

# Proceedings of The Institute of Food Technologists' First Annual Food Protection & Defense Research Conference

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[Session: **Public Health and Response Coordination**]

## Public Health and Response Coordination: Is it Good Enough?

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Even though actual bioterrorism events have been rare, what we learn from “naturally occurring outbreaks” is that food contamination if and when it happens can affect thousands of people. This begs the question of how well is the “public health system” prepared. I put *public health system* in quotation marks because it is not a system in the sense that many of us think of a system. It is a federation, an amalgam of not quite 3,000 city and county health departments that – are highly variable in terms of their relationship to the 50 states, and the 50 state health departments are also highly variable in the way they practice public health. Finally, one has the CDC that basically does a lot of its work through good will. And, of course, this is how the framers of the U.S. Constitution intended it.

Each state has a state statute that requires communicable disease reporting; they list which diseases are reportable; illnesses are recognized by the public health system based on reports that come up through this pyramid dependent upon infected people getting sick; those people seeking care; and healthcare providers compliance with the list of reportable diseases in that state. Typically, it goes to the local health department and then to the state health department and then to CDC on voluntary basis.

Some good news is that since 1996 or so, the foodborne disease surveillance has improved. We've clearly made improvements in rebuilding some of CDC's capacity, for example, FoodNet, HAV sentinel counties, eFORS, and so on. We've also made improvements at the state levels, particularly in terms of laboratory capacity for example, PulseNet, CaliciNet, DPDx, Salmonella serotyping. Less easily measured, but we have probably improved state epidemiologic capacity to detect and respond to foodborne outbreaks. Anecdotally, we know that some of the funding sent out to states has been used to hire more epidemiologists and to strengthen that capacity. In general, as we look back we've made major improvements in the use of new laboratory technology and new information technology.

CaliciNet is an example of improvements in state laboratory capacity, the Norovirus version of PulseNet. If you live in a green state on this slide, your state health department is capable of taking a clinical specimen and diagnosing whether you have a Norovirus infection. If you live in a state with green cross-hatching, the state laboratory is capable of having a specimen sequenced/fingerprinted. In the 1980s a state epidemiologist who wanted Norovirus testing would have to send a specimen to a Univ. and might get a result back in a year. SODA is an example of automation/information technology at the federal level. CDC receives Salmonella serotyping reports from

states, then the computer flags events that go out of range. This is basically a control chart.

Some of these improvements in IT come from the outside world. For example, increased use of credit cards at retail has revolutionized our ability to actually start matching up food exposures to go beyond just memory when take food histories from cases and controls. Georgia is an example of improved epidemiology capacity (slide from State of Georgia from Paul Blake MD). Georgia was one of the less well represented states when it came to doing foodborne disease investigations. With increased funding they hire more epidemiologists and found more outbreaks.

Listeria outbreaks and *E. coli* 0157 outbreaks further illustrate laboratory improvements at the state level. On these 2 slides, one can see cases and outbreaks declining; then, PulseNet turns on, and we find more. Not only are we finding more, we are finding them earlier. In the 1993 “fast-food restaurant outbreak and it took 39 d to recognize there was an outbreak. In 2002, Colorado use PFGE to recognize the outbreak in only 18 d. In the past, CDC received about 500 outbreak reports. Now we receive 2 to 3 times the number of outbreaks. And now, all the reporting from the states is done electronically. The number of outbreaks of unknown cause is falling, probably due to increase ability to diagnosis Norovirus, at least in part. However, the majority of outbreaks are still of unknown etiology.

However, if one looks at foodborne outbreak reporting per million population by state, the states are highly variable. Moreover, not only is there variability between the states but also within the states as the slide from Dr. Blake, Georgia State Epidemiologist shows. Some parts of Georgia reported no outbreaks in the year 2000.

Council of State and Territorial Epidemiologists (CSTE) conducted a survey asking the states what are some of the barriers to doing foodborne outbreak investigations. “Delayed notification,” “limited staff,” and “lack of apparent importance” were the top three reasons cited. I think these are all related. Given limited resources and staffing, somebody is making a judgment about the relative importance of investigating one apparent outbreak versus another.

So what does it take to fix? An obvious answer is more funding. And we have seen what Georgia was able to do with increased funding. However, in the absence of large investments of new money for the public health system, incremental progress can be made by engaging in some systematic process improvement.

Here are a couple of slides flowcharting of disease reporting at the local level for DeKalb County which is one of the metropolitan counties

in Atlanta. One of the things I think that the public health community can do is actually start charting and analyzing their processes and looking for hopefully what will be low hanging fruit that can be fixed.

This is a “lessons learned” slide taken from an “after action” report from the 2001 anthrax. Many folks at many levels have pointed out we need to communicate and coordinate better. But what does that mean? To better understand communication and coordination problems, the CDC Food Safety Office conducted a couple of Harvard-style case studies of actual outbreaks with the assistance of Tulane case researchers. We found that some problems of communication resulted from differences in expectations of roles and responsibilities, and the nature of the investigation between regulatory professional and disease control professionals. For example, regarding the definition & approach to an “investigation”, disease control staff defined an investigation in terms of an epidemiologic process with epidemiologic methods & standards of “proof,” while regulators defined “investigation” in

terms of a regulatory process. Hence, the regulator’s understanding is primarily oriented to methods that support a legal procedure & standards of “proof.”

