Child/Adolescent Immunization Update 2017

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Disclosures

- Candice Robinson is a federal government employee with no financial interest or conflict with the manufacturer of any product named in this presentation.

- The speaker will discuss the off-label use of Tdap.

- The speaker will not discuss a vaccine not currently licensed by the FDA.
Disclosures

- The recommendations to be discussed are primarily those of the Advisory Committee on Immunization Practices (ACIP):
  - Composed of 15 non-government experts in clinical medicine and public health.
  - Provides guidance on use of vaccines and other biologic products to DHHS, CDC, and the U.S. Public Health Service.

Next ACIP Meeting
June 21-22, 2017

http://www.cdc.gov/vaccines/acip/meetings/upcoming-dates.html
Overview

- Recent ACIP Updates
- Vaccine Updates
- 2017 Child/adolescent Immunization Schedule
- Vaccination Coverage Rates
- Resources
Advisory Committee on Immunization Practices (ACIP) Updates and MMWR Publications
Hepatitis B

- Monovalent Hepatitis B vaccine should be administered within 24h of birth for medically stable infants weighing ≥2,000 grams born to hepatitis B surface antigen (HBsAg)-negative mothers

- The recommendations for vaccination of infants <2,000 grams remain unchanged
  - Preterm infants weighing <2,000 g born to HBsAg-negative mothers should receive the first dose of vaccine 1 month after birth or at hospital discharge

- The recommendation for infants born to HBsAg-positive mothers or mothers whose hepatitis B status is unknown also remain unchanged

Influenza Recommendations

- ACIP recommendations for the 2016-17 season were published in the MMWR on August 26, 2016
- Annual influenza vaccination continues to be recommended for persons without contraindications or precautions 6 months of age and older
- Principal changes:
  - Live attenuated influenza vaccine (LAIV) is not recommended during the 2016-17 season
  - Updated egg allergy recommendations
ACIP Recommendations LAIV

- In light of low effectiveness against influenza A(H1N1)pdm09 in the United States during the 2013-14 and 2015-16 seasons, for the 2016-17 season, ACIP makes the interim recommendation that LAIV4 should not be used in the 2016-17 influenza season
Influenza Vaccination for Persons with Egg Allergy

- Residual egg protein in influenza vaccine is a very rare cause of allergic reaction even in severely allergic people
  - VSD data indicate that anaphylaxis occurs at a rate of about 1 case per million vaccine doses
  - 12 cases of anaphylaxis have been reported after RIV3 (which does not contain egg protein)
- The amount of ovalbumin in a dose of influenza vaccine (<1 µg per 0.5 mL dose) is less than that needed to cause anaphylaxis (estimated about 130 µg)
ACIP Recommendations for Influenza Vaccination of Persons with Egg Allergy

- Persons with a history of egg allergy who have experienced only hives after exposure to egg should receive any licensed age-appropriate influenza vaccine (IIV or RIV3)
ACIP Recommendations for Influenza Vaccination of Persons with Egg Allergy

- Persons who report having had reactions to egg involving symptoms other than hives, such as angioedema, respiratory distress, lightheadedness, or recurrent vomiting or who required epinephrine or another emergency medical intervention, may also receive any age-appropriate influenza vaccine (IIV or RIV3).

- The vaccine should be administered in medical setting (such as a clinic or physician office)

- Vaccine administration should be supervised by a health care provider who is able to recognize and manage severe allergic conditions
ACIP Recommendations for Influenza Vaccination of Persons with Egg Allergy

- A previous severe allergic reaction to influenza vaccine, regardless of the component suspected of being responsible for the reaction, is a contraindication to future receipt of the vaccine.
- Providers should consider observing all patients for 15 minutes after vaccination to decrease the risk for injury should they experience syncope.
Tdap Update

- For persons aged 7 through 10 years who receive a dose of Tdap as part of the catch-up series, an adolescent Tdap vaccine dose may be given at age 11 through 12 years
  - In line with guidance of children for which Tdap is inadvertently administered

https://www.cdc.gov/vaccines/acip/meetings/downloads/slides-2016-10/pertussis-03-liang.pdf
Tdap in Pregnancy

- Infants of Tdap vaccinated mothers were born with significantly higher anti-pertussis antibodies compared to infants of unvaccinated mothers.

- Within the 27–36 weeks administration “window”
  - Concentration of anti-pertussis antibodies in infant cord blood were higher when mothers were vaccinated earlier.
  - Longer exposure to vaccine allows for higher vaccine induced antibody levels produced by mother and transferred to infant.

- The tetanus and diphtheria toxoids and acellular pertussis vaccine (Tdap) footnote for vaccination of pregnant adolescents/adults between gestational weeks 27–36 has been updated to reflect a preference for vaccination earlier during this period.

Meningococcal ACWY Recommendations for HIV-infected Persons

- Accumulating evidence indicates that HIV infection increases the risk of invasive meningococcal disease.

- At the June 2016 meeting ACIP voted to recommend routine MenACWY vaccination for all HIV-infected persons age 2 months and older.

- Number of doses depends on age:
  - Persons 2 years and older should receive 2 doses separated by 8 weeks.
Use of 2- and 3-Dose Schedules of MenB-FHbp (Trumenba) Meningococcal Serogroup B Vaccine

- Current ACIP Recommendations for Serogroup B Meningococcal (MenB) Vaccines
  - Certain persons aged ≥10 years who are at increased risk for meningococcal disease should receive MenB vaccine (Category A)\(^1\)
  
  - A MenB vaccine series may be administered to adolescents and young adults aged 16–23 years to provide short-term protection against most strains of serogroup B meningococcal disease (Category B)\(^2\)

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1 MMWR 2015 64(22); 608-612
2 MMWR 2015 64(41); 1171-1176
Use of 2- and 3-Dose Schedules of MenB-FHbp (Trumenba) Meningococcal Serogroup B Vaccine

- Changes to the dosage and administration section for MenB-FHbp approved by FDA on April 14, 2016

- Original language:
  - Three doses according to a 0, 2, and 6 month schedule

- Updated language:
  - **Three-dose schedule**: Administer a dose at 0, 1-2, and 6 months
  - **Two-dose schedule**: Administer a dose at 0 and 6 months

The choice and dosing schedule may depend on the risk of exposure and the patient’s susceptibility to meningococcal serogroup B disease

Use of 2- and 3-Dose Schedules of MenB-FHbp (Trumenba) Meningococcal Serogroup B Vaccine

- For persons at increased risk for meningococcal disease and for use during serogroup B outbreaks, 3 doses of MenB-FHbp should be administered at 0, 1-2, 6 months

- When given to healthy adolescents who are not at increased risk for meningococcal disease, 2 doses of MenB-FHbp should be administered at 0 and 6 months
HPV 2-dose Schedule

- For persons initiating vaccination **before age 15**, the recommended immunization schedule is 2 doses of HPV vaccine at 0, 6-12 months.

- For persons initiating vaccination **at age 15 years or older**, the recommended immunization schedule is 3 doses of HPV vaccine at 0, 1–2, 6 months.

- Immunocompromised persons*, including those with human immunodeficiency virus (HIV) infection, should receive a 3-dose series at 0, 1–2, and 6 months, regardless of age at vaccine initiation.

*See MMWR December 16, 2016;65(49):1405-1408, available at https://www.cdc.gov/mmwr/volumes/65/wr/pdfs/mm6549a5.pdf
Polio

- MMWRs published 1/13/17 and 2/17/17 provide additional guidance regarding assessment of poliovirus vaccination status and vaccination of children who have received poliovirus vaccine outside the U.S.

- If both OPV and IPV were administered as part of a series, **the total number of doses needed to complete the series is the same as that recommended for the U.S. IPV schedule**. A minimum interval of 4 weeks should separate doses in the series, with the final dose administered on or after the fourth birthday and at least 6 months after the previous dose.

- If only OPV was administered, and all doses were given before age 4 years, 1 dose of IPV should be given at 4 years or older and **at least 6 months** after the last OPV dose.

