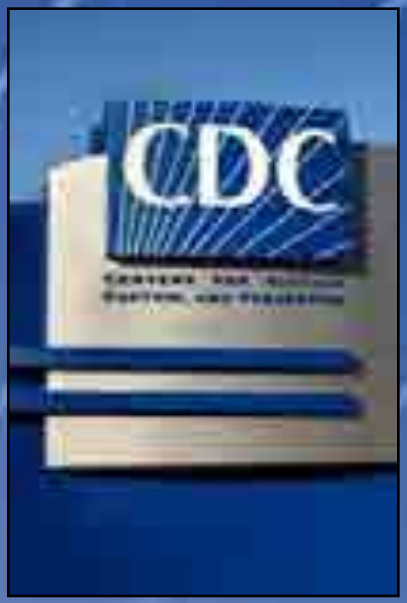
Current State & Future Opportunities in Public Health Surveillance



Lisa M. Lee, PhD
Assistant Science Officer
Centers for Disease Control and Prevention

CDC is Public Health

- More than preventing illness
- Promotion of health

World of Extreme Challenges

Emerging Public Health Threats

Human Genome

Aging Society

Globalization

Changing Demographics

Rising Health Care Costs

Information Technology

Aging Workforce

Public Health Infrastructure

Extreme Climate

Storms, Tornadoes, Hurricanes, Floods, Drought

Extreme Diet

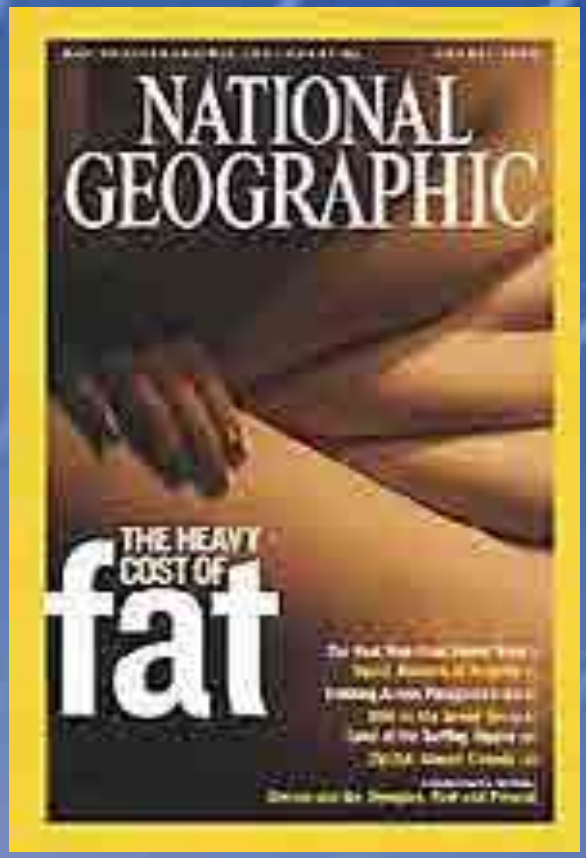
Extreme Convenience

Extreme Poverty

Kevin Carter, Pulitzer Prize 1994

The World of Urgent Threats and Urgent Realities

David Handschuh, New York Daily News



Urgent Threats

- World Trade Center — Sept 2001
- Anthrax Attacks — Oct-Nov 01
- West Nile Virus — Aug-Nov 02
- Space Shuttle Columbia Disaster — Feb 03
- SARS — Mar-Aug 03
- Monkey Pox — June-Aug 03
- Hurricane Isabel — Sept 03
- Influenza — Sept 03
- Northeast Blackout — Aug 03
- California Wildfires — Oct-Nov 03
- Ricin Tularemia Anthrax — Oct-Nov 03
- BSE — Dec 03
- Avian Influenza — Jan-Mar 04
- Guam Typhoon — Feb 04
- Ricin Domestic Response — Feb 04
- G8 Summit — June 04
- 2004 Summer Olympics — June 04
- DNC 2004 — July 04
- RNC 2004 — Aug 04
- Hurricanes (Charley, Frances, Ivan, Jean) — Aug-Oct 04
- West Nile Virus — Aug-Nov 04
- Tsunami — Dec 04-Feb 05
- Influenza Vaccine Shortage — Oct 04-05
- Marburg Virus — Mar 05-Sept 05
- Hurricane Katrina — Aug. 05 - present
- H1N1 — Mar 09-Present
- Avian Flu — 2006- 2008

