Performance Metrics for Foodborne Illness Programs

CHAPTER SUMMARY POINTS

- Evaluating the timeliness and effectiveness of surveillance, investigation, and control of foodborne illnesses and outbreaks is critical to improving these activities at the local, state, territorial, tribal, and national levels.

- Numerous programs involved in foodborne illness outbreak detection, investigation, and response have developed and routinely use metrics to assess their work and measure performance.

- The aggregation of data at state, regional, or national levels could provide a comprehensive overview of foodborne illness surveillance and control programs, rather than a system for ranking them.

URLs and email addresses in this chapter are valid as of July 9, 2019.

8.0 Introduction

Surveillance and investigation of foodborne illnesses and outbreaks are essential for controlling and preventing foodborne illnesses. Multiple entities—more than 3,000 local health departments; 50 state and numerous territorial and tribal health departments; and several federal agencies—interact in a complex system covering surveillance for, detection of, and response to enteric and other foodborne illnesses and outbreaks.

Evaluating the timeliness and effectiveness of surveillance, investigation, and control of foodborne illnesses and outbreaks is critical to improving these activities at all levels. Since the publication of the Second Edition of the CIFOR Guidelines, the use of performance metrics by various food-safety programs and agencies has increased. Performance metrics enable a program to assess processes and identify opportunities to improve processes. This Third Edition of the CIFOR Guidelines draws heavily on the experiences of other programs in developing and using performance metrics.

Performance metrics are commonly associated with quality improvement initiatives, including accreditation and capacity building. The types of performance metrics, and how they are developed and implemented, are often determined by the type of program or initiative in which a jurisdiction is participating. Quality improvement literature and programmatic experience has shown that

- The most meaningful performance metrics are tied directly to a program's activities;

- Metrics promote a common understanding of the key elements of foodborne illness surveillance and control activities across local, state, territorial, tribal, and federal public health agencies;

- Using a framework (like the one presented in this chapter) can save time and resources by describing what types of activities could be measured, but programs or jurisdictions will need to determine how to measure components in a way that is meaningful for their purposes;

- Process-based metrics are often easier to design and implement, whereas multifactorial outcome metrics can be more challenging;

- Evaluating performance metric data over time can enable programs or jurisdictions to evaluate the impact of changes in practice and target additional activities for ongoing improvement efforts; and

- Metrics can elucidate successes and identify gaps in the detection, investigation, prevention, and control of sporadic foodborne illnesses and outbreaks.

8.1 Purpose and Intended Use

Numerous programs involved in foodborne illness outbreak detection, investigation, and response have developed and use metrics for routine program evaluation (Table 8.1). The combined experience of these programs was used to develop the performance metrics in Table 8.2. URLs for each program's complete list of metrics are available on the CIFOR website.

The metrics are a curated list of the most important metrics that programs can use to assess their work and measure performance in activities related to surveillance, investigation, and control of foodborne illnesses and outbreaks.

Foodborne illness and outbreak investigations are multidisciplinary, but different agencies use staff in varying disciplines or areas of

8.1 Purpose and Intended Use

expertise to perform surveillance, investigation, and control activities. Thus, categories of environmental health, laboratory, and epidemiology are used solely for the organization of the metrics, not to suggest which staff should perform the specific duties within an agency. In other words, not every metric applies to every agency; for example, some laboratory metrics may not be relevant to local public health agencies.

Users can evaluate their performance metric data over multiple time points, when those data are available. Additionally, users can

compare their data to the summary data from other programs or agencies to determine where improvements might be realistic. Neither target ranges nor participant data are intended to be used as scorecards or performance standards. Defining the level of performance expected from foodborne illness and outbreak surveillance, investigation, and control programs exceeds the scope of these Guidelines. The aggregation of data at state, regional, or national levels could provide a comprehensive overview of foodborne illness surveillance and control programs, rather than a system for ranking them.

Table 8.1. Programs with Performance Metrics		
HOST AGENCY	PROGRAM	ABOUT THE PROGRAM
Centers for Disease Control and Prevention (CDC)	Foodborne Diseases Centers for Outbreak Response Enhancement (FoodCORE)	FoodCORE centers collaborate to develop new and better methods to detect, investigate, respond to, and control multistate outbreaks of foodborne illness. They focus primarily on outbreaks caused by bacteria, including *Salmonella*, Shiga toxin–producing *Escherichia coli* (STEC), and *Listeria*.
CDC	OutbreakNet Enhanced	OutbreakNet Enhanced supports local and state health departments to improve their capacity to detect, investigate, control, and respond to enteric illness outbreaks. OutbreakNet Enhanced sites collaborate with each other and CDC to share experiences and insights that help improve enteric illness outbreak response. OutbreakNet Enhanced activities focus on improving detection and rapid interviewing *Salmonella*, STEC, and *Listeria* case-patients and of persons with enteric illness caused by pathogens that demonstrate antimicrobial resistance.
CDC	National Environmental Assessment Reporting System (NEARS)	NEARS is a Web-based surveillance system that local and state health departments use to report environmental assessment data from foodborne illness outbreak investigations. NEARS helps the national food-safety system by providing critical data from environmental assessments to prevent and reduce future outbreaks.
CDC	National Outbreak Reporting System (NORS)	NORS is a Web-based platform launched in 2009. It is used by local, state, and territorial health departments to report to CDC all waterborne and foodborne illness outbreaks and enteric disease outbreaks transmitted by contact with environmental sources, infected persons or animals, or unknown modes.
Food and Drug Administration (FDA)	Rapid Response Teams (RRTs)	RRTs are multiagency, multidisciplinary teams that operate using Incident Command System/National Incident Management System principles and a Unified Command structure to respond to human and animal food emergencies. RRTs are housed in food-regulatory agencies.