- Only trivalent OPV (tOPV) counts toward the U.S. vaccination requirements.
Vaccine Updates
HPV Vaccines

- 2vHPV and 4vHPV vaccines are no longer being distributed in the United States.
- All available doses of 2vHPV expired at the end of 2016
- All available doses of 4vHPV will expire in May 2017
Hiberix

- Hiberix was first licensed in the US in August 2009 for use as a booster dose.

- Hiberix is now FDA approved for a 3-dose infant primary vaccination series.
  - Safety and immunogenicity of Hiberix in infants is similar to ActHIB and Pentacel.

Morbidity and Mortality Weekly Report

Food and Drug Administration Approval for Use of Hiberix as a 3-Dose Primary
*Haemophilus influenzae* Type b (Hib) Vaccination Series

https://www.cdc.gov/mmwr/volumes/65/wr/pdfs/mm6516a3.pdf
MenHibrix

- The vaccine manufacturer notified providers that it has decided to discontinue MenHibrix manufacturing

- All doses of MenHibrix will expire by mid September 2017
Td Supply Shortage

- If Td is unavailable, Tdap should be used in place of Td when indicated for wound management.
- For routine vaccination and booster doses:
  - If a person has never received a dose of Tdap, Tdap should be administered.
  - If a person has previously received a dose of Tdap, using Tdap in place of Td is at the discretion of the provider, but would be a reasonable alternative.
2017 Child/Adolescent Immunization Schedule
Recommended Immunization Schedule for
Children and Adolescents Aged 18 Years or Younger, UNITED STATES, 2017

This schedule includes recommendations in effect as of January 1, 2017. 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 www.cdc.gov/vaccines/hcp/acip-recs/index.html. Clinically significant adverse events that follow vaccination should be reported to the Vaccine Adverse Event Reporting System (VAERS) online (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 (www.cdc.gov/vaccines/hcp/admin/contraindications.html) or by telephone (800-CDC-INFO [800-232-4636]).

The Recommended Immunization Schedule for Children and Adolescents Aged 18 Years or Younger are approved by the

Advisory Committee on Immunization Practices
(www.cdc.gov/vaccines/acip)

American Academy of Pediatrics
(www.aap.org)

American Academy of Family Physicians
(www.aafp.org)

American College of Obstetricians and Gynecologists
(www.acog.org)
**Figure 1. Recommended Immunization Schedule for Children and Adolescents Aged 18 Years or Younger—United States, 2017.**

*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 shaded in gray.

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**NOTE:** The above recommendations must be read along with the footnotes of this schedule.
Figure 1. Recommended Immunization Schedule for Children and Adolescents Aged 18 Years or Younger—United States, 2017.

**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 shaded in gray.

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<td>Pneumococcal polysaccharide (PPSV23)</td>
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</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 for non-high-risk groups that may receive vaccine, subject to individual clinical decision making**

**No recommendation**

**NOTE:** The above recommendations must be read along with the footnotes of this schedule.
Figure 1. Recommended Immunization Schedule for Children and Adolescents Aged 18 Years or Younger—United States, 2017.

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 shaded in gray.

<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 yrs</th>
<th>17-18 yrs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hepatitis B (HepB)</td>
<td>1st dose</td>
<td>2nd dose</td>
<td>3rd dose</td>
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<tr>
<td>Rotavirus (RV) (4-dose series), RSV (1-dose series)</td>
<td>1st dose</td>
<td>2nd dose</td>
<td>3rd dose</td>
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<tr>
<td>Diphtheria, tetanus, &amp; acellular pertussis (DTaP) (DTaP &lt; 7 yrs)</td>
<td>1st dose</td>
<td>2nd dose</td>
<td>3rd dose</td>
<td>4th dose</td>
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<tr>
<td>Haemophilus influenzae type b (Hib)</td>
<td>1st dose</td>
<td>2nd dose</td>
<td></td>
<td>See footnote 4</td>
<td>3rd dose</td>
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<tr>
<td>Pneumococcal conjugate (PCV13)</td>
<td>1st dose</td>
<td>2nd dose</td>
<td>3rd dose</td>
<td>4th dose</td>
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<tr>
<td>Inactivated poliovirus (IPV &lt; 18 yrs)</td>
<td>1st dose</td>
<td>2nd dose</td>
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<td>3rd dose</td>
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<tr>
<td>Influenza a (IV)</td>
<td></td>
<td>Annual vaccination (IV)</td>
<td>1 or 2 doses</td>
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<td>Annual vaccination (IV)</td>
<td>1 dose only</td>
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<tr>
<td>Measles, mumps, rubella (MMR)</td>
<td>See footnote 8</td>
<td>1st dose</td>
<td></td>
<td></td>
<td>2nd dose</td>
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<tr>
<td>Varicella (VAR)</td>
<td></td>
<td>1st dose</td>
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<td>2nd dose</td>
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<tr>
<td>Hepatitis A (HepA)</td>
<td></td>
<td>2-dose series, See footnote 10</td>
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<tr>
<td>Meningococcal (Hib-MCV/4) &amp; Hib-MCV/2 (MenACWY D+2-5 years)</td>
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<td></td>
<td>See footnote 11</td>
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<tr>
<td>Tetanus, diphtheria, &amp; acellular pertussis (TdAP &gt; 7 yrs)</td>
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<tr>
<td>Human papillomavirus (HPV)</td>
<td>See footnote 13</td>
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<tr>
<td>Meningococcal (B)</td>
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<tr>
<td>Pneumococcal polysaccharide (PPSV23)</td>
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</table>

NOTE: The above recommendations must be read along with the footnotes of this schedule.
Figure 1. Recommended Immunization Schedule for Children and Adolescents Aged 18 Years or Younger—United States, 2017.

(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 shaded in gray.

<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>8 mos</th>
<th>10 mos</th>
<th>12 mos</th>
<th>14 mos</th>
<th>16 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 yrs</th>
<th>17-18 yrs</th>
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</thead>
<tbody>
<tr>
<td>Hepatitis B (HepB)</td>
<td>1st dose</td>
<td>2nd dose</td>
<td>3rd dose</td>
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<td>Poliovirus</td>
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<tr>
<td>Diphtheria, tetanus, &amp; acellular pertussis (DTaP)</td>
<td>1st dose</td>
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<td>3rd dose</td>
<td>4th dose</td>
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<td>Haemophilus influenzae type b (Hib)</td>
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<td>Pneumococcal conjugate</td>
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<td>Inactivated poliovirus (IPV)</td>
<td>1st dose</td>
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<td>Annual vaccination (IV)</td>
<td>1 or 2 doses</td>
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<td>Measles, mumps, rubella (MMR)</td>
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<td>Hepatitis A (HepA)</td>
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<td>Meningococcal (Hib-MenCY, b, W135, and meningitis C)</td>
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<td>Tetanus, diphtheria, &amp; acellular pertussis (Tdap)</td>
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<td>Human papillomavirus (HPV)</td>
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<td>Meningococcal (MM)</td>
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<tr>
<td>Pneumococcal polysaccharide (PPSV23)</td>
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**NOTE:** The above recommendations must be read along with the footnotes of this schedule.
FIGURE 2. Catch-up immunization schedule for persons aged 4 months through 18 years who start late or who are more than 1 month behind—United States, 2017.

The figure below provides catch-up schedules and minimum intervals between doses for children whose vaccinations have been delayed. A vaccine series does not need to be restarted, regardless of the time that has elapsed between doses. Use the section appropriate for the child’s age. Always use this table in conjunction with Figure 1 and the footnotes that follow.

