Foodborne Diseases Active Surveillance Network (FoodNet)

Elaine Scallan, PhD
Foodborne Diseases Active Surveillance Network (FoodNet)
Foodborne and Diarrheal Disease Branch
Centers for Disease Control and Prevention, Atlanta, GA
What is FoodNet?

- Established in 1996
- Principle foodborne disease component of Emerging Infections Program (EIP)
- CDC, USDA (FSIS), FDA, and participating state health departments
FoodNet Sites 2005

44.1 million (15.2% of U.S. population)
FoodNet Objectives

1. To determine the burden of foodborne diseases
2. To determine the change in the burden of foodborne diseases over time
3. To determine the proportion of domestically-acquired sporadic human infections attributed to different food sources
FoodNet Surveillance

• >600 laboratories

1996
• Campylobacter
• Shiga toxin-producing *E. coli O157*
• *Listeria monocytogenes*
• *Salmonella*
• *Shigella*
• *Vibrio*
• *Yersinia*

1997
• *Cryptosporidium parvum*
• *Cyclospora cayetanensis*
• Hemolytic uremic syndrome

2000
• Non-O157 STEC

2004
• Outbreaks (eFORS)
# 2004 Surveillance Data

<table>
<thead>
<tr>
<th>Pathogen</th>
<th># isolates</th>
<th>Cases per 100,000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Salmonella</td>
<td>6,464</td>
<td>14.7</td>
</tr>
<tr>
<td>Campylobacter</td>
<td>5,665</td>
<td>12.9</td>
</tr>
<tr>
<td>Shigella</td>
<td>2,231</td>
<td>5.1</td>
</tr>
<tr>
<td>Cryptosporidium</td>
<td>613</td>
<td>1.3</td>
</tr>
<tr>
<td>E. coli O157</td>
<td>401</td>
<td>0.9</td>
</tr>
<tr>
<td>Yersinia</td>
<td>173</td>
<td>0.39</td>
</tr>
<tr>
<td>Vibrio</td>
<td>124</td>
<td>0.28</td>
</tr>
<tr>
<td>Listeria</td>
<td>120</td>
<td>0.27</td>
</tr>
<tr>
<td>Cyclospora</td>
<td>15</td>
<td>0.03</td>
</tr>
</tbody>
</table>
Negative Binomial Regression Model

- Measured change in incidence compared to 3-year baseline (1996-1998)
- Accounts for:
  - Increase in number of participating sites
  - Site-to-site variation in incidence
- Future enhancements
  - Incidence stratified by age
Important declines

Declines:
- *Campylobacter*
- *Cryptosporidium*
- *E. coli O157*
- *Listeria*
- *Yersinia*

Little change:
- *Shigella*
- *Salmonella*

Increase:
- *Vibrio*
Campylobacter  E. coli O157  Listeria  Salmonella
Surveillance Artifacts?

• Changes in access to care?
  – No important changes in access to care

• Changes in isolation rates?
  – No important changes in practices of clinical laboratories
## 2004 *E. coli* O157 Incidence

<table>
<thead>
<tr>
<th>Pathogen</th>
<th>Change</th>
<th>95% Confidence Interval</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>E. coli</em> O157</td>
<td>-42%</td>
<td>-54% to -28%</td>
</tr>
</tbody>
</table>
**E. coli O157**

Relative Rate: $-42 (-54 \text{ to } -28)$
## Healthy People 2010 Objectives

<table>
<thead>
<tr>
<th>Pathogen</th>
<th>Total # isolates</th>
<th>Cases per 100,000</th>
<th>2010 Objective</th>
</tr>
</thead>
<tbody>
<tr>
<td>E. coli O157</td>
<td>401</td>
<td>0.9</td>
<td>1.0</td>
</tr>
</tbody>
</table>
Decline in *E. coli* O157?

- FoodNet population is 15.2% of U.S. population
- Differences exist among FoodNet sites
E. coli O157 Incidence in FoodNet Sites, 2004

Cases per 100,000 persons

Site

All sites

MN

OR

NY

CT

CO

CA

TN

NM

MD

GA

0.9

2.2

1.7

1.3

0.9

0.8

0.8

0.8

0.5

0.4

0.3

HP 2010

1.0 / 100,000
## MN, OR, NY

<table>
<thead>
<tr>
<th>FN site</th>
<th>Baseline</th>
<th>Change</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>All sites</td>
<td>1996-1998</td>
<td>-42</td>
<td>-54 to -28</td>
</tr>
<tr>
<td>Minnesota</td>
<td>1996-1998</td>
<td>-53</td>
<td>-95 to 358</td>
</tr>
<tr>
<td>Oregon</td>
<td>1996-1998</td>
<td>-33</td>
<td>-93 to 552</td>
</tr>
<tr>
<td>New York</td>
<td>1998</td>
<td>-29</td>
<td>-96 to 1129</td>
</tr>
<tr>
<td>5 Original Sites</td>
<td>1996-1998</td>
<td>-44</td>
<td>-58 to -27</td>
</tr>
</tbody>
</table>
Prevalence of *E. coli* O157:H7 in Ground Beef

Results of raw ground beef products analyzed for *E. coli* O157:H7 in federal plants.

* In 1998 FSIS increased sample size from 25 g to 375g.

** In July 1999 FSIS changed to a more sensitive analytical method.
Consistency in data sources:
Decline in *E. coli* O157

1. FoodNet surveillance data- declines overall and in high incidence sites
2. FSIS data- decline in ground beef prevalence

**Current project:** Collaborate with AMI to describe changes in ground beef production
FoodNet Objectives

1. To determine the burden of foodborne diseases
2. To determine the change in the burden of foodborne diseases over time
3. To determine the proportion of domestically-acquired sporadic human infections attributed to different food sources
CDC attribution efforts

- Start with human illness data
  - Attribute to different sources
  - “Top down” qualitative risk assessment approach (“Fork-to-farm” approach)

- Can partition illness at various steps throughout the food supply
  - Point of consumption
  - Point of processing
  - Reservoir
‘Point of consumption’ attribution

- Foodborne Disease Outbreaks
  - Summarize data from eFORS
  - Complex problem due to food categorization

- FoodNet sporadic case-control studies
  - 18 FoodNet case-control studies completed
Blending Project

- *e.g. E. coli O157:H7*
  - Summary of outbreaks*
    - 20% due to eating hamburgers
    - 4% due to animal contact
  - FoodNet sporadic case-control study
    - 15% due to eating pink hamburgers
    - 8% due to visiting a farm

*Rangel et al. EID 11:603-9, 2005*
'Point of Processing' Attribution

- Quantify the contribution of meat and poultry as a source of human Salmonellosis

- Data sources
  - Public Health Laboratory Information System
  - USDA, FSIS Hazard Analysis and Critical Control Points (HACCP)
Example of microbiological approach:
Salmonellosis in Denmark

Source: Annual Report on Zoonoses in Denmark, 1998 <www.svs.dk>
Trends in sources for human salmonellosis

Source: Danish Zoonosis Centre
Travel-associated cases

• How many of the infections were related to food consumed in the United States?

OR

• Was the patient traveling overseas during the exposure period?
  – In 2004, FoodNet interviewing Salmonella, Listeria, and E. coli O157 cases for travel history
  – In 2005, FoodNet will interview Shigella cases to determine percent foodborne
Summary

• Important declines in *E. coli* O157
  – Work with AMI to describe changes in ground beef production

• CDC attribution efforts
  – Travel-associated infections
  – Point-of-consumption attribution
  – Point-of-processing attribution
http://www.cdc.gov/foodnet