

## 2016 Immunization Schedules: Children and adolescents

On February 5, 2016, the Advisory Committee on Immunization Practices (ACIP) released its 2016 recommended schedules for birth to 18 years of age, footnotes and "catch-up" immunizations. This issue of the *CD Summary* presents the new tables, along with their all-important footnotes, and highlights changes in recommendations since last year.

### ROUTINE SCHEDULE

- In figure 1: Vaccines are now grouped by the recommended age for administration. The order was also changed within the footnotes.
- Purple bars have been added for:
  - *Haemophilus influenzae* type B (Hib) vaccine for children aged 5–18 years, denoting the recommendation to vaccinate certain high-risk children in this age group.
  - Human papillomavirus (HPV) vaccine for children aged 9–10 years, denoting the recommendation to vaccinate high-risk children in this age group, including children with a history of sexual abuse.
  - Serogroup B meningococcal vaccine for certain high-risk persons aged  $\geq 10$  years. This row also contains a blue bar denoting the "permissive" recommendation for administration to non-high-risk persons 16–23 years of age (preferably at 16–18 years of age), subject to individual clinical decision making.
- In figure 2, "Catch-up" schedule, Tdap/Td was added to the list of possible previous vaccines in the Tdap line for children aged  $\geq 7$  years, dose 2 to dose 3 column.

### 2016 FOOTNOTES

- In figure 2: The hepatitis B (HepB) vaccine footnote was revised to present more clearly the timing for postvaccination serologic testing for infants born to hepatitis B surface antigen (HBsAg) -positive mothers. The footnote was also revised to present the newly recommended interval for postvaccination serologic testing in this population.

- The diphtheria and tetanus toxoids and acellular pertussis (DTaP) vaccine footnote was revised to reflect more clearly the recommendations for use following an inadvertently early administered 4<sup>th</sup> dose of DTaP vaccine.
- The inactivated polio vaccine (IPV) footnote was updated to provide guidance for vaccination of persons who received only OPV and received all doses before age 4 years.
- The meningococcal vaccine footnote has been updated to include recommendations for the administration of the meningococcal B vaccine. A “clinical discretion” category has been added for the recommendation for vaccination of non-high-risk persons aged 16–23 years, subject to individual clinical decision making. Meningococcal B vaccines have been added to the section recommending vaccination of persons with high-risk conditions and other persons at increased risk of disease. A definition of persistent complement deficiency has also been added.
- The human papillomavirus (HPV) vaccine footnote has been updated to reflect the new HPV vaccine nomenclature. Guidance had been added for vaccination beginning at age 9 years for children with a history of sexual abuse.

## 1. Hepatitis B (HepB) vaccine. (Minimum age: birth)

Routine vaccination:

At birth:

- Administer monovalent HepB vaccine to all newborns before hospital discharge.
- 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 HBsAg (anti-HBs) at age 9–18 months (preferably at the next well-child visit) or 1 to 2 months after completion of the HepB series if the series was delayed; CDC recently recommended that testing be done at age 9–12 months; see <http://www.cdc.gov/mmwr/preview/mmwrhtml/mm6439a6.htm>.
- 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 HBsAg-positive, also administer HBIG for 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 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 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.
- Administration of a total of 4 doses of HepB vaccine is permitted when a combination vaccine containing HepB is administered after the birth dose.

Catch-up vaccination:

- Unvaccinated persons should complete a 3-dose series.
- A 2-dose series (doses separated by at least 4 months) of adult formulation Recombivax HB is licensed for use in children aged 11–15 years.
- For other catch-up guidance, see Figure 2.

## 2. Rotavirus (RV) vaccines. (Minimum age: 6 weeks for both RV1 [Rotarix] and RV5 [RotaTeq])

Routine vaccination:

Administer a series of RV vaccine to all infants as follows:

1. If Rotarix is used, administer a 2-dose series at 2 and 4 months of age.
2. If RotaTeq is used, administer a 3-dose series at ages 2, 4, and 6 months.
3. If any dose in the series was RotaTeq or vaccine product is unknown for any dose in the series, a total of 3 doses of RV vaccine should be administered.