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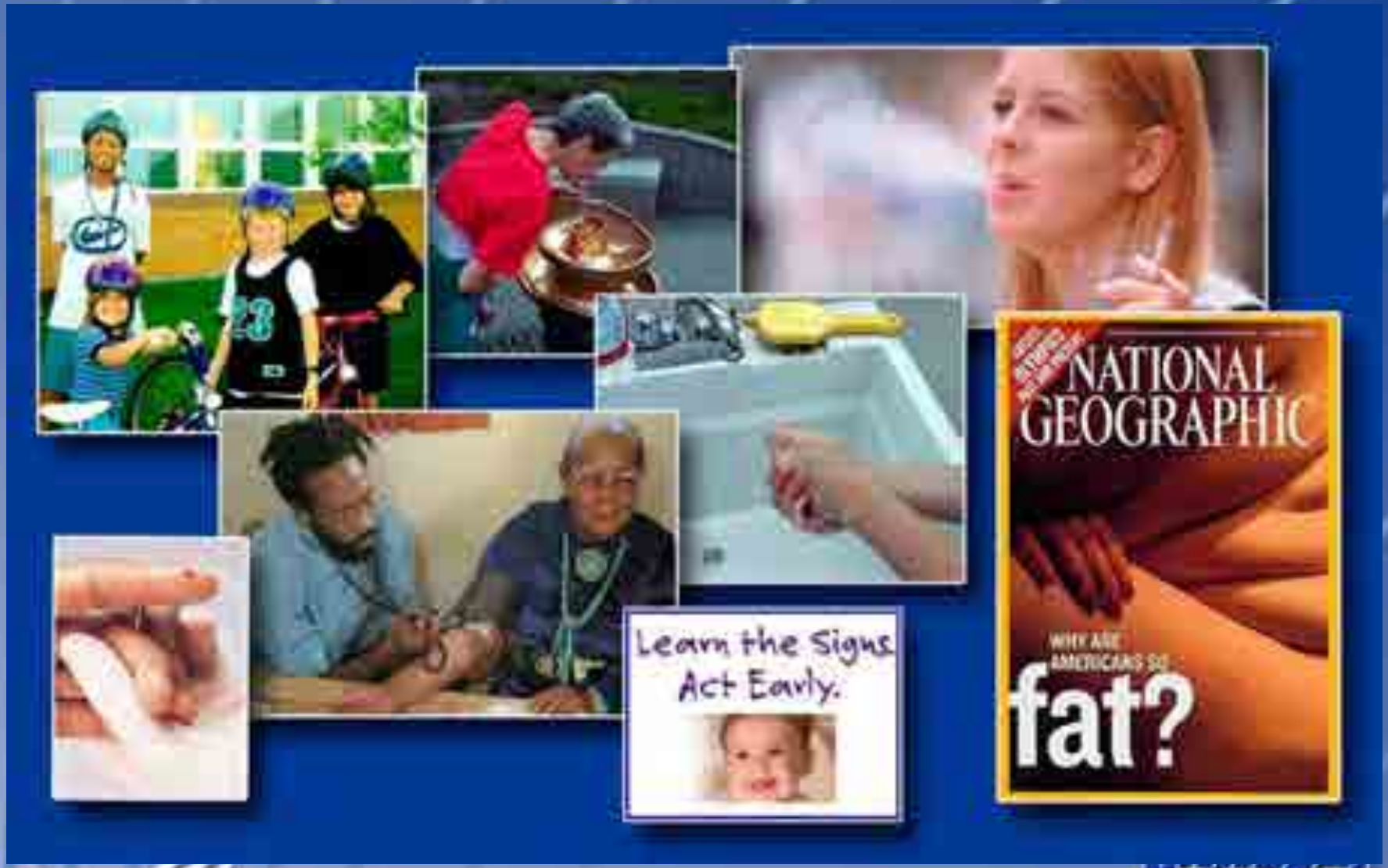
Urgent Realities



Assessing These Realities

- Public Health Surveillance: The foundation for effective public health response

PH Surveillance Defined

- Ongoing, systematic collection of health-related data
- Routine analysis & interpretation
- Essential tool for planning, implementation, & evaluation of PH practice
- Integrated with timely dissemination
- Application to disease & injury prevention & control, & health promotion

Key Differentiating Factor

- Purpose of the activity
  - First step of the systematic activities is to plan a system with ***defined outputs*** and a ***specific public health purpose***

7 Systematic Activities of PH Surveillance

- Planning and system design
- Data collection
- Collation
- Analysis
- Interpretation
- Dissemination
- Application to PH program

