



**Evaluation of Florida Foodborne Illness and Outbreak Response
Using the Council to Improve Foodborne Outbreak and Response
(CIFOR) Performance Measures**

Final Report

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INTRODUCTION

The Council to Improve Foodborne Outbreak Response (CIFOR) was nationally established in 2006 to improve methods at the local, state, and federal levels to detect, investigate, control, and prevent foodborne disease outbreaks. In 2014, the second edition of the CIFOR Guidelines was released and included measurable indicators of effective surveillance for enteric diseases and response to outbreaks by state and local public health agencies.¹ The performance indicators are intended to be used by agencies to evaluate the performance of their foodborne disease surveillance programs, environmental health programs, laboratory programs, and control programs. They also provide a framework for communicating best practices for surveillance activities and create clear performance expectations that would increase the likelihood of compliance across jurisdictions. Along with the indicators, an abridged version of the performance measures was published that identified specific target ranges for 16 selected performance indicators. The target ranges allow a common criterion for all agencies involved in foodborne outbreak investigations to evaluate their program effectiveness and identify areas that need improvement.

The Integrated Food Safety Centers of Excellence (CoE) proposed evaluating data using the CIFOR performance measures as a way to assess strengths and areas for improvement in outbreak detection and response. This evaluation assesses Florida's performance for the year 2014 at the state level and uses the most recent performance measures which are included in the second edition of the CIFOR Guidelines.¹

METHODS

To evaluate Florida's performance on the 16 performance measures for 2014, data were obtained and calculated by calendar year from the following sources:

- Merlin, an electronic surveillance database specific to Florida and used by Department of Health (DOH) staff at the state and local level to report, investigate, and manage cases of reportable diseases.
- National Outbreak Reporting System (NORS), a national web-based platform for reporting of enteric disease outbreaks transmitted by food and managed by the Centers for Disease Control and Prevention (CDC).
- BioNumerics, developed by Applied Maths. BioNumerics is used by CDC PulseNet as an unbiased and reproducible way of describing pulsed-field gel electrophoresis (PFGE) patterns.
- LabWare, a laboratory information management system utilized by the Bureau of Public Health Laboratories (BPHL) at DOH.

RESULTS

The results of the analysis for the 16 CIFOR performance measures, suggested target ranges for each measure, and Florida's performance and achieved target range for each measure are found below (Table 1).

Table 1. CIFOR Performance Measures and Florida's Performance

CIFOR Performance Measures		Florida Performance	
Performance Measure	Target Range	Findings for Each Performance Measure	Target Range Achieved
<p>1. Foodborne illness complaint reporting system: 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.</p>	<p>Preferable: database Acceptable: system to log complaints</p>	<p>Florida Environmental Health Surveillance System (FLEHS)</p>	<p>Preferable</p>
<p>2. Outbreaks detected from complaints: Number of outbreaks detected as a result of foodborne illness complaints. Rate of outbreaks detected per 1,000 complaints received.</p>	<p>Preferable: >20 outbreaks/1,000 complaints Acceptable: 10-20 outbreaks/1,000 complaints</p>	<p>48 outbreaks/2165 total complaints = 22.2 outbreaks/1,000 complaints</p>	<p>Preferable</p>
<p>3. Foodborne illness outbreak rate: Number foodborne outbreaks reported, all agents. Rate of outbreaks reported / 1,000,000 population.</p>	<p>Preferable: >6 outbreaks/1,000,000 population Acceptable: 1-6 outbreaks/1,000,000 population</p>	<p>93 outbreaks/19.89 million people = 4.7 per 1,000,000</p>	<p>Acceptable</p>
<p>4. Confirmed cases with exposure history obtained: Number and percentage of confirmed <i>Salmonella</i>, Shigatoxin producing <i>E. coli</i> (STEC), and <i>Listeria</i> cases with exposure history obtained.</p>	<p>Preferable: >75% of cases Acceptable: 50-75% of cases</p>	<p>Salmonella: (1037/5738) = 18.1% STEC: (63/97 confirmed cases) = 64.9% Listeria: (43/49 confirmed cases) = 87.7%</p>	<p>Salmonella: Not acceptable STEC: Acceptable Listeria: Preferable</p>