We also found differences in expectations of “timeliness,” respect for the communications through the “chain of command,” and who the critical stakeholders were and how their needs should be taken into account. The differences often led to different behaviors whose motivations were not well-understood or misunderstood leading to an atmosphere of distrust. For example, what is “attention to detail” and “due process” for a regulator could look to the communicable disease staff as foot-dragging. Concern for the economic impact on industry and society if a product is erroneously implicated, could be interpreted as a lack of concern for the public’s health.

Finally, similar breakdowns in communication can be magnified when the diversity among state and local health departments is added to the mix.

**First Annual  
IFT Food Protection & Defense Research Conference**

**Public Health Response & Coordination:  
Is it good enough?**

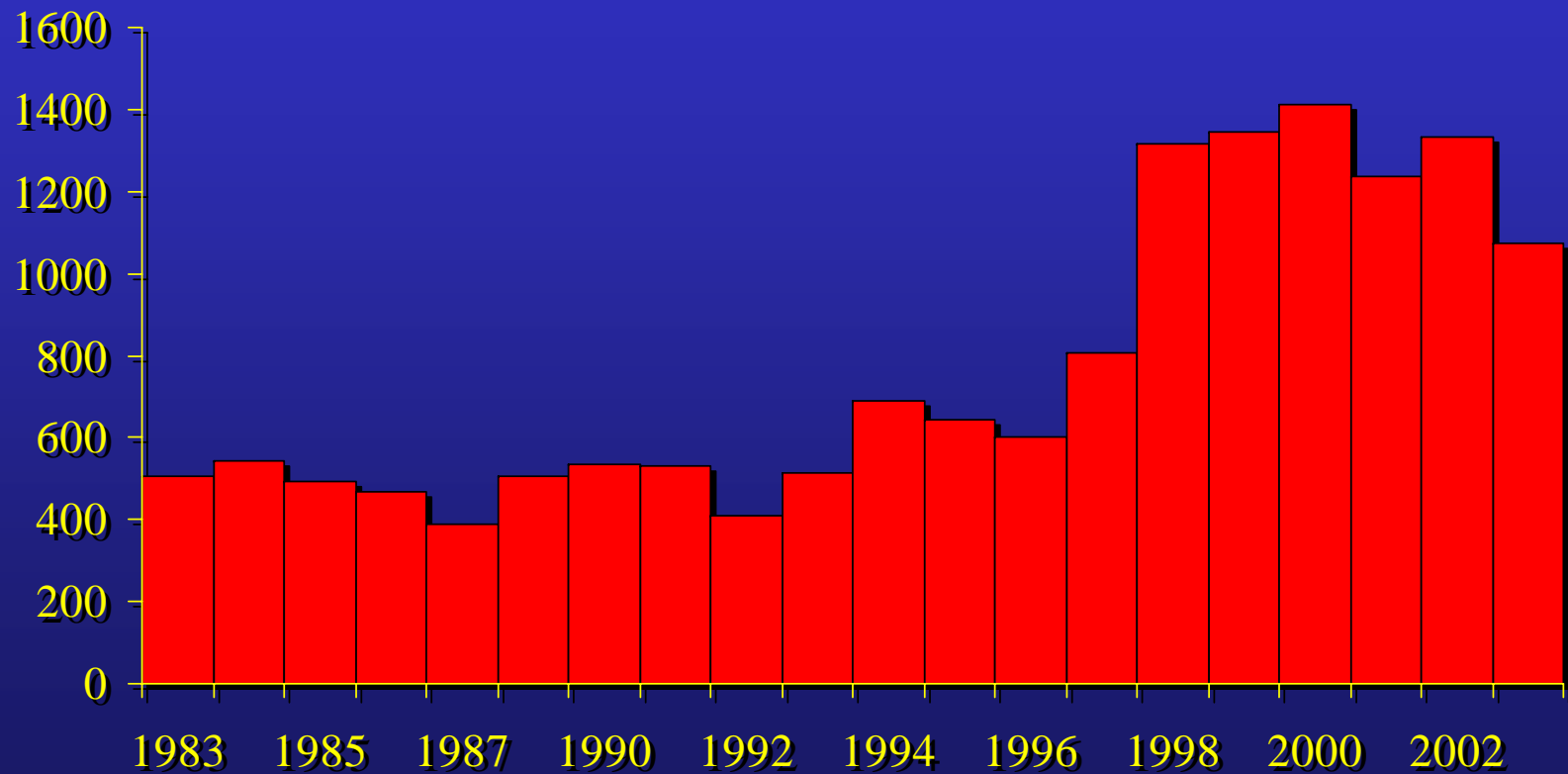
Arthur P. Liang, MD, MPH  
Director , Food Safety Office  
Division of Bacterial & Mycotic Diseases  
National Center for Infectious Diseases

