Surveillance for Vaccine-preventable Disease and Immunization Coverage

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IOM Committee – National Vaccine Plan
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New, complex outcomes

Old clinical presentations now unfamiliar

Newly preventable pathogens

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**Recommended Immunization Schedule for Persons Aged 0–6 Years—UNITED STATES**

*For those who fall behind or start late, see the catch-up schedule*

<table>
<thead>
<tr>
<th>Vaccine</th>
<th>Age</th>
<th>Birth</th>
<th>1 month</th>
<th>2 months</th>
<th>4 months</th>
<th>6 months</th>
<th>12 months</th>
<th>15 months</th>
<th>18 months</th>
<th>15–23 months</th>
<th>2–3 years</th>
<th>4–6 years</th>
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<tbody>
<tr>
<td>Hepatitis B®</td>
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<td>Rotavirus®</td>
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<tr>
<td>Diphtheria, Tetanus, Pertussis®</td>
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<td>DTaP</td>
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<td>DTaP</td>
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<td>Haemophilus influenza type b®</td>
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<td>Pneumococcal®</td>
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<td>Inactivated Poliovirus</td>
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<td>Influenza®</td>
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<td>Measles, Mumps, Rubella®</td>
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<td>MMR</td>
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<td>Varicella®</td>
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<td>Hepatitis A®</td>
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<td>HepA (2 doses)</td>
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<td>Meningococcal®</td>
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<td>MCV1</td>
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Challenging Surveillance Climate, Increasingly Complex Needs

- Health care sector:
  - fragmented delivery, financing strains

- Health IT:
  - EMRs, PHRs, privacy, interoperability, IIS uptake

- Complex needs for surveillance systems
  - Justify return on public investments
  - Monitor national, state, local programs
  - Track vax performance over time and pops.
  - Forecast resurgent disease, pockets of “need”
  - Initiate timely public health responses
Role for Surveillance for Vaccine-Preventable Disease

- Vital link between immunization policy & health outcomes
- Early warning system for changes in population susceptibility and force of infection
- Informs program monitoring
<table>
<thead>
<tr>
<th>What</th>
<th>Where</th>
<th>Why</th>
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</thead>
<tbody>
<tr>
<td>Reportable, Nationally Notifiable systems</td>
<td>All states</td>
<td>Support elimination</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Prompt public health response</td>
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<td></td>
<td></td>
<td>Monitor national trends</td>
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<tr>
<td>Enhanced systems</td>
<td>Selected locations</td>
<td>Identify nat’l dis. trends</td>
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<tr>
<td></td>
<td></td>
<td>Monitor new vaccine performance</td>
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<tr>
<td></td>
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<td>Assess policy</td>
</tr>
<tr>
<td>Laboratory-based systems</td>
<td>Selected laboratories</td>
<td>Inform vaccine formulation (flu, Pnc)</td>
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<tr>
<td></td>
<td></td>
<td>Assess vaccine performance</td>
</tr>
<tr>
<td>Vaccination coverage (e.g. NIS)</td>
<td>All states, selected cities</td>
<td>Monitor state and national program</td>
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<tr>
<td></td>
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<td>Identify disparities</td>
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</table>
Laboratory-based systems
Invasive Pneumococcal Disease rates in children aged <5 years, 1998 through 2006

CDC, ABCs/Emerging Infections Program Network
Total Acute Gastroenteritis (AGE) and Rotavirus AGE cases, Jan-April, 2006-2008

<table>
<thead>
<tr>
<th>Year</th>
<th>Total AGE</th>
<th>Rotavirus</th>
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<tbody>
<tr>
<td>2006</td>
<td>405</td>
<td>227</td>
</tr>
<tr>
<td>2007</td>
<td>481</td>
<td>261</td>
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<tr>
<td>2008</td>
<td>268</td>
<td>16</td>
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</tbody>
</table>

New Vaccine Surveillance Network
Address More Complex Outcomes
Monitoring Complex Outcomes of New Vaccines and Recommendations

- **HPV Vaccine**
  - Cervical ca, other ca
  - HPV prevalence
  - CIN, Genital warts

