The current and future climate for immunizations: Victories and challenges

Alan R. Hinman, MD, MPH
Missouri Immunization Conference
November 18, 2010
Vaccines Routinely Recommended for Children and Adolescents

1985 -
- Measles
- Rubella
- Mumps
- Diphtheria
- Tetanus
- Pertussis
- Polio

1995 -
- Measles
- Rubella
- Mumps
- Diphtheria
- Tetanus
- Pertussis
- Polio
- Hib (infant)
- HepB
- Varicella

2009 -
- Measles
- Rubella
- Mumps
- Diphtheria
- Tetanus
- Pertussis
- Polio
- Hib (infant)
- Hepatitis B
- Varicella
- Pneumococcal disease
- Influenza
- Meningococcal disease
- Hepatitis A
- Rotavirus
- HPV

Public Health INFORMATICS Institute
Number of Recommended Vaccinations Per Child, 1985-2009*

* Does not include recent combination vaccines
# Recommended Immunization Schedule for Persons Aged 0 Through 6 Years—United States • 2010

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

<table>
<thead>
<tr>
<th>Vaccine ▼ 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>19-23 months</th>
<th>2-3 years</th>
<th>4-6 years</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hepatitis B¹</td>
<td>HepB</td>
<td>HepB</td>
<td></td>
<td></td>
<td>HepB</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rotavirus²</td>
<td>RV</td>
<td>RV</td>
<td>RV²</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Diphtheria, Tetanus, Pertussis³</td>
<td>DTaP</td>
<td>DTaP</td>
<td>DTaP</td>
<td>DTaP</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Haemophilus influenza type b⁴</td>
<td>Hib</td>
<td>Hib</td>
<td>Hib⁵</td>
<td>Hib⁶</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pneumococcal⁶</td>
<td>PCV</td>
<td>PCV</td>
<td>PCV</td>
<td>PCV</td>
<td>PCV</td>
<td></td>
<td></td>
<td></td>
<td>PPSV⁷</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inactivated Poliovirus⁸</td>
<td>IPV</td>
<td>IPV</td>
<td>IPV</td>
<td>IPV</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Influenza⁹</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Influenza (Yearly)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Measles, Mumps, Rubella⁸</td>
<td>MMR</td>
<td>MMR</td>
<td>MMR</td>
<td>MMR</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Varicella⁹</td>
<td>Varicella</td>
<td>Varicella</td>
<td>Varicella</td>
<td>Varicella</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hepatitis A¹⁰</td>
<td>HepA (2 doses)</td>
<td></td>
<td>HepA Series</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Meningococcal¹¹</td>
<td>MCV</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Range of recommended ages for all children except certain high-risk groups.

Range of recommended ages for certain high-risk groups.

This schedule includes recommendations as of December 15, 2009. Any dose not administered at the recommended age should be administered at a subsequent visit, when indicated and feasible. The use of a combination vaccine generally is preferred over separate injections of its equivalent component vaccines. Considerations should include provider assessment, patient preference, and the potential for adverse events. Providers should consult the relevant Advisory Committee on Immunization Practices statement for detailed recommendations: [http://www.cdc.gov/vaccines/pubs/acip-list.htm](http://www.cdc.gov/vaccines/pubs/acip-list.htm). Clinically significant adverse events that follow immunization should be reported to the Vaccine Adverse Event Reporting System (VAERS) at [http://www.vaers.hhs.gov](http://www.vaers.hhs.gov) or by telephone, 800-822-7967.
## Recommended Immunization Schedule for Persons Aged 7 Through 18 Years—United States • 2010

For those who fall behind or start late, see the schedule below and the catch-up schedule.

