Disclosures

- No financial conflict or interest with the manufacturer of any product named during this presentation.
- I will present recommendations for meningococcal conjugate vaccines (MCV4 and Hib-MenCY) and tetanus-toxoid, diphtheria-toxoid, acellular pertussis (Tdap) vaccine which conflict with the package insert.
Overview

- 2014 Immunization schedule
- Hib recommendations
- MCV4 recommendations
- Pneumococcal vaccine recommendations
- MMR vaccine
- Tdap vaccine
- Storage and handling
- Vaccine administration

* Citations,
Figure 1. Recommended immunization schedule for persons aged 0 through 18 years – United States, 2014.

(FOR THOSE WHO FALL BEHIND OR START LATE, SEE THE CATCH-UP SCHEDULE [FIGURE 2]).

These recommendations must be read with the footnotes that follow. For those who fall behind or start late, provide catch-up vaccination at the earliest opportunity as indicated by the green bars in Figure 1. To determine minimum intervals between doses, see the catch-up schedule (Figure 2). School entry and adolescent vaccine age groups are in bold.

<table>
<thead>
<tr>
<th>Vaccine</th>
<th>Birth</th>
<th>1 mo</th>
<th>2 mos</th>
<th>4 mos</th>
<th>6 mos</th>
<th>9 mos</th>
<th>12 mos</th>
<th>15 mos</th>
<th>18 mos</th>
<th>19-23 mos</th>
<th>2-3 yrs</th>
<th>4-6 yrs</th>
<th>7-10 yrs</th>
<th>11-12 yrs</th>
<th>13-15 yrs</th>
<th>16-18 yrs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hepatitis B (HepB)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>rotavirus (RV) RV1 (2-dose series); RV2 (3-dose series)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Diphtheria, tetanus, &amp; acellular pertussis (DTaP &lt;7 yrs)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tetanus, diphtheria, &amp; acellular pertussis (Tdap ≥7 yrs)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Haemophilus influenzae type b (Hib)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pneumococcal conjugate (PCV13)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pneumococcal polysaccharide (PPSV23)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inactivated poliovirus (IPV) (18 yrs)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Influenza (IIV, LAIV): 2 doses for some: See footnote 8</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Measles, mumps, rubella (MMR)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Varicella (VAR)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hepatitis A (HepA)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Human papillomavirus (HPV2: females only; HPV4: males and females)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Meningococcal (Hib-MenCY ≥6 weeks; MenACWY-D ≥9 mos; MenACWY-CRM ≥2 mos)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></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**
- **Range of recommended ages for catch-up immunization**
- **Range of recommended ages for certain high-risk groups**
- **Range of recommended ages during which catch-up is encouraged for certain high-risk groups**
- **Not routinely recommended**

This schedule includes recommendations in effect as of January 1, 2014. 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. Vaccination providers should consult the relevant Advisory Committee on Immunization Practices (ACIP) statement for detailed recommendations, available online at http://www.cdc.gov/vaccines/recs/acip-recs/index.html. Clinically significant adverse events that follow vaccination should be reported to the Vaccine Adverse Event Reporting System (VAERS) online (http://www.vaers.hhs.gov) or by telephone (800-822-7967). Suspected cases of vaccine-preventable diseases should be reported to the state or local health department. Additional information, including precautions and contraindications for vaccination, is available from CDC online (http://www.cdc.gov/vaccines/recs/vac-admin/contraind-cats.htm) or by telephone (800-CDC-INFO (800-232-4636)).

This schedule is approved by the Advisory Committee on Immunization Practices (http://www.cdc.gov/vaccines/acip), the American Academy of Pediatrics (http://www.aap.org), the American Academy of Family Physicians (http://www.aafp.org), and the American College of Obstetricians and Gynecologists (http://www.acog.org).

**NOTE:** The above recommendations must be read along with the footnotes of this schedule.
### Recommended Adult Immunization Schedule—United States - 2014