- **Influenza, PCV13**
  - P&I, ILI - nonspecific
  - Pneumonia hosp’s

- **Rotavirus vaccines**
  - Diarrhea hospitalizations
Aggregating disparate information
Case definition

Clinical and demographic data (age, outcome, complications)

Laboratory data, +/- clinical specimen

Immunization history
Reasons unimmunized (Eg PBEs)

Epidemiologic context
Travel hx
Outbreak associated
School or Day-care information
Future Needs in Aggregating Data and Addressing More Complex Outcomes:
Better Use of Technology

- IT can address some, not all needs
- Large-linked databases useful when vax effects large, outcomes specific

But…
- Special lab testing needed for some key outcomes and interview needed for PH response
- Role for human touch in VPD tracking will evolve, but can’t be eliminated
- Improved dx tests still needed for some VPDs
Duration of Protection
Reported Pertussis Cases
U.S., 1922-2004

National Notifiable Disease Surveillance System (NNDSS)
Duration of Protection: Future challenges

- Low levels of many VPDs
- Less circulation‡ less natural boosting
- Assessing of long-term protection requires reliable correlate
- Surv. for breakthrough cases can inform booster dose policy
- Long-term monitoring of new outcomes needed (e.g., HPV, Tdap)
Indirect Effects
Herd (Indirect) Effect: Invasive pneumococcal disease in adults >18 years, 1998/99-2006, PCV7 serotypes

ABCs/Emerging Infections Program Network (CDC unpublished)
Indirect Effects: Future Issues

- Influenza vaccine recently recommended for all children 6 mo – 18 years
- Demonstrating important indirect or herd effects of influenza vaccination would
  - support sustainability of school-aged programs
  - overcome impact of stalled rates of influenza vaccination in elderly and high risk
  - reduce need to find more effective formulations for elderly and immunocompromised

Other needs: Assess indirect benefits of Tdap, rotavirus, meningococcal vaccination
Assess immunization coverage
Sustained High Levels of Protection in Preschool-Aged Children

2010 Target

DTP / DTaP(3+)
MMR(1+)
Polio (3+)
Hib (3+)
Hep B (3+)
Varicella (1+)
PCV 7 (3+)

National immunization survey
Immunization Registry Sentinel Sites: Dose 1 coverage in <3 mo olds of rotavirus vs. DTaP, PCV7

Data as of May 15, 2007
Immunization Coverage: The Way Forward

- Implement recent Strategic Assessment*
- Annual Teen NIS – state-specific, national
- Vax acceptance and SES modules
- Develop methods for sustainability:
  - Less landline use‡ census pilot (sample frame)
- Use Immunization Information Systems when uptake sufficient (pvt use << public currently)
- Address small-area variation, exemptors
  - Develop targeted approaches for hot spots
  - Registry efforts; stdzing school entry surveys

*Summary of internal/external strategic review to be distributed
Permit rapid public health response
Measles, US, 2008
As of July 11, N=132*

<table>
<thead>
<tr>
<th># Cases</th>
<th>Age Group</th>
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<tbody>
<tr>
<td>20 (16%)</td>
<td>&lt; 12 mos</td>
</tr>
<tr>
<td>32 (25%)</td>
<td>12 mos - 4 years</td>
</tr>
<tr>
<td>41 (33%)</td>
<td>5-19 years</td>
</tr>
<tr>
<td>28 (22%)</td>
<td>20-49 years</td>
</tr>
<tr>
<td>5 (4%)</td>
<td>&gt; 50 years old</td>
</tr>
</tbody>
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38/41 (93%) of the school-aged children were PBEs

* Information on age was available for 126 cases
Need for VPD & IZ Monitoring: Greater than ever but getting more difficult?

- Complacency about disease risk
- Clinicians, parents lack familiarity with sx
- Lab assay challenges in vaccinated people
- Global interdependence
  - VPD risk around the world impacts risk here
- Local level coverage data most useful for program improvements – but least available
  - Resource-intensive unless comprehensive IIS or comparable system available
How will we know we’re there? Evaluation plans

- Measure progress toward disease elimination/reduction targets
- Measure progress toward achievement of coverage goals
- Report VPD burden and immunization coverage on annual basis
- Availability of data (coverage, incidence) at the program level where it is needed