<table>
<thead>
<tr>
<th>Vaccine</th>
<th>Minimum Age/First Dose</th>
<th>Minimum Interval Between Doses</th>
<th>Children age 4 months through 6 years</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Dose 1 to Dose 2</td>
<td>Dose 2 to Dose 3</td>
</tr>
<tr>
<td>Hepatitis B ²</td>
<td>Birth, 4 weeks</td>
<td>8 weeks and at least 16 weeks after first dose. Minimum age for the final dose is 24 weeks.</td>
<td></td>
</tr>
<tr>
<td>Rotavirus ²</td>
<td>6 weeks, 4 weeks</td>
<td>4 weeks</td>
<td></td>
</tr>
<tr>
<td>Diphtheria, tetanus, and acellular pertussis ²</td>
<td>6 weeks, 4 weeks</td>
<td>4 weeks</td>
<td></td>
</tr>
<tr>
<td>Haemophilus influenzae type b ²</td>
<td>6 weeks, 4 weeks</td>
<td>4 weeks if first dose was administered before the 1st birthday. 8 weeks as final dose.</td>
<td>6 weeks if current age is younger than 12 months and first dose was administered at younger age 7 months, and at least 1 previous dose was PEP-T (ActHib, Pentacel, HibAct) or unknown.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>8 weeks if first dose was administered at age 12 through 14 months.</td>
<td>8 weeks if current age is 12 through 59 months as final dose.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>No further doses needed if first dose was administered at age 15 months or older.</td>
<td>If current age is younger than 12 months and first dose was administered at younger age 7 through 11 months; or if current age is 12 through 59 months and first dose was administered before the 1st birthday and second dose administered at younger than 15 months; or if both doses were PEP-T (ActHib, Pentacel, HibAct) and were administered before the 1st birthday.</td>
</tr>
<tr>
<td>Pneumococcal ²</td>
<td>6 weeks, 4 weeks</td>
<td>4 weeks if first dose administered before the 1st birthday. 8 weeks as final dose for healthy children.</td>
<td>4 weeks if current age is younger than 12 months and previous dose given at &lt; 7 months old.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>8 weeks as final dose for healthy children. If first dose was administered at the 1st birthday or after.</td>
<td>8 weeks as final dose for healthy children. If previous dose given between 7-11 months (wait until at least 12 months old).</td>
</tr>
<tr>
<td></td>
<td></td>
<td>No further doses needed for healthy children. If first dose was administered at age 24 months or older.</td>
<td>If current age is 12 months or older and at least 1 dose was given before age 12 months. No further doses needed for healthy children if previous dose administered at age 24 months or older.</td>
</tr>
<tr>
<td>Bacille Calmette-Guérin ²</td>
<td>6 weeks, 4 weeks</td>
<td>4 weeks</td>
<td>8 weeks (as final dose)</td>
</tr>
<tr>
<td>Measles, mumps, rubella ²</td>
<td>12 months, 4 weeks</td>
<td>6 months if current age is younger than 12 months.</td>
<td></td>
</tr>
<tr>
<td>Varicella ²</td>
<td>12 months, 3 months</td>
<td>6 months (minimum age 4 years for final dose).</td>
<td></td>
</tr>
<tr>
<td>Measles, mumps, rubella ²</td>
<td>12 months, 6 months</td>
<td>6 months (minimum age 4 years for final dose).</td>
<td></td>
</tr>
<tr>
<td>Measles, mumps, rubella ²</td>
<td>12 months, 4 weeks</td>
<td>6 months (minimum age 4 years for final dose).</td>
<td></td>
</tr>
<tr>
<td>Meningococcal ² (Men-C, Men-Y, Men-A)</td>
<td>6 weeks, 4 weeks</td>
<td>6 months</td>
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<tr>
<td>Meningococcal ² (Men-Wright, Men-OM)</td>
<td>6 weeks, 4 weeks</td>
<td>6 months</td>
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</tr>
<tr>
<td>Meningococcal ² (Men-C, Men-Y, Men-Wright)</td>
<td>6 weeks, 4 weeks</td>
<td>6 months</td>
<td></td>
</tr>
<tr>
<td>Meningococcal ² (Men-OM)</td>
<td>6 weeks, 4 weeks</td>
<td>6 months</td>
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</tr>
<tr>
<td>Tdap, diphtheria, tetanus, and acellular pertussis ²</td>
<td>7 years, 4 weeks</td>
<td>4 weeks</td>
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</tr>
<tr>
<td>Tdap, diphtheria, tetanus, and acellular pertussis ²</td>
<td>7 years, 4 weeks</td>
<td>4 weeks</td>
<td></td>
</tr>
<tr>
<td>Tdap, diphtheria, tetanus, and acellular pertussis ²</td>
<td>7 years, 4 weeks</td>
<td>4 weeks</td>
<td></td>
</tr>
<tr>
<td>Human papillomavirus ²</td>
<td>9 years, routine dosing intervals are recommended ¹²</td>
<td>6 months if first dose of DTaP/DT was administered before the 1st birthday.</td>
<td></td>
</tr>
<tr>
<td>Hepatitis B ²</td>
<td>N/A, 6 months</td>
<td>6 months</td>
<td></td>
</tr>
<tr>
<td>Hepatitis B ²</td>
<td>N/A, 6 months</td>
<td>6 months</td>
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</tr>
<tr>
<td>Hepatitis B ²</td>
<td>N/A, 6 months</td>
<td>6 months</td>
<td></td>
</tr>
<tr>
<td>Infant poliovirus ²</td>
<td>6 weeks, 4 weeks</td>
<td>6 weeks</td>
<td></td>
</tr>
<tr>
<td>Measles, mumps, rubella ²</td>
<td>12 months, 6 months</td>
<td>6 months</td>
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NOTE: The above recommendations must be read along with the footnotes of this schedule.
Introduction of High-risk Figure

- Demonstrates most children with medical conditions can (and should) be vaccinated according to the routine immunization schedule

- Indicates when a medical condition is a precaution or contraindication

- Indicates when additional doses of vaccines may be necessary secondary to the child’s/adolescent’s medical condition
### Figure 3. Vaccines that might be indicated for children and adolescents aged 18 years or younger based on medical indications

<table>
<thead>
<tr>
<th>VACCINE ▼</th>
<th>INDICATION ▼</th>
<th>Pregnancy</th>
<th>Immunocompromised states (including HIV infection)</th>
<th>HIV infection CD4+ count (cells/µL)</th>
<th>Kidney failure, end-stage renal disease, on hemodialysis</th>
<th>Heart disease, chronic lung disease</th>
<th>CSF leaks/ocular implants</th>
<th>Asplenia and persistent complement component deficiencies</th>
<th>Chronic liver disease</th>
<th>Diabetes</th>
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<td>Hepatitis B¹</td>
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*Severe Combined Immunodeficiency

NOTE: The above recommendations must be read along with the footnotes of this schedule."
1. Hepatitis B (HepB) vaccine. (Minimum age: birth) Routine vaccination: At birth:
   - Administer monovalent HepB vaccine to all newborns within 24 hours of birth.
   - For infants born to hepatitis B surface antigen (HBeAg)-positive mothers, administer HepB vaccine and 0.5 mL of hepatitis B immune globulin (HBIG) within 12 hours of birth. These infants should be tested for HBeAg and antibody to HBsAg (anti-HBs) at age 9 through 12 months (preferably at the next well-child visit) or 1 to 2 months after completion of the HepB series if the series was delayed.
   - If mother’s HBsAg status is unknown, within 12 hours of birth, administer HepB vaccine regardless of birth weight. For infants weighing less than 2,000 grams, administer HBIG in addition to HepB vaccine within 12 hours of birth. Determine mother’s HBsAg status as soon as possible and, if mother is HBeAg-positive, also administer HBIG to infants weighing 2,000 grams or more as soon as possible, but no later than age 7 days.

Doses following the birth dose:
   - The second dose should be administered at age 1 or 2 months. Monovalent HepB vaccine should be used for doses administered before age 6 weeks.
   - Infants who did not receive a birth dose should receive 3 doses of a HepB-containing vaccine on a schedule of 0, 1 to 2 months, and 6 months, starting as soon as possible (see figure 2).
   - Administer the second dose 1 to 2 months after the first dose (minimum interval of 4 weeks); administer the third dose at least 8 weeks after the second dose and at least 16 weeks after the first dose. The final (third or fourth) dose in the HepB vaccine series should be administered no earlier than age 24 weeks.

Footnotes — Recommended Immunization Schedule for Children and Adolescents Aged 18 Years or Younger, UNITED STATES, 2017
For further guidance on the use of the vaccines mentioned below, see: www.cdc.gov/vaccines/hcp/acip-recs/index.html.
For vaccine recommendations for persons 19 years of age and older, see the Adult Immunization Schedule.

