Overview of Vaccine Preventable Disease (VPD) Surveillance in the United States

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Presentation Objectives

Discuss:

- Purpose of vaccine-preventable disease (VPD) surveillance
- Types of surveillance data collected
- Surveillance systems/methods
- Support for VPD surveillance
Purpose of vaccine-preventable disease (VPD) surveillance
Purpose of Vaccine-Preventable Disease Surveillance

- Estimate burden of disease
- Evaluate control measures
- Determine geographic distribution
- Portray the natural history
- Detect epidemics/define a problem
- Generate hypotheses, stimulate research
- Monitor changes in infectious agents
- Detect changes in health practices
- Facilitate planning
## Comparison of 20th Century Annual Morbidity and Current Morbidity: Vaccine-Preventable Diseases

<table>
<thead>
<tr>
<th>Disease</th>
<th>20th Century Annual Morbidity†</th>
<th>2011 Reported Cases † †</th>
<th>Percent Decrease</th>
</tr>
</thead>
<tbody>
<tr>
<td>Smallpox</td>
<td>29,005</td>
<td>0</td>
<td>100%</td>
</tr>
<tr>
<td>Diphtheria</td>
<td>21,053</td>
<td>0</td>
<td>100%</td>
</tr>
<tr>
<td>Measles</td>
<td>530,217</td>
<td>212</td>
<td>&gt; 99%</td>
</tr>
<tr>
<td>Mumps</td>
<td>162,344</td>
<td>370</td>
<td>&gt; 99%</td>
</tr>
<tr>
<td>Pertussis</td>
<td>200,752</td>
<td>15,216</td>
<td>92%</td>
</tr>
<tr>
<td>Polio (paralytic)</td>
<td>16,316</td>
<td>0</td>
<td>100%</td>
</tr>
<tr>
<td>Rubella</td>
<td>47,745</td>
<td>4</td>
<td>&gt; 99%</td>
</tr>
<tr>
<td>Congenital Rubella Syndrome</td>
<td>152</td>
<td>0</td>
<td>100%</td>
</tr>
<tr>
<td>Tetanus</td>
<td>580</td>
<td>9</td>
<td>98%</td>
</tr>
<tr>
<td><strong>Haemophilus influenzae</strong></td>
<td>20,000</td>
<td>8*</td>
<td>&gt; 99%</td>
</tr>
</tbody>
</table>

†Source: JAMA. 2007;298(18):2155-2163

† † Source: CDC. MMWR January 6, 2012;60(51);1762-1775. (provisional 2011 data)

* Haemophilus influenzae type b (Hib) < 5 years of age. An additional 14 cases of Hib are estimated to have occurred among the 237 reports of Hi (< 5 years of age) with unknown serotype.
# Comparison of Pre-Vaccine Era Estimated Annual Morbidity with Current Estimate: Vaccine-Preventable Diseases

<table>
<thead>
<tr>
<th>Disease</th>
<th>Pre-Vaccine Era Annual Estimate</th>
<th>2010 Estimate</th>
<th>Percent Decrease</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hepatitis A</td>
<td>117,333 †</td>
<td>7,138</td>
<td>94%</td>
</tr>
<tr>
<td>Hepatitis B (acute)</td>
<td>66,232 †</td>
<td>9,428</td>
<td>86%</td>
</tr>
<tr>
<td>Pneumococcus (invasive)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>all ages</td>
<td>63,067 †</td>
<td>39,500 #</td>
<td>37%</td>
</tr>
<tr>
<td>&lt; 5 years of age</td>
<td>16,069 †</td>
<td>4,400##</td>
<td>73%</td>
</tr>
<tr>
<td>Rotavirus (hospitalizations, &lt; 3 years of age)</td>
<td>62,500 † †</td>
<td>2,500###</td>
<td>96%</td>
</tr>
<tr>
<td>Varicella</td>
<td>4,085,120 †</td>
<td>281,873</td>
<td>93%</td>
</tr>
</tbody>
</table>

