

*Advisory Committee for Blood Safety and Availability*

# **Public Health Surveillance: Considerations for the Advisory Committee for Blood Safety and Availability**

Robert W. Pinner, MD  
August 30, 2006



# **Blood Safety and Availability Background**

- Matt Kuehnert, CDC – Biovigilance Working Group Discussion
- Center for Biologics Evaluation and Review, FDA – Review and Management of AE Reports
- Robert Wise, FDA – FDA’s Safety Surveillance System for Blood and Blood Products
- Teresa Horan – National Healthcare Safety Network
- Pierre Robillard, Quebec PHI - Hemovigilance

# General Considerations

- Authorities, incentives, punishments, making it reportable
- QA of production & distribution processes vs. surveillance for health outcomes
- Informatics – standards, technologies
- Framing the questions; deciding what to count and why (then how)

# Public Health Surveillance: A Definition

“...ongoing, systematic collection, analysis, interpretation, and dissemination of data regarding a health-related event, for use in public health action to reduce morbidity and improve health.”

*CDC. Updated Guidelines for Evaluating Public Health Surveillance Systems. MMWR 2001;50:(RR-13)*



# Purposes of Surveillance

- Guide immediate action for cases of public health importance
- Estimate disease burden; follow trends
- Detection of outbreaks
- Evaluation of public policy
- Measure impact of practice changes
- Facilitate planning and allocation of resources
- Provide a basis for epidemiologic research

*CDC. Updated Guidelines for Evaluating Public Health Surveillance Systems.*

*MMWR 2001;50:(RR-13)*



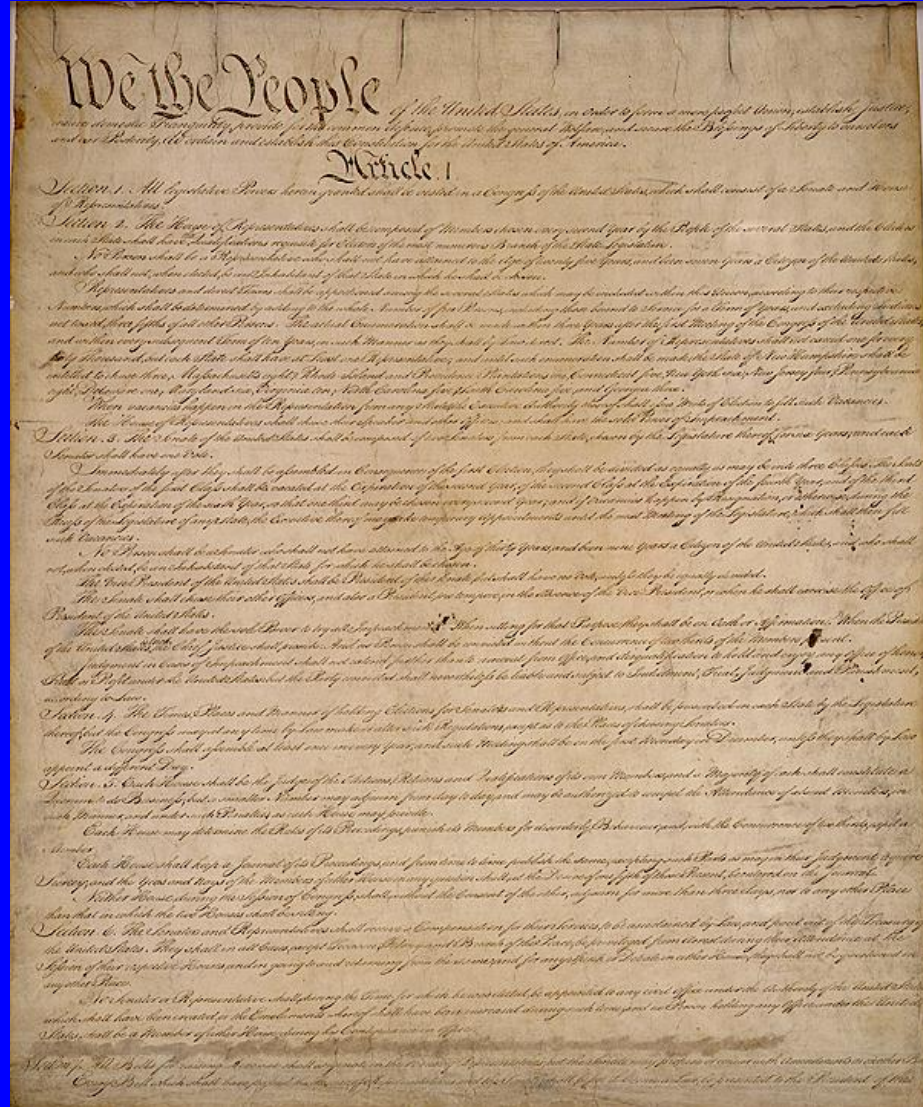
# Sources of Data for Surveillance

- Health care providers
- Laboratories
- Vital statistics (e.g., birth/death certificates)
- Medical records (e.g., hospital databases, emergency department visit data)
- Surveys (e.g., National Health Interview Survey, National Health and Nutrition Examination Survey, Behavioral Risk Factor Survey)



# Constitution of the United States of America: Preamble

We the People of the United States, in Order to form a more perfect Union, establish Justice, insure domestic Tranquility, provide for the common defense, promote the general Welfare, and secure the Blessings of Liberty to ourselves and our Posterity, do ordain and establish this Constitution for the United States of America.



# Constitution of the United States of America: Bill of Rights

**Amendment I:** Congress shall make no law respecting an establishment of religion, or prohibiting the free exercise thereof; or abridging the freedom of speech, or of the press; or the right of the people peaceably to assemble, and to petition the Government for a redress of grievances.

**Amendment II**

**Amendment III**

**Amendment IV**

**Amendment V**

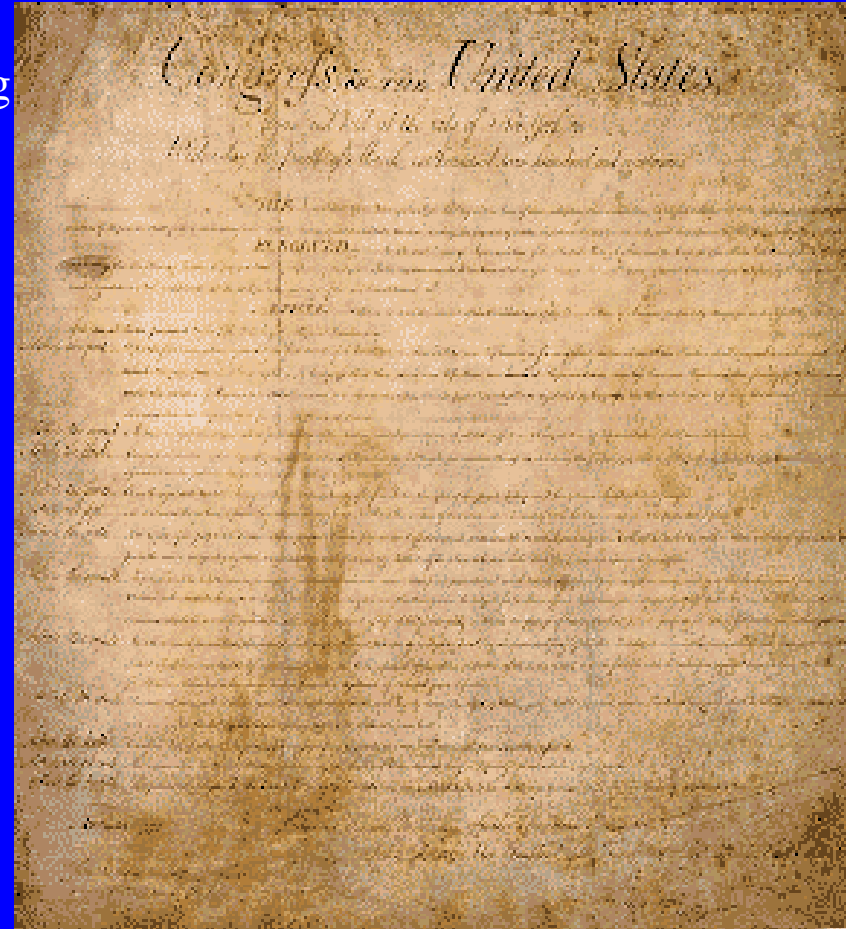
**Amendment VI**

**Amendment VII**

**Amendment VIII**

**Amendment IX**

**Amendment X:** The powers not delegated to the United States by the Constitution, nor prohibited by it to the States, are reserved to the States respectively, or to the people.



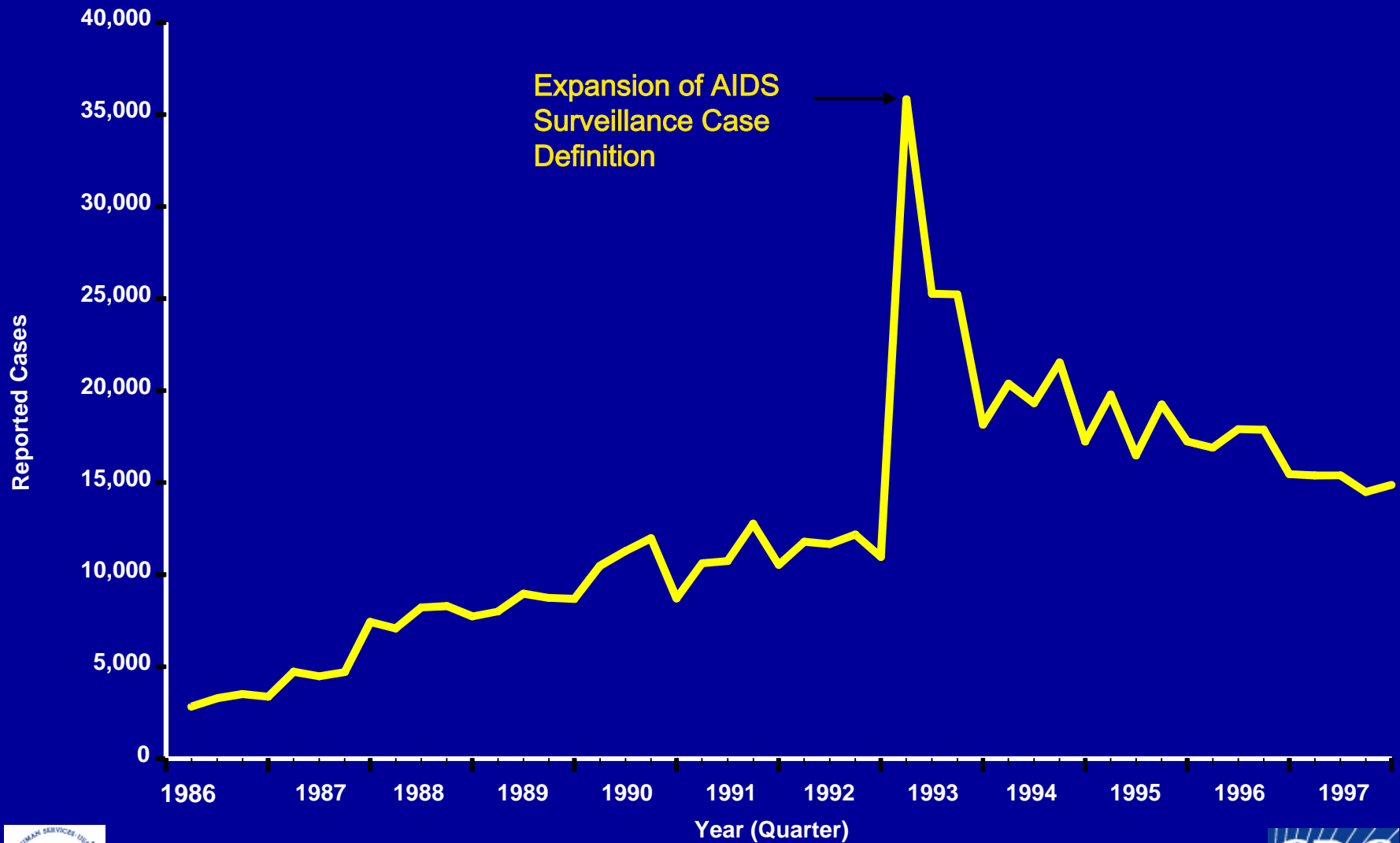


# Impact of Changing Circumstances – Examples from Notifiable Diseases Surveillance

- New case definition – AIDS, 1993
- Advances in virology – Hepatitis
- Changing surveillance requirements –  
Polio