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PERFORMANCE METRICS FOR
FOODBORNE ILLNESS PROGRAMS

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Table 8.1. Programs with Performance Metrics		
HOST AGENCY	PROGRAM	ABOUT THE PROGRAM
FDA	Voluntary National Retail Food Regulatory Program Standards (Retail Program Standards)	The Retail Program Standards define what constitutes a highly effective and responsive program for regulating food-service and retail food establishments. The Retail Program Standards are intended to reinforce proper sanitation (good retail practices) and operational and environmental prerequisite programs while encouraging regulatory agencies and industry to focus on the factors that cause and contribute to foodborne illness, with the ultimate goal of reducing the occurrence of those factors.
FDA	Manufactured Foods Regulatory Program Standards (MFRPS)	The MFRPS are a critical component in establishing the national Integrated Food Safety System. The goal of the MFRPS is to implement a nationally integrated, risk-based, food-safety system focused on protecting public health. The MFRPS establish a uniform basis for measuring and improving the performance of prevention, intervention, and response activities of manufactured food-regulatory programs. Development and implementation of the standards help state and federal programs better direct their regulatory activities toward reducing foodborne illness.
U.S. Department of Agriculture–Food Safety and Inspection Service (USDA-FSIS)	Public Health Indicators (from FSIS 2017–2021 Strategic Plan)	The mission of FSIS is to protect the public's health by ensuring the safety of meat, poultry, and processed egg products. FSIS has developed plans and resources to strengthen collaborative relationships with outbreak investigation partners.

8.2 Performance Metrics

The remainder of this chapter focuses on Table 8.2, which includes 21 metrics organized by discipline: environmental health, epidemiology, and laboratory. As noted above, the disciplines listed are for organizational purposes, not to suggest which staff should conduct certain portions of outbreak investigations. Within the epidemiology section, metrics are grouped by investigations typically initiated from laboratory surveillance data and investigations typically initiated from complaint data (see Chapter 4).

Details on calculating a particular metric are available on the websites of the programs that produced the metrics, as are other metrics from these groups that might be relevant to their programs. The original source metrics also may provide additional instructions, summary data from implementation of the metrics, and examples of how the metrics have been used to guide planning and evaluation activities.

Agencies that frequently use metrics (Table 8.1) have extensive metrics but do not capture every component of foodborne illness surveillance and control programs. Table 8.3 presents additional metrics that are not currently available from the referenced programs but may be valuable for agencies to examine. Because these metrics are not routinely collected by programs, users may need to create standardized definitions to calculate the metrics.

8.2 Performance Metrics

Table 8.2. Foodborne Illness Performance Metrics from Existing Programs

CATEGORY	PERFORMANCE METRIC	SOURCE OF METRIC
Environmental health	The program maintains logs or databases for all complaint or referral reports from other sources alleging food-related illness, food-related injury, or unintentional food contamination. The final disposition for each complaint is recorded in the database or log and is filed in, or linked to, the establishment record for retrieval purposes.	Voluntary National Retail Food Regulatory Program Standards, https://www.fda.gov/Food/GuidanceRegulation/RetailFoodProtection/ProgramStandards/ucm245409.htm
	Percentage of outbreak investigations that included an environmental assessment.	National Environmental Assessment Reporting System (NEARS), https://www.cdc.gov/nceh/ehs/nears/resources.htm
	Percentage of outbreak investigations that identified a contributing factor.	NEARS, https://www.cdc.gov/nceh/ehs/nears/resources.htm
	Average number of days between date the outbreak establishment was identified for an environmental assessment and date of the establishment observation.	NEARS, https://www.cdc.gov/nceh/ehs/nears/resources.htm
	Percentage of traceback investigations that successfully result in identification of an implicated food.	Rapid Response Teams (RRTs), https://www.fda.gov/ForFederalStateandLocalOfficials/ProgramsInitiatives/ucm475021.htm#Manual
	Percentage of outbreaks reported to NEARS.	NEARS, https://www.cdc.gov/nceh/ehs/nears/resources.htm
Epidemiology	Percentage of confirmed cases with exposure history obtained for *Salmonella*, Shiga toxin–producing *Escherichia coli* (STEC), and *Listeria*.	Foodborne Diseases Centers for Outbreak Response Enhancement (FoodCORE), https://www.cdc.gov/foodcore/metrics/ssl-metrics.html OutbreakNet Enhanced (OBNE), https://www.cdc.gov/foodsafety/outbreaknetenhanced/metrics.html
	Time from case report to first interview attempt for *Salmonella*, STEC, and *Listeria* cases.	FoodCORE, https://www.cdc.gov/foodcore/metrics/ssl-metrics.html OBNE, https://www.cdc.gov/foodsafety/outbreaknetenhanced/metrics.html
	Number and percentage of *Salmonella*, STEC, and *Listeria* investigations with supplemental or targeted interviewing of case-patients.	FoodCORE, https://www.cdc.gov/foodcore/metrics/ssl-metrics.html