Additional information
   - For information on contraindications and precautions for the use of a vaccine and for additional information regarding that vaccine, vaccination providers should consult the ACIP General Recommendations on Immunization and the relevant ACIP statement, available online at www.cdc.gov/vaccines/hcp/acip-recs/index.html.
   - For purposes of calculating intervals between doses, 4 weeks = 28 days. Intervals of 4 months or greater are determined by calendar months.
   - Vaccine doses administered ≥4 days before the minimum interval are considered valid. Doses of any vaccine administered ≥5 days earlier than the minimum interval or minimum age should not be counted as valid doses and should be repeated at age-appropriate intervals. The repeat dose should be spaced after the invalid dose by the recommended minimum interval. For further details, see Table 1, Recommended and minimum ages and intervals between vaccine doses, in MMWR. General Recommendations on Immunization and Reports / Vol. 60/ No. 2, available online at www.cdc.gov/mmwr/pdf/rr/rr6002.pdf.
   - Information on travel vaccine requirements and recommendations is available at wwwnc.cdc.gov/travel/.
   - The National Vaccine Injury Compensation Program (VICP) is a no-fault alternative to the traditional legal system for resolving vaccine injury petitions. Created by the National Childhood Vaccine Injury Act of 1986, it provides compensation to people found to be injured by certain vaccines. All vaccines within the recommended childhood immunization schedule are covered by VICP except for pneumococcal polysaccharide vaccine (PPSV23). For more information, see: www.hrsa.gov/vaccinecompensation/index.html.

1. Hepatitis B (HepB) vaccine. (Minimum age: birth) Routine vaccination:
2. At birth:
   - Administer monovalent HepB vaccine to all newborns within 24 hours of birth.

1. If Rotarix is used, administer a 2-dose series at ages 2 and 4 months.
2. If Rotarix is used, administer a 3-dose series at ages 2, 4, and 6 months.
   - For other catch-up guidance, see Figure 2.
   - For other vaccinia vaccine, see Figure 2.
   - Administer monovalent HepB vaccine and 0.5 mL of hepatitis B immune globulin (HBIG) within 12 hours of birth. These infants should be tested for HBeAg and antibody to HBsAg (anti-HBs) at age 9 through 12 months (preferably at the next well-child visit) or 1 to 2 months after completion of the HepB series if the series was delayed.

2. Diphtheria and tetanus toxoids and acellular pertussis (DTaP) vaccine. (Minimum age: 6 weeks. Exceptions: DTaP-IPV [Kírínix, Quadracel]; 4 years)
   - Administer a 5-dose series of DTaP vaccine at ages 2, 4, 6, 15 through 18 months, and 4 through 6 years. The fourth dose may be administered as early as age 12 months.
4. Haemophilus influenzae type b (Hib) conjugate vaccine. (Minimum age: 6 weeks for PRP-T [ActHIB, DTaP-IPV/Hib (Pentacel), Hiberix, and Hib-MenCY (MenHibrix)], PRP-OMP [PedvaxHIB])

1. Hepatitis B (HepB) vaccine. (Minimum age: birth)
   Routine vaccination:
   - Administer monovalent HepB vaccine to all newborns within 24 hours of birth.
   - For infants born to hepatitis B surface antigen (HBsAg)-positive mothers, administer HepB vaccine and 0.5 mL of hepatitis B immune globulin (HBIG) within 12 hours of birth. These infants should be tested for HBsAg and antibody to HepB at age 9 through 12 months (preferably at 12 months). The second dose should be administered no earlier than age 24 weeks.

   - Administration of a total of 4 doses of HepB vaccine is recommended, with the last dose administered at 12 months of age.
   - 2 doses of HepB vaccine are recommended for children 12 through 23 months of age.

2. Diphtheria and tetanus toxoids and acellular pertussis (DTaP) vaccine. (Minimum age: 2 months. Exceptions: DTaP-IPV [Kinrix, Quadracel] 4 years)

   - Infants aged 15 weeks, 6 days, or older.
   - The maximum age for the final dose in the series is 18 months.
   - For other catch-up guidance, see Figure 2.

3. Pneumococcal vaccine (Minimum age: 2 months).

   - Administration of a total of 4 doses of Hib vaccine is recommended, with the last dose administered at 12 months of age.
   - 2 doses of Hib vaccine are recommended for children 12 through 23 months of age.

   - Administration of 4 doses of Hib vaccine is recommended, with the last dose administered at 12 months of age.
   - For other catch-up guidance, see Figure 2.

4. Haemophilus influenzae type b (Hib) conjugate vaccine.
   (Minimum age: 6 weeks for PRP-T [ActHIB, DTaP-IPV/Hib (Pentacel), Hiberix, and Hib-MenCY (MenHibrix)], PRP-OMP [PedvaxHIB])

   - Infants who did not receive a birth dose should receive 3 doses of a Hib-containing vaccine on a schedule of 0, 1 to 2 months, and 6 months, starting as soon as feasible (see Figure 2).
   - Administer the second dose 1 to 2 months after the first dose (minimum interval of 4 weeks); administer the third dose at least 8 weeks after the second dose (preferably at 12 months). The final (third or fourth) dose in the HepB vaccine series should be administered no earlier than age 24 weeks.
   - Administration of a total of 4 doses of Hib vaccine is recommended, with the last dose administered at 12 months of age.
   - 2 doses of Hib vaccine are recommended for children 12 through 23 months of age.

   - Administration of 4 doses of Hib vaccine is recommended, with the last dose administered at 12 months of age.
   - For other catch-up guidance, see Figure 2.
5. Pneumococcal vaccines. (Minimum age: 6 weeks for PCV13, 2 years for PPSV23)

references to 7-valent pneumococcal conjugate vaccine (PCV7) have been removed

For further guidance on the use of the vaccines mentioned below, see: www.cdc.gov/vaccines/hcp/acip-recs/index.html.

Catch-up vaccination:
- If dose 1 was administered at ages 12 through 14 months, administer a second (final) dose at least 8 weeks after dose 1, regardless of Hib vaccine used in the primary series.
- If both doses were PRP-OMP (PedvaxHib or COMVAX) and were administered before the first birthday, the third (and final) dose should be administered at age 12 through 15 months and at least 8 weeks after the second dose.
- If the first dose was administered at age 7 through 11 months, administer the second dose at least 4 weeks later and a third (and final) dose at age 12 through 15 months or 8 weeks after second dose, whichever is later.
- If first dose is administered before the first birthday and second dose administered at younger than 15 months.

5. Pneumococcal vaccines. (Minimum age: 6 weeks for PCV13, 2 years for PPSV23)

Routine vaccination with PCV13:
- Administer a 4-dose series of PCV13 at ages 2, 4, and 6 months and at age 12 through 15 months.

Catch-up vaccination with PCV13:
- Administer 1 dose of PCV13 to all healthy children aged 24 through 59 months who are not completely vaccinated for their age.
- For other catch-up guidance, see Figure 2.

Vaccination of persons with high-risk conditions with PCV13 and PPSV23:
- All recommended PCV13 doses should be administered prior to PPSV23 vaccination if possible.
- For children aged 2 through 5 years with any of the following conditions: 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; cerebral spinal fluid leak; cochlear implant; sickle cell disease and other hemoglobinopathies; anatomic or functional asplenia; HIV infection; chronic renal failure; nephrotic syndrome; diseases associated with treatment with immunosuppressive drugs or radiation therapy, including malignant neoplasms, leukemias, lymphomas, and Hodgkin disease; and congenital immunodeficiencies.
- Administer 1 dose of PCV13 if any incomplete schedule of 3 doses of PCV13 was received previously.
- Administer 2 doses of PCV13 at least 8 weeks apart if unvaccinated or any incomplete schedule of fewer than 3 doses of PCV13 was received previously.
- The minimum interval between doses of PCV13 is 8 weeks.
- For children with no history of PPSV23 vaccination, administer PPSV23 at least 8 weeks after the most recent dose of PCV13.
- For children aged 6 through 18 years who have cerebral spinal fluid leak; cochlear implant; sickle cell disease and other hemoglobinopathies; anatomic or functional asplenia; congenital or acquired immunodeficiencies; HIV infection; chronic renal failure; nephrotic syndrome; diseases associated with treatment with immunosuppressive drugs or radiation therapy, including malignant neoplasms, leukemias, lymphomas, and Hodgkin disease; and congenital immunodeficiencies.
- Administer 1 dose of PCV13 and 1 dose of PPSV23 at least 8 weeks later.