Increasing Complexity Has Changed Things

~~Challenges~~ Opportunities for PH Surveillance in the 21st Century

- Lexicon
  - Differentiating surveillance from all ways we learn about health
- Accountability
  - Measuring our impact
- Advances in IT
  - Promise of efficiency
- Ethical responsibilities
  - Collecting, storing, using data

Health Awareness

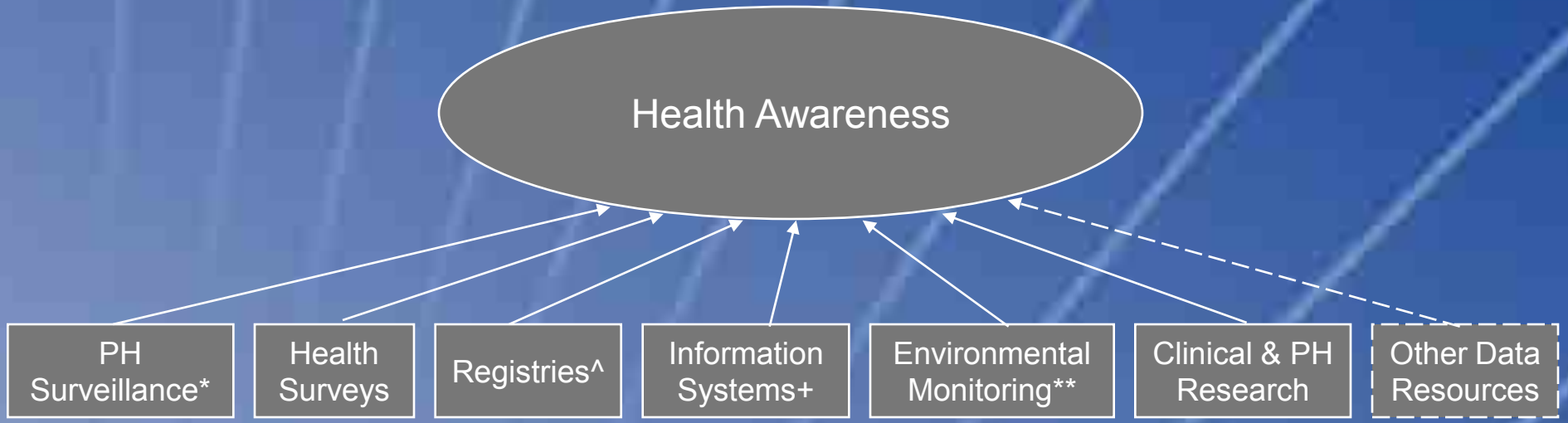
- Sum of all activities that provide us with
  - Relevant, timely, accurate information
- For
  - Health protection and preparedness: families to communities; local to global




Assessing the Health Landscape

- Increasing our awareness of the public health situation
  - Making use of various sources of data available
  - Leveraging technology
  - Promoting connectivity
  - Fusing or integrating into actionable information

Conceptual Framework for Health Awareness: Community and National Health Assessment and Awareness in the 21st Century



*Ongoing systematic collection, analysis, and interpretation of health data, essential to the planning, implementation, and evaluation of ph practice, closely integrated with the timely dissemination of the data to those who need to know. Last JM. A Dictionary of Epidemiology, 4th Ed., Oxford University Press, 2001.