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>DOSAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Influenza</td>
<td>19-21 years</td>
<td>1 dose annually</td>
</tr>
<tr>
<td>Tetanus, diphtheria, pertussis (Td/Tdap)</td>
<td>19-21 years</td>
<td>Substitute 1-time dose of Tdap for Td booster; then boost with Td every 10 yrs</td>
</tr>
<tr>
<td>Varicella</td>
<td>19-21 years</td>
<td>2 doses</td>
</tr>
<tr>
<td>Human papillomavirus (HPV) Female</td>
<td>19-21 years</td>
<td>3 doses</td>
</tr>
<tr>
<td>Human papillomavirus (HPV) Male</td>
<td>19-21 years</td>
<td>3 doses</td>
</tr>
<tr>
<td>Zoster</td>
<td>19-21 years</td>
<td>1 dose</td>
</tr>
<tr>
<td>Measles, mumps, rubella (MMR)</td>
<td>19-21 years</td>
<td>1 or 2 doses</td>
</tr>
<tr>
<td>Pneumococcal 13-valent conjugate (PCV13)</td>
<td>19-21 years</td>
<td>1 dose</td>
</tr>
<tr>
<td>Pneumococcal polysaccharide (PPSV23)</td>
<td>19-21 years</td>
<td>1 or 2 doses</td>
</tr>
<tr>
<td>Meningococcal</td>
<td>19-21 years</td>
<td>1 or more doses</td>
</tr>
<tr>
<td>Hepatitis A</td>
<td>19-21 years</td>
<td>2 doses</td>
</tr>
<tr>
<td>Hepatitis B</td>
<td>19-21 years</td>
<td>3 doses</td>
</tr>
<tr>
<td>Haemophilus influenzae type b (Hib)</td>
<td>19-21 years</td>
<td>1 or 3 doses</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 documentation of vaccination or have no evidence of previous infection, zoster vaccine recommended regardless of prior episode of zoster.

Recommended if some other risk factor is present (e.g., on the basis of medical, occupational, lifestyle, or other indications).

No recommendation.

---

Report all clinically significant postvaccination reactions to the Vaccine Adverse Event Reporting System (VAERS). Reporting forms and instructions on filing a VAERS report are available at www.vaers.hhs.gov or by telephone, 800-822-7967.

Information on how to file a Vaccine Injury Compensation Program claim is available at www.hrsa.gov/vaccinecompensation or by telephone, 800-338-2382. To file a claim for vaccine injury, contact the U.S. Court of Federal Claims, 717 Madison Place, N.W., Washington, D.C. 20005; telephone, 202-357-6600.

Additional information about the vaccines in this schedule, extent of available data, and contraindications for vaccination is also available at www.cdc.gov/vaccines or from the CDC-INFO Contact Center at 800-CDC-INFO (800-232-4636) in English and Spanish, 8:00 a.m. - 8:00 p.m. Eastern Time, Monday - Friday, excluding holidays.

Use of trade names and commercial sources is for identification only and does not imply endorsement by the U.S. Department of Health and Human Services.

The recommendations in this schedule were approved by the Centers for Disease Control and Prevention’s (CDC) Advisory Committee on Immunization Practices (ACIP), the American Academy of Family Physicians (AAFP), the American College of Physicians (ACP), American College of Obstetricians and Gynecologists (ACOG), and American College of Nurse-Midwives (ACNM).
Figure 2. Vaccines that might be indicated for adults based on medical and other indications