2. If PCV13 has been received previously but PPSV23 has not, administer 1 dose of PCV13 at least 8 weeks after the most recent dose of PCV13.
3. If PPSV23 has been received but PCV13 has not, administer 1 dose of PCV13 at least 8 weeks after the most recent dose of PPSV23.

- For children aged 6 through 18 years 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; alcoholism; or chronic liver disease, who have not received PPSV23, administer 1 dose of PPSV23. If PCV13 has been received previously, then PPSV23 should be administered at least 8 weeks after any prior PCV13 dose.
- A single revaccination with PPSV23 should be administered 5 years after the first dose to children with sickle cell disease or other hemoglobinopathies; anatomic or functional asplenia; congenital or acquired immunodeficiencies; HIV infection; chronic renal failure; nephrotic syndrome; diseases associated with treatment with immunosuppressive drugs or radiation therapy, including malignant neoplasms, leukemias, lymphomas, and Hodgkin disease; generalized malignancy; solid organ transplantation; or multiple myeloma.

4. IPV: (Minimum age: 6 weeks)

Routine vaccination:
- Administer a 4-dose series of IPV at ages 2, 4, 6 through 18 months, and 4 through 6 years. The final dose in the series should be administered on or after the fourth birthday and at least 6 months after the previous dose.

Catch-up vaccination:
- In the first 6 months of life, minimum age and minimum intervals are only recommended if the person is at risk of imminent exposure to circulating poliovirus (i.e., travel to a polio-endemic region or during an outbreak).
- If 4 or more doses are administered before age 4 years, an additional dose should be administered at age 4 through 6 years and at least 6 months after the previous dose.
- A fourth dose is not necessary if the third dose was administered at age 4 years or older and at least 6 months after the previous dose.
- If both oral polio vaccine (OPV) and IPV were administered as part of a series, a total of 4 doses should be administered, regardless of the child’s current age. If only OPV was administered, and all doses were given prior to age 4 years, 1 dose of IPV should be given at 4 years or older, at least 4 weeks after the last OPV dose.
- IPV is not routinely recommended for U.S. residents aged 18 years or older.
- For other catch-up guidance, see Figure 2.
7. Influenza vaccines. (Minimum age: 6 months for inactivated influenza vaccine [IIV], 18 years for recombinant influenza vaccine [RIV])

Routine vaccination:
- Administer influenza vaccine annually to all children beginning at age 6 months. For the 2016–17 season, use of live attenuated influenza vaccine (LAIV) is not recommended.

For children aged 6 months through 8 years:
- For the 2016–17 season, administer 2 doses (separated by at least 4 weeks) to children who are receiving influenza vaccine for the first time or who have not previously received ≥2 doses of trivalent or quadrivalent influenza vaccine before July 1, 2016. For additional guidance, follow dosing guidelines in the 2016–17 ACIP influenza vaccine recommendations (see MMWR August 26, 2016;65(5):1-54, available at www.cdc.gov/mmwr/volumes/65/pdfs/mm6505.pdf).
- For the 2017–18 season, follow dosing guidelines in the 2017–18 ACIP influenza vaccine recommendations.

For persons aged 9 years and older:
- Administer 1 dose.

For further guidance on the use of the vaccines mentioned below, see: www.cdc.gov/vaccines/hcp/acip-recs/index.html.

8. Measles, mumps, and rubella (MMR) vaccine. (Minimum age: 12 months for routine vaccination)

Routine vaccination:
- Administer a 2-dose series of MMR vaccine at ages 12 through 15 months and 4 through 6 years. The second dose may be administered before age 4 years, provided at least 4 weeks have elapsed since the first dose.
- Administer 1 dose of MMR vaccine to infants aged 6 through 11 months before departure from the United States for international travel. These children should be revaccinated with 2 doses of MMR vaccine, the first at age 12 through 15 months (12 months if the child remains in an area where disease risk is high), and the second dose at least 4 weeks later.
- Administer 2 doses of MMR vaccine to children aged 12 months and older before departure from the United States for international travel. The first dose should be administered on or after age 12 months and the second dose at least 4 weeks later.

Catch-up vaccination:
- Ensure that all school-aged children and adolescents have had 2 doses of MMR vaccine: the minimum interval between the 2 doses is 4 weeks.

9. Varicella (VAR) vaccine. (Minimum age: 12 months)

Routine vaccination:
- Administer a 2-dose series of VAR vaccine at ages 12 through 15 months and 4 through 6 years. The second dose may be administered before age 4 years, provided at least 3 months have elapsed since the first dose. If the second dose was administered at least 4 weeks after the first dose, it can be accepted as valid.

8. Measles, mumps, and rubella (MMR) vaccine. (Minimum age: 12 months for routine vaccination)

Routine vaccination:
- Administer a 2-dose series of VAR vaccine at ages 12 through 15 months and 4 through 6 years. The second dose may be administered before age 4 years, provided at least 4 weeks have elapsed since the first dose. If the second dose was administered at least 4 weeks after the first dose, it can be accepted as valid.

10. Influenza vaccines. (Minimum age: 6 months for inactivated influenza vaccine [IIV], 18 years for recombinant influenza vaccine [RIV])

Routine vaccination:
- Administer influenza vaccine annually to all children beginning at age 6 months. For the 2016–17 season, use of live attenuated influenza vaccine (LAIV) is not recommended.

For children aged 6 months through 8 years:
- For the 2016–17 season, administer 2 doses (separated by at least 4 weeks) to children who are receiving influenza vaccine for the first time or who have not previously received ≥2 doses of trivalent or quadrivalent influenza vaccine before July 1, 2016. For additional guidance, follow dosing guidelines in the 2016–17 ACIP influenza vaccine recommendations (see MMWR August 26, 2016;65(5):1-54, available at www.cdc.gov/mmwr/volumes/65/pdfs/mm6505.pdf).
- For the 2017–18 season, follow dosing guidelines in the 2017–18 ACIP influenza vaccine recommendations.

For persons aged 9 years and older:
- Administer 1 dose.

11. Meningococcal vaccines. (Minimum age: 6 weeks for Hib-MenCY [MenHibrix], 2 months for MenACWY-CRM [Menveo], 9 months for MenACWY-D [Menactra], 10 years for serogroup B meningococcal [MenB] vaccines: MenB-4C [Bexsero] and MenB-FLHb [Trumenba])

Routine vaccination:
- Administer a single dose of Menactra or Menveo vaccine at age 11 through 12 years, with a booster dose at age 16 years.
- For children aged 2 months through 18 years with high-risk conditions, see “Meningococcal conjugate ACWY vaccination of persons with high-risk conditions and other persons at increased risk” and “Meningococcal B

risk conditions and other r conditions below.
- Accorine at age 13 through 18 years by 5
- Administration of LAIV at age 16 through 18 years by 5
- At age 16 or older, a

years (preferred age) and are not at increased or be vaccinated with a
- ≥1 month or Tularida
- A 2016 Dose: protection B meningococcal
- eM not interchangeable;

used for all doses.
- Given at an interval of
- Given at least 6 months of between the
- Vaccination of persons

Children with anatomic or functional asplenia (including sickle cell disease), children with HIV infection, or children with persistent complement component deficiency (includes persons with inherited or chronic deficiencies in C3, C5-9, properdin, factor D, factor H, or taking eculizumab [Soliris]):

- MenB:
- Children who initiate vaccination at 8 weeks. Administer doses at ages 2, 4, 6, and 12 months.
- Unvaccinated children who initiate vaccination at 7 through 23 months. Administer 2 primary doses, with the second dose at least 12 weeks after the first dose AND after the first birthday.
- Children 24 months and older who have not received a complete series. Administer 2 primary doses at least 8 weeks apart.