^E.g., vital registration, cancer registries, exposure registries

+E.g., medical & laboratory records, criminal justice information, Lexis-Nexis

**E.g., weather, climate change, pollution

DRAFT
v. 1Oct08

Epidemiologists, Statisticians, Social Scientists, Informaticians, Economists…

Laboratory Scientists, Medicine, Engineering…

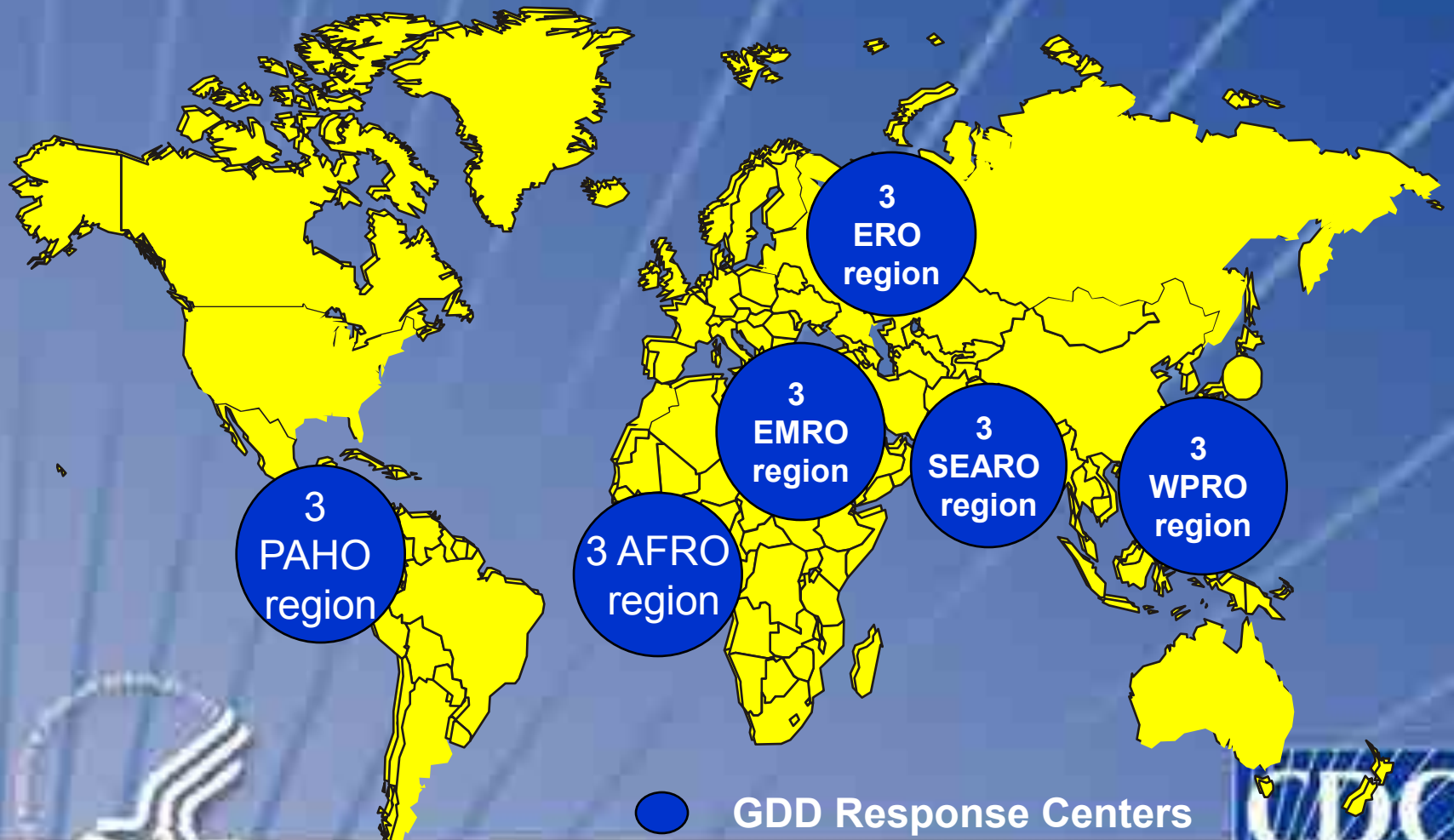
SARS

Marburg Outbreak
Angola, March 2005

Field Investigators, Veterinarians, Allied Scientists

Building Connectivity

CDC / WHO Global Disease Detection Response Center Collaboration



Epi- and Lab-Directed IT Innovation, Multi-Discipline Collaboration, and Measurable Impact: An Example

Foodborne Disease: Challenges

- 76 million cases, 5000 deaths annually in US
- 1200 outbreaks reported annually
  - Most cases “sporadic”
- Changes: pathogens, environment, tastes, behavior
- Prevention requires many groups
  - From farm to fork

New Problems Need Innovative Strategies

- Changing context of food production
  - Centralized production
  - Wide dissemination & distribution
- No longer the “school picnic” outbreak