# Impact of Change in AIDS Surveillance Case Definition

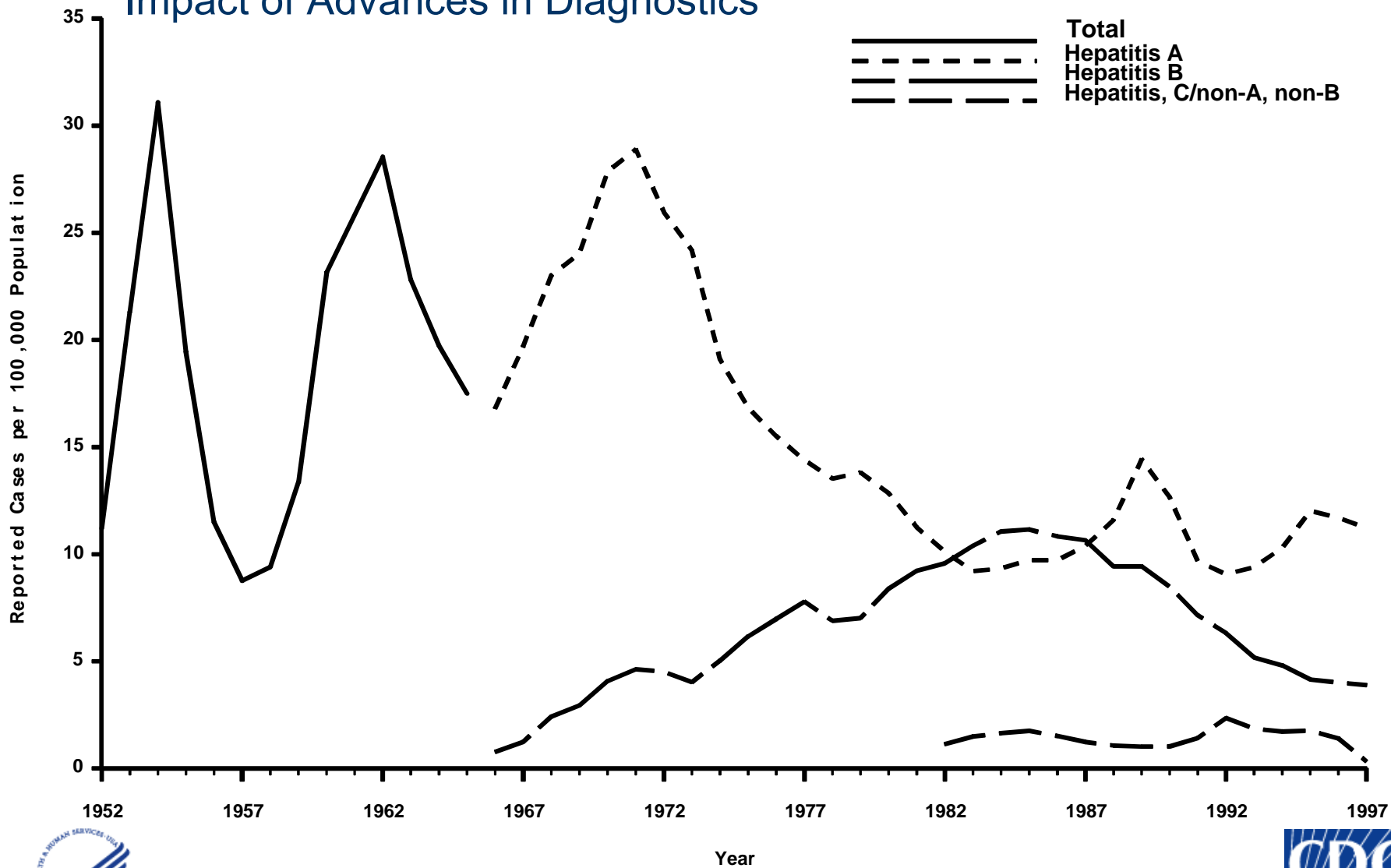


\*Includes Guam, Puerto Rico, the U.S. Pacific Islands, and the U.S. Virgin Islands.

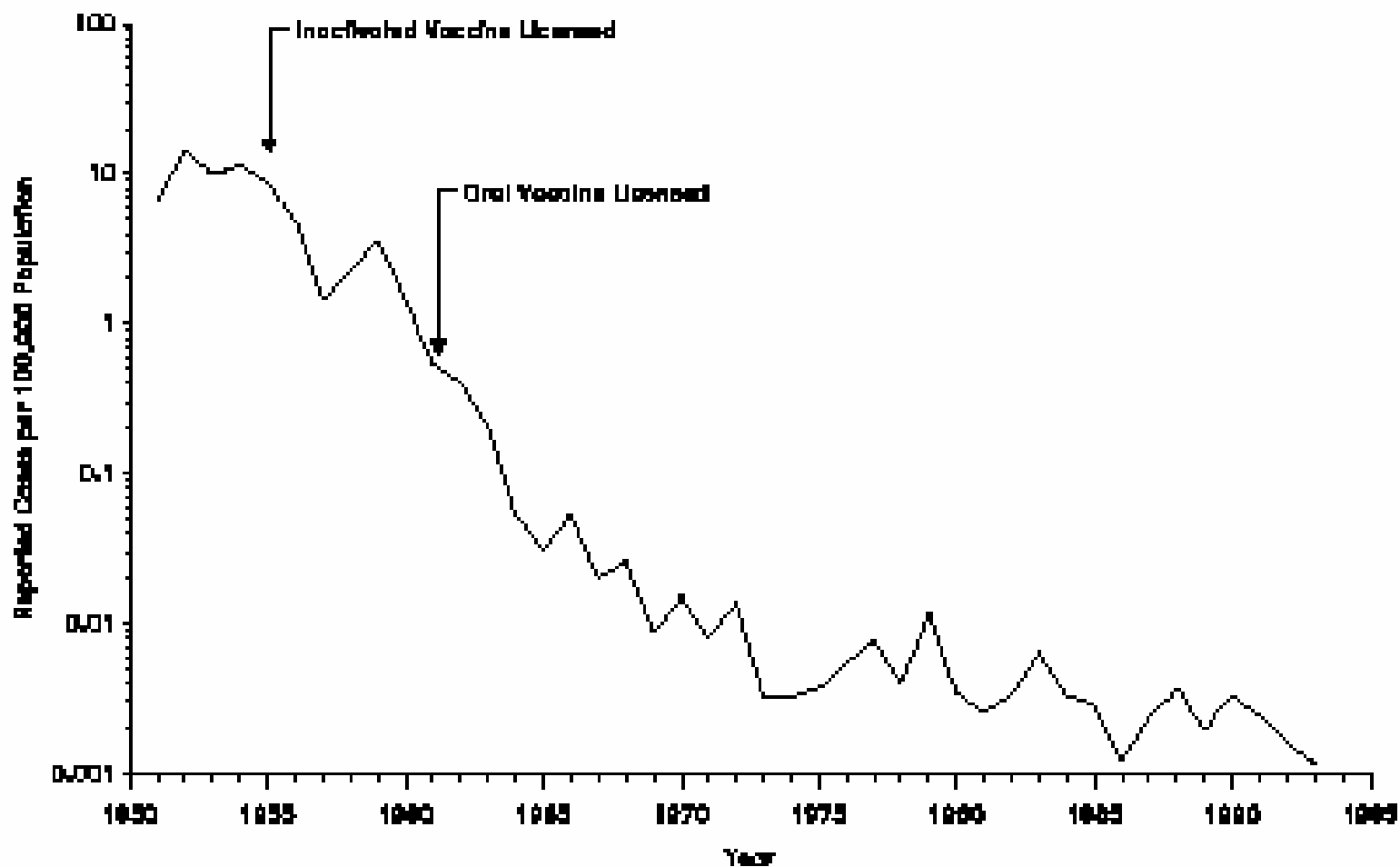


# Viral Hepatitis by Year, United States, 1952-1997, National Notifiable Diseases Surveillance System

## Impact of Advances in Diagnostics



## POLIOMYELITIS (paralytic) — by year, United States, 1951-1993

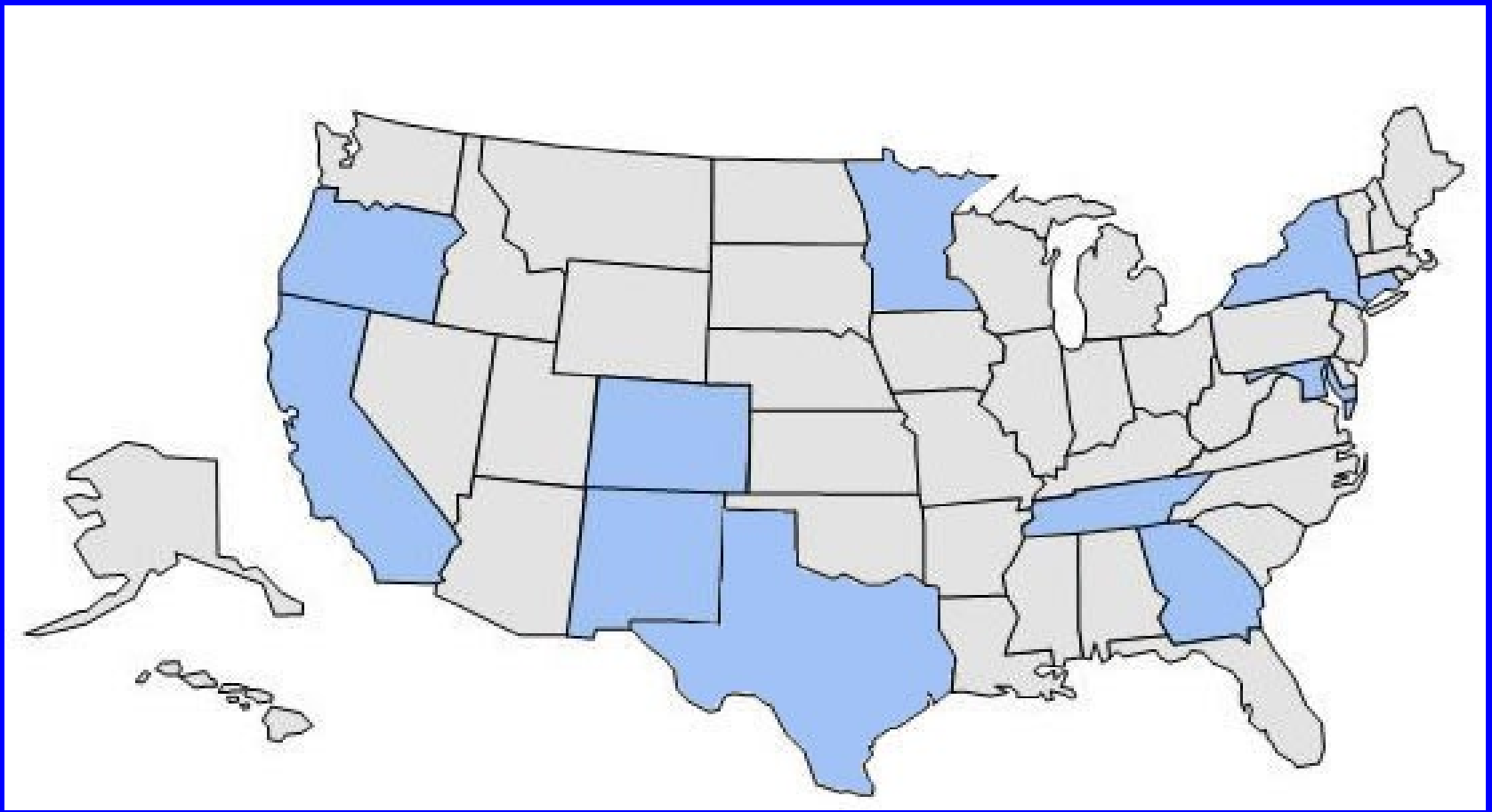


Y-AXIS IS LOG SCALE

Changing importance of specificity of case definition

# Emerging Infections Programs

A *population-based*, scientific, public health network



# Emerging Infections Programs

A population-based, scientific, public health network

- Network of CDC and 11 state health departments
- Collaborators: local health departments, academic institutions, infection control practitioners, other federal agencies (FDA, USDA, EPA)
- Activities: (1) active surveillance; (2) applied epidemiology and laboratory research; (3) implementation and evaluation of pilot prevention and intervention projects; (4) flexible response