- MenHibrix:
- Children who initiate vaccination at 6 weeks. Administer doses at ages 2, 4, 6, and 12 through 15 months.
- If the first dose of MenHibrix is given at or after age 12 months, a total of 2 doses should be given at least 8 weeks apart to ensure protection against serogroups C and Y meningococcal disease.
Clinical discretion:
• Young adults aged 16 through 23 years (preferred age range is 16 through 18 years) who are not at increased risk for meningococcal disease may be vaccinated with a 2-dose series of either Bexsero (0, ≥1 month) or Trumenba (0, 6 months) vaccine to provide short-term protection against most strains of serogroup B meningococcal disease. The two MenB vaccines are not interchangeable; the same vaccine product must be used for all doses.

Catch-up vaccination:
• Administer a single dose of Menactra or Menveo vaccine at age 11 through 12 years, with a booster dose at age 16 years.
• For children aged 2 months through 18 years with high-risk conditions, see “Meningococcal conjugate ACYW vaccination of persons with high-risk conditions and other persons at increased risk of disease” below.

Catch-up vaccination:
• Similarly, in the event of household exposure to meningococcal disease, a close contacts of a meningococcal disease patient may be vaccinated with either Bexsero (0, 6 months) or Trumenba (0, 6 months) vaccine to provide short-term protection against most strains of meningococcal disease.
MenB vaccine use for children at increased risk or for use during an outbreak:
Administer a 2-dose series of Bexsero, with doses at least 1 month apart, or a 3-dose series of Trumenba, with the second dose at least 1–2 months after the first and the third dose at least 6 months after the first. The two MenB vaccines are not interchangeable; the same vaccine product must be used for all doses.

For further guidance on the use of the vaccines mentioned below, see: www.cdc.gov/vaccines/hcp/acip-recs/index.html.

- Menactra
  - Children with anatomic or functional asplenia or HIV infection
    - Children 24 months and older who have not received a complete series. Administer 2 primary doses at least 8 weeks apart. If Menactra is administered to a child with asplenia (including sickle cell disease) or HIV infection, do not administer Menactra until age 2 years and at least 4 weeks after the completion of all PCV13 doses.
  - Children with persistent complement component deficiency
    - Children 9 through 21 months. Administer 2 primary doses at least 12 weeks apart.
    - Children 24 months and older who have not received a complete series. Administer 2 primary doses at least 6 weeks apart.
  - All high-risk children
    - If Menactra is to be administered to a child at high risk for meningococcal disease, it is recommended that Menactra be given either before or at the same time as DTaP.

Meningococcal B vaccination of persons with high-risk conditions and other persons at increased risk of disease:
Children with anatomic or functional asplenia (including sickle cell disease) or children with persistent complement component deficiency includes persons with inhaled or chronic deficiencies in C3, C5-9, properdin, factor D, factor H, or taking eculizumab (Soliris).

- Bexsero or Trumenba
  - Persons 10 years or older who have not received a complete series. Administer a 2-dose series of Bexsero, with doses at least 1 month apart, or a 3-dose series of Trumenba, with the second dose at least 1–2 months after the first and the third dose at least 6 months after the first. The two MenB vaccines are not interchangeable; the same vaccine product must be used for all doses.

For children who travel or reside in countries in which meningococcal disease is hyperendemic or epidemic, including countries in the African meningitis belt or the Hajj:
- Administer an age-appropriate formulation and series of Menactra or Menveo for protection against serogroups A and W meningococcal disease. Prior receipt of MenHibrix is not sufficient for children traveling to the meningitis belt or the Hajj because it does not contain serogroups A or W.

For children at risk during an outbreak attributable to a vaccine serogroup:
- For serogroup A, C, W, or Y: Administer or complete an age- and formulation-appropriate series of MenHibrix, Menactra, or Menveo.
Meningococcal conjugate ACWY vaccination of persons with high-risk conditions and other persons at increased risk:

**Children with anatomic or functional asplenia (including sickle cell disease), children with HIV infection, or children with persistent complement component deficiency (includes persons with inherited or chronic deficiencies in C3, C5-9, properdin, factor D, factor H, or taking eculizumab [Soliris]):**

- **Catch-up vaccination:**
  - Ensure that all persons aged 7 through 18 years without evidence of immunity (see MMWR 2007;56[No. RR-4], available at www.cdc.gov/mmwr/volumes/56/rr/pdfs/mm5604.pdf) have 2 doses of varicella vaccine. For children aged 7 through 12 years, the recommended minimum interval between doses is 3 months (if the second dose was administered at least 4 weeks after the first dose, it can be accepted as valid); for persons aged 13 years and older, the minimum interval between doses is 4 weeks.

- **Varicella (VAR) vaccine routine vaccination:**
  - Administer a 2-dose schedule: 1 dose at 15 months of age and the second dose at age 4 through 6 months. The second dose may be administered at least 3 months after the first dose, but not within 28 days of the first dose (ACIP, 2017).
**Menactra**
- **Children with anatomic or functional asplenia or HIV infection**
  - Children 24 months and older who have not received a complete series. Administer 2 primary doses at least 8 weeks apart. If Menactra is administered to a child with asplenia (including sickle cell disease) or HIV infection, do not administer Menactra until age 2 years and at least 4 weeks after the completion of all PCV13 doses.

- **Children with persistent complement component deficiency**
  - Children 9 through 21 months. Administer 2 primary doses at least 12 weeks apart.
  - Children 24 months and older who have not received a complete series. Administer 2 primary doses at least 6 weeks apart.

- **All high-risk children**
  - If Menactra is to be administered to a child at high risk for meningococcal disease, it is recommended that Menactra be given either before or at the same time as DTaP.

Meningococcal B vaccination of persons with high-risk conditions and other persons at increased risk of disease: Children with anatomic or functional asplenia (including sickle cell disease) or children with persistent complement component deficiency includes persons with inherited or chronic deficiencies in C3, C4, properdin, factor D, factor H, or taking eculizumab (Soliris®).

- **Bexsero or Trumena**
  - Persons 10 years or older who have not received a complete series. Administer 2-dose series of Bexsero, with doses at least 1 month apart, or a 3-dose series of Trumena, with the second dose at least 1-2 months after the first and the third dose at least 6 months after the first. The two MenB vaccines are not interchangeable; the same vaccine product must be used for all doses.

For children who travel to or reside in countries in which meningococcal disease is epidemic or endemic, including countries in the African meningitis belt or the Hajj:
- **Menactra**
  - Menactra is administered in a 3-dose series and is recommended for protection against serogroups A and W meningococcal disease. Prior receipt of MenBrix in Africa is not sufficient for children traveling to the meningitis belt or the Hajj because it does not contain serogroups A or W.

For children at risk during an outbreak attributable to a vaccine serogroup:
- For serogroup A, C, W, or Y: Administer or complete an age- and formulation-appropriate series of MenBrix, Menactra, or Menveo.

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**Menactra**

**Children with anatomic or functional asplenia or HIV infection**

> Menactra is indicated for the active immunization of children 24 months and older who have not received a complete series. It is recommended that Menactra be given either before or at the same time as DTaP. For children at high risk for meningococcal disease, it is recommended that Menactra be given either before or at the same time as DTaP. Meningococcal B vaccination of persons with high-risk conditions and other persons at increased risk of disease is recommended. Bexsero or Trumena may be used for children 10 years or older who have not received a complete series. The two vaccines are not interchangeable; the same vaccine product must be used for all doses.

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For further guidance on the use of the vaccines mentioned below, see: [www.cdc.gov/vaccines/hcp/acip-recs/index.html](http://www.cdc.gov/vaccines/hcp/acip-recs/index.html)

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12. **Tetanus and diphtheria toxoids and acellular pertussis (Tdap) vaccine** (Minimum age: 10 years for both Boostrix and Adacel):

- Administer 1 dose of Tdap vaccine to all adolescents aged 11 through 12 years.
- Tdap may be administered regardless of the interval since the last tetanus and diphtheria toxoid-containing vaccine.
- Administer 1 dose of Tdap vaccine to pregnant adolescents during each pregnancy preferably during the early part of gestational weeks 27 through 36, regardless of time since prior Td or Tdap vaccination.