# Since 1996, surveillance strengthened

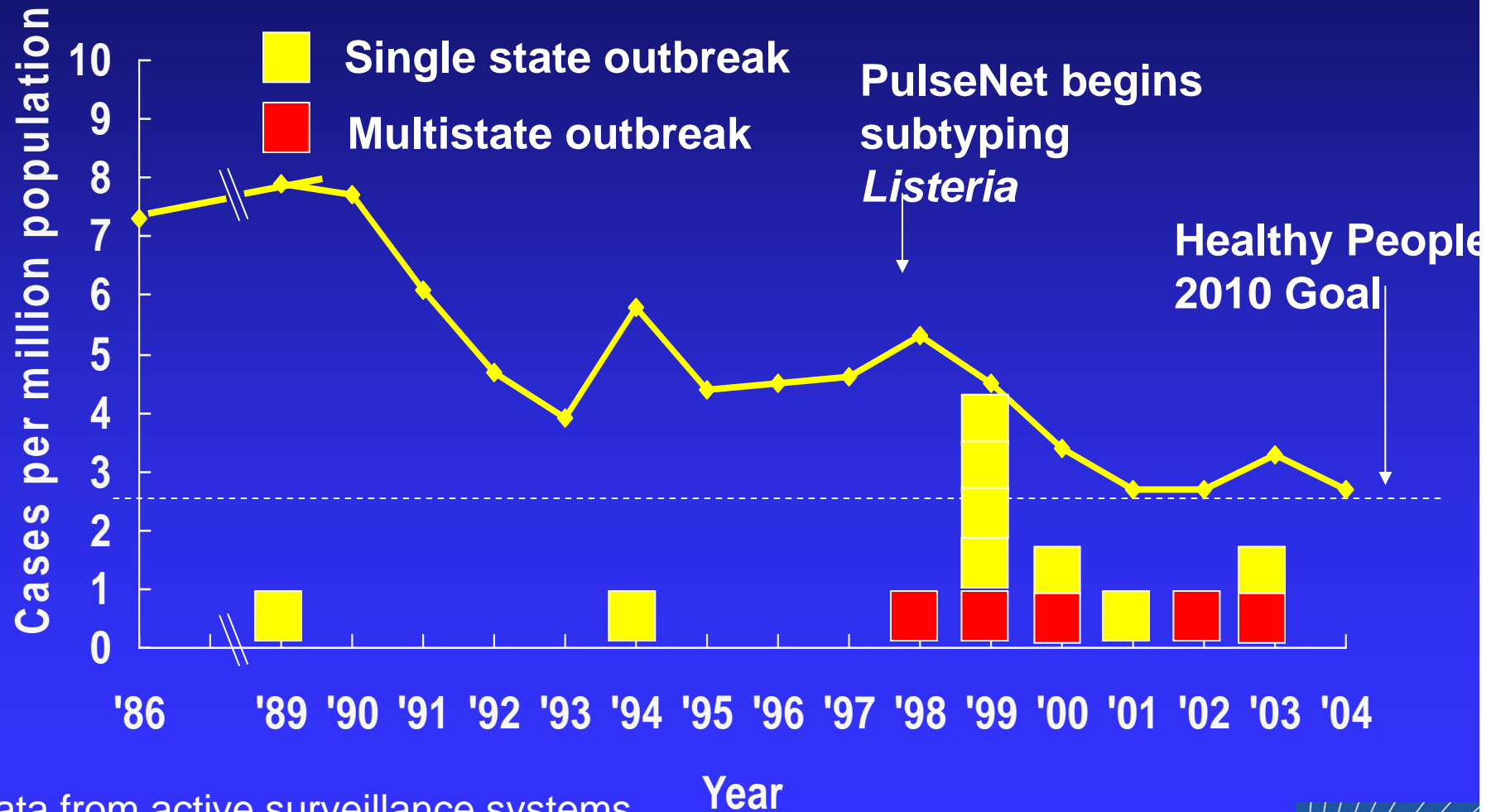
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- **Standard notifiable disease reporting:** All 50 states:
  - Added *Listeria*, non-O157 Shiga toxin prod. *E. coli*
  - Serotyping of *Salmonella*, *Shigella* strengthened
  - Added NARMS = antibiotic resistance monitoring
- **FoodNet:** Active sentinel 10-site surveillance collects data about sporadic cases. Burden and trend monitoring.
- **PulseNet:** The national subtyping network for bacterial foodborne pathogens: All 50 states. Improved outbreak detection and investigation.
- **eFORS (Electronic Foodborne Outbreak Reporting):** Reporting foodborne outbreaks to CDC via the web