# EIP ABCs Methods

- Case: pneumococcus isolated from normally sterile site
- Active contact with clinical laboratories to identify cases
- Audits to ensure complete reporting
- Susceptibility testing and serotyping at reference laboratories
- Chart review for clinical information

Emerging Infections  
Programs



# Decline in invasive pneumococcal disease after introduction of protein-polysaccharide conjugate vaccine

Whitney DB, Farley MM, Hadler J, Harrison LH, Bennett NM, Lynfield R, Reingold A, Cieslak PR, Pilishvili T, Jackson D, Facklam RR, Jorgensen JH, Schuchat A;  
Active Bacterial Core Surveillance of the Emerging Infections Program Network

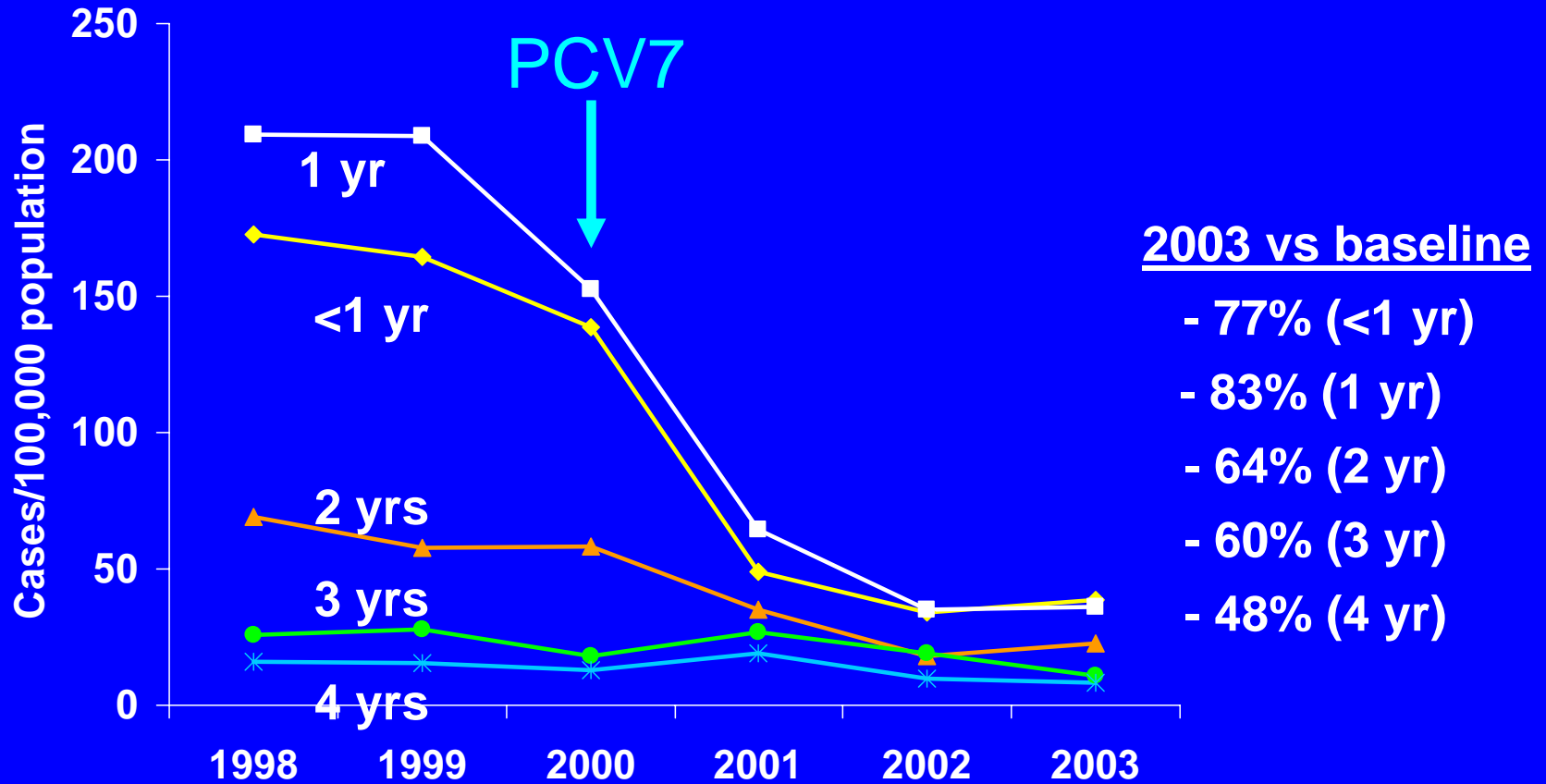
N Engl J Med. 2003 May 1;348(18):1737-46





# Effect in Target Age Group

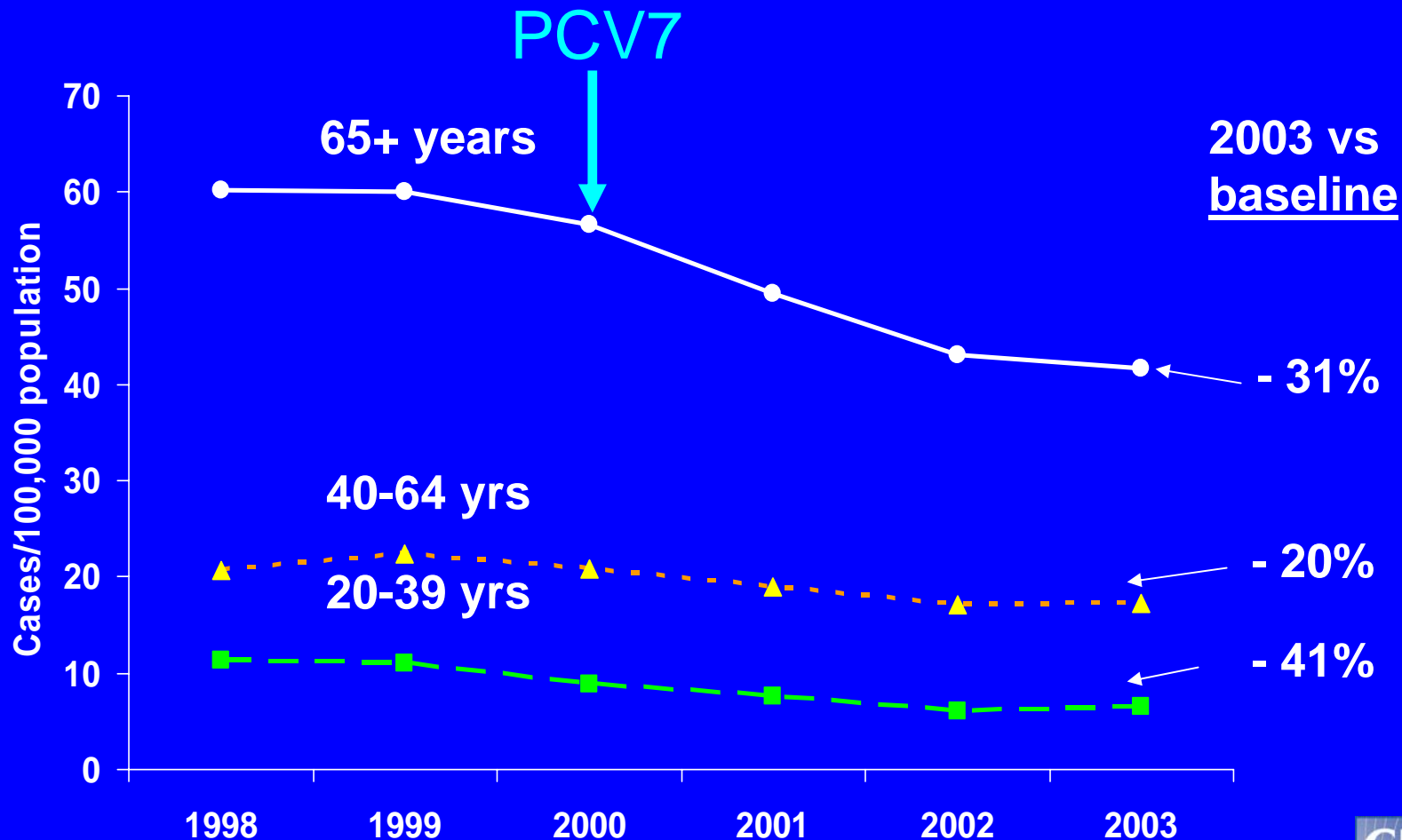
Invasive Pneumococcal Disease Rates  
in Children <5 Years, ABCs, 1998-2003