<table>
<thead>
<tr>
<th>Vaccine</th>
<th>Age</th>
<th>7–10 years</th>
<th>11–12 years</th>
<th>13–18 years</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tetanus, Diphtheria, Pertussis(^1)</td>
<td></td>
<td></td>
<td>Tdap</td>
<td>Tdap</td>
</tr>
<tr>
<td>Human Papillomavirus(^2)</td>
<td>see footnote 2</td>
<td>HPV (3 doses)</td>
<td>HPV series</td>
<td></td>
</tr>
<tr>
<td>Meningococcal(^3)</td>
<td>MCV</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Influenza(^4)</td>
<td></td>
<td></td>
<td>Influenza (Yearly)</td>
<td></td>
</tr>
<tr>
<td>Pneumococcal(^5)</td>
<td>PPSV</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hepatitis A(^6)</td>
<td></td>
<td></td>
<td>HepA Series</td>
<td></td>
</tr>
<tr>
<td>Hepatitis B(^7)</td>
<td></td>
<td></td>
<td>Hep B Series</td>
<td></td>
</tr>
<tr>
<td>Inactivated Poliovirus(^8)</td>
<td></td>
<td></td>
<td>IPV Series</td>
<td></td>
</tr>
<tr>
<td>Measles, Mumps, Rubella(^9)</td>
<td></td>
<td></td>
<td>MMR Series</td>
<td></td>
</tr>
<tr>
<td>Varicella(^10)</td>
<td></td>
<td></td>
<td>Varicella Series</td>
<td></td>
</tr>
</tbody>
</table>

This schedule includes recommendations in effect as of December 15, 2009. Any dose not administered at the recommended age should be administered at a subsequent visit, when indicated and feasible. The use of a combination vaccine generally is preferred over separate injections of its equivalent component vaccines. Considerations should include provider assessment, patient preference, and the potential for adverse events. Providers should consult the relevant Advisory Committee on Immunization Practices statement for detailed recommendations: [http://www.cdc.gov/vaccines/pubs/acip-list.htm](http://www.cdc.gov/vaccines/pubs/acip-list.htm). Clinically significant adverse events that follow immunization should be reported to the Vaccine Adverse Event Reporting System (VAERS) at [http://www.vaers.hhs.gov](http://www.vaers.hhs.gov) or by telephone, 800-822-7967.
**Recommended Adult Immunization Schedule**

**UNITED STATES - 2010**

*Note: These recommendations must be read with the footnotes that follow containing number of doses, intervals between doses, and other important information.*

**Figure 1. Recommended adult immunization schedule, by vaccine and age group**

<table>
<thead>
<tr>
<th>VACCINE</th>
<th>AGE GROUP</th>
<th>19–26 years</th>
<th>27–49 years</th>
<th>50–59 years</th>
<th>60–64 years</th>
<th>≥65 years</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tetanus, diphtheria, pertussis (Td/Tdap) 1,*</td>
<td>1 time dose</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Human papillomavirus (HPV) 2,*</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Varicella 3,*</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Zoster 4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Measles, mumps, rubella (MMR) 5,*</td>
<td>1 or 2 doses</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Influenza 6,*</td>
<td>1 dose annually</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pneumococcal (polysaccharide) 7,8</td>
<td>1 or 2 doses</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hepatitis A 9,*</td>
<td>2 doses</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hepatitis B 10,*</td>
<td>3 doses</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Meningococcal 11,*</td>
<td>1 or more doses</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*covered by the Vaccine Injury Compensation Program.

For all persons in this category who meet the age requirements and who lack evidence of immunity (e.g., lack documentation of vaccination or have no evidence of prior infection) recommended if some other risk factor is present (e.g., on the basis of medical, occupational, lifestyle, or other indications).