# Foodborne Disease Outbreak Surveillance System



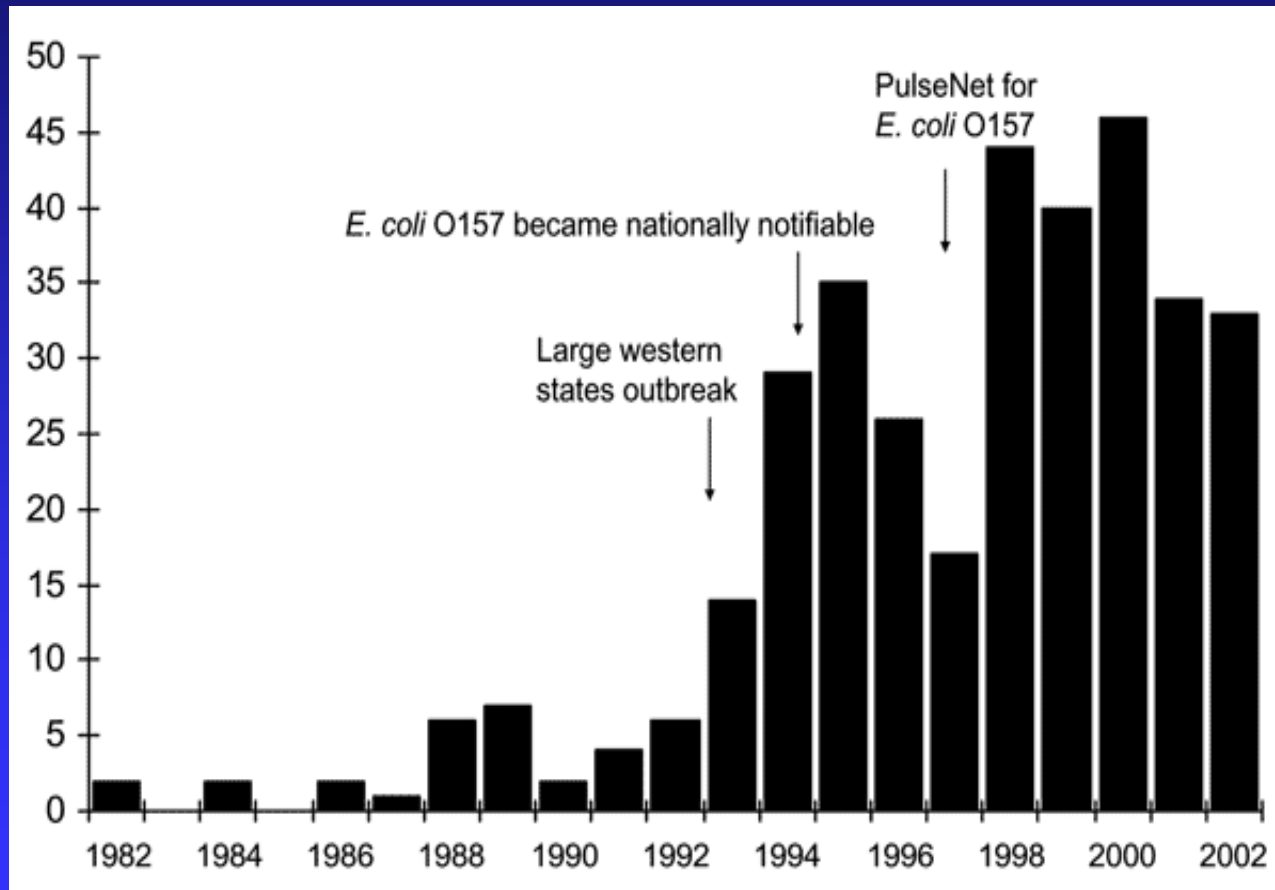
# Incidence of reported cases and outbreaks of listeriosis in the United States, 1986-2004\*



\*Data from active surveillance systems, 2004 data are preliminary



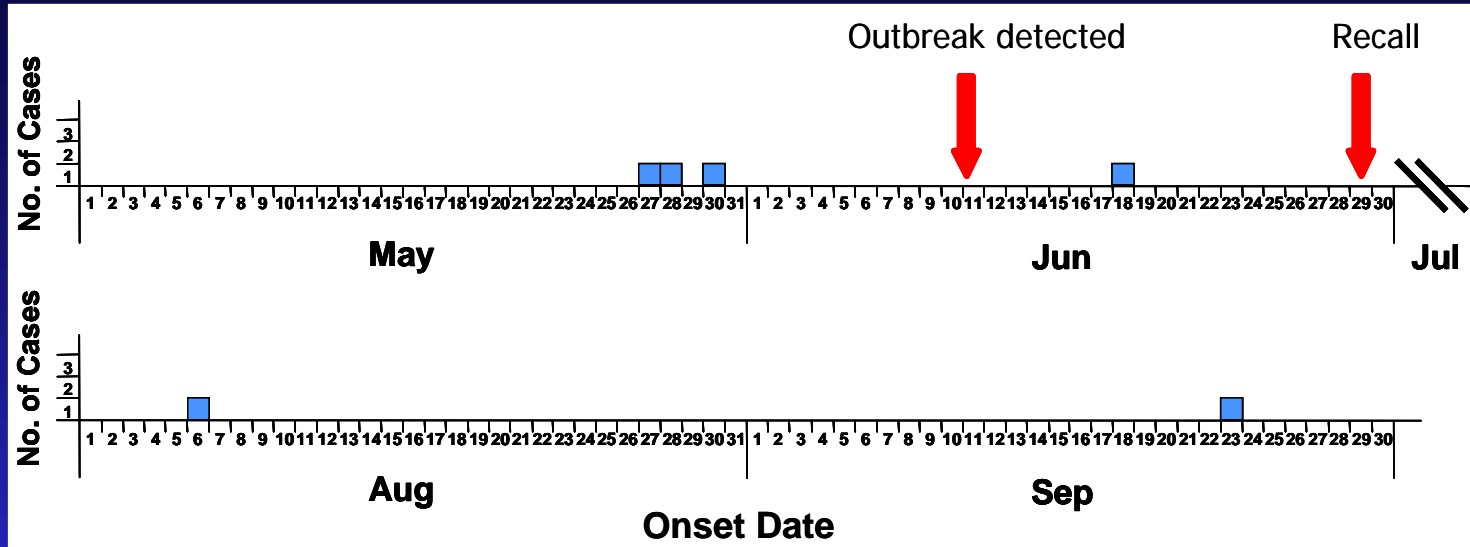
# Reported outbreaks of *E. coli* O157:H7 infections in the United States 1982-2002