<table>
<thead>
<tr>
<th>VACCINE ▼</th>
<th>INDICATION ▼</th>
<th>Pregnancy</th>
<th>Immuno-compromising conditions (excluding human immunodeficiency virus (HIV) A42.A53)</th>
<th>HIV infection CD4+ T lymphocyte count A42.A53</th>
<th>Men who have sex with men (MSM)</th>
<th>Kidney failure, end-stage renal disease, receipt of hemodialysis</th>
<th>Heart disease, chronic lung disease, chronic alcohleism</th>
<th>Asplenia (including elective splenectomy and persistent complement component deficiencies) R.M</th>
<th>Chronic liver disease</th>
<th>Diabetes</th>
<th>Healthcare personnel</th>
</tr>
</thead>
<tbody>
<tr>
<td>Influenza 2*</td>
<td></td>
<td></td>
<td>1 dose IIV annually</td>
<td>Substitute 1-time dose of Tdap for Td booster; then boost with Td every 10 yrs</td>
<td>1 dose IIV annually</td>
<td>Substitute 1-time dose of Tdap for Td booster; then boost with Td every 10 yrs</td>
<td>1 dose IIV annually</td>
<td>Substitute 1-time dose of Tdap for Td booster; then boost with Td every 10 yrs</td>
<td>1 dose IIV annually</td>
<td>Substitute 1-time dose of Tdap for Td booster; then boost with Td every 10 yrs</td>
<td>1 dose IIV annually</td>
</tr>
<tr>
<td>Tetanus, diphtheria, pertussis (Td/Tdap) 3*</td>
<td>1 dose Tdap each pregnancy</td>
<td></td>
<td></td>
<td>Substitute 1-time dose of Tdap for Td booster; then boost with Td every 10 yrs</td>
<td>1 dose IIV annually</td>
<td>Substitute 1-time dose of Tdap for Td booster; then boost with Td every 10 yrs</td>
<td>1 dose IIV annually</td>
<td>Substitute 1-time dose of Tdap for Td booster; then boost with Td every 10 yrs</td>
<td>1 dose IIV annually</td>
<td>Substitute 1-time dose of Tdap for Td booster; then boost with Td every 10 yrs</td>
<td>1 dose IIV annually</td>
</tr>
<tr>
<td>Varicella 5*</td>
<td></td>
<td></td>
<td>Contraindicated</td>
<td>2 doses</td>
<td>2 doses</td>
<td>Contraindicated</td>
<td>2 doses</td>
<td>Contraindicated</td>
<td>2 doses</td>
<td>Contraindicated</td>
<td>2 doses</td>
</tr>
<tr>
<td>Human papillomavirus (HPV) Female 5*</td>
<td></td>
<td></td>
<td>3 doses through age 26 yrs</td>
<td>3 doses through age 26 yrs</td>
<td>3 doses through age 26 yrs</td>
<td>3 doses through age 26 yrs</td>
<td>3 doses through age 26 yrs</td>
<td>3 doses through age 26 yrs</td>
<td>3 doses through age 26 yrs</td>
<td>3 doses through age 26 yrs</td>
<td>3 doses through age 26 yrs</td>
</tr>
<tr>
<td>Human papillomavirus (HPV) Male 5*</td>
<td></td>
<td></td>
<td>3 doses through age 26 yrs</td>
<td>3 doses through age 26 yrs</td>
<td>3 doses through age 21 yrs</td>
<td>3 doses through age 21 yrs</td>
<td>3 doses through age 21 yrs</td>
<td>3 doses through age 21 yrs</td>
<td>3 doses through age 21 yrs</td>
<td>3 doses through age 21 yrs</td>
<td>3 doses through age 21 yrs</td>
</tr>
<tr>
<td>Zoster 6*</td>
<td></td>
<td></td>
<td>Contraindicated</td>
<td>1 dose</td>
<td>1 dose</td>
<td>Contraindicated</td>
<td>1 dose</td>
<td>Contraindicated</td>
<td>1 dose</td>
<td>Contraindicated</td>
<td>1 dose</td>
</tr>
<tr>
<td>Measles, mumps, rubella (MMR) 7*</td>
<td></td>
<td></td>
<td>Contraindicated</td>
<td>1 or 2 doses</td>
<td>1 or 2 doses</td>
<td>Contraindicated</td>
<td>1 or 2 doses</td>
<td>Contraindicated</td>
<td>1 or 2 doses</td>
<td>Contraindicated</td>
<td>1 or 2 doses</td>
</tr>
<tr>
<td>Pneumococcal 13-valent conjugate (PCV13) 8*</td>
<td></td>
<td></td>
<td></td>
<td>1 dose</td>
<td>1 dose</td>
<td>Contraindicated</td>
<td>1 dose</td>
<td>Contraindicated</td>
<td>1 dose</td>
<td>Contraindicated</td>
<td>1 dose</td>
</tr>
<tr>
<td>Pneumococcal polysaccharide (PPSV23) 9,10</td>
<td></td>
<td></td>
<td></td>
<td>1 or 2 doses</td>
<td>1 or 2 doses</td>
<td>Contraindicated</td>
<td>1 or 2 doses</td>
<td>Contraindicated</td>
<td>1 or 2 doses</td>
<td>Contraindicated</td>
<td>1 or 2 doses</td>
</tr>
<tr>
<td>Meningococcal 11*</td>
<td></td>
<td></td>
<td></td>
<td>1 or more doses</td>
<td>1 or more doses</td>
<td>Contraindicated</td>
<td>1 or more doses</td>
<td>Contraindicated</td>
<td>1 or more doses</td>
<td>Contraindicated</td>
<td>1 or more doses</td>
</tr>
<tr>
<td>Hepatitis A 12*</td>
<td></td>
<td></td>
<td></td>
<td>2 doses</td>
<td>2 doses</td>
<td>Contraindicated</td>
<td>2 doses</td>
<td>Contraindicated</td>
<td>2 doses</td>
<td>Contraindicated</td>
<td>2 doses</td>
</tr>
<tr>
<td>Hepatitis B 13*</td>
<td></td>
<td></td>
<td></td>
<td>3 doses</td>
<td>3 doses</td>
<td>Contraindicated</td>
<td>3 doses</td>
<td>Contraindicated</td>
<td>3 doses</td>
<td>Contraindicated</td>
<td>3 doses</td>
</tr>
<tr>
<td>Haemophilus influenzae type b (Hib) 14*</td>
<td>post HSCT recipients only</td>
<td></td>
<td></td>
<td>1 or 3 doses</td>
<td>1 or 3 doses</td>
<td>Contraindicated</td>
<td>1 or 3 doses</td>
<td>Contraindicated</td>
<td>1 or 3 doses</td>
<td>Contraindicated</td>
<td>1 or 3 doses</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 documentation of vaccination or who have no evidence of previous infection; zoster vaccine recommended regardless of prior episode of zoster.