No recommendation
## Comparison of 20th century annual and current morbidity

<table>
<thead>
<tr>
<th>Disease</th>
<th>20th century*</th>
<th>2009**</th>
<th>% reduction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diphtheria</td>
<td>21,053</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>Hepatitis A</td>
<td>117,333</td>
<td>11,049+</td>
<td>91</td>
</tr>
<tr>
<td>Hepatitis B (acute)</td>
<td>66,232</td>
<td>11,269+</td>
<td>83</td>
</tr>
<tr>
<td>Hib &lt;5</td>
<td>20,000</td>
<td>213#</td>
<td>99</td>
</tr>
<tr>
<td>Measles</td>
<td>530,217</td>
<td>71</td>
<td>&gt;99</td>
</tr>
<tr>
<td>Mumps</td>
<td>162,344</td>
<td>1,991</td>
<td>99</td>
</tr>
<tr>
<td>Pertussis</td>
<td>200,752</td>
<td>16,858</td>
<td>92</td>
</tr>
<tr>
<td>Pneumo (inv) all ages</td>
<td>63,607</td>
<td>44,000+</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td>&lt;5</td>
<td>16,069</td>
<td>4,167+</td>
</tr>
<tr>
<td>Poliomyelitis (para)</td>
<td>16,316</td>
<td>1</td>
<td>&gt;99</td>
</tr>
<tr>
<td>Rotavirus (hosp)</td>
<td>62,500°</td>
<td>7,550+</td>
<td>88</td>
</tr>
<tr>
<td>Rubella</td>
<td>47,745</td>
<td>3</td>
<td>&gt;99</td>
</tr>
<tr>
<td>CRS</td>
<td>152</td>
<td>2</td>
<td>99</td>
</tr>
<tr>
<td>Smallpox</td>
<td>29,005</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>Tetanus</td>
<td>580</td>
<td>18</td>
<td>97</td>
</tr>
<tr>
<td>Varicella</td>
<td>4,085,120</td>
<td>449,363+</td>
<td>89</td>
</tr>
</tbody>
</table>

Note: Children in the USIS and NHIS were 24-35 months of age. Children in the NIS were 19-35 months of age.


† DTP(3+) is not a Healthy People 2010 objective. DTaP(4) is used to assess Healthy People 2010 objectives.
<table>
<thead>
<tr>
<th>Vaccine</th>
<th>USA</th>
<th>MO</th>
</tr>
</thead>
<tbody>
<tr>
<td>DTP/DTaP 4+</td>
<td>83.9%</td>
<td>78.4%</td>
</tr>
<tr>
<td>Polio 3+</td>
<td>92.8%</td>
<td>87.5%</td>
</tr>
<tr>
<td>MMR 1+</td>
<td>90.0%</td>
<td>88.8%</td>
</tr>
<tr>
<td>Hib 3+</td>
<td>83.6%</td>
<td>79.6%</td>
</tr>
<tr>
<td>Hep B 3+</td>
<td>92.4%</td>
<td>89.4%</td>
</tr>
<tr>
<td>Varicella 1+</td>
<td>89.6%</td>
<td>87.8%</td>
</tr>
<tr>
<td>PCV 4+</td>
<td>80.4%</td>
<td>67.5%</td>
</tr>
<tr>
<td>Hep A 2+</td>
<td>46.6%</td>
<td>33.6%</td>
</tr>
<tr>
<td>Rota 2+</td>
<td>43.9%</td>
<td>46.9%</td>
</tr>
</tbody>
</table>
Vaccination coverage among adolescents aged 13-17 years, 2009

<table>
<thead>
<tr>
<th>Vaccine</th>
<th>USA</th>
<th>MO</th>
</tr>
</thead>
<tbody>
<tr>
<td>MMR 2+</td>
<td>89.1%</td>
<td>86.2%</td>
</tr>
<tr>
<td>Hep B 3+</td>
<td>89.9%</td>
<td>89.7%</td>
</tr>
<tr>
<td>Var 2+/Hx</td>
<td>75.7%</td>
<td>78.8%</td>
</tr>
<tr>
<td>Td/Tdap 1+</td>
<td>76.2%</td>
<td>74.7%</td>
</tr>
<tr>
<td>Tdap 1+</td>
<td>55.6%</td>
<td>60.1%</td>
</tr>
<tr>
<td>MCV4 1+</td>
<td>53.6%</td>
<td>45.5%</td>
</tr>
<tr>
<td>HPV 1+ (F)</td>
<td>44.3%</td>
<td>32.7%</td>
</tr>
<tr>
<td>HPV 3+ (F)</td>
<td>26.7%</td>
<td>19.9%</td>
</tr>
</tbody>
</table>
Vaccination Coverage Levels by Race and Ethnicity: NIS 2009

http://www.cdc.gov/vaccines/stats-surv/nis/data/tables_2009.htm#demographics

Adolescent Immunization by Poverty, U.S., 2009

Types of costs in immunization

- Vaccine purchase
- Vaccine administration
- Non-vaccine costs
Cost to Vaccinate from Birth Through 18 Years of Age with Vaccines Recommended Universally: 1990, 2000, and 2010

2010 represents minimum cost to vaccinate a child (birth through 18); exception is no preservative influenza vaccine, which is included for children 6-47 months of age.