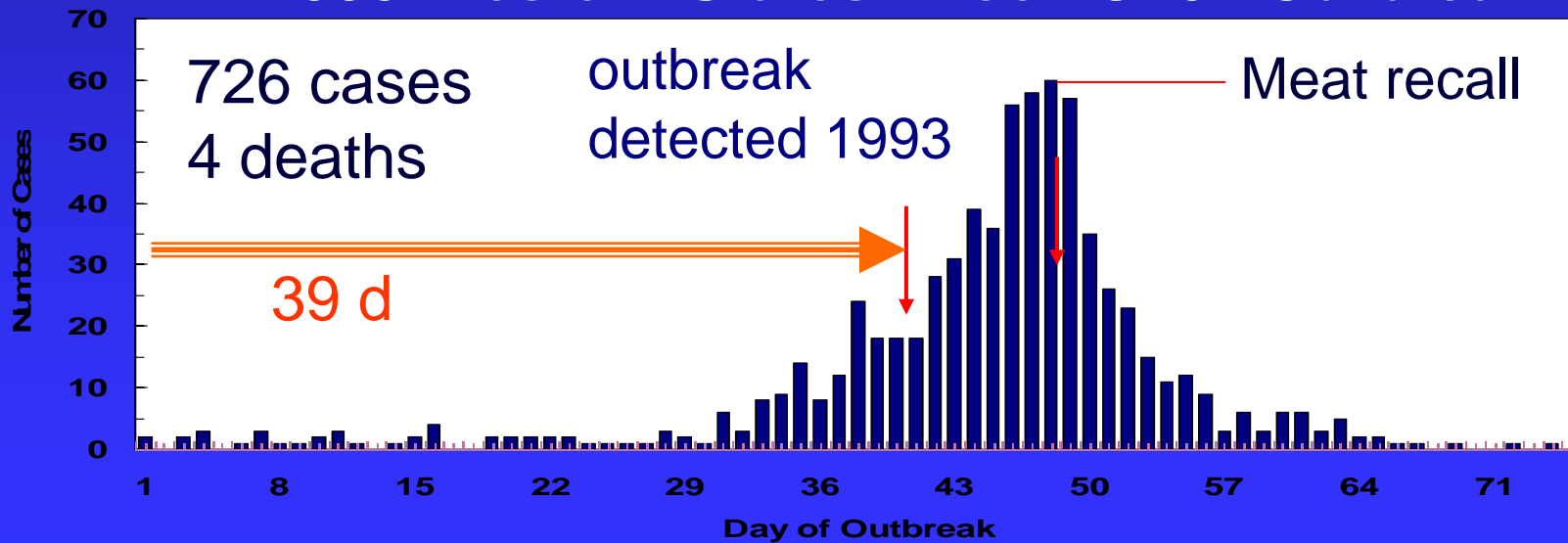
Rangel et al, EID 11:603-609, 2005



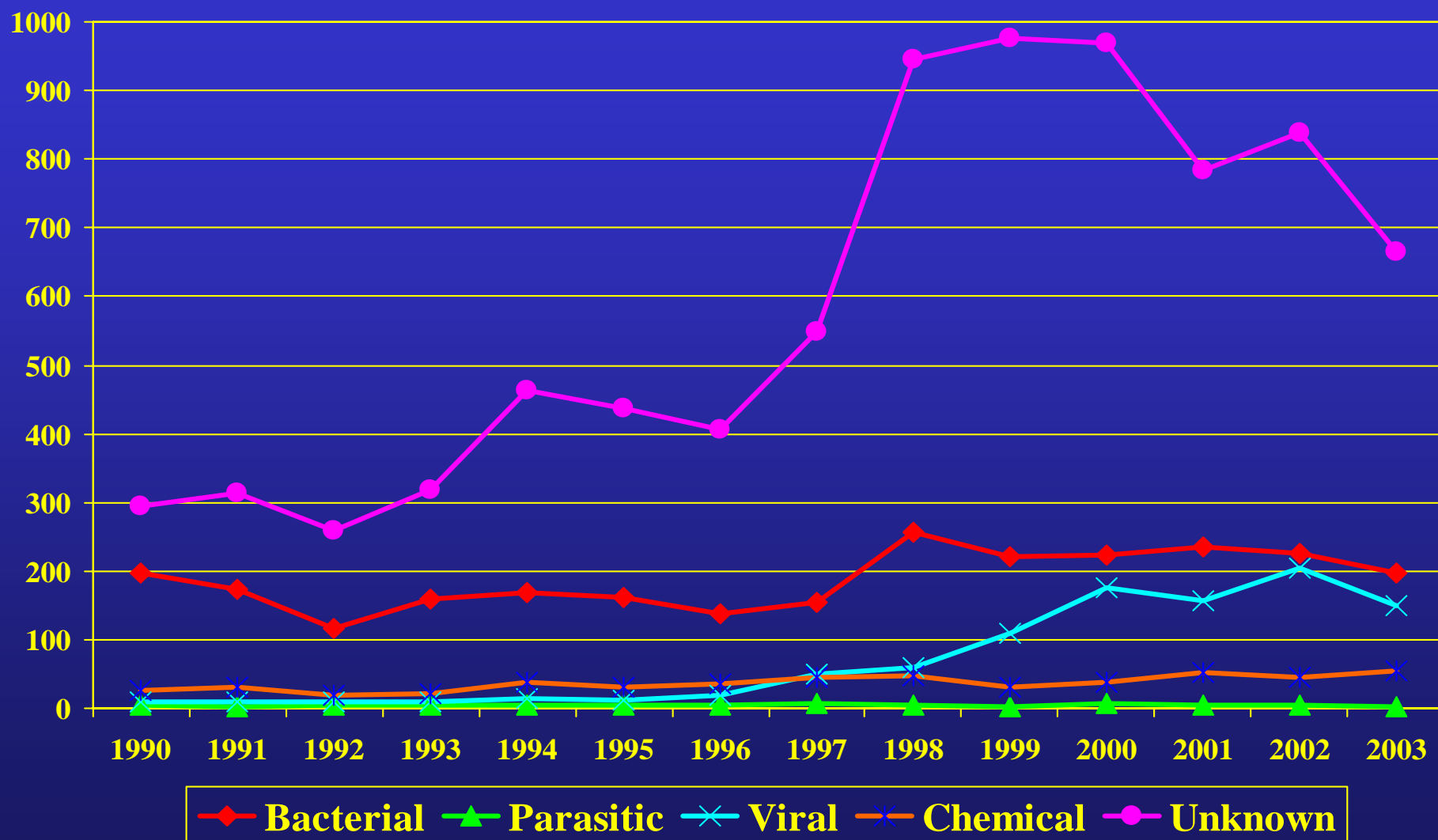
## 2003 Vacuum-Packed Steak Outbreak



## 1993 Western States *E. coli* O157 Outbreak



# Outbreaks of Foodborne Illness by etiology



Source: Foodborne Outbreak Reporting System  