**2003 data are preliminary**

# Herd Effect in Adults

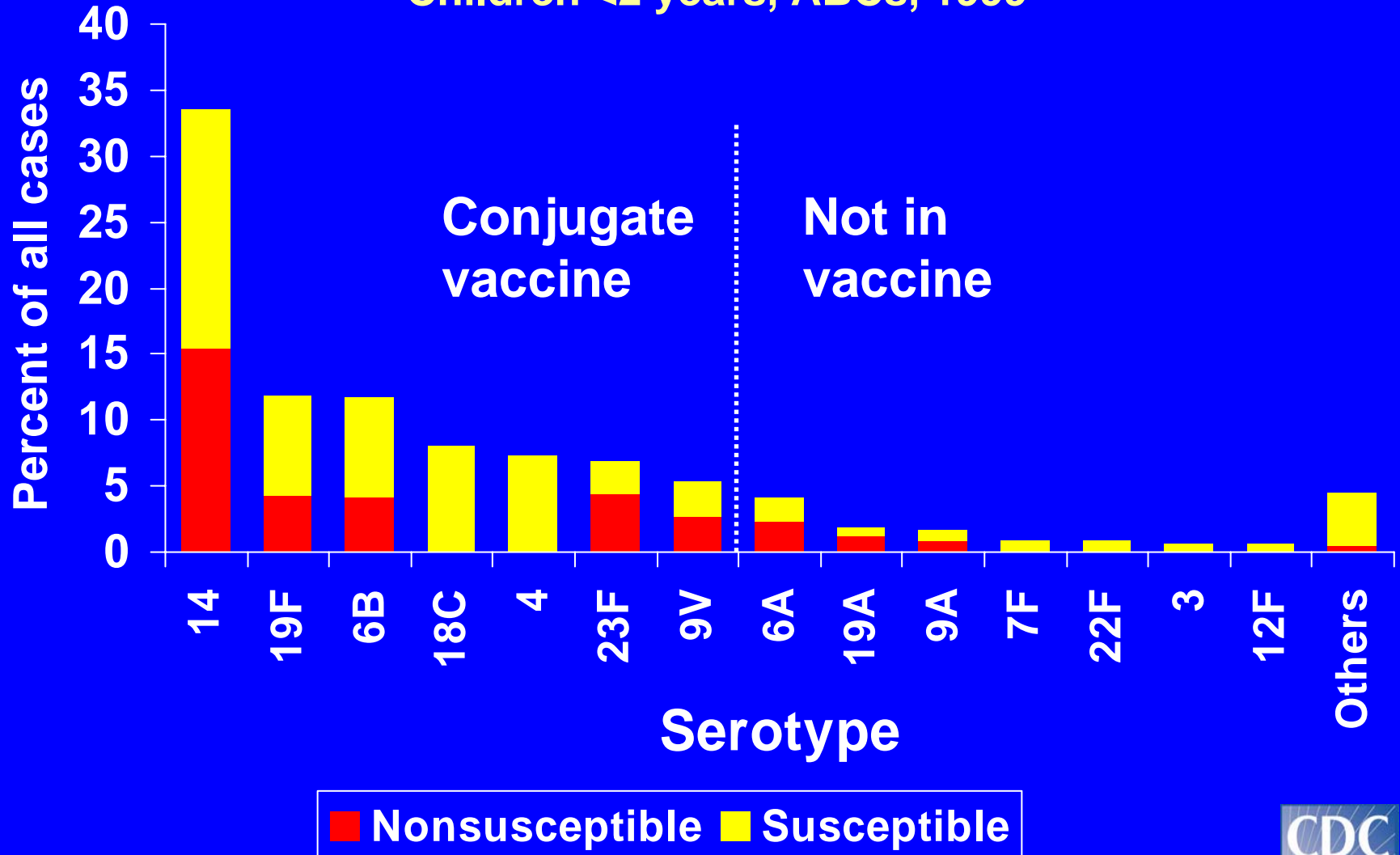
Invasive Pneumococcal Disease Rates over Time  
ABCs, 1998-2003



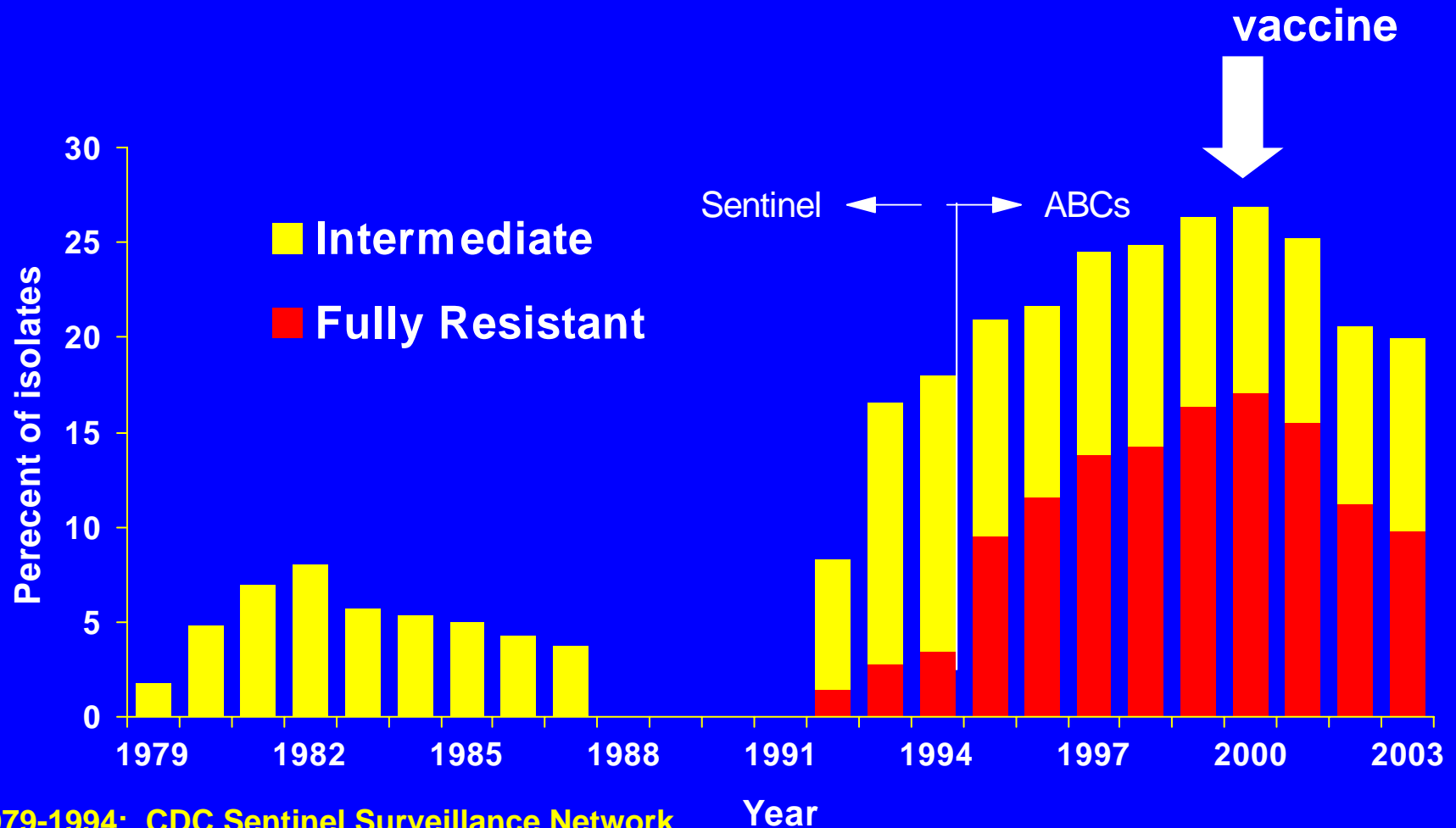
**2003 data are preliminary**

# Distribution of Pneumococcal Serotypes by Frequency and Penicillin Resistance

## Children <2 years, ABCs, 1999



# Penicillin Resistance in *S. pneumoniae* United States 1979-2003



1979-1994: CDC Sentinel Surveillance Network

1995-2003: CDC Active Bacterial Core Surveillance (ABCs) /Emerging Infections Program

# Perinatal Group B Streptococcal Disease (GBS)

- Emerged 1970s
- Newborn disease cost ~\$300 mill (1992)
- Preventable through use of intrapartum antibiotics (IAP) to women at risk



# First U.S. Consensus Recommendations (CDC '96, ACOG '96, AAP '97)

## Screening-based approach:

35-37 wks culture, offer intrapartum antibiotic prophylaxis (IAP) to GBS carriers and to preterm unless neg. culture result available

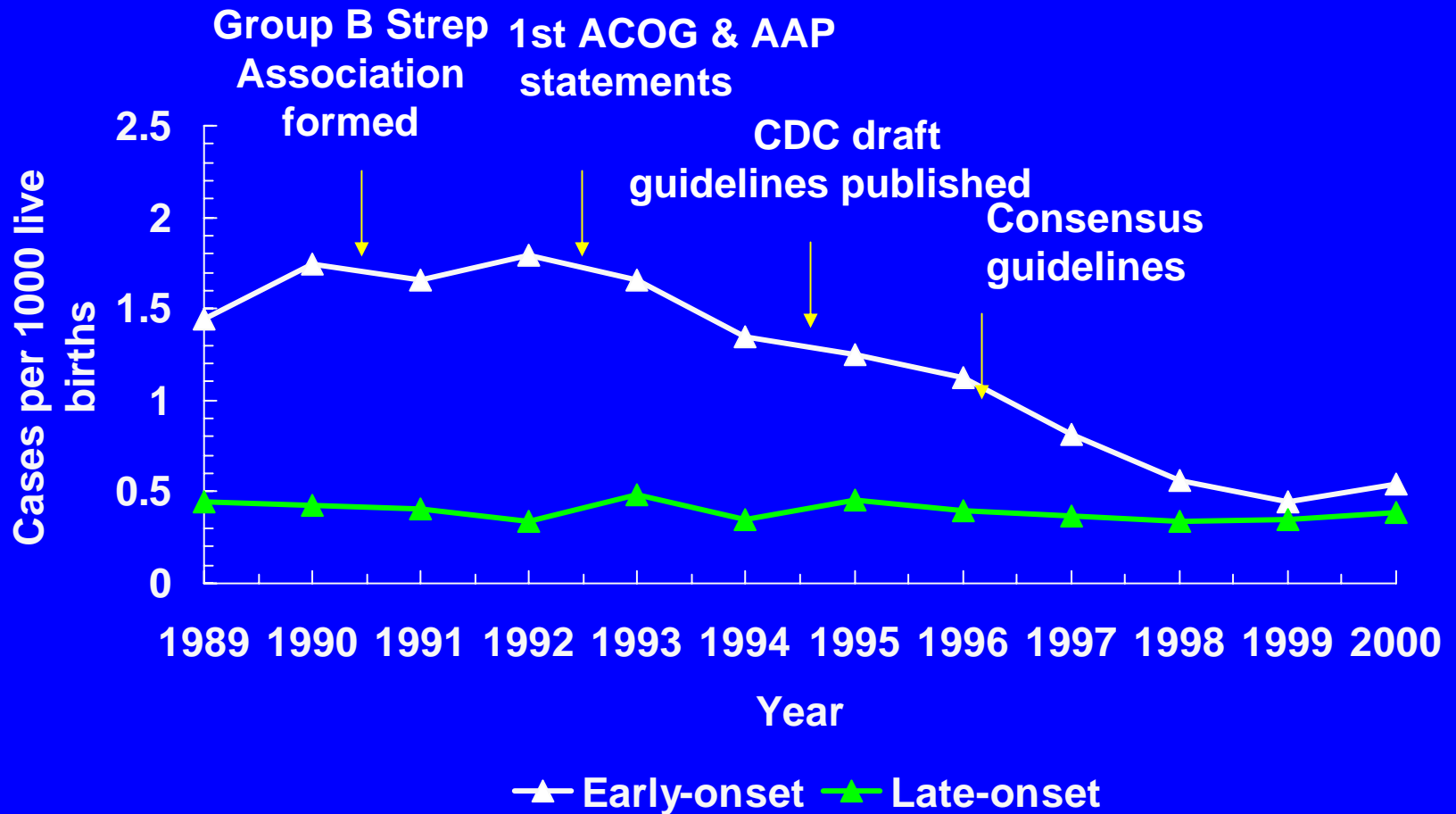
or

## Risk-based approach:

IAP to preterm, membrane rupture  $\geq 18$  hours, or intrapartum fever ( $T \geq 38C$ )