Surveillance & Laboratory Capacity

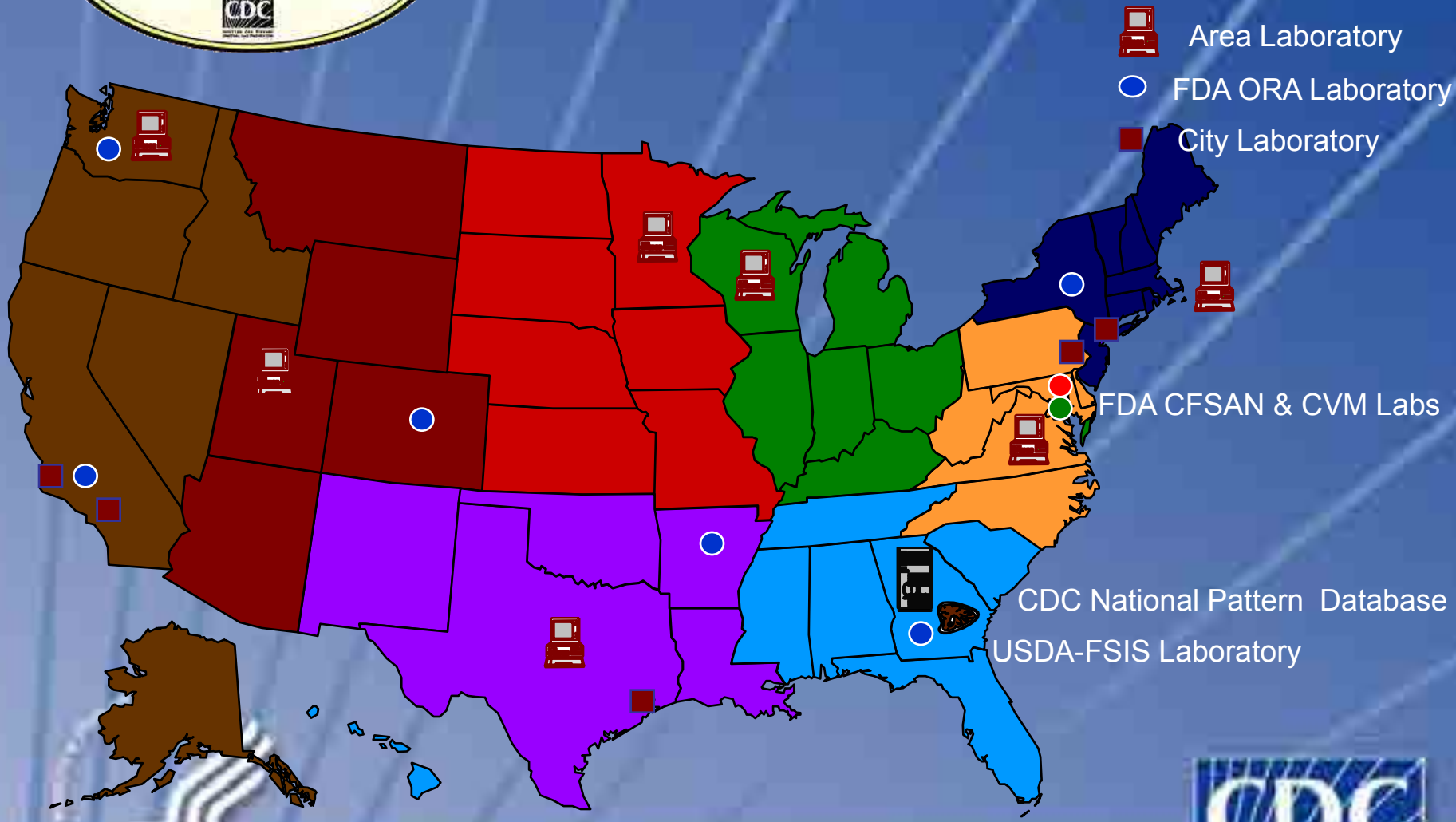
- PulseNet: Nat'l Molecular Subtyping Network for Foodborne Surveillance
- NARMS: Nat'l Antimicrobial Resistance Montoring System
- FoodNet: Foodborne Diseases Active Surveillance Network
- OutbreakNet: Network for Foodborne Surveillance & Response
- eFORS: Electronic Foodborne Outbreak Reporting System
- CIFOR: Council to Improve Foodborne Outbreak Response
- GSS: Global Salmonella Surveillance, WHO
- SODA: Salmonella Outbreak Detection Algorithm

PulseNet

- Detect foodborne disease case clusters by pulsed-field gel electrophoresis (PFGE)
- Early identification of common source outbreaks
- Assist epidemiologic investigations
  - Separate outbreak-associated cases from sporadic cases
  - Assist in rapidly identifying source of outbreak
  - Act as rapid & effective means of communication between public health laboratories

PulseNet USA
The National Molecular Subtyping Network for Foodborne Disease Surveillance