**Catch-up vaccination**

- Persons aged 7 years and older who are not fully immunized with DTaP vaccine should receive Tdap vaccine as 1 dose preferably in the first 6 months after the last dose of DTaP unless contraindicated.
- Persons aged 7 through 10 years who receive Tdap vaccine should receive Tdap vaccine as 1 dose preferably in the first 6 months after the last dose of DTaP unless contraindicated.
- Persons aged 11 through 18 years who have not received Tdap vaccine should receive 1 dose followed by tetanus and diphtheria toxoids (Td) booster doses every 10 years thereafter.

**Inadvertent doses of DTaP vaccine**

- If administered inadvertently to a child aged 7 through 10 years, the dose may count as part of the catch-up series. This dose may count as the adolescent Tdap dose, or the child may receive a Tdap booster dose at age 11 through 12 years.
- If administered inadvertently to an adolescent aged 11 through 18 years, the dose should be counted as the adolescent Tdap booster.

For other catch-up guidance, see Figure 2.

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For persons receiving vaccination before age 15, the recommended immunization schedule is 2 doses of HPV vaccine at 0, 6-12 months.

For persons initiating vaccination at age 15 years or older, the recommended immunization schedule is 3 doses of HPV vaccine at 0, 1-2, 6 months.

A vaccine dose administered at a shorter interval should be re-administered at the recommended interval.

In a 2-dose schedule of HPV vaccine, the minimum interval is 5 months between the first and second dose. If the second dose is administered at a shorter interval, a third dose should be administered a minimum of 12 weeks after the second dose and a minimum of 5 months after the first dose.

In a 3-dose schedule of HPV vaccine, the minimum interval is 4 weeks between the first and second dose, 12 weeks between the second and third dose, and 5 months between the first and third dose. If a vaccine dose is administered at a shorter interval, it should be re-administered after another minimum interval has been met since the most recent dose.

Special populations:

- For children with history of sexual abuse or assault, administer HPV vaccine beginning at age 9 years.
- Immunocompromised persons, including those with human immunodeficiency virus (HIV) infection, should receive 3 doses at 6, 12, and 24 months, regardless of age at vaccine initiation.

Note: HPV vaccination is not recommended during pregnancy, although there is no evidence that the vaccine poses harm. If a woman is found to be pregnant after initiating the vaccine series, no intervention is needed; the remaining vaccine doses should be delayed until after the pregnancy. Pregnancy testing is not needed before HPV vaccination.

*See MMWR December 16, 2016:65(49):1405-1408, available at [www.cdc.gov/mmwr/volumes/65/wr/pdfs/mm6549a5.pdf](http://www.cdc.gov/mmwr/volumes/65/wr/pdfs/mm6549a5.pdf).*
For children 7 through 10 years who receive a dose of Tdap as part of the catch-up series, an adolescent Tdap vaccine dose at age 11 through 12 years may be administered.

12. Tetanus and diphtheria toxoids and acellular pertussis (Tdap) vaccine. (Minimum age: 10 years for both Boostrix and Adacel)

Routine vaccination:
- Administer 1 dose of Tdap vaccine to all adolescents aged 11 through 12 years.
- Tdap may be administered regardless of the interval since the last tetanus and diphtheria toxoid-containing vaccine.
- Administer 1 dose of Tdap vaccine to pregnant adolescents during each pregnancy (preferably during the early part of gestational weeks 27 through 36), regardless of time since prior Td or Tdap vaccination.

Catch-up vaccination:
- Persons aged 7 years and older who are not fully immunized with Tdap vaccine should receive Tdap vaccine as 1 dose (preferably the first) in the catch-up series; additional doses are needed as part of the catch-up series.
- For children 7 through 10 years who receive a dose of Tdap as part of the catch-up series, an adolescent Tdap vaccine dose at age 11 through 12 years may be administered.
- Persons aged 11 through 12 years who have not received Tdap vaccine should receive a dose, followed by tetanus and diphtheria toxoids and acellular pertussis (Tdap) booster doses every 10 years thereafter.
- Inadvertent doses of Tdap vaccine:
  - If inadvertently administered to a child aged 7 through 10 years, the dose may be counted as part of the catch-up series. This dose may count as the adolescent Tdap dose, or the child may receive a Tdap booster dose at age 11 through 12 years.
  - If administered inadvertently to an adolescent aged 11 through 18 years, the dose should be counted as the adolescent Tdap booster.
- For other catch-up guidance, see Figure 2.

For further guidance on the use of the vaccines mentioned below, see: www.cdc.gov/vaccines/hcp/acip-recs/index.html.

**Menactra**
- Children with anatomic or functional asplenia or HIV infection
  - Children 24 months and older who have not received a complete series. Administer 2 primary doses at least 8 weeks apart. If Menactra is administered to a child with asplenia (including sickle cell disease) or HIV infection, do not administer Menactra until age 2 years and at least 4 weeks after the completion of all PCV13 doses.
- Children with persistent complement component deficiency
  - Children 9 through 21 months. Administer 2 primary doses at least 12 weeks apart.
  - Children 24 months and older who have not received a complete series. Administer 2 primary doses at least 6 weeks apart.
- All high-risk children
  - If Menactra is to be administered to a child at high risk for meningococcal disease, it is recommended that Menactra be given either before or at the same time as DTaP.

Meningococcal B vaccination of persons with high-risk conditions and other persons at increased risk of disease:
- Children with anatomic or functional asplenia (including sickle cell disease) or persistent complement component deficiency include persons with inherited or chronic deficiencies in C3, C5, C6, properdin, factor D, factor H, or a factor H-binding protein (Soliris):
  - Bispe vitamins or Trumab
- Persons 10 years or older who have not received a complete series. Administer a 2-dose series of Bexsero, with doses at least 1 month apart, or a 3-dose series of Trumab, with the second dose at least 1-2 months after the first and the third dose at least 6 months after the first. The two MenB vaccines are not interchangeable; the same vaccine product must be used for all doses.
- For children who travel to or reside in countries in which meningococcal disease is hyperendemic or endemic, including countries in the African meningitis belt or the Hajj:
  - Administer an age-appropriate formulation and series of Menactra or Menveo for protection against serogroups A and W meningococcal disease. Prior receipt of MenB vaccine is not sufficient for children traveling to the meningitis belt or the Hajj because it does not contain serogroups A or W.

For children at risk during an outbreak attributable to a vaccine serogroup:
- For serogroup A, C, W, or Y: Administer or complete an age- and formulation-appropriate series of MenBrix, Menactra, or Menveo.

13. Human papillomavirus (HPV) vaccines. (Minimum age: 9 years for age 4, Gardasil 9, and Gardasil 5)

Routine and catch-up vaccinations:
- Administer a 2-dose series of HPV vaccine on a schedule of 0, 6-12 months to all adolescents aged 11 or 12 years. The vaccination series can start at age 9 years.
- Administer HPV vaccine to all adolescents through age 18 years who were not previously adequately vaccinated. The number of recommended doses is based on age at administration of the first dose.
- For persons initiating vaccination before age 15, the recommended immunization schedule is 2 doses of HPV vaccine at 0, 6-12 months.
- For persons initiating vaccination at age 15 years or older, the recommended immunization schedule is 3 doses of HPV vaccine at 0, 1-2, 6 months.
- A vaccine dose administered at a shorter interval should be reimmunized at the recommended interval.
- In a 2-dose schedule of HPV vaccine, the minimum interval is 4 months between the first and second dose.
Administer 1 dose of Tdap vaccine to pregnant adolescents during each pregnancy (preferably during the early part of gestational weeks 27 through 36), regardless of time since prior Td or Tdap vaccination.

12. Tetanus and diphtheria toxoids and acellular pertussis (Tdap) vaccine. (Minimum age: 10 years for both Boostrix and Adacel)

Routine vaccination:
- Administer 1 dose of Tdap vaccine to all adolescents aged 11 through 12 years.
- Tdap may be administered regardless of the interval since the last tetanus and diphtheria toxoid-containing vaccine.
- Administer 1 dose of Tdap vaccine to pregnant adolescents during each pregnancy (preferably during the early part of gestational weeks 27 through 36), regardless of time since prior Td or Tdap vaccination.