Recommended if some other risk factor is present (e.g., on the basis of medical, occupational, lifestyle, or other indications).

No recommendation.

These schedules indicate the recommended age groups and medical indications for which administration of currently licensed vaccines is commonly indicated for adults ages 19 years and older, as of February 1, 2014. For all vaccines being recommended on the Adult Immunization Schedule, a vaccine series does not need to be restarted, regardless of the time that has elapsed between doses. Licensed combination vaccines may be used whenever any components of the combination are indicated and when the vaccine's other components are not contraindicated. For detailed recommendations on all vaccines, including those used primarily for travelers or that are issued during the year, consult the manufacturers' package inserts and the complete statements from the Advisory Committee on Immunization Practices (www.cdc.gov/vaccines/acip/policy-docs/index.html). Use of trade names and commercial sources is for identification only and does not imply endorsement by the U.S. Department of Health and Human Services.
Haemophilus influenzae
Impact of *Haemophilus influenzae* type b disease

- Formerly the leading cause of bacterial meningitis among children younger than 5 years of age
- Approximately 1 in 200 children developed invasive Hib disease
- Almost all infections among children younger than 5 years
Uptick in disease among adults in Utah from 1998-2008

- 121 cases
- persons 65 years of age and older
- 51% of cases
- 66% of Hib-related deaths
- increase also in nontypeable Hib strains and in serotype f
- increases have also been noted in Illinois, Alaska, and Spain

Reasons may include:
- changes in the organism
- greater numbers of high-risk people
- waning immunity to the organism
Updates to Hib Footnotes

- High-risk Hib vaccine for young children
  - 15-59 months of age
  - Vaccinate with 2 doses if unvaccinated or only 1 dose prior to 12 months of age, for Ig deficiency, complement deficiency, anatomic/functional asplenia, chemotherapy recipients and HIV infection
  - Vaccinate with 1 dose if no primary series/booster or no doses after 14 months of age, for those undergoing elective splenectomy vaccine to be given 14 days before splenectomy
Updates to Hib Footnotes

- **High-risk Hib vaccine for older children/adults**
  - **5 years to 18 years**
    Vaccinate with 1 dose if no primary series/booster or no doses after 14 months of age, for those with anatomic/functional asplenia, chemotherapy recipients and HIV infection
  - **Adults**
    1 dose of Hib vaccine should be administered to persons who have functional or anatomic asplenia, sickle cell disease, or are undergoing elective splenectomy, if they have not previously received Hib vaccine. Hib vaccination 14 or more days before splenectomy is suggested.

For Hib vaccine guidance recommended that Hib vaccination of persons infected with human immunodeficiency (HIV) be considered, but updated guidance no longer recommends Hib vaccination of previously unvaccinated adults with HIV infection because their risk for Hib infection is low.
Hib Recommendations Hematopoietic Cell Transplant Recipients

- Recipients of hematopoietic stem cell transplant (Adults who have had a successful hematopoietic stem cell transplant are recommended to receive a 3-dose series of Hib vaccine 6–12 months after transplant regardless of prior Hib vaccination.)
Prevention and Control of Meningococcal Disease
Recommendations of the Advisory Committee on Immunization Practices (ACIP)

Continuing Education Examination available at http://www.cdc.gov/mmwr/cm/cm4.html.

U.S. Department of Health and Human Services
Centers for Disease Control and Prevention

http://www.cdc.gov/mmwr/PDF/rr/rr6202.pdf
# Comparing Meningococcal Vaccines

<table>
<thead>
<tr>
<th></th>
<th>Meningococcal Polysaccharide (Menomune)</th>
<th>Meningococcal Conjugate (Menactra)</th>
<th>Meningococcal Conjugate &amp; Haemophilus influenzae type b</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Ages</strong></td>
<td>2 years and older</td>
<td>9 months through 55 years</td>
<td>6 weeks through 18 months</td>
</tr>
<tr>
<td><strong>Abbrev</strong></td>
<td>MPSV4</td>
<td>MCV4 or MenACWY</td>
<td>Hib-MenCY</td>
</tr>
<tr>
<td><strong>Route</strong></td>
<td>Subcutaneous (Subcut.)</td>
<td>Intramuscular (IM)</td>
<td></td>
</tr>
</tbody>
</table>
## Routine MCV4 Vaccination for Persons 11 through 21 Years of Age

