L. monocytogenes* (PHEP 12.15).	Determine the number of isolates submitted to the public health laboratory. Determine the number of isolates for which PFGE subtyping was performed. This will be the denominator for the metric. Determine the number of number of primary patterns from subtyped isolates uploaded to PulseNet. Determine the number of results from PFGE subtyped isolates that were submitted to PulseNet within four working days of receipt at the PFGE laboratory. This will be the numerator for the metric. Divide the numerator by the denominator and multiply by 100.	Denominator (No. isolates subtyped by PFGE) = _____ Numerator (No. isolates subtyped within 4 days) = _____ Rate (Num./Denom. x 100) = _____

8.2. Performance Indicators

Table 8.5. CIFOR performance measures chosen for target range development
Continued

CIFOR PERFORMANCE MEASURE	MEASUREMENT METHODS	PERFORMANCE
10. Outbreak clinical specimen collections: Metric: Outbreak clinical specimen collections: Number and % of outbreak investigations with clinical specimens collected and submitted to PHL from two or more people. Definitions: Foodborne illness outbreak: The occurrence of two or more similar illnesses resulting from ingestion of a common food. Feasibility: This metric is associated with CIFOR Indicator 8.2.4 "Foodborne outbreaks investigated." It extends FoodCORE metrics to investigations for all pathogens.	Determine the number of foodborne illness outbreaks that were investigated. This will be the denominator for the metric. Determine the number of outbreaks for which clinical specimens were collected and submitted to the PHL from two or more people. This will be the numerator for the metric. Divide the numerator by the denominator and multiply by 100.	Denominator (No. outbreaks) = _____ Numerator (No. outbreaks with clinical specimens collected) = _____ Rate (Num./Denom. x 100) = _____

8.2. Performance Indicators

Table 8.5. CIFOR performance measures chosen for target range development
Continued

CIFOR PERFORMANCE MEASURE	MEASUREMENT METHODS	PERFORMANCE
11. Cluster investigation interval: Metric: Median number days from initiation of investigation to identification of source. Definitions: Cluster: Two or more isolates with a matching molecular subtype pattern identified in a period of two weeks. Cluster investigation interval: The number of days from the initiation of an investigation to the identification of source, for clusters with a source identified. Initiation of an investigation: Steps taken to investigate the possible source of a cluster of cases after it is determined that they may represent a common source outbreak. This goes beyond routine follow-up of individual cases. Feasibility: This metric is associated with CIFOR Indicator 8.2.5 "Case clusters investigated." It aggregates FoodCORE metrics for investigations across all pathogens.	Determine the number of clusters that were detected by the public health laboratory. Determine the number and % of clusters where a source was identified. For each cluster for which a source was identified, determine the date at which the investigation was initiated and the date at which the source was identified. Determine the number of calendar days between these dates, which is the cluster investigation interval. Analyze the distribution of all known cluster investigation intervals for the year. Report the median value for investigations with known cluster investigation intervals.	Percentage of clusters with source identified: _____ Median interval for cluster with known investigation intervals: _____

8.2. Performance Indicators

Table 8.5. CIFOR performance measures chosen for target range development
Continued

CIFOR PERFORMANCE MEASURE	MEASUREMENT METHODS	PERFORMANCE
12. Complaint investigation interval: Metric: Median number days from initiation of investigation to implementation of intervention. Definitions: Foodborne illness complaint: A report of illness experienced by one or more persons following exposure to a specific event or establishment. Complaint investigation interval: The number of days from the initiation of an investigation to the initial intervention. Initiation of an investigation: Steps taken to investigate the possible source of a complaint after it is determined that it may represent a common source outbreak. This goes beyond routine follow-up of individual complaints. Intervention: A public health action taken to control an identified hazard. Feasibility: This metric is associated with CIFOR Indicator 8.2.1 "Foodborne complaints investigated." It aggregates FoodCORE metrics for investigations across all pathogens.	Determine the number of foodborne illness complaints that were investigated. Determine the number and percentage of foodborne complaint investigations that led to an intervention. For each complaint investigation that led to an intervention, determine the date at which the investigation was initiated and the date at which an intervention was initiated. Determine the number of calendar days between these dates, which is the complaint investigation interval. Analyze the distribution of all complaint investigation intervals for the year. Report the median value for complaint investigation intervals.	% of complaint investigations with interventions: _____ Median interval for complaints with known isolate investigation intervals: _____

8.2. Performance Indicators

Table 8.5. CIFOR performance measures chosen for target range development
Continued

CIFOR PERFORMANCE MEASURE	MEASUREMENT METHODS	PERFORMANCE
13. Cluster source identification: Metric: Number and % of clusters with more than five cases in which a source was identified. Definitions: Cluster: Two or more isolates with a matching molecular subtype pattern identified in a period of two weeks. Cluster source identification: The number of identified clusters for which a specific food transmission setting, meal, food item or ingredient was identified, leading the cluster to be considered an outbreak. Feasibility: This metric is associated with CIFOR Indicator 8.2.5 "Case clusters investigated."	Determine the number of clusters that include five or more cases. This will be the denominator for the metric. Determine the number of clusters for which a source was identified that include five or more cases. This will be the numerator for the metric. Divide the numerator by the denominator and multiply by 100.	Denominator (No. clusters with ≥ 5 cases) = _____ Numerator (No. clusters with ≥ 5 cases with source identified) = _____ Rate (Num./Denom. x 100) = _____