HPV excluded for boys because it is not routinely recommended by the ACIP.

Sources of financing childhood immunizations

• Government
  – Federal
  – State/local
• Insurance
  – Private
  – Public
• Out-of-pocket
317 Immunization Program

317 grants support:

- Purchase of vaccine for free administration at local health departments
- Immunization delivery
- Surveillance
- Communication
- Education
Percentage Calculations: % increases are cumulative using 1999 as the base year. Beginning 2006 series costs are an average of the cost to vaccinate a male and a female. Estimates are based on inflationary increases and this figure reflects April 1, 2007 federal contract prices.
Vaccines for Children Act

• Provides entitlement to free vaccines specified by ACIP for
  – Uninsured
  – Medicaid
  – American Indian/Alaska Native
  – Underinsured (FQHC only)
• Allows States to buy off Federal Contract with their own funds
How Public Health Reaches Children through VFC

- VFC program has 45,000 provider sites
  - 75% of sites are private providers
  - 25% are public sector sites

- Collectively, VFC providers vaccinate 90% of children
  - VFC vaccine for VFC-eligible children
  - Private purchase vaccine for other children

- Improving VFC providers’ practices improves vaccinations for almost all children
VFC and Section 317 Vaccine Funding to Immunization Programs: 1990 - 2009

Public Health INFORMATICS Institute
Vaccine Funding; VFC, Section 317, ARRA-317: 2006-2010

* Current as of 8-30-2010; Y-axis is in $ millions
Insurance/VFC Status 19-35 Month Old Children; 2008 NIS Insurance Module

Totals add to > 100% because some AI/AN children are enrolled in Medicaid

Phil Smith et al. Submitted to Public Health Reports
Insurance/VFC Status 13-17 Year Olds; 2008 NIS-Teen Insurance Module

Totals add to > 100% because some AI/AN children are enrolled in Medicaid.
### Annual Premiums for Routine Vaccines as a Percent of Total Premiums

<table>
<thead>
<tr>
<th></th>
<th>2009 Premiums for Routine Vaccination</th>
<th>2009 Premiums for Large Plans</th>
<th>% of Premiums Due to Vaccines</th>
</tr>
</thead>
<tbody>
<tr>
<td>Family Coverage</td>
<td>$107</td>
<td>$13,280</td>
<td>0.8%</td>
</tr>
<tr>
<td>Single Coverage</td>
<td>$8</td>
<td>$4,940</td>
<td>0.2%</td>
</tr>
</tbody>
</table>

Source: Rose Chu, ASPE presentation at NVAC, June 2, 2009
Available at: http://www.hhs.gov/nvpo/nvac/meetings/pastmeetings/ins_premiums_200906.pdf
Public insurance for childhood immunizations

- Medicare
- Medicaid
- CHIP
  - Medicaid enhancement
  - S-CHIP
VFC, average private insurance, and average Medicare vaccine administration rates

Administration Fee Per Immunization for the VFC Program by State (2008)

Texas

*2011 FMAP rates used to identify the maximum CMS contribution

Out-of-pocket expenses for childhood immunizations

- Primarily with underinsured children
- Providers may refer to health departments
- Exacerbated by costs of newer vaccines
- May be further exacerbated by efforts to make HPV mandatory without assuring that all children have access to vaccine in public sector
317 funding FY 2009-2011

<table>
<thead>
<tr>
<th>Year</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>FY 2009</td>
<td>$ 557 M</td>
</tr>
<tr>
<td>FY 2010</td>
<td>$ 559 M</td>
</tr>
<tr>
<td>+ ARRA (2 yr)</td>
<td>$ 300M</td>
</tr>
<tr>
<td>FY 2011</td>
<td>$ 576 M</td>
</tr>
<tr>
<td>CDC estimate</td>
<td>$1,629 M</td>
</tr>
<tr>
<td>317 Coalition ask</td>
<td>$803 M</td>
</tr>
</tbody>
</table>
Vaccine administration