<table>
<thead>
<tr>
<th>Age Group</th>
<th>Primary Vaccination</th>
<th>Booster Dose*</th>
</tr>
</thead>
<tbody>
<tr>
<td>11-12 years</td>
<td>1 dose</td>
<td>1 dose recommended if first dose administered before 16th birthday</td>
</tr>
<tr>
<td>13-18 years</td>
<td>1 dose if not vaccinated previously</td>
<td></td>
</tr>
<tr>
<td>19-21 years</td>
<td>Not routinely recommended but 1 dose may be administered as catch-up vaccination for those who have not received a dose after their 16th birthday</td>
<td></td>
</tr>
</tbody>
</table>

*ACIP off-label recommendation
# Meningococcal Vaccination for Infants 2 through 18 months of Age at Increased Risk

<table>
<thead>
<tr>
<th>Risk Group</th>
<th>Primary Vaccination</th>
</tr>
</thead>
<tbody>
<tr>
<td>Persistent complement deficiencies</td>
<td>4 doses of Hib-MenCY at 2, 4, 6, and 12–15 months</td>
</tr>
<tr>
<td>Functional or anatomic asplenia, including sickle cell</td>
<td>4 doses of MCV4-CRM at 2, 4, 6, and 12-15 months</td>
</tr>
<tr>
<td>Risk during a community outbreak attributable to a vaccine serogroup</td>
<td>*If later travel to an area where A and W-135 protection are needed, administer an age-appropriate MCV4 dose prior to travel</td>
</tr>
</tbody>
</table>

*ACIP off-label recommendation
### Meningococcal Vaccination for Children 9 through 23 months of Age at Increased Risk

<table>
<thead>
<tr>
<th>Risk Group</th>
<th>Primary Vaccination</th>
</tr>
</thead>
<tbody>
<tr>
<td>Persistent complement deficiencies</td>
<td>2 doses of MCV4, 12 weeks apart&lt;br&gt;<strong>8 weeks apart if needed for travel</strong>&lt;br&gt;8 weeks for catch-up for MCV4 and Hib-MenCY&lt;br&gt;<strong>Because of high risk for IPD, children with functional or anatomic asplenia should not be immunized with Menactra before 2 years of age to avoid interference with the immune response to PCV series</strong></td>
</tr>
<tr>
<td>Travel to or resident of countries where meningococcal disease is hyperendemic or endemic</td>
<td>8 weeks for catch-up for MCV4 and Hib-MenCY&lt;br&gt;<strong>Because of high risk for IPD, children with functional or anatomic asplenia should not be immunized with Menactra before 2 years of age to avoid interference with the immune response to PCV series</strong></td>
</tr>
<tr>
<td>Risk during a community outbreak attributable to a vaccine serogroup</td>
<td><strong>Because of high risk for IPD, children with functional or anatomic asplenia should not be immunized with Menactra before 2 years of age to avoid interference with the immune response to PCV series</strong></td>
</tr>
</tbody>
</table>
### Meningococcal Vaccination for Persons 2 through 55 Years of Age at Increased Risk and Not Previously Vaccinated

<table>
<thead>
<tr>
<th>Risk Group</th>
<th>Primary Vaccination</th>
</tr>
</thead>
<tbody>
<tr>
<td>Persistent complement deficiencies</td>
<td>2 doses of MCV4, 8 to 12 weeks apart</td>
</tr>
<tr>
<td>Functional or anatomic asplenia, including sickle cell</td>
<td>*If Menactra is used, it should be administered at least 4 weeks after completion of all PCV doses</td>
</tr>
<tr>
<td>HIV+, if another indication for vaccination exists</td>
<td></td>
</tr>
</tbody>
</table>

*ACIP off-label recommendation*
### Meningococcal Vaccination for Persons 2 through 55 Years of Age at Increased Risk and Not Previously Vaccinated

<table>
<thead>
<tr>
<th>Risk Group</th>
<th>Primary Vaccination</th>
</tr>
</thead>
<tbody>
<tr>
<td>First year college students 21 yrs of age or younger living in residential housing</td>
<td>1 dose of MCV4&lt;br&gt;*If Menactra is used, it should be administered at least 4 weeks after completion of all PCV doses.</td>
</tr>
<tr>
<td>Travel to or resident of countries where meningococcal disease is hyper endemic or endemic</td>
<td></td>
</tr>
<tr>
<td>Risk during a community outbreak attributable to a vaccine serogroup</td>
<td></td>
</tr>
<tr>
<td>Microbiologists routinely exposed to isolates of <em>Neisseria meningitidis</em></td>
<td></td>
</tr>
</tbody>
</table>