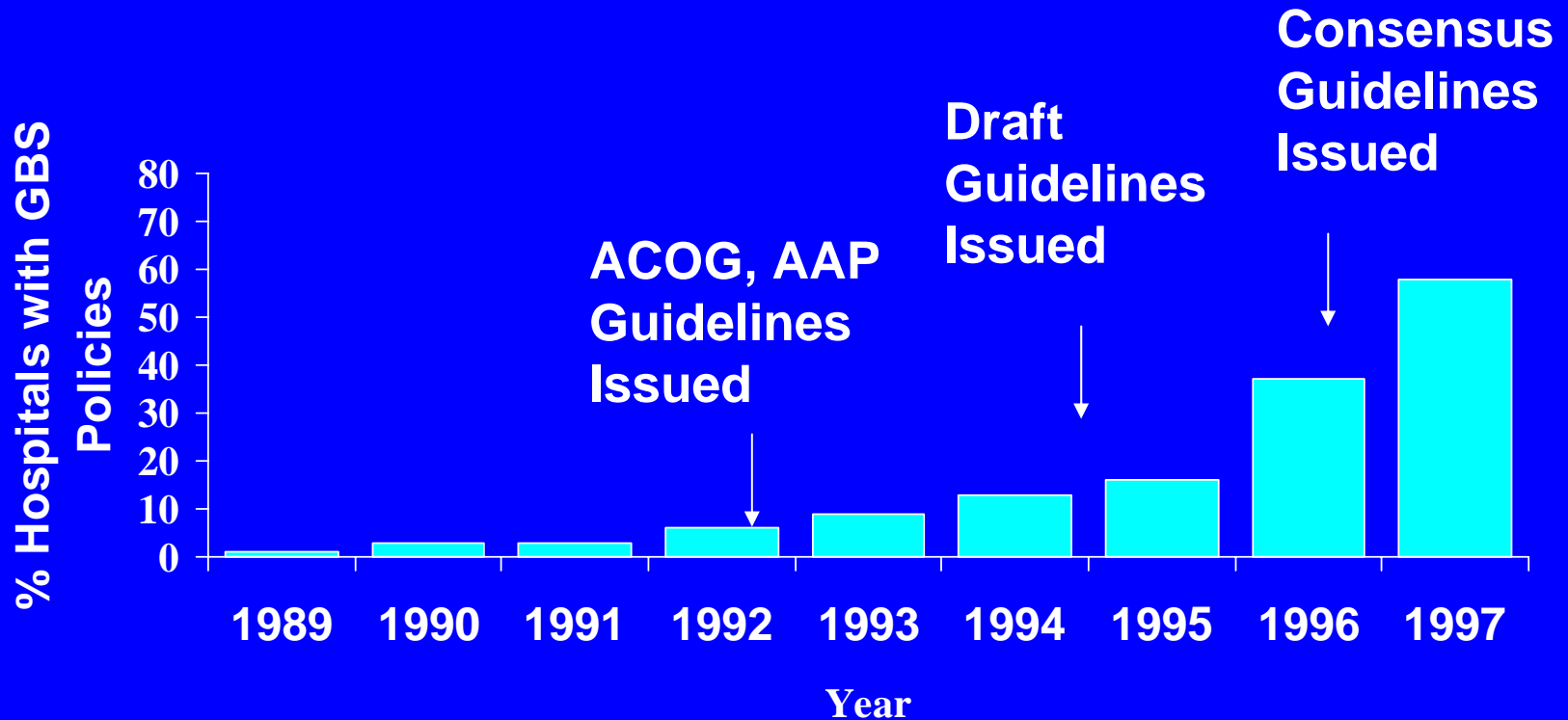
***Both strategies also give IAP to women with GBS bacteriuria, or previous infant with GBS disease***

# Rate of Early- and Late-onset GBS Disease in the 1990s, U.S.



Schrag, NEJM 2000

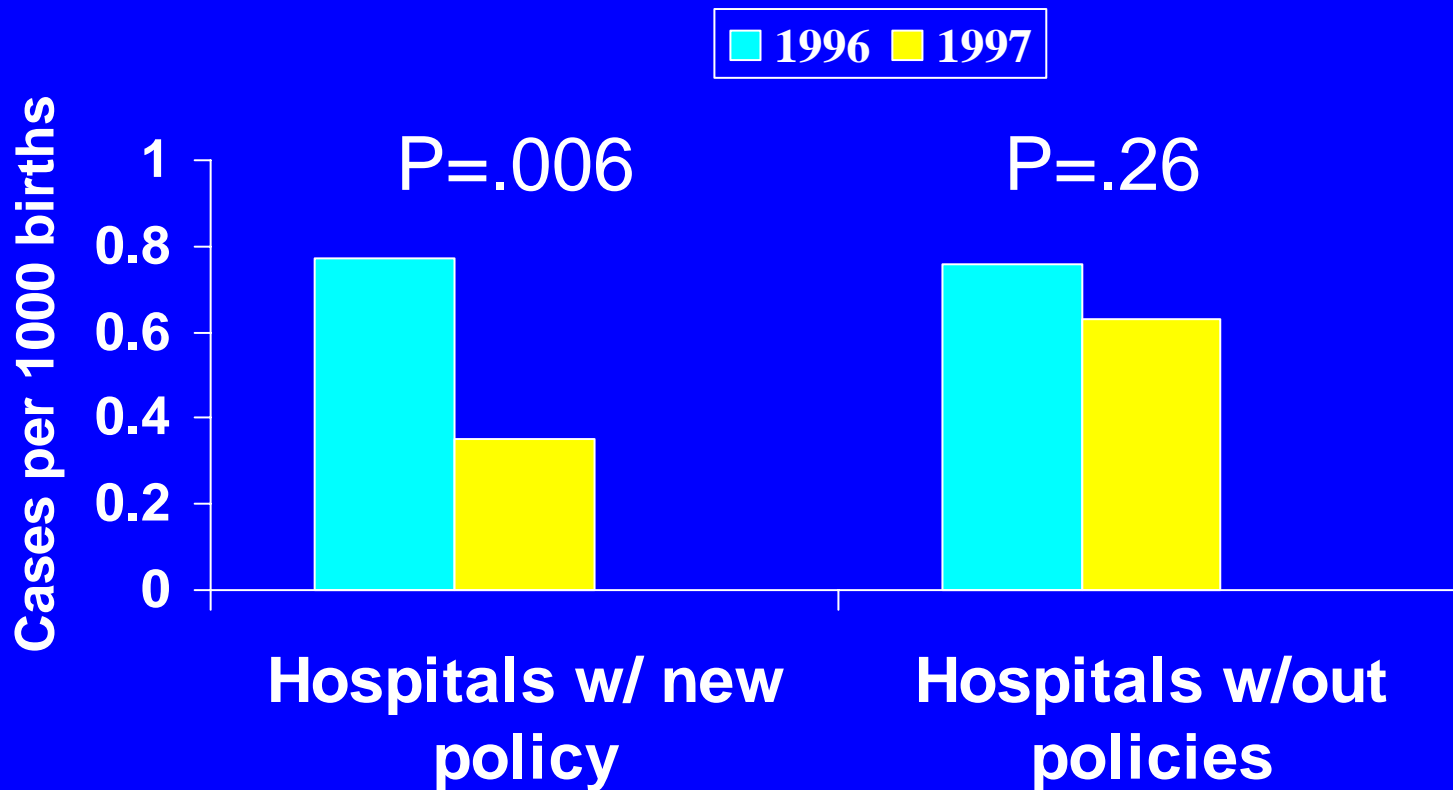
# GBS Policies in US Hospitals Implementation by Year



**ABCs Hospitals, EIP Network  
MMWR 1998; 47:665-670**

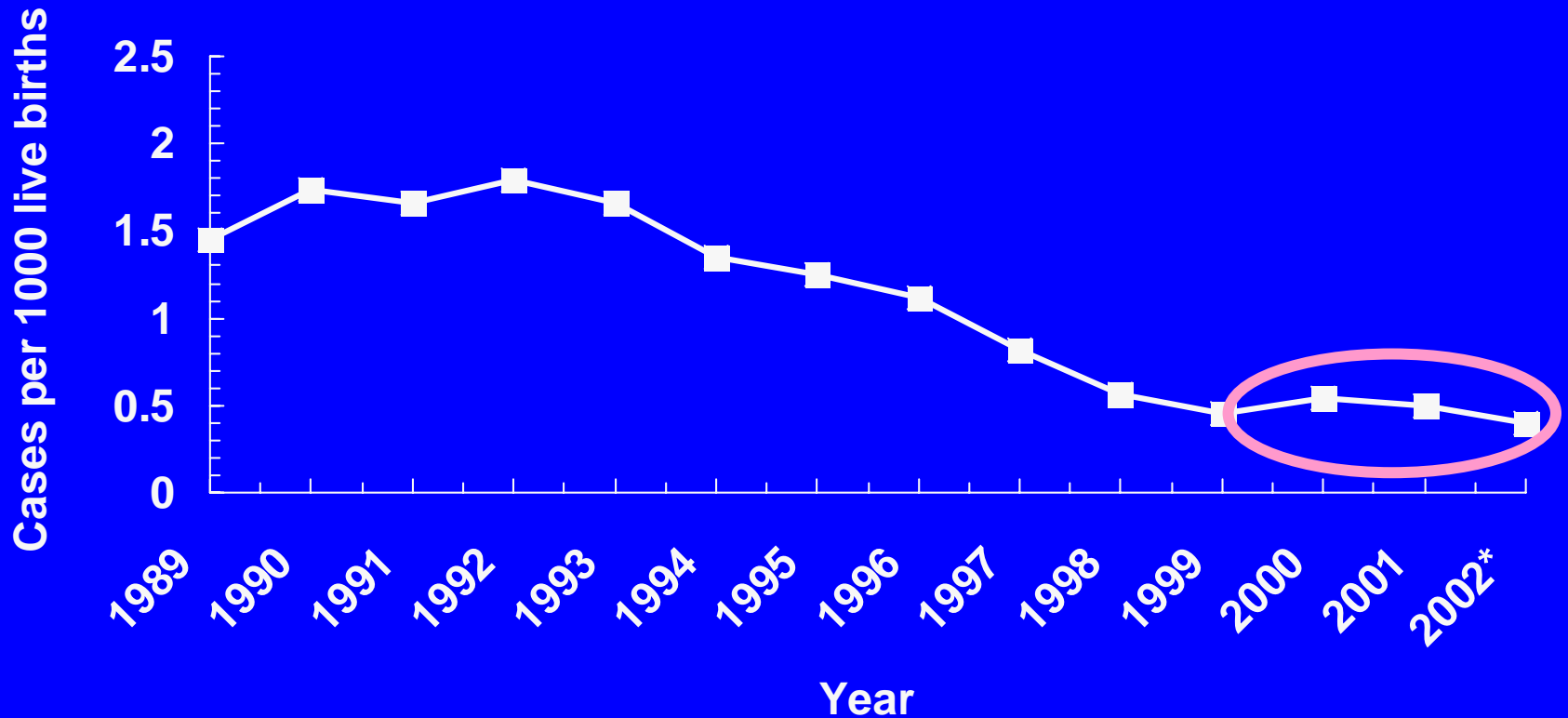


# Change in incidence of early-onset GBS disease in hospitals w/ and w/out new policies



Factor, *Obstet Gynecol* 2000;95:377-82

# Rate of Early-Onset GBS Disease since 1989, U.S. (ABCs sites)



Schrag, New Engl J Med 2000

\*2002 estimate provisional ([www.cdc.gov/abcs](http://www.cdc.gov/abcs))

# Factors associated with early-onset GBS disease: multivariable analysis

Characteristic	Adjusted RR (95% CI)
GBS screening	0.46 (0.36-0.60)
Prolonged ROM ( $\geq 18$ h)	1.41 (0.97-2.06)
Pre-term delivery	1.50 (1.07-2.10)
Black race	1.87 (1.45-2.43)
Maternal age <20 y	2.22 (1.59-3.11)
Previous GBS infant	5.54 (1.71-17.94)
Intrapartum fever	5.36 (3.60-7.99)

Study Design – multistate, retrospective cohort study using EIP ABCs infrastructure