[http://www.cdc.gov/ncidod/dbmd/outbreak/us\\_outb.htm](http://www.cdc.gov/ncidod/dbmd/outbreak/us_outb.htm)

**Preliminary data**

# Foodborne Disease Outbreaks 7 FoodNet Sites

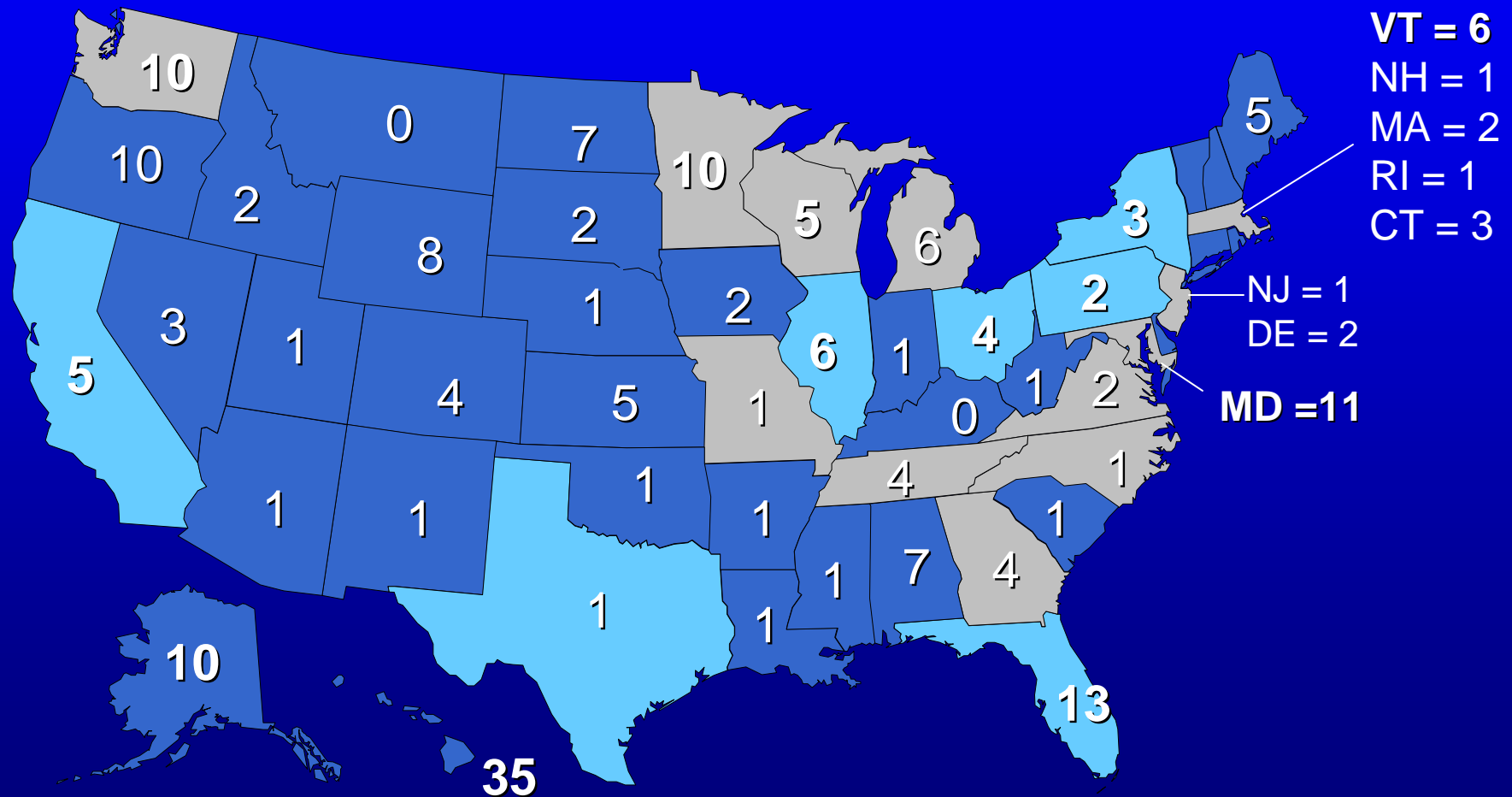
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Review, n=130 outbreaks