The National Molecular Subtyping Network for Foodborne Disease Surveillance



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PulseNet USA

The National Molecular Subtyping Network for Foodborne Disease Surveillance

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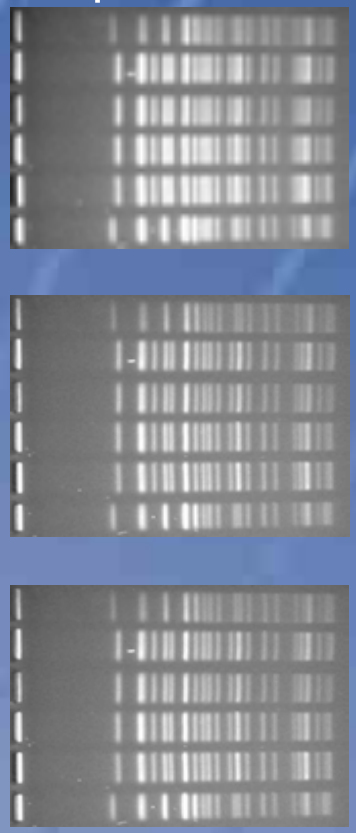
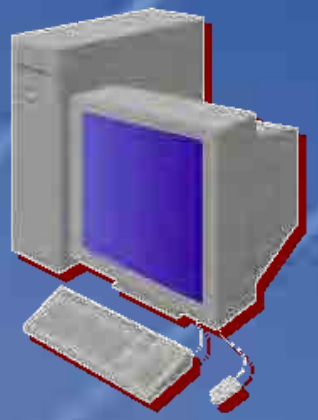
Participating public health laboratories

PFGE patterns



National database



★ Local database

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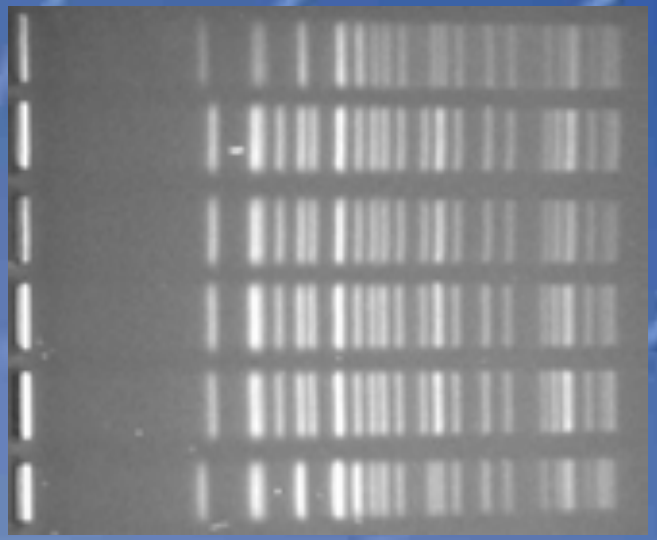
The invisible becoming visible

PulseNet USA
The National Molecular Subtyping Network for Foodborne Disease Surveillance