# MMWR™

Morbidity and Mortality Weekly Report

Recommendations and Reports

August 16, 2002 / Vol. 51 / No. RR-11

## Prevention of Perinatal Group B Streptococcal Disease

Revised Guidelines from CDC



CENTERS FOR DISEASE CONTROL AND PREVENTION

SAFER • HEALTHIER • PEOPLE™

# The Recommendations

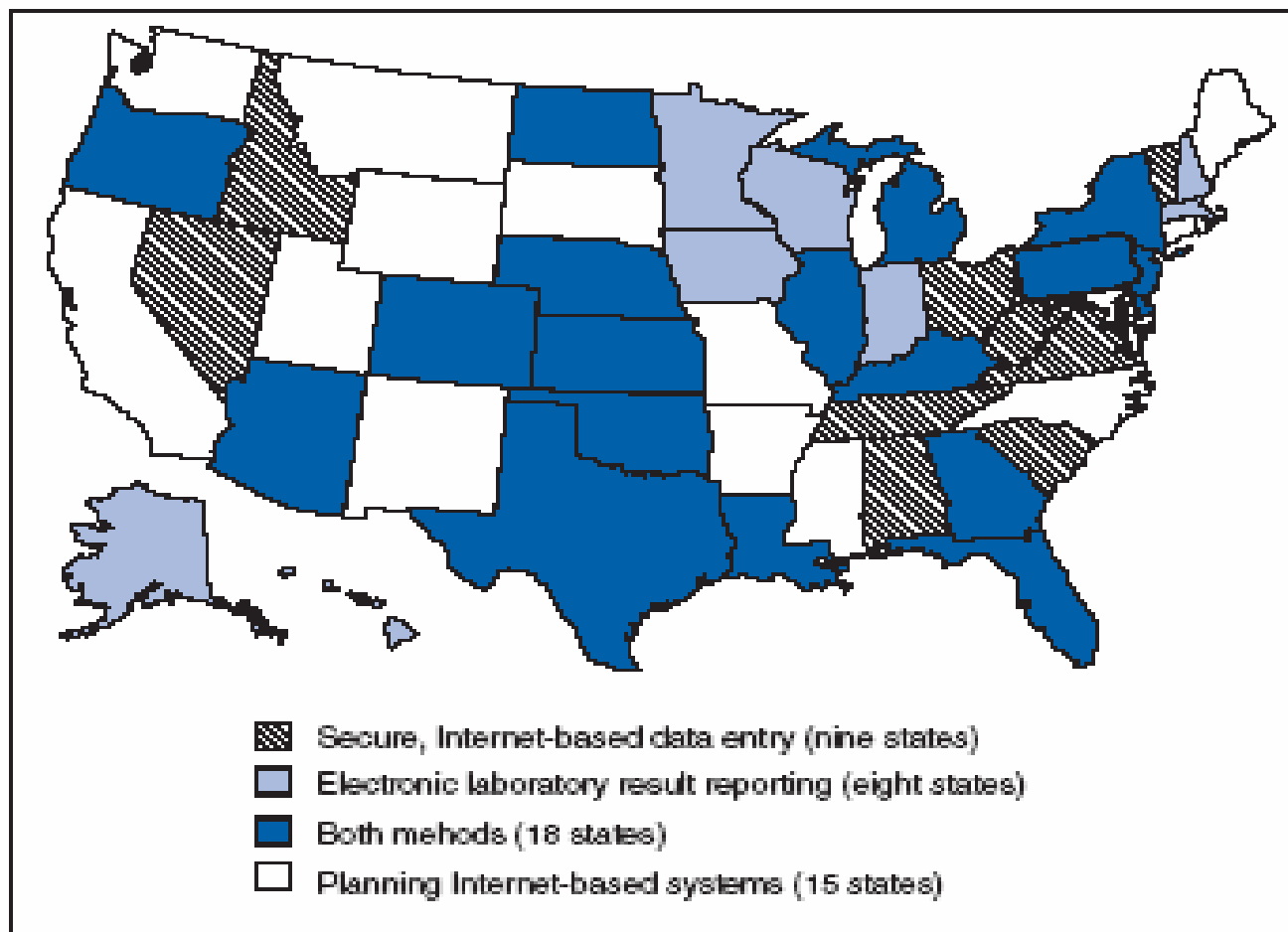
## MMWR, Vol 51 (RR-11)



# U.S. Efforts on Surveillance and Informatics (Public Health Information Network)

- Capture and analyze data in real time, using data that are already electronic
- Organize surveillance by relevant data sources, not diseases
- Standards-based development in a defined architecture
- Integrate public health and health care data, as appropriate
- Emphasize adoption and implementation of standards

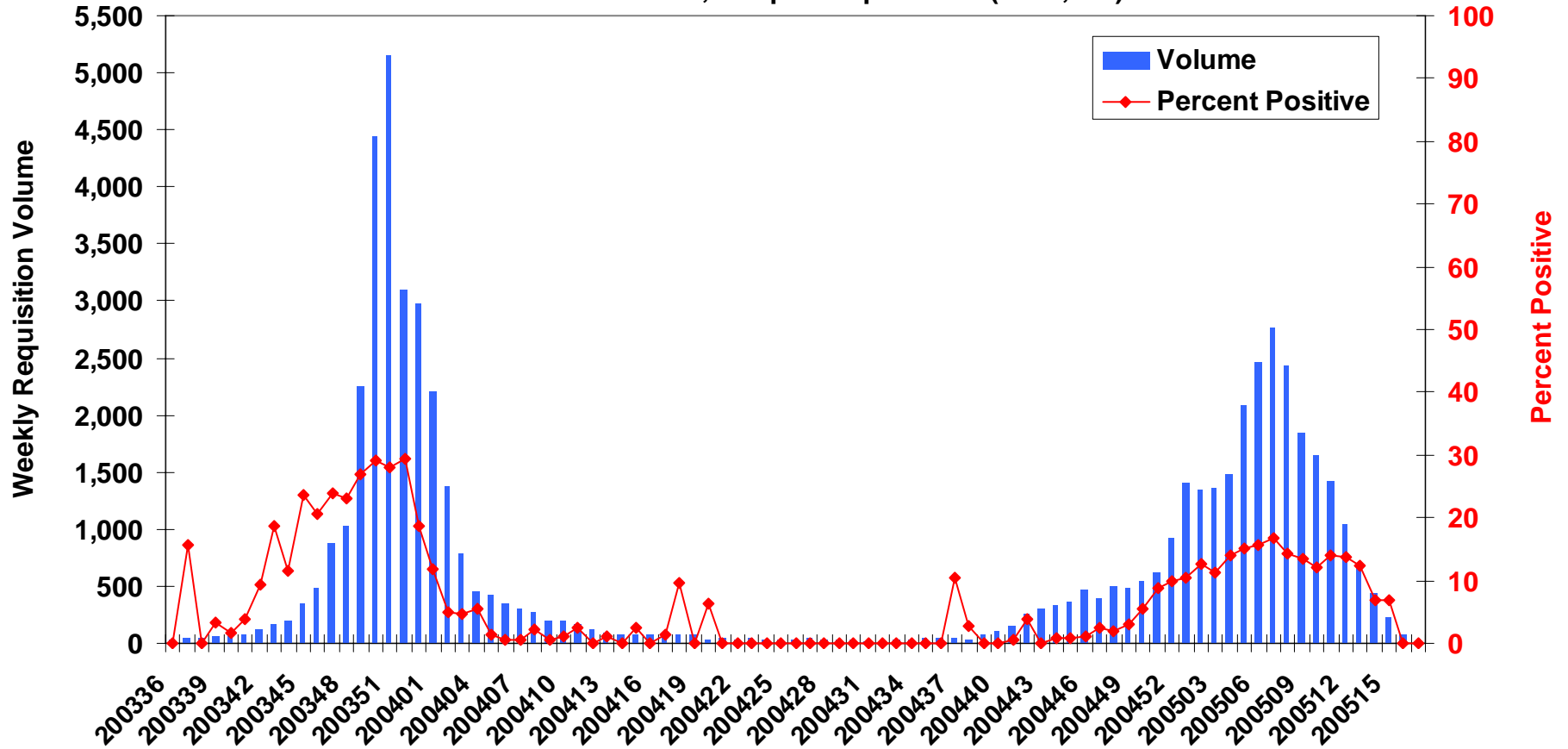
**FIGURE 1. Disease surveillance, by state and method — National Electronic Disease Surveillance System, United States, April 2005**



- Substantial recent progress
- Much work remains
- Connecting IT and surveillance effectively remains important challenge

# Quest Diagnostics Corporation Data Warehouse

Influenza Antigen and Culture Testing and Percent Positive by Region and Week  
9/1/2003 - 4/25/2005, Unique Requisitions (n=57,688)



Total Positives = 9274

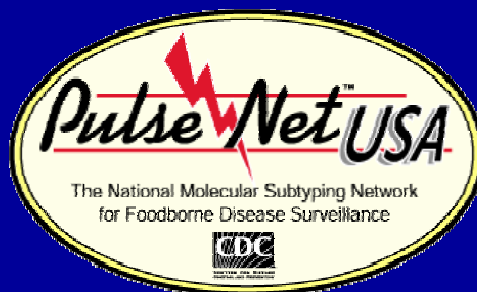
# PulseNet USA: Overview of the Molecular Subtyping Network for Foodborne Disease Surveillance in the United States

Kelley B. Hise, MPH

Centers for Disease Control and Prevention

Atlanta, GA

May 9, 2005





# What is PulseNet USA?

- A national network of public health and food regulatory agency laboratories coordinated by CDC
  - State health departments, Local health departments, Federal agencies (CDC, USDA, FDA)
- Perform standardized molecular typing of foodborne disease-causing bacteria by Pulsed-Field Gel Electrophoresis (PFGE)
- PFGE data are shared electronically and maintained in a database at CDC
- Database available on-demand to participants