CIFOR Performance Measures		Florida Performance	
Performance Measure	Target Range	Findings for Each Performance Measure	Target Range Achieved
<p>5. Isolate submissions to Public Health Laboratory: Number and percentage of isolates from confirmed <i>Salmonella</i>, STEC, and <i>Listeria</i> cases submitted to Public Health Laboratory (PHL).</p>	<p>Preferable: >90% of isolates Acceptable: 60-90% of isolates</p>	<p>Salmonella: (1886/5738 confirmed cases) = 32.9% STEC: (97/97 confirmed cases) = 100% Listeria: (41/49 confirmed cases) = 83.7%</p>	<p>Salmonella: Not Acceptable STEC: Preferable Listeria: Acceptable</p>
<p>6. Pulsed-Field Gel Electrophoresis (PFGE) subtyping of isolates: Number and percentage of <i>Salmonella</i>, STEC, and <i>Listeria</i> isolates with PFGE information.</p>	<p>Preferable: >90% of isolates Acceptable: 60-90% of isolates</p>	<p>Salmonella: (1871/1886 isolated submitted to BPHL) = 99.8% STEC: (46/97 isolates submitted to BPHL) = 47.4% Listeria: (37/41 isolates submitted to BPHL) = 90.2%</p>	<p>Salmonella: Preferable STEC: Not Acceptable Listeria: Preferable</p>
<p>7. Isolate submission interval: Median number of days from report of clinical findings to receipt of <i>Salmonella</i>, STEC, and <i>Listeria</i> isolate at PHL.</p>	<p>Preferable: <7 days Acceptable: 7-8 days</p>	<p>Salmonella: 7 Days STEC: 7 Days Listeria: 6 Days</p>	<p>Salmonella: Acceptable STEC: Acceptable Listeria: Preferable</p>
<p>8. Isolate subtyping interval: Median number days from receipt of <i>Salmonella</i>, STEC, and <i>Listeria</i> isolates to serotyping or subtyping results.</p>	<p>Preferable: <4 days Acceptable: 5-6 days</p>	<p>Salmonella: 2 Days STEC: 3 Days Listeria: 3 Days</p>	<p>Salmonella: Preferable STEC: Preferable Listeria: Preferable</p>

CIFOR Performance Measures		Florida Performance	
Performance Measure	Target Range	Findings for Each Performance Measure	Target Range Achieved
9. PFGE <i>E. coli</i> O157 and <i>Listeria</i> subtyping interval: Percent of pulsed-field gel electrophoresis (PFGE) subtyping data results for <i>E. coli</i> O157:H7 and <i>Listeria</i> submitted to the PulseNet national database within four working days of receiving isolate at the PFGE laboratory.	Acceptable: >90% of PFGE subtyping results submitted to PulseNet within 4 working days.	100%	Acceptable
10. Outbreak clinical specimen collections: Number and percentage of outbreak investigations with clinical specimens collected and submitted to PHL from 2 or more people.	Preferable: >75% of outbreaks Acceptable: 50-75% of outbreaks	Foodborne outbreaks excluding ciguatera, scombroid, and chemical poisoning: (22/65) = 33.8%	Not Acceptable
11. Cluster investigation interval: Median no. days from initiation of investigation to identification of a source.	Preferable: <7 days Acceptable: 7-21 days	Not Available	Not Available
12. Complaint investigation interval: Median no. days from initiation of investigation to implementation of intervention.	Preferable: < 7 days Acceptable: 7-21 days	Not Available	Not Available
13. Cluster source identification: Number and percentage of clusters with more than 5 cases in which a source was identified.	Preferable: >20% of clusters with >5 cases Acceptable: 10-20% of clusters with >5 cases	0	Not Acceptable
14. Outbreak etiology reported to NORS: Number and percentage of outbreaks for which etiology was identified and reported to NORS.	Preferable: >68% of outbreaks Acceptable: 44-68% of outbreaks	74/93 outbreaks = 79.6%	Preferable

CIFOR Performance Measures		Florida Performance	
Performance Measure	Target Range	Findings for Each Performance Measure	Target Range Achieved
15. Outbreak vehicle reported to NORS: Number and percentage of outbreaks for which a vehicle was identified and reported to NORS.	Preferable: >60% of outbreaks Acceptable: 48-60% of outbreaks	58/93 outbreaks = 62.4%	Preferable
16. Outbreak contributing factor reported to NORS: Number and percentage of outbreaks for which contributing factors were identified and reported to NORS.	Preferable: >55% of outbreaks Acceptable: 33-55% of outbreaks	76/93 outbreaks = 81.7%	Preferable

CONCLUSIONS

In 2014, 14 of the 16 CIFOR performance measures were available for evaluation for state-level data; measures 11 and 12 were unavailable for evaluation.