Workload is increasing
Doing more & better surveillance

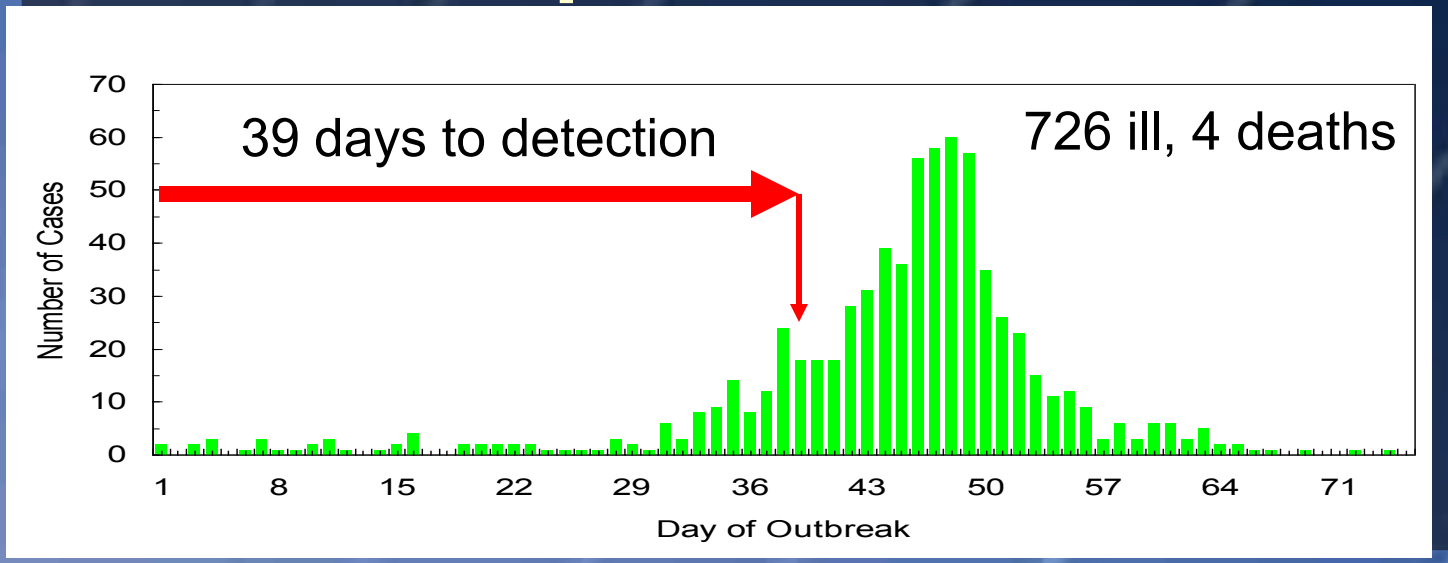
PulseNet: "DNA Fingerprinting“

- **E. coli O157**
- **Salmonella**
- **Shigella**
- **Listeria**
- **Campylobacter jejuni**
- **Clostridium perfringens**