Catch-up vaccination:
- Persons aged 7 years and older who are not fully immunized with Tdap vaccine should receive Tdap vaccine as 1 dose (preferably the first) in the catch-up series; an additional dose is not recommended. For children aged 7 through 10 years who receive a dose of Tdap as part of the catch-up series, an adolescent Tdap vaccine dose may be administered. For children 7 through 10 years who have not received Tdap vaccine should receive a dose, followed by tetanus and diphtheria toxoids (Td) booster doses every 10 years thereafter.
- inadvertently doses of Tdap vaccine:
  - If administered inadvertently to a child aged 7 through 10 years, the dose may count as part of the catch-up series. This dose may count as the adolescent Tdap dose, or the child may receive a Tdap booster dose at age 11 through 12 years.
  - If administered inadvertently to an adolescent aged 11 through 18 years, the dose should be counted as the adolescent Tdap booster.
- For other catch-up guidance, see Figure 2.
13. Human papillomavirus (HPV) vaccines. (Minimum age: 9 years for 4vHPV [Gardasil], and 9vHPV [Gardasil 9])

Routine and catch-up vaccination:
• Administer a 2-dose series of HPV vaccine on a schedule of 0, 6-12 months to all adolescents aged 11 or 12 years. The vaccination series can start at age 9 years.
• Administer HPV vaccine to all adolescents through age 18 years who were not previously adequately vaccinated. The number of recommended doses is based on age at administration of the first dose.
• For persons initiating vaccination before age 15, the recommended immunization schedule is 2 doses of HPV vaccine at 0, 6-12 months.
• For persons initiating vaccination at age 15 years or older, the recommended immunization schedule is 3 doses of HPV vaccine at 0, 1–2, 6 months.
• A vaccine dose administered at a shorter interval should be re-administered at the recommended interval.

Special populations:
• For children with history of sexual abuse or assault, administer HPV vaccine beginning at age 9 years.
• Immunocompromised persons* including those with human immunodeficiency virus (HIV) infection, should receive a 3-dose series at 0, 1–2, and 6 months regardless of age at vaccine initiation.

Note: HPV vaccination is not recommended during pregnancy, although there is no evidence that the vaccine poses harm. If a woman is found to be pregnant after initiating the vaccination series, no intervention is needed; the remaining vaccine doses should be delayed until after the pregnancy. Pregnancy testing is not needed before HPV vaccination.

*See MMWR December 16, 2016;65(49):1405-1408, available at www.cdc.gov/mmwr/volumes/65/wr/pdfs/mm6549a5.pdf.
Immunization Coverage Rates
## Estimated Vaccine Coverage Among Children Aged 19-35 Months, NIS 2015

<table>
<thead>
<tr>
<th>State/Area</th>
<th>Vaccine Series*</th>
</tr>
</thead>
<tbody>
<tr>
<td>United States</td>
<td>72.2%</td>
</tr>
<tr>
<td>New York</td>
<td>71.9%</td>
</tr>
</tbody>
</table>

*Includes >4 doses DTaP/DT/DTP, > 3 doses polio, > 1 dose MMR, full series Hib, > 3 doses Hep B, dose > 1 varicella, and > 4 doses PCV.

MMWR 2015; 64(33): 889-896
Estimated percentage of children enrolled in kindergarten with an exemption from one or more vaccines, United States, 2015–16 school year

New York
(All kindergartners = 232,521)

<table>
<thead>
<tr>
<th>Exemption Type</th>
<th>N (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Any</td>
<td>2,052 (0.9)</td>
</tr>
<tr>
<td>Medical</td>
<td>323 (0.1)</td>
</tr>
<tr>
<td>Nonmedical</td>
<td>1,729 (0.7)</td>
</tr>
</tbody>
</table>

MMWR 2016; 65(39): 1057-1064
Estimated Vaccination Coverage among Adolescents Aged 13-17 Years, NIS-Teen, United States, 2006-2015

* Revised APD definition *

- ≥1 Tdap
- ≥1 MenACWY
- ≥1 HPV (F)
- ≥1 HPV (M)
- ≥3 HPV (F)
- ≥2 MenACWY**
- ≥3 HPV (M)

* APD = Adequate provider data; ** ≥2 doses MenACWY among adolescents aged 17 years
MMWR 65(33);850-858
## Estimated Vaccination Coverage among Adolescents Aged 13-17 Years, NIS-Teen, United States, 2015

<table>
<thead>
<tr>
<th>Vaccine</th>
<th>United States</th>
<th>New York</th>
</tr>
</thead>
<tbody>
<tr>
<td>≥1 Tdap</td>
<td>86.4%</td>
<td>89%</td>
</tr>
<tr>
<td>≥1 HPV (F)</td>
<td>62.8%</td>
<td>62.3%</td>
</tr>
<tr>
<td>≥3 HPV (F)</td>
<td>41.9%</td>
<td>47.3%</td>
</tr>
<tr>
<td>≥1 HPV (M)</td>
<td>49.8%</td>
<td>60.3%</td>
</tr>
<tr>
<td>≥3 HPV (M)</td>
<td>28.1%</td>
<td>38.1%</td>
</tr>
<tr>
<td>≥1 MenACWY</td>
<td>81.3%</td>
<td>86.2%</td>
</tr>
<tr>
<td>≥2 MenACWY*</td>
<td>33.3%</td>
<td>--</td>
</tr>
</tbody>
</table>

*≥2 doses of MenACWY or meningococcal-unknown type vaccine among adolescents 17 years. Does not include adolescents who received their first dose of MenACWY vaccine at ≥16 years.

https://www.cdc.gov/mmwr/volumes/65/wr/mm6533a4.htm
Impact of Vaccination
Childhood Immunization Provides Big Savings

- CDC estimates vaccination of children born between 1994 and 2016 will prevent:
  - 381 million illnesses
  - 24.5 million hospitalizations
  - 855,000 early deaths

- Cost savings
  - $360 billion in direct costs
  - $1.65 trillion in total societal costs
Resources
CDC Resources for Staff Education

- Competency-based education for staff is critical
- Multiple education products available free through the CDC website:
  - Immunization courses (webcasts and online self-study)
  - Netconferences
  - You Call the Shots self-study modules
- Continuing education credits available

https://www.cdc.gov/vaccines/ed/index.html
You Call the Shots
(Several Modules Added or Updated)

https://www.cdc.gov/vaccines/ed/youcalltheshots.html
Now Available

- Supplemental information regarding:
  - Human Papillomavirus
  - Meningococcal Disease
  - Pneumococcal Disease

https://www.cdc.gov/vaccines/pubs/pinkbook/supplement.html
https://www.cdc.gov/vaccines/pubs/pinkbook/index.html
Now Available
General Best Practice Guidelines on Immunization

- Replaces the “General Recommendations on Immunization”
- Timing and Spacing of Immunobiologics
- Contraindications and precautions
- Preventing and Managing Adverse Reactions
- Vaccine Administration
- Storage and Handling of Immunobiologics
- Altered Immunocompetence
- Special Situations
- Vaccination Records
- Vaccination Programs
- Vaccine Information Sources

https://www.cdc.gov/vaccines/hcp/acip-recs/general-recs/index.html
CDC Vaccine and Immunization Resources

Questions? Email CDC
- Providers
  - Providers
- Parents and patients
  - Parents and patients

Website
- Website
  - Website

Twitter
- Twitter
  - Twitter

Influenza
- Influenza
  - Influenza

Vaccine Safety
- Vaccine Safety
  - Vaccine Safety
Additional Resources

- State Immunization Program
  - [https://www.health.ny.gov/prevention/immunization/](https://www.health.ny.gov/prevention/immunization/)
  - And local public health immunization programs, too!
- Immunization Action Coalition [www.immunize.org](http://www.immunize.org)
- Vaccine Education Center [www.chop.edu](http://www.chop.edu)
- American Academy of Pediatrics (AAP) [www.aap.org/immunize](http://www.aap.org/immunize)
- National Foundation for Infectious Diseases (NFID) [www.nfid.org](http://www.nfid.org)