# Objectives of PulseNet USA

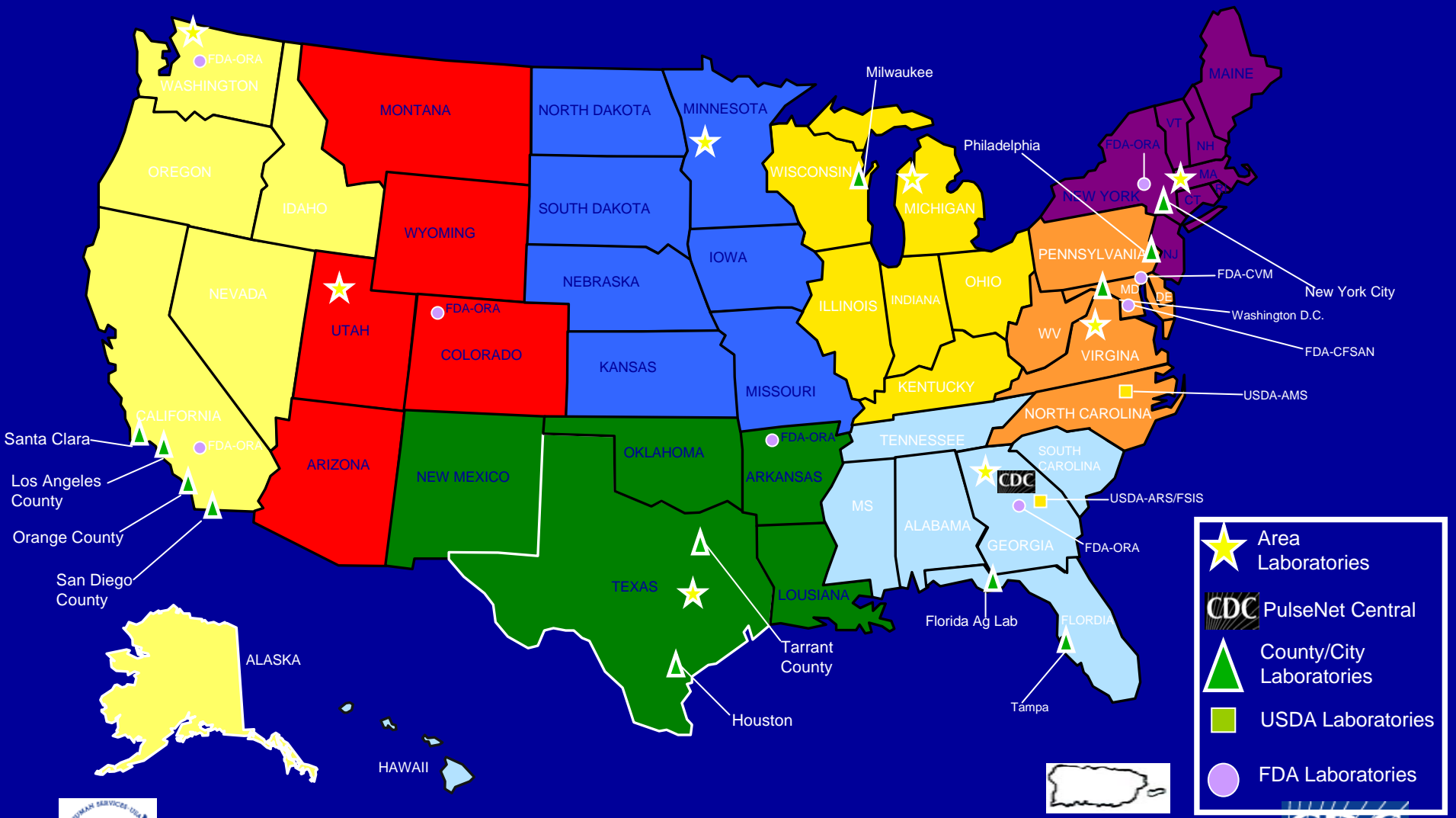
- Detect foodborne disease case clusters by PFGE
- Facilitate early identification of common source outbreaks\*
- Assist epidemiologists in investigating outbreaks
  - Help separate outbreak-associated cases from other sporadic cases \*
  - Assist in rapidly identifying the source of outbreaks \*
  - Act as a rapid and effective means of communication between public health laboratories



\* Depends on subtyping being performed in real-time.



# The National Molecular Subtyping Network for Foodborne Disease Surveillance



West Mountain South Central North Central Midwest Mid-Atlantic Southeast Northeast



# Outbreak of *E. coli* O157:H7 at a State Fair – North Carolina, 2004

In November 2004, PulseNet helped in the investigation of an outbreak of *E. coli* O157:H7 associated with a petting zoo at the North Carolina State Fair.

- On November 4<sup>th</sup>, 2004, the PulseNet laboratory in North Carolina alerted other PulseNet participants of the outbreak through a WebBoard posting.

The screenshot shows a web browser window displaying a WebBoard interface. The top navigation bar includes buttons for Post, Refresh, Search, Chat, Mark Read, More..., Help, and Logoff. The main content area is divided into a left sidebar with a list of forum topics and a right main post area. The post is titled "Topic: 0411NC-2ml- *E. coli* outbreak in NC (1 of 22), Read 236 times, 2 File Attachments" and is categorized under "Conf: *E.coli*". The author is Denise Griffin, with the email address denise.griffin@ncmail.net. The post date is Thursday, November 04, 2004 08:24 AM. The main text of the post describes a statewide outbreak of shiga toxin-producing *E. coli* O157:H7 in North Carolina, linked to a petting zoo. It mentions 28 patients, 8 hospitalized with HUS, and provides details about PFGE patterns and key isolate numbers. A file attachment "NC04112.TIF (310KB)" is visible at the bottom of the post. A blue callout box with an arrow points to the attachment, stating: "The PFGE pattern related to the outbreak is submitted for comparison to patterns in other states." The bottom of the page features logos for the Ministry of Health and the CDC.

Post Refresh Search Chat Mark Read More... Help Logoff **WebBoard**

2005 PulseNet Update Meeting (15, 15 New) new  
BioNumerics Server Status (0)  
Important PulseNet Documents (44, 40 New) new  
General PulseNet Information (180, 54 New) new  
**E.coli** (658, 644 New) new  
+ Ohio *E. coli* O157:H7 @ 2/23/2005 (31, 60 New) new  
+ 0502GA-c *E. coli* O157:H7 Georgia cluster @ 2/4/2005 (35, 68 New) new  
+ 0502CT-c *E. coli* O157:H7 in CT @ 2/4/2005 (35, 68 New) new  
+ *E. coli* O157:H7 in AR @ 1/31/2005 (27, 26 New) new  
+ *E. coli* O157:H7 in MS @ 1/24/2005 (27, 52 New) new  
+ 0412NY-1c NY *E. coli* O157:H7 @ 1/3/2005 (24, 46 New) new  
+ *E. coli* O157 non motile in Quebec @ 12/22/2004 (1, 1 New) new  
+ VA *E. coli* Multistate Cluster#2 on NatDbs @ 12/17/2004 (2, 2 New) new  
+ MA *E. coli* O157:H7 @ 12/17/2004 (23, 44 New) new  
+ *E. coli* Database offline 12 16 2004 12/16/2004 (2, 2 New) new  
+ 0412OK-1c *E. coli* O157:H7 in OK @ 12/14/2004 (2, 2 New) new  
+ 0412ml-1c Multistate *E. coli* O157:H7 @ 12/14/2004 (2, 2 New) new  
+ 0412NJ-1c *E. coli* O157 is NJ @ 12/14/2004 (22, 42 New) new  
+ 0412MA-1c MA *E. coli* O157:H7 @ 12/8/2004 (29, 48 New) new  
+ *E. coli* O157:H7 cluster in NC @ 12/6/2004 (21, 20 New) new  
+ 0411ml-2c- multistate *E. coli* cluster @ 11/29/2004 (2, 2 New) new  
+ VA *E. coli* isolate clusters to others on Nat Dbs @ 11/29/2004 (2, 2 New) new  
+ 0411FL-1c *E. coli* O157:H7 in FL @ 11/22/2004 (24, 44 New) new  
+ Michigan O157:H7 cluster @ 11/17/2004 (26, 50 New) new  
+ 0411CA-1c *E. coli* O157:H7 Cluster in Northern CA @ 11/17/2004 (26, 50 New) new  
+ 0411NC-2ml- *E. coli* outbreak in NC @ 11/4/2004 (21, 20 New) new  
+ 0411NC-1 *E. coli* O157:H7 cluster in NC 11/4/2004 (21, 20 New) new  
+ *E. coli* O157:H7 VA matches other states @ 10/21/2004 (2, 2 New) new  
+ *E. coli* O111 cluster in NY- orchard assoc @ 10/13/2004 (2, 2 New) new  
+ IL *E. coli* O157:H7 - Gnd. Beef Pattern @ 10/4/2004 (2, 2 New) new  
▼ Next – Bottom

**Salmonella** (2915, 2767 New) new  
**Listeria** (143, 92 New) new


TOP ... Post ... Reply ... Reply/Quote ... Email Reply ... Delete ... Edit  
Previous ... Next ... Previous Topic ... Next Topic ... Entire Topic

**Topic:** 0411NC-2ml- *E. coli* outbreak in NC (1 of 22), Read 236 times, 2 File Attachments **new**  
**Conf:** *E.coli*  
**From:** Denise Griffin denise.griffin@ncmail.net  
**Date:** Thursday, November 04, 2004 08:24 AM  
*Originally Posted 3-Nov-2004 15:52*

NC is investigating a statewide outbreak of shiga toxin producing *E. coli*. The outbreak appears to be linked to a petting zoo and currently includes three different strains of *E. coli* O157:H7 and an *E. coli* O45:?. To date, twenty eight patients meet the case definition, eight of these have been pulsed and four children are hospitalized with HUS. Dates of collection range from 10/20/04 to 10/26/04. We have five additional isolates pending analysis and more on the way. Please find attached gel NC04112 with Xba I patterns and gel NC04113 with Blns. H9812 reference is in lanes 1, 6 and 11 and patient's Xba I and Bln I patterns are in corresponding lanes. The O45:? isolate patterns are in lane 8. Key #s are 2004-002900, 2004-002962, 2004-002963, 2004-002964, 2004-002965, 2004-002978 (the O45:? isolate), 2004-002979 and 2004-002980; all have been uploaded. Our epi contact is Pam Jenkins and she can be reached at Pamela.Jenkins@ncmail.net or (919)715-4818. Wish us luck!

Denise

Denise L. Griffin, BSMT(ASCP)  
Medical Laboratory Specialist  
NC State Lab of Public Health  
(919)807-8763  
Denise.Griffin@ncmail.net

 [NC04112.TIF \(310KB\)](#)

The PFGE pattern related to the outbreak is submitted for comparison to patterns in other states.

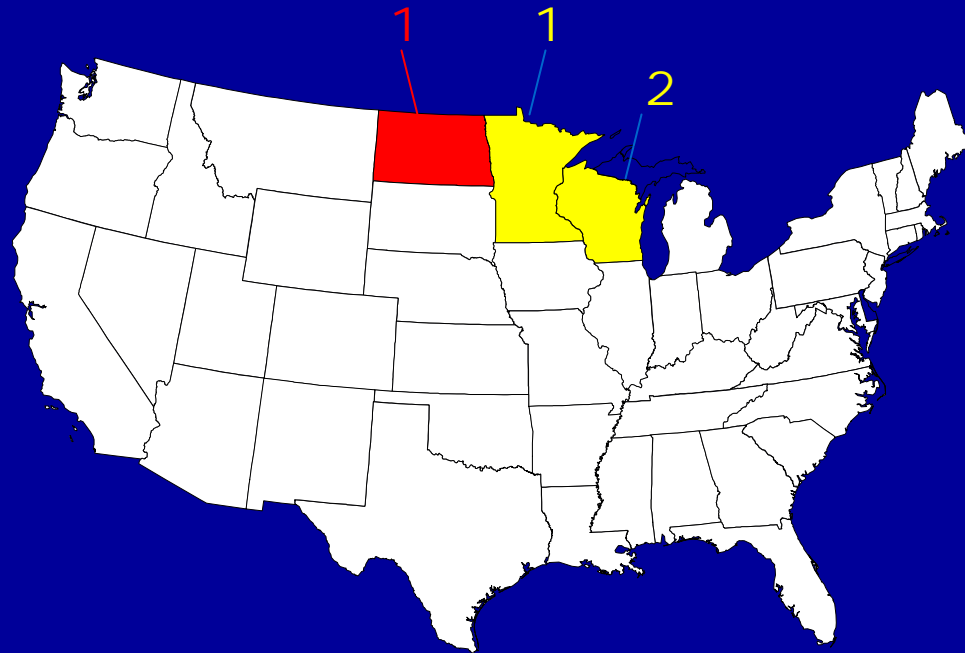
# A 60 day search within the *E. coli* national database shows isolates that appear indistinguishable