*ACIP off-label recommendation*
Meningococcal Vaccination of High-Risk Persons 56 Years of Age and Older

- MPSV4 is only licensed vaccine for persons in this age group
- MPSV4 is preferred for meningococcal vaccine-naïve persons aged 56 years and older who anticipate requiring a single dose of meningococcal vaccine (e.g., travelers and persons at risk as a result of a community outbreak)

For persons now aged 56 years of age and older who were vaccinated previously with MCV4 and are recommended for revaccination or for whom multiple doses are anticipated (e.g., persons with asplenia and microbiologists), MCV4* is preferred

*ACIP off-label recommendation
http://www.cdc.gov/mmwr/PDF/rr/rr6202.pdf
Use of 13-Valent Pneumococcal Conjugate Vaccine and 23-Valent Pneumococcal Polysaccharide Vaccine for Adults with Immunocompromising Conditions: Recommendations of the Advisory Committee on Immunization Practices (ACIP)

Weekly

On June 20, 2012, the Advisory Committee on Immunization Practices (ACIP) recommended routine use of 13-valent pneumococcal conjugate vaccine (PCV13; Prevnar 13, Wyeth Pharmaceuticals, Inc., a subsidiary of Pfizer, Inc.) for adults aged ≥19 years with immunocompromising conditions; functional or anatomic asplenia; chronic renal failure requiring hemodialysis; HIV infection (CD4 count ≥200/µL); and certain medical conditions (such as sickle cell disease, diabetes mellitus, chronic lung disease, and malignancy in remission) (1). PCV13 should be administered to eligible adults in addition to the 23-valent pneumococcal polysaccharide vaccine (PPSV23; Pneumovax 23, Merck & Co., Inc.), which currently is recommended for these groups of adults (2). The evidence for the benefits and risks of PCV13 vaccination of adults with immunocompromising conditions was evaluated using the Grading of Recommendations, Assessment, Development, and Evaluation (GRADE) framework and designated as a "Category B" recommendation (2,3). This report outlines the new ACIP recommendations for PCV13 and PPSV23 among adults with immunocompromising conditions; functional or anatomic asplenia; HIV infection; or certain medical conditions and summarizes the evidence considered by ACIP to make the recommendations.

Epidemiology of Pneumococcal Infection in Immunocompromised Adults

Pneumococcal pneumonia (pneumococcal pneumonia) remains a leading cause of serious illness, including bacteremia, meningitis, and pneumonia among adults in the United States. An estimated 8,000 deaths occur in the United States each year because of pneumococcal pneumonia among adults (4). The incidence of invasive disease ranges from 3.8 per 100,000 among persons aged 18-34 years to 36.4 per 100,000 among those aged ≥65 years (4). Adults with certain medical conditions are at increased risk for invasive pneumococcal disease (IPD). For adults aged 65-84 years with hematologic cancer, the rate of IPD in 2013 was 180 per 100,000, and for persons with human immunodeficiency virus (HIV) who are >55 years, the rate was 152 per 100,000 (CDC, unpublished data, 2013). The disease rates for adults in these groups can be more than 20 times those for adults without high-risk medical conditions.

PCV13 has been used for children since 2000, when it replaced an earlier infant inoculation schedule with 7-valent PCV (Prevnar; Pfizer) that had been in use since 2000. The routine use of PCV7 in infants and young children resulted in significant reductions in IPD caused by vaccine serotypes in children, and because of indirect effects, in adults. Rates of IPD caused by vaccine serotypes in adults aged ≥65 years during 2000-2007 decreased from 36 cases per 100,000 during 2000-2001. However, after indirect effects of the pediatric immunization had been realized fully, the incidence of IPD caused by the serotypes included in PCV7 remained high in HIV-infected persons aged 18-64 years at 54 cases per 100,000 persons with acquired immunodeficiency syndrome (AIDS) (5). Moreover, 70% of IPD cases among immunocompromised adults in 2008 were caused by serotypes contained in PCV13, an additional 26% were

http://www.cdc.gov/vaccines/pubs/ACIP-list.htm#pcv
Incidence of Invasive Pneumococcal Disease Among Children <5 Years by Serotype, 1998-2009

ABCs unpublished data, continuous sites
Risk Factors for Invasive Pneumococcal Disease

- Functional or anatomic asplenia
- Immunosuppression
- Renal disease
- CSF leak
- Cochlear implants
- Chronic disease
- Cardiovascular
- Pulmonary (including asthma over 19 years of age)
- Metabolic
- Liver
- Alcoholism
- Cigarette smoking over 19 years of age
- Resident of nursing home
Percent of Invasive Pneumococcal Cases Caused by Serotypes in Different Vaccine Formulations, 2009