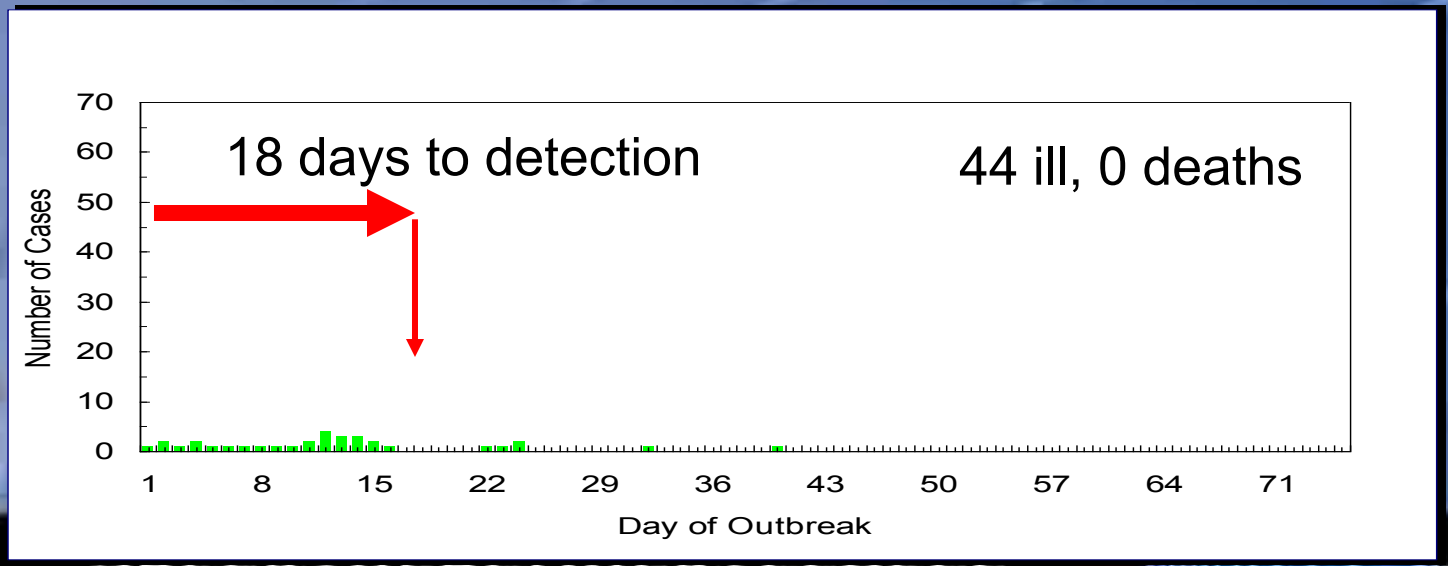


PulseNet: Improving Outbreak Detection and Response

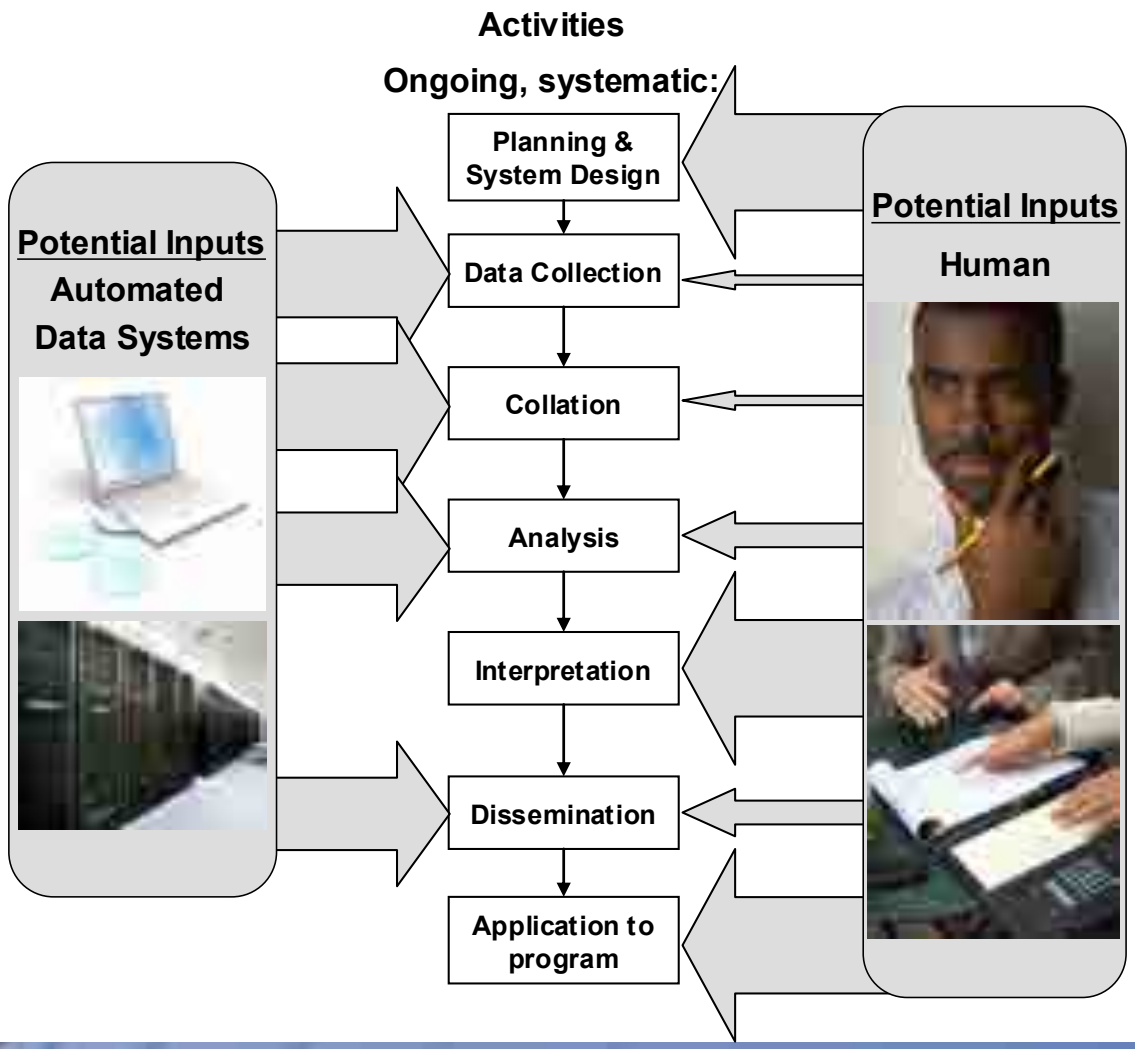
1993 *E. coli* O157 outbreak



2002 *E. coli* O157 outbreak



Balan Inputs



Ethical Responsibilities of PH Surveillance

- Greatest human input
- Ability to gather & store data increasing steadily
- Electronic & physical security are just one (albeit important!) piece

Public Trust

- Public trust is the foundation of PH surveillance
- Collection of personally identifiable information
  - Health data
  - Private behavioral information
    - Some of which might be deemed illegal or immoral by others
  - Without explicit patient consent

Key Ethical Considerations

- Use the data for public health action!
  - Risks of collecting data must be outweighed by benefits achieved
  - No benefit can be achieved if data sit on a computer server
- Ensure data quality
  - Data collected should be able to answer the question intended

Key Ethical Considerations

- Collect minimum data necessary
  - Surveillance is not research
- Security measures in place
  - Physical & electronic, minimum persons granted access
- Stewardship & trust
  - Each individual with access has *personal* responsibility

The Future of PH Surveillance

- Robust component of an effective system of health awareness
- Leverage technology, information, and dissemination sciences
- Provide systematic, collection, analysis, and interpretation of health data integrated with timely dissemination for use in PH programs

The Ultimate Reason We Are in This Together

Thank you

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