Performance Measure 1: The preferable achievement for measure 1 refers to the Florida Environmental Health Surveillance System (FLEHS), a web-based database for environmental health data management. All foodborne illness complaints received by DOH from a number of reporting entities are entered into FLEHS and complaints are monitored for ongoing surveillance purposes.

Performance Measure 2: The capacity to track complaints that are part of an outbreak was established in September 2013. The rate of outbreaks detected from complaints was preferable (22.2/1,000).

Performance Measure 3: The rate of outbreaks reported increased from 2.5 per 1 million people in 2013 to 4.7 per 1 million people in 2014. This ratio was acceptable.

Performance Measure 4: There were 97 cases of Shiga toxin-producing *E. coli* (STEC) reported; 64.9% with a complete exposure history available, therefore meeting the acceptable performance level. A total of 49 cases of listeriosis were reported; 87.7% with completed exposure history collected, therefore meeting the preferable status for the measure. Florida does not require county health departments (CHD) to report exposure history for *Salmonella* cases in Merlin, thus yielding a low percentage of obtained exposure history (18.1%).

Performance Measure 5: Isolate submissions to BPHL for *E. coli* was 100%, achieving a measure of preferable and isolate submissions for *Listeria* was 83.7%, achieving a measure of acceptable. *Salmonella* isolates are not required to be submitted to BPHL, thus yielding a low percentage of submissions (32.9%).

Performance Measure 6: The number of isolates that had PFGE analysis completed for *Salmonella* (99.8%) and *Listeria* (90.2%) was preferable. BPHL runs PFGE on *E. coli* O157:H7 and “Big Six” serotypes (O26, O45, O103, O111, O121, and O145) only, resulting in a limited number of isolates with completed PFGE information for STEC cases (47.4%).

Performance Measure 7: Preferable for *Listeria* and acceptable for *Salmonella* and STEC.

Performance Measure 8: Preferable for all pathogens.

Performance Measure 9: PFGE information for *Listeria* and *E. coli* O157:H7 isolates were submitted to PulseNet within four working days of receiving the isolates 100% of the time.

Performance Measure 10: Florida’s percentage of outbreak clinical specimen collection (33.8%) from two or more people can be partially attributed to the patients’ willingness to submit stool samples in combination with the timing of disease reporting. DOH routinely requests three to five specimens per outbreak but not every person is comfortable submitting a stool sample. Case confirmation requires epidemiological evidence implicating an agent and confirmatory

laboratory data. DOH only requires one case and one confirmed clinical specimen for an outbreak to be counted. This measure only includes an outbreak with two or more lab-confirmed cases for reporting in NORS. Also, foodborne outbreaks of botulism, marine toxins, and other chemicals are often reported in Florida and have distinct clinical symptoms where a physician's diagnosis is sufficient, and laboratory confirmation is not always necessary for case confirmation.

Performance Measure 11: This information is not available because no clusters were identified in 2014.

Performance Measure 12: This information is not available because no clusters were identified in 2014.

Performance Measure 13: Zero clusters were identified in 2014 due to a vacancy in the PFGE Cluster Epidemiologist position.

Performance Measure 14: Outbreaks for which etiology was reported to NORS was preferable (79.6%).

Performance Measure 15: Outbreaks for which a vehicle was identified and reported to NORS was preferable (62.4%).

Performance Measure 16: Outbreaks for which contributing factors were identified and reported to NORS was preferable (81.7%).