† Source: JAMA. 2007;298(18):2155-2163
†† Source: CDC. MMWR. February 6, 2009 / 58(RR02);1-25
## Source: 2010 (provisional) Active Bacterial Core surveillance
### Source: New Vaccine Surveillance Network (unpublished)
Types of VPD surveillance data collected
Reported Pertussis Cases, 1922–2010

SOURCE: CDC, National Notifiable Diseases Surveillance System and Supplemental Pertussis Surveillance System and 1922-1949, passive reports to the Public Health Service
Reported Pertussis Cases by Diagnosis±
1990-2010

±Data collection for PCR and Epi-Link began in 1995
Measles Cases, United States, 1962-2011

Number of cases

Year


1963 Vaccine Licensed

1989-1991 Resurgence

1993 Vaccines for Children Program

2000 Elimination Declared

1989 – 2nd Dose Recommended
Measles, United States, 2001-2011
Importations by WHO Region

- **Unknown**
- **Western Pacific (WPR)**
- **South East Asian (SEAR)**
- **European (EUR)**
- **Eastern Mediterranean (EMR)**
- **African (AFR)**
- **American (AMR)**

<table>
<thead>
<tr>
<th>Year</th>
<th>Number of Cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>2001</td>
<td>55</td>
</tr>
<tr>
<td>2002</td>
<td>15</td>
</tr>
<tr>
<td>2003</td>
<td>10</td>
</tr>
<tr>
<td>2004</td>
<td>16</td>
</tr>
<tr>
<td>2005</td>
<td>20</td>
</tr>
<tr>
<td>2006</td>
<td>25</td>
</tr>
<tr>
<td>2007</td>
<td>30</td>
</tr>
<tr>
<td>2008</td>
<td>20</td>
</tr>
<tr>
<td>2009</td>
<td>10</td>
</tr>
<tr>
<td>2010</td>
<td>25</td>
</tr>
<tr>
<td>2011</td>
<td>70</td>
</tr>
</tbody>
</table>
Critical Elements in National Surveillance for VPDs

- Demographic data
- Clinical history
- Vaccination history
- Laboratory testing, confirmation, and molecular epidemiology
- Role of importation
Surveillance systems/methods
VPD Surveillance Data Sources in the U.S.

- State-based national passive surveillance (National Notifiable Disease Surveillance System - NNDSS)
- Sentinel sites with active surveillance
- Administrative data reviews (hospital discharge data and other resources)
- Special studies for specific diseases or conditions
- Laboratory-based studies
NNDSS: Case Reporting and Case Notification in the U.S.

- Laboratory reporting
- State Health Department
- Local Health Department
- Health Care Provider reporting
- CDC

- 50 states
- 64 grantees
- > 3,000 counties
States’ Participation in National VPD Surveillance

• List of nationally notifiable diseases from the Council of State and Territorial Epidemiologists (CSTE), with individual state implementation

• Case definitions determined by CSTE, to improve specificity and enhance comparability of cases (suspect, probable, confirmed)

• Laboratory support from Association of Public Health Laboratories (APHL)
National VPD Surveillance Data in the U.S.

- Reporting completeness varies (10%-90%)
- Limited federal funding is available specifically for surveillance
- Number of case reports changes related to disease incidence, but also due to testing technology, state laws, provider awareness
Support for vaccine-preventable disease (VPD) surveillance
Federal Assistance for VPD Surveillance

- Immunization program grant/cooperative agreement and special projects
- Technical assistance
  - Consultation and epidemiologic response
- Laboratory support
Federal Assistance for VPD Surveillance, continued

• Information dissemination
  – Weekly/annual MMWR surveillance summaries
  – Manuscripts and other venues

• Electronic data transmission, including demographic and epidemiologic case information (NETSS, NEDSS)

• Monitoring national surveillance indicators (imported cases, laboratory confirmation, timeliness, completeness, and others)
Thank you!

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