• Studies indicate that it costs approximately $18-25/injection to administer vaccines
• VFC does not reimburse for vaccine administration
• Widely varying rates of reimbursement from Medicaid and private insurers
Variation in provider vaccine purchase prices and payer reimbursement* - 1

- Survey of 76 practices in 5 states
- Major variation (up to 3X) in minimum & maximum purchase price for a given vaccine
- Some practices got better prices than VFC
- Larger practices, those in MSAs, and those participating in purchasing cooperatives generally had lower prices

*Freed et al. Pediatrics 2008;122:1325-1331
Variation in provider vaccine purchase prices and payer reimbursement - 2

- On average, practices had a positive net yield on vaccine purchase, ranging from $2.90 - $24.34 / dose for different vaccines
- However, for 15 / 21 vaccines studied, 2% – 26% of practices lost money (up to $29.31/dose)
- Larger practices, those in MSAs, and those participating in purchase cooperatives generally had higher net yield
Variation in provider vaccine purchase prices and payer reimbursement - 3

- Vaccine administration fee reimbursement from most common payer
  - First dose
    - Mean $16.62
    - Range $3.87 - $26.55
  - Subsequent doses
    - Mean $11.63
    - Range $3.36 - $37.20
“There is a wide range of prices paid by practices for the same vaccine product and in the reimbursement for vaccines and administration fees by payers. This variation highlights the need for individual practices to understand their own costs and reimbursements and to seek opportunities to reduce costs and increase reimbursements.”
Non-vaccine costs

- Include costs of
  - Acquiring vaccine
  - Storing vaccine
  - Handling vaccine
  - Loss of vaccines
  - Infrastructure
  - Insurance
PCP perspectives on reimbursement for childhood immunizations* - 1

• National survey of 1280 pediatricians and family physicians
• Response rate 70% for pediatricians; 60% for family physicians
• 49% reported delaying purchase of specific vaccines for financial reasons
• 53% reported decreased profit margin from immunizations in previous 3 years

*Freed et al. Pediatrics 2008;122:1319-1324
• Decreased profit margin from immunizations
  – Mod/significant decrease 41.4%
  – No/small decrease 22.6%
  – Don’t know 36.0%
PCP perspectives on reimbursement for childhood immunizations - 3

- Extent to which practice has seriously considered whether to stop providing all vaccines to privately insured patients
  - Seriously considered 11%
  - Considered not seriously 23%
  - Never considered 66%
“Physicians who provide vaccines to children and adolescents report dissatisfaction with reimbursement levels and increasing financial strain from immunizations. Although large-scale withdrawal of immunization providers does not seem to be imminent, efforts to address root causes of financial pressures should be undertaken.”
Selected NVAC recommendations on vaccine financing, 2008 - 1

- Extend VFC underinsured access to public health departments, not just FQHC/RHC
- Expand VFC by reimbursing for vaccine administration
- Reduce financial burden for initial & ongoing vaccine inventories
- Professional organizations should provide Technical Assistance to members on efficient business practices
Selected NVAC recommendations on vaccine financing, 2008 - 2

- Providers should participate in purchasing pools
- Insurance plans should provide first-dollar coverage with no deductible or co-pays for all ACIP-recommended vaccines
- NVPO should calculate marginal increase in insurance premiums if plans were to cover all ACIP-recommended vaccines
Selected NVAC recommendations on vaccine financing, 2008 - 3

• Government & professional organizations should encourage participation in VFC
• Ensure funding to cover all costs arising from assuring compliance with school immunization requirements
• Promote public/private sector approaches to help fund school-based and other complementary-venue child & adolescent immunization efforts
Response to: “I trust the vaccine advice my child’s main healthcare provider gives me.”

Preliminary HealthStyles survey analyses 2003 and 2008; n=649 and 608
Conclusions

- Vaccine-preventable diseases in children are at, or near, record low levels
- Immunization coverage in children is at, or near, record high levels
- Private-public partnership has improved childhood immunization rates
  - VFC has been a major factor
- Increasing number and costs of vaccines have put strains on system
- Unless resolved, these strains may undermine our current successes