Strengths

The Food and Waterborne Disease Program (FWDP) provides support to the CHDs via eight Regional Environmental Epidemiologists (REEs), each assigned to a different region of the state. REEs assist the 67 counties in the surveillance, investigation, reporting, and prevention of

food and waterborne disease. CHDs compile food and waterborne complaint logs and submit them to their respective REE. REEs are responsible for entering these complaints into FLEHS and entering the outbreak data into NORS. Duties required for measures 1 and 14-16 are concentrated among REEs to ensure efficient data cleaning and timely data entry. Performance evaluations for the REEs include timely data submission for FLEHS and NORS data. The FWDP, which includes subject matter experts who only handle food and waterborne disease investigations, has provided Florida with the ability to achieve a target range of preferable for each of the performance measures listed above.

Before the existence of FLEHS, DOH utilized an external database to track food and waterborne complaints. It was in Florida's best interest to build an internal complaint management system to more efficiently manage complaints and tailor the system to fit the needs of the DOH best.

Midway through the 2013 reporting year, FLEHS was configured to detect the number of outbreaks as a result of foodborne illness complaints. This configuration allowed for an accurate calculation of performance measure 2 for 2014.

To maximize the amount of specimens received at BPHL and to reduce shipping costs, BPHL laboratorians physically picked up specimens from private laboratory facilities located close to the Tampa BPHL location. Due to a large number of *Salmonella* cases, the number of isolates received at BPHL still remained below 60%, the criteria for achieving an acceptable performance measure status.

Challenges

Florida leads the nation in the incidence of salmonellosis. To maximize the likelihood of implementation of timely and effective outbreak control measures, DOH's recommended priority for enteric disease case interviews is to intervene when individuals are still symptomatic with diarrhea.² If a person with salmonellosis is free of diarrhea by the time they are contacted by

DOH, and is not in a sensitive situation, it is less likely they would contribute to the spread of disease, so there is lesser value in conducting an interview.² This recommendation has resulted in the case interviewers not collecting necessary exposure information on individuals who have recovered.

Florida requires CHDs to report exposure history information (performance measure 4) for STEC and *Listeria*. In 2014, there was not a policy in place that required CHDs to enter exposure history information in Merlin for *Salmonella* cases. The number of confirmed cases with exposure history obtained for statewide analysis could not be performed for this evaluation due to the large number of *Salmonella* cases in Florida each year, generally over 6,000. Although 82% of cases of *Salmonella* were interviewed in 2014, only 18.1% had exposure history information completed in Merlin. Presently, there is an absence of a state mandate that requires clinical specimens or isolates of *Salmonella* to be submitted to BPHL for additional analysis, except *Salmonella* Typhi (performance measure 5).

Diagnosis of marine toxin poisoning, such as ciguatera fish poisoning, saxitoxin poisoning, and scombroid poisoning are generally based on symptoms and a recent history of consuming high-risk seafood, such as large, recreationally caught reef fish. Laboratory testing for the specific toxin in patient samples is not possible due to limited availability of special techniques and laboratory equipment. If leftover fish or meal remnants are available, they can be tested for the presence of the toxin. Identification of the specific toxin is not usually necessary for treating patients since there is not a known cure for these types of marine toxin exposures. Florida's geographic location and rate of seafood consumption, in combination with the naturally occurring marine toxins, create a confounding effect for performance measure 10, yielding a low rate of clinical specimens sent to BPHL during outbreaks.

RECOMMENDATIONS

- Review requirements for entering *Salmonella* exposure history into Merlin and ensure clinical specimens are forwarded to BPHL for analysis.
- Update state guidance to require *Salmonella* isolates to be submitted to BPHL for confirmation.
- Continue timely data entry into NORS.
- Continue active outbreak surveillance and detection.
- Explore ways to increase clinical specimen collection among affected foodborne illness outbreak cases.
- Fill vacant PFGE Cluster Epidemiologist position to assist with cluster detection and timeliness metrics.

REFERENCES

¹ Council to Improve Foodborne Outbreak Response (CIFOR). Guidelines for Foodborne Disease Outbreak Response. Second edition. Atlanta: Council of State and Territorial Epidemiologists; 2014.

² Recommendations from the Bureau of Epidemiology for Interview and Investigation of Reported Cases of Enteric Infections. Guidance Document. Florida Department of Health. 2012.



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