- 79 (61%) of unknown etiology.
  - ✓ 67% = no specimen collected
  - ✓ 33% = specimen collected tested negative

# Wide variation in State performance:

FB Outbreaks Outbreaks per 1,000,000 population by State,  
2001 - 2003



Source: Preliminary Analysis of eFORS data

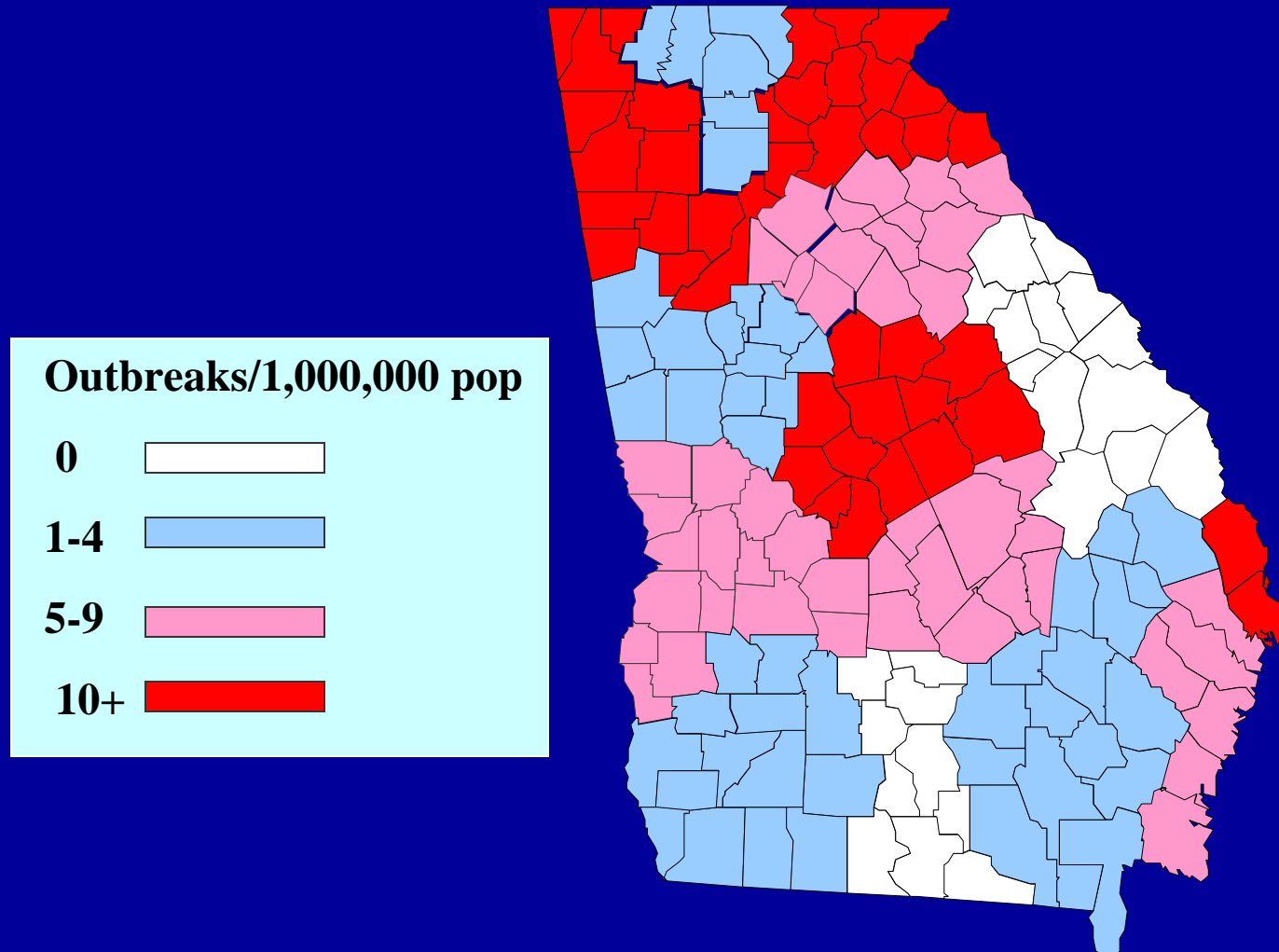
# What are we missing something...?