8.2. Performance Indicators

Table 8.5. CIFOR performance measures chosen for target range development
Continued

CIFOR PERFORMANCE MEASURE	MEASUREMENT METHODS	PERFORMANCE
14. Outbreak etiology reported to NORS: Metric: Number and % of outbreaks for which etiology was identified and reported to NORS. Definitions: Foodborne illness outbreak: The occurrence of two or more similar illnesses resulting from ingestion of a common food. NORS form: National Outbreak Reporting System, Foodborne Disease Outbreaks and Enteric Disease Outbreaks Transmitted by Contact with Persons, Animals, or Environmental Sources, or by an Unknown Mode; NORS Form (CDC 52.13 Form). Etiology identified: For most etiologic agents CDC considers an outbreak to have a confirmed etiology if there are two or more lab-confirmed cases (*MMWR* 2000, Vol. 49/ SS-1, App. B). Etiology may be suspected based on characteristic combinations of clinical symptoms, incubation periods, and duration of illness. Feasibility: This metric is associated with CIFOR Indicator 8.3.1 "Etiology of outbreak identified." This metric will require improved investigation and documentation by many agencies.	Determine the number of foodborne outbreaks that were investigated. This will be the denominator for the metric. Determine the number of outbreaks for which an etiology was identified and reported to NORS. This will be the numerator for the metric. Divide the numerator by the denominator and multiply by 100.	Denominator (No. outbreaks) = _____ Numerator (No. with etiology reported to NORS) = _____ Rate (Num./Denom. x 100) = _____

8.2. Performance Indicators

Table 8.5. CIFOR performance measures chosen for target range development
Continued

CIFOR PERFORMANCE MEASURE	MEASUREMENT METHODS	PERFORMANCE
15. Outbreak vehicle reported to NORS: Metric: Number and % of outbreaks for which a vehicle was identified and reported to NORS. Definitions: Foodborne illness outbreak: The occurrence of two or more similar illnesses resulting from ingestion of a common food. NORS form: National Outbreak Reporting System, Foodborne Disease Outbreaks and Enteric Disease Outbreaks Transmitted by Contact with Persons, Animals, or Environmental Sources, or by an Unknown Mode; NORS Form (CDC 52.13 Form). Vehicle identified: A specific food item or ingredient was confirmed or suspected to be the source of the outbreak based on one of the following: (1) Statistical evidence from epidemiological investigation, (2) Laboratory evidence (e.g., identification of agent in food), (3) Compelling supportive information, (4) Other data (e.g., same phage type found on farm that supplied eggs), (5) Specific evidence lacking but prior experience makes it a likely source. Feasibility: This metric is associated with CIFOR Indicator 8.3.2 "Vehicle of outbreak identified." This metric will require improved investigation and documentation by many agencies.	Determine the number of foodborne outbreaks that were investigated. This will be the denominator for the metric. Determine the number of outbreaks for which a vehicle was identified and reported to NORS. This will be the numerator for the metric. Divide the numerator by the denominator and multiply by 100.	Denominator (No. outbreaks) = _____ Numerator (No. with vehicle reported to NORS) = _____ Rate (Num./Denom. x 100) = _____

8.2. Performance Indicators

Table 8.5. CIFOR performance measures chosen for target range development
Continued

CIFOR PERFORMANCE MEASURE	MEASUREMENT METHODS	PERFORMANCE
16. Outbreak contributing factor reported to NORS: Metric: Number and % of outbreaks for which contributing factors were identified and reported to NORS. Definitions: Foodborne illness outbreak: The occurrence of two or more similar illnesses resulting from ingestion of a common food. NORS form: National Outbreak Reporting System, Foodborne Disease Outbreaks and Enteric Disease Outbreaks Transmitted by Contact with Persons, Animals, or Environmental Sources, or by an Unknown Mode; NORS Form (CDC 52.13 Form). Contributing factor identified: Contributing factors (CFs) are defined as the food safety practices and behaviors which most likely contributed to a foodborne illness outbreak. A CF should be identified only if the investigator has strong evidence that it actually occurred in the investigated outbreak; just because a factor has been cited in similar outbreaks in the past does not mean it was involved in the investigated outbreak. Feasibility: This metric is associated with CIFOR Indicator 8.3.3 "Contributing factor identified." This metric will require improved investigation and documentation by many agencies.	Determine the number of foodborne outbreaks that were investigated. This will be the denominator for the metric. Determine the number of outbreaks for which a contributing factor was identified and reported to NORS. This will be the numerator for the metric. Divide the numerator by the denominator and multiply by 100.	Denominator (No. outbreaks) = _____ Numerator (No. with contributing factors reported to NORS) = _____ Rate (Num./Denom. x 100) = _____