- **PCV7**
- **PCV13**
- **PPV23**

<table>
<thead>
<tr>
<th>Age Group, years</th>
<th>PCV7</th>
<th>PCV13</th>
<th>PPV23</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;5</td>
<td>3</td>
<td></td>
<td>62</td>
</tr>
<tr>
<td>5 to 17</td>
<td>6</td>
<td>61</td>
<td>78</td>
</tr>
</tbody>
</table>

*•ABCs unpublished data, 2006-2008*
Incidence of IPD in Adults Aged 18-64 Years with Selected Underlying Conditions, US, 2009

20 fold increased risk

3-7 fold increased risk

Kyaw, JID 2005;192:377-86 & CDC Unpublished
## Comparing Pneumococcal Vaccines

<table>
<thead>
<tr>
<th></th>
<th>Pneumococcal Polysaccharide (Pneumovax 23)</th>
<th>Pneumococcal Conjugate (Prevnar 13)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Ages</strong></td>
<td>2 years and older (high-risk only)</td>
<td>6 weeks and older*</td>
</tr>
<tr>
<td><strong>Abbreviation</strong></td>
<td>PPSV23</td>
<td>PCV13</td>
</tr>
<tr>
<td><strong>Route</strong></td>
<td>Intramuscular (IM) or Subcutaneous (Subcut.)</td>
<td>Intramuscular (IM)</td>
</tr>
</tbody>
</table>

*ACIP off-label recommendation*
PCV13 for Children Birth through 18 Years of Age

- Four doses of PCV13 at 2, 4, 6 months and a booster at 12 through 15 months
  - Catch up per catch-up schedule
    - 4-week minimum interval between primary doses
    - 8-week interval between last primary dose and booster and minimum of 12 months of age

- One supplemental dose for children 14 through 59 months who have received an age-appropriate series of PCV7
PCV13 for Children
Birth through 18 Years of Age

- One dose for high-risk children 6 through 18* years who have not received PCV13
  - asplenia
    - functional or anatomic, sickle cell
  - immunocompromised
    - congenital or acquired from disease or treatment
    - chronic renal failure
    - nephrotic syndrome
    - solid organ transplant
    - HIV
  - cerebrospinal fluid leak
  - cochlear implant
PPSV23 for High-Risk Children 2 through 18 Years

- One dose of PPSV23 at least 8 weeks after the last dose of PCV13 to children 2 years or older with:
  - chronic heart disease (particularly cyanotic congenital heart disease and cardiac failure)
  - chronic lung disease (including asthma if treated with high-dose oral corticosteroid therapy)
  - diabetes mellitus
  - cerebrospinal fluid leaks
  - cochlear implant
  - anatomic or functional asplenia (including sickle cell disease and other hemoglobinopathies, congenital or acquired asplenia, or splenic dysfunction)
  - immunocompromising conditions

- One revaccination PPSV23 dose 5 years after first dose for children with:
  - anatomic or functional asplenia (including sickle cell disease)
  - an immunocompromising condition

http://www.cdc.gov/mmwr/pdf/wk/mm6225.pdf
Measles Outbreaks and Cases (April 18)

- Clustered on both coasts (NYC and California)

- More cases in first quarter of 2014 since 1996
  - CA – 58
  - WA – 13
  - NY - 24

- 34 known importations – half from Philippines
MMR and Infant Travelers

- A dose of MMR is recommended for infants 6 months through 11 months if they are traveling internationally
- One dose recommended
- The dose does NOT count as one of the two doses in the series
New MMR Recommendations –

- **Children with HIV**
  - Recommended age for 2\textsuperscript{nd} dose – 4 – 6 years
  - Definition of severe immunosuppression
  - Recommendations for Children with perinatal HIV who received MMR vaccine before combination Anti-retroviral Therapy (cART)

- **General criteria of immune/susceptible – adults**

- **Recommendation for use of passive immunobiologics**
Severe Immunosuppression

- **ABSENCE OF SEVERE IMMUNOSUPPRESSION**
  - **Children 5 years old or younger**
    - CD4 T-lymphocyte percentage $\geq 15$ for 6 months or longer
      - Preferred metric
    - CD4 T-lymphocyte counts above sliding scale parameters for 6 months or longer (value varies by age (see text for details))
  - **Persons older than 5 years**
    - CD4 T-lymphocyte count greater than 200 cells/mm$^3$ for 6 months or longer
      - Preferred metric
    - CD4 T-lymphocyte percentage $\geq 15$ for 6 months or longer

www.cdc.gov/mmwr/pdf/rr/rr6204.pdf
Revaccination with MMR

- A revaccination dose of MMR vaccine should be given to children infected with HIV in the perinatal period who received MMR vaccine before establishment of combined Anti-retroviral Therapy (cART).
- Use the same parameters for absence of severe immunosuppression:
  - Add 6 months of cART therapy prior to revaccination.
Updated Recommendations for Use of Tetanus Toxoid, Reduced Diphtheria Toxoid, and Acellular Pertussis Vaccine (Tdap) in Pregnant Women − Advisory Committee on Immunization Practices (ACIP), 2012