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## Reported FB outbreaks, U.S., 2001 - 3

- US population (est.) 295,734,134
- If all states reported like AK, MN, WA, & OR:
  - Expected = **2950 / year** (average)
  - Actual = 1214

# Wide variation by Health District in outbreak detection, Georgia, 2000



Source: Paul Blake, Georgia State Epidemiologist, March 2001

## Median Intervals (days) and Range (by state) from Onset of Symptoms to Timeline Event

<b>Timeline Event</b>	<b><i>Salmonella</i></b>	<b><i>E. coli O157</i></b>
<b>Collection of stool sample</b>	<b>4 (2, 4)</b>	<b>3 (2, 6)</b>
<b>Case report from clinician to health department</b>	<b>9 (8, 11)</b>	<b>7 (6, 7)</b>
<b>Submission of isolate to public health laboratory</b>	<b>10 (8, 11)</b>	<b>8 (5, 9)</b>
<b>Case interview</b>	<b>14 (14, 22)</b>	<b>12 (9, 16)</b>
<b>PFGE subtyping</b>	<b>18 (15, 28)</b>	<b>15 (11, 22)</b>

**Source: Craig Hedberg, National Center for Food Protection & Defense,  
University of Minnesota**

# Why are outbreaks NOT investigated? (n = 48)

Barrier	%Yes	Barrier	%Yes
<b>Delayed notification</b>	<b>83</b>	Travel policy constraints	11
<b>Limited staff</b>	<b>67</b>	Statistical support	8
<b>Lack of apparent importance</b>	<b>46</b>	Ability to pay overtime	8
<b>Lab capacity</b>	<b>21</b>	Other	13
<b>Jurisdictional issues</b>	<b>19</b>		
Expertise	13		
Political considerations	13		

\* Source: Hoffman et al. EID 2005;11:11-16.

# Anthrax Affair “Lessons Learned”

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- **What went well?**
  - Investigations
  - Clinical Lab testing
  - Prophylaxis
  - Pharmaceutical stockpile
- **What could have gone better?**
  - **Coordination**
  - **Communications**
  - Environmental Lab testing
  - Decision making / adjustment

# INVESTIGATIONS OF INTERAGENCY COORDINATION & COMMUNICATION

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**Microbiological, MMWR 1999 Jul 16;48(27):582-5**  
**Chemical, MMWR 2002 Apr 19; 51(15);321-3**

**The case research process used:**

- Structured face-to-face interviews,
- Analysis of email communications,
- Document analysis &,
- Individual & group discussants

## Preliminary Finding: Definition of “Investigation”

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➤ Disease Control staff defines an investigation in terms of an epidemiologic process. Epidemiologic methods & standards of "proof"

“preponderance of evidence”.

➤ Regulator defines "investigation" in terms of a regulatory process. Hence, the Regulator understanding is primarily oriented to methods that support a legal procedure & standards of "proof" \

“beyond a reasonable doubt”

➤ When the definition & approach to an “investigation” are different, & at times in conflict, inter-agency communication is weakened, & an atmosphere of distrust may be created.

## Preliminary Finding: Definition of “Timeliness”

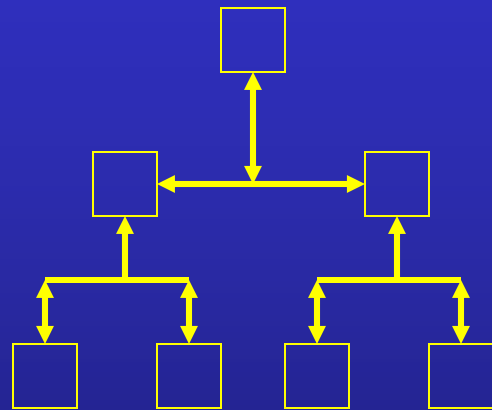
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- Because of its surveillance & consultation functions with state public health agencies, Public Health may become involved very early in the process.
- Relative priorities - Regulatory field staff may experience a conflict between the occasional need for involvement in outbreak investigations & the ongoing need for regulatory functions.
- The "due process" nature of regulatory activities requires careful attention to the quality of the evidence concerning a suspect producer.

# Preliminary Finding: Timeliness

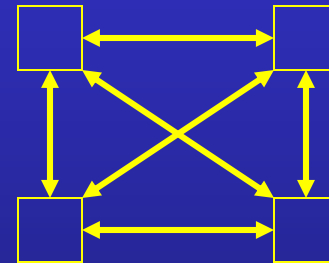
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## Regulator



**Figure A**

## Public Health



**Figure B**

- Each of these communication patterns is important for the types of work necessary within the individual agencies. However, different expectations within the agencies about appropriate & timely intra-agency communication may lead to misunderstandings between the agencies.

# Preliminary Finding: Different Economic Considerations

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- **Public Health - role of consultant & adviser for health care professionals and patients.**
- **Regulators - statutorily mandated oversight of specific segments of the food industry, a suspect food producer or a food industry sector may be a more involved stakeholder in a decision situation.**
- **Different economic consequences of an incorrect judgement on such groups appears to influence differently the concern of the two agencies.**

## **Preliminary Finding: Variation in the Characteristics of State & Local Health Departments**

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- **State health departments & local health departments are highly variable among the states. This variability makes it difficult to predict how or when communication will occur within a state about a possible foodborne outbreak.**
- **An individual "on call" at a health department, who could be the first contact in a possible outbreak, does not necessarily have foodborne disease expertise. Hence they may not take the most appropriate action early in an outbreak situation.**
- **The variation in the ways state public health systems react may be misinterpreted at the federal level as withholding information or as preferential communication.**

# Thank you

## Disclaimer

*“The findings & conclusions in this presentation have not been formally disseminated by CDC & should not be construed to represent any agency determination or policy.”*