Cluster of indistinguishable isolates in NC

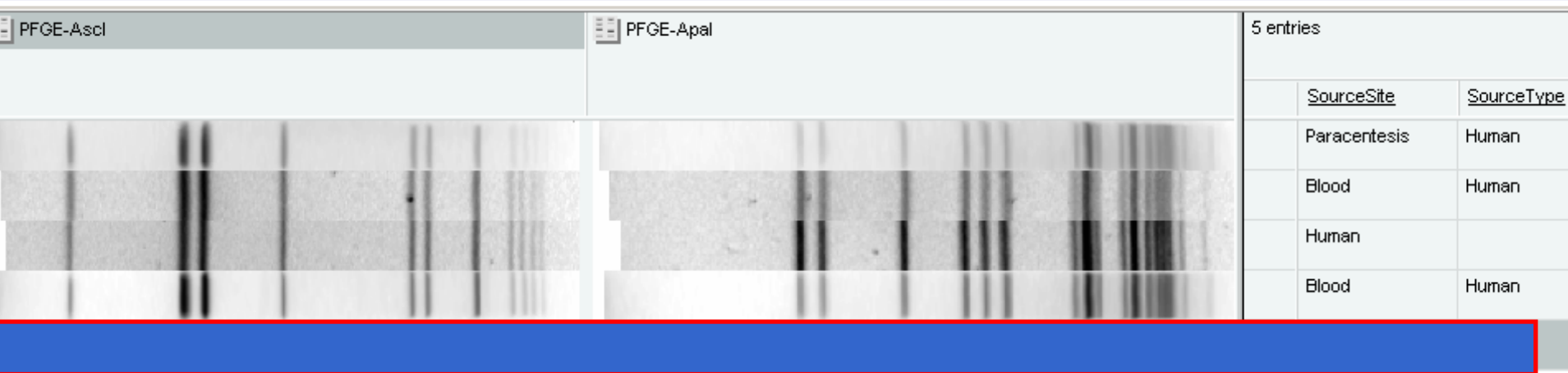


# PulseNet - Listeriosis



- role in dispersed outbreaks
- role in implicating vehicle

# BioNumerics PFGE Pattern Analysis

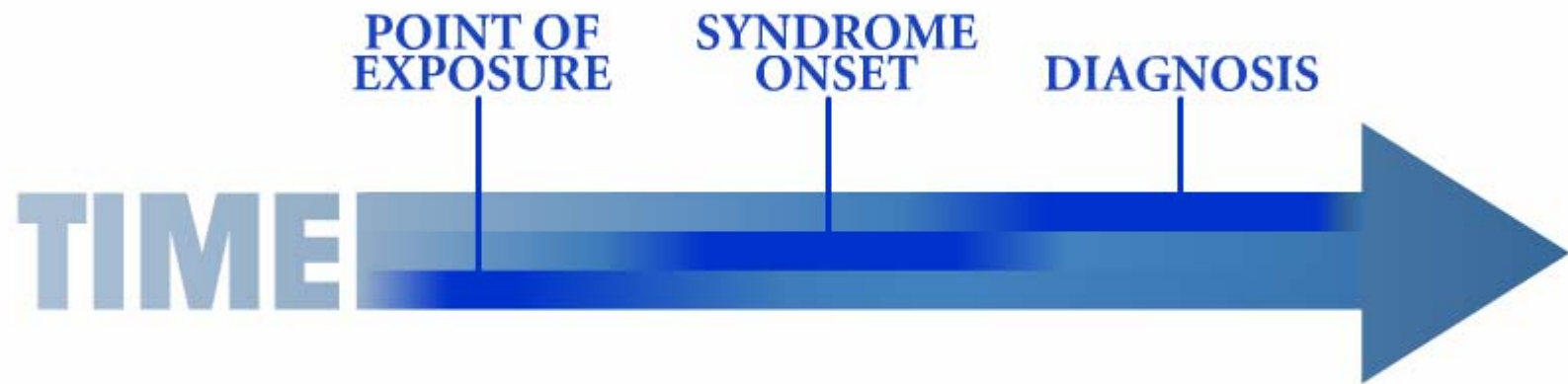


- PFGE results excluded turkey and cheese sandwiches as suspect vehicle

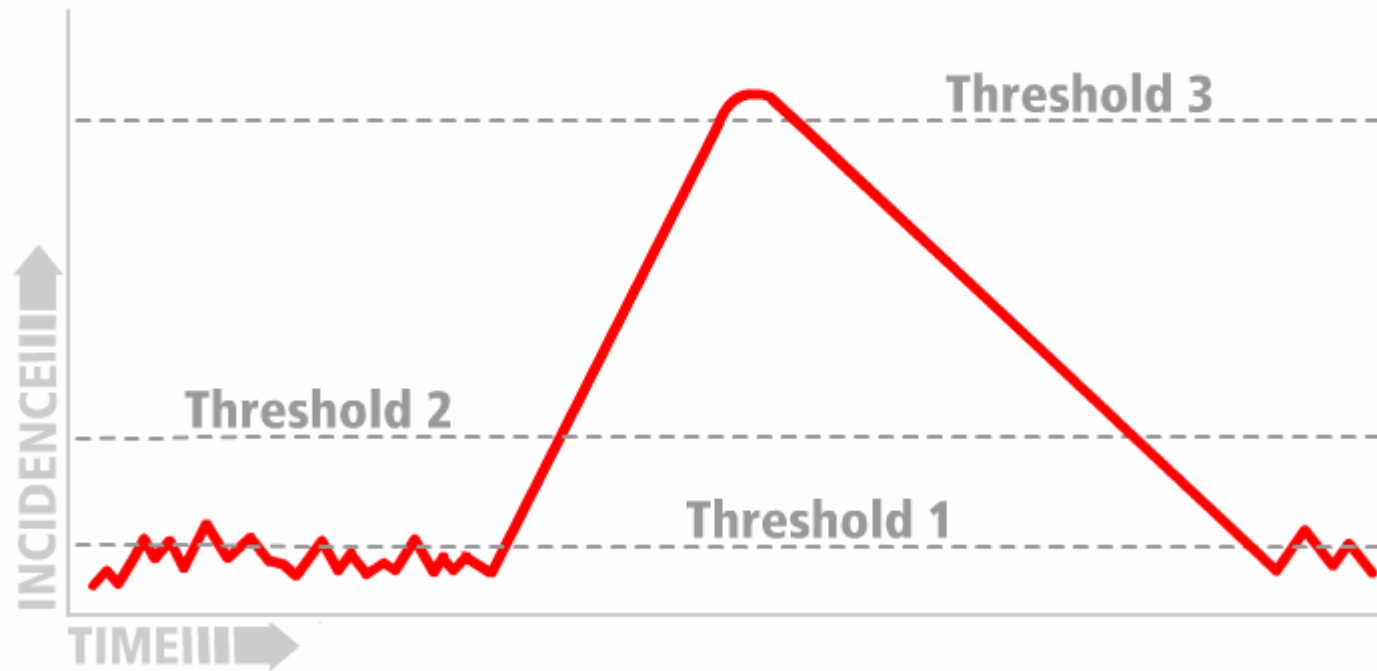
# Detecting Outbreaks: Considerations



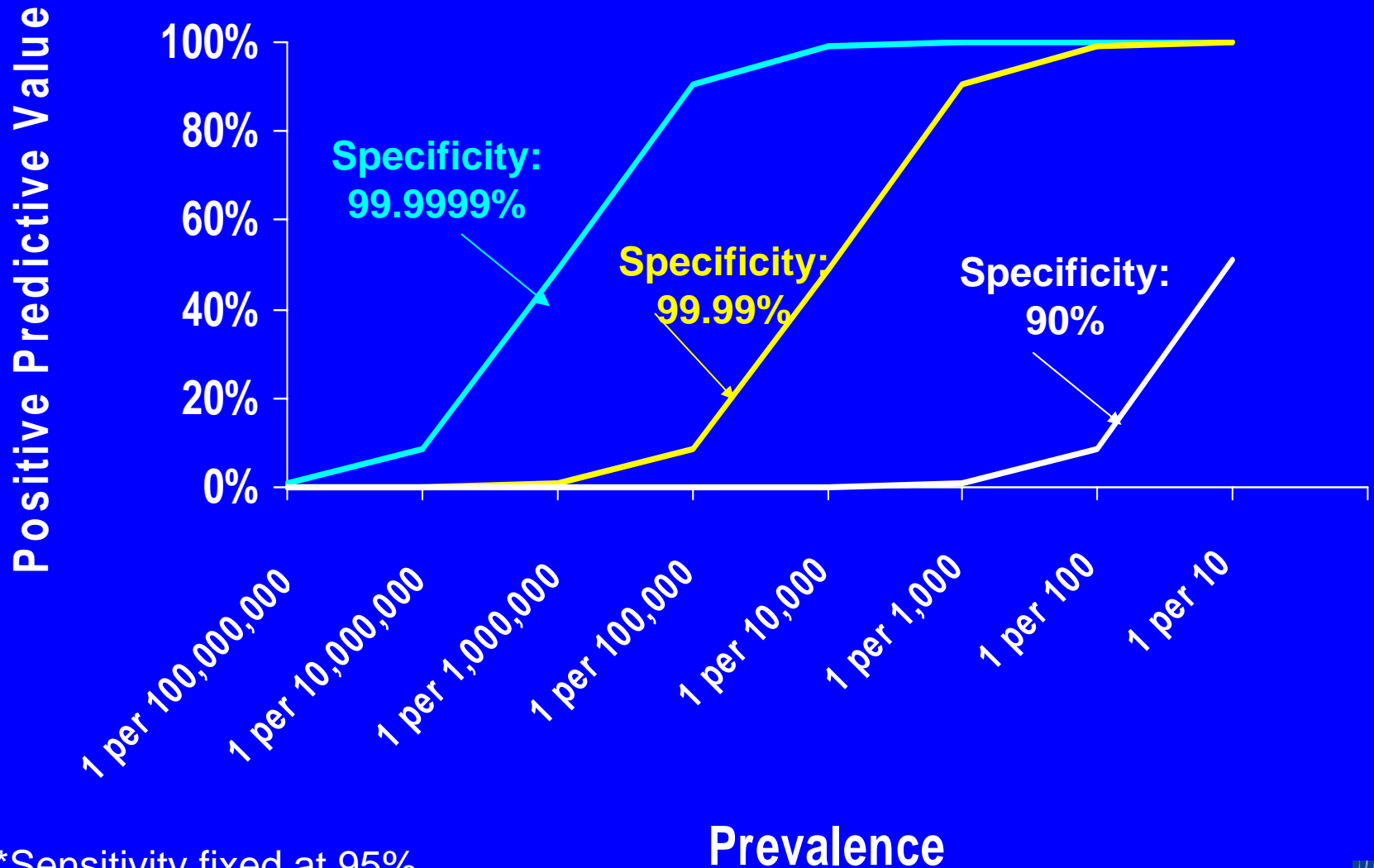
# PUBLIC HEALTH SURVEILLANCE – A MODEL



# THRESHOLD INCIDENCE MODEL TO DETECT EPIDEMICS



# The Relationship Between Specificity\* and PPV



\*Sensitivity fixed at 95%



# Skilled, Attentive People

- **Hantavirus pulmonary syndrome, 1993** – Cases of acute illness characterized by fever, myalgias, headache, and cough, followed by rapid development of respiratory failure reported to health departments in NM, AZ, CO, UT. (MMWR June 11, 1993)
- **West Nile Virus, 1999** - Infectious disease physician in Queens contacted the NYC Department of Health to report two patients with encephalitis (MMWR October 1, 1999)
- **Inhalational anthrax, 2001** – Local infectious disease physician Larry Bush promptly notified Jean Malecki, director, Palm Beach County Health Department. (EID Oct. 2002)



# General Considerations

- Process improvements and health outcomes
  - Surveillance for health outcomes may inform quality improvement of production and distribution processes, but they're not the same thing
- Understand, adapt to, take advantage of evolving standards and information technology
- Understand and frame the questions; know what needs to be counted and why; then design

*Advisory Committee for Blood Safety and Availability*

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