Weekly
February 22, 2013 / 62(7R):131-139

In October 2011, in an effort to reduce the burden of pertussis in infants, the Advisory Committee on Immunization Practices (ACIP) recommended that unvaccinated pregnant women receive a dose of pertussis toxoid-reduced diphtheria toxoid and acellular pertussis vaccine (Tdap) (1). Vaccination of women with Tdap during pregnancy is expected to provide some protection to infants from pertussis until they are old enough to be vaccinated themselves. Tdap given to pregnant women will stimulate the development of maternal anti-pertussis antibodies, which will pass through the placenta, likely providing the newborn with protection against pertussis in early life and will protect the mother from pertussis around the time of delivery, making her less likely to become infected and transmit pertussis to her infant (2). The 2011 Tdap recommendation did not call for vaccinating pregnant women previously vaccinated with Tdap. On December 24, 2012, ACIP voted to recommend use of Tdap during every pregnancy. This report summarizes data considered and conclusions made by ACIP and provides guidance for implementing its recommendations. These updated recommendations on use of Tdap in pregnant women aim to optimize strategies for preventing pertussis morbidity and mortality in infants.

The United States has experienced substantial increases in reported pertussis cases over the past several years: Proportional case counts for 2010 have surpassed the last peak year, 2005, with 40,803 pertussis cases and 14 deaths in infants aged <12 months (3) (CDC, unpublished data, 2012). To reduce the burden, optimizng the current vaccination program and protecting infants who are at highest risk for death are immediate priorities. Since the 2011 ACIP vaccination recommendations, uptake of Tdap among pregnant women has been low and survey of 1,033 women (August 2011 to April 2012) estimated that only 3.4% of women received Tdap during their recent pregnancy (4). This data indicate the maternal anti-pertussis antibodies are short lived; therefore, Tdap vaccination in early pregnancy will not provide high levels of antibodies to protect newborns during subsequent pregnancies (5).

Methods
In several teleconferences during 2012, the ACIP Pertussis Vaccine Work Group considered published, peer-reviewed literature and unpublished data relevant to vaccinating pregnant women with Tdap. When data were not available, expert opinion was considered. Summaries of the data reviewed and work group discussions were presented to ACIP before recommendations were proposed. The proposed Tdap recommendation for pregnant women was presented at the October 2012 ACIP meeting and approved by ACIP.

Purpose of ACIP Recommendations and National

http://www.cdc.gov/vaccines/pubs/ACIP-list.htm#tdap
General Principles for Use of Tdap

- Previously unvaccinated persons: Tdap preferred to Td to provide protection against pertussis

- Tdap is approved by FDA for a single booster dose
  - NOT recommended for multiple administrations except for pregnant women*
  - Tdap may be used for wound prophylaxis

- No minimum interval between the last dose of tetanus toxoid-containing vaccine and a dose of Tdap

- If possible, Boostrix should be used for adults 65 years of age and older
  - administer Adacel* if Boostrix is not available

*ACIP off-label recommendation
Tdap Recommendations

- Children 7 through 10 years who are not “fully vaccinated against pertussis”*
- Routinely at 11 or 12 years of age
- Catch up teens 13 through 18 years who have not been vaccinated with Tdap
- Unvaccinated adults 19 years and older

*ACIP off-label recommendation
CDC recommends vaccines be stored in stand-alone refrigerator and freezer units rather than combination units

- The refrigerator compartment of a combination unit may be used to store refrigerated vaccines and a separate freezer unit to store frozen vaccines

- Storage units should have
  - Enough room to store the year’s largest inventory without crowding;
  - Sufficient room to store water bottles (refrigerator) or frozen coolant packs (freezer);
  - Frost free or automatic defrost units are preferred

www.cdc.gov/vaccines/recs/storage/toolkit/default.htm
Storage and Handling Practices

- Storage unit temperatures should be read and documented twice each workday.
- The min/max temperature should be read and documented once per workday preferably in the morning.
- Stored temperature monitoring data should be downloaded and reviewed weekly.
- Weekly review of vaccine expiration dates and rotation of vaccine stock.
Thank You

Email: nipinfo@cdc.gov

CDC-INFO Website www.cdc.gov/info

Website: www.cdc.gov/vaccines