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Table 8.2. Foodborne Illness Performance Metrics from Existing Programs		
CATEGORY	PERFORMANCE METRIC	SOURCE OF METRIC
Epidemiology	Number and percentage of *Salmonella*, STEC, and *Listeria* investigations for which an analytic epidemiologic study was conducted.	FoodCORE, https://www.cdc.gov/foodcore/metrics/ssl-metrics.html OBNE, https://www.cdc.gov/foodsafety/outbreaknetenhanced/metrics.html
	Number and percentage of *Salmonella*, STEC, and *Listeria* investigations with suspected vehicle/source identified. Number and percentage of *Salmonella*, STEC, and *Listeria* investigations with confirmed vehicle/source identified.	FoodCORE, https://www.cdc.gov/foodcore/metrics/ssl-metrics.html OBNE, https://www.cdc.gov/foodsafety/outbreaknetenhanced/metrics.html
	Number and percentage of all investigations with clinical specimens collected and submitted to any laboratory (public health or clinical).	FoodCORE, https://www.cdc.gov/foodcore/metrics/nou-metrics.html
	Number and percentage of foodborne or point-source investigations with suspected vehicle/source identified. Number and percentage of foodborne or point-source investigations with confirmed vehicle/source identified.	FoodCORE, https://www.cdc.gov/foodcore/metrics/nou-metrics.html
	Number and percentage of outbreaks for which National Outbreak Reporting System form was completed.	FoodCORE, https://www.cdc.gov/foodcore/metrics/ssl-metrics.html OBNE, https://www.cdc.gov/foodsafety/outbreaknetenhanced/metrics.html
Laboratory	Time from isolation/isolate-yielding *Salmonella*, STEC, or *Listeria* specimen collection to receipt at public health laboratory.	FoodCORE, https://www.cdc.gov/foodcore/metrics/ssl-metrics.html
	Time from *Salmonella* or STEC isolate receipt (or recovery) at public health laboratory to serotype result (not applicable for *Listeria*).	FoodCORE, https://www.cdc.gov/foodcore/metrics/ssl-metrics.html
	Percentage of primary *Salmonella*, STEC, and *Listeria* isolates with whole genome sequencing (WGS)* results.	FoodCORE, https://www.cdc.gov/foodcore/metrics/ssl-metrics.html OBNE, https://www.cdc.gov/foodsafety/outbreaknetenhanced/metrics.html
	Time from *Salmonella*, STEC, and *Listeria* isolate receipt (or recovery) at public health laboratory to WGS* upload to PulseNet.	FoodCORE, https://www.cdc.gov/foodcore/metrics/ssl-metrics.html OBNE, https://www.cdc.gov/foodsafety/outbreaknetenhanced/metrics.html

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Table 8.2. Foodborne Illness Performance Metrics from Existing Programs		
CATEGORY	PERFORMANCE METRIC	SOURCE OF METRIC
Laboratory	Time from *Salmonella*, STEC, and *Listeria* isolate receipt (or recovery) at public health laboratory to sharing of WGS with national database.	FoodCORE, https://www.cdc.gov/foodcore/metrics/ssl-metrics.html OBNE, https://www.cdc.gov/foodsafety/outbreaknetenhanced/metrics.html

*PFGE and WGS data will be compiled through 2019. Starting with 2020 data, only WGS will be measured.

Table 8.3. Additional Performance Metrics to Assess Response Effectiveness	
CATEGORY	PERFORMANCE METRIC
Environmental health	Program maintenance of complaint data in an electronic manner that can be queried. Number of complaints received and rate of complaints per 100,000 population in the jurisdiction. Number of outbreaks detected from complaints and rate of outbreaks per 1,000 complaints.
	Percentage of investigations reported to federal regulatory agencies within 72 hours after the suspected vehicle is identified.
	Median number of days from initiation of investigations to implementation of control measures
Epidemiology	Median number of days from initiation of *Salmonella*, Shiga toxin–producing *Escherichia coli* (STEC), and *Listeria* investigations to identification of source
	Foodborne illness outbreak rate: number of foodborne outbreaks reported (all agents) per 1,000,000 population.
	Number of foodborne outbreaks reported (*Salmonella*, STEC, and *Listeria*) per 1,000 cases
	Percentage of outbreaks for which etiology is identified.
Laboratory	Number and percentage of *Salmonella*, STEC, and *Listeria* isolates/clinical specimens submitted to the public health laboratory from cases diagnosed by culture-independent diagnostic testing at the clinical laboratory.
	Percentage recovery of *Salmonella* and STEC isolates from culture-independent diagnostic test positive specimens received at the public Health Laboratory.