Catch-up vaccination:

- The maximum age for the first dose in the series is 14 weeks, 6 days; vaccination should not be initiated for infants aged 15 weeks, 0 days or older.
- The maximum age for the final dose in the series is 8 months, 0 days.
- For other catch-up guidance, see Figure 2.

**Table 1. Recommended Immunization Schedule for Persons aged 0 through 18 years**  
United States, 2016

Vaccine	Birth	1 mo	2 mos	4 mos	6 mos	9 mos	12 mos	15 mos	18 mos	19–23 mos	2-3 yrs	4-6 yrs	7-10 yrs	11-12 yrs	13–15 yrs	16–18 yrs
Hepatitis B <sup>1</sup> (HepB)	1 <sup>st</sup> dose		2 <sup>nd</sup> dose						3 <sup>rd</sup> dose							
Rotavirus <sup>2</sup> (RV) RV1 (2-dose series); RV5 (3-dose series)			1 <sup>st</sup> dose	2 <sup>nd</sup> dose	See footnote 2											
Diphtheria, tetanus, & acellular pertussis <sup>3</sup> (DTaP: <7 yrs)			1 <sup>st</sup> dose	2 <sup>nd</sup> dose	3 <sup>rd</sup> dose				4 <sup>th</sup> dose			5 <sup>th</sup> dose				
<i>Haemophilus influenzae</i> type b <sup>4</sup> (Hib)			1 <sup>st</sup> dose	2 <sup>nd</sup> dose	See footnote 4			3 <sup>rd</sup> or 4 <sup>th</sup> dose. See footnote 4								
Pneumococcal conjugate <sup>5</sup> (PCV13)			1 <sup>st</sup> dose	2 <sup>nd</sup> dose	3 <sup>rd</sup> dose			4 <sup>th</sup> dose								
Inactivated poliovirus <sup>6</sup> (IPV: <18 yrs)			1 <sup>st</sup> dose	2 <sup>nd</sup> dose								4 <sup>th</sup> dose				
Influenza <sup>7</sup> (IIV; LAIV)					Annual vaccination (IIV only) 1 or 2 doses		Annual vaccination (LAIV or IIV) 1 or 2 doses		Annual vaccination (LAIV or IIV) 1 dose only							
Measles, mumps, rubella <sup>8</sup> (MMR)					See footnote 8		1 <sup>st</sup> dose					2 <sup>nd</sup> dose				
Varicella <sup>9</sup> (VAR)							1 <sup>st</sup> dose					2 <sup>nd</sup> dose				
Hepatitis A <sup>10</sup> (HepA)							2-dose series, See footnote 10									
Meningococcal <sup>11</sup> (Hib-MenCY ≥ 6 weeks; Men-ACWY-D ≥ 9 mos; MenACWY-CRM ≥ 2 mos)				See footnote 11									1 <sup>st</sup> dose		Booster	
Tetanus, diphtheria, & acellular pertussis <sup>12</sup> (Tdap: ≥7 yrs)														(Tdap)		
Human papillomavirus <sup>13</sup> (2vHPV: females only; 4vHPV, 9vHPV: males and females)														(3-dose series)		
Meningococcal B <sup>11</sup>												See footnote 11				
Pneumococcal polysaccharide <sup>5</sup> (PPSV23)												See footnote 5				

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 recommendations

This schedule includes recommendations in effect as of January 1, 2016. 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/hcp/acip-recs/index.html>. Clinically significant adverse events that follow vaccinations 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 disease 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/res/vac-admin/contraindications.htm>) or by telephone (800-CDC-INFO or 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 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. 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.

3. Diphtheria and tetanus toxoids and acellular pertussis (DTaP) vaccine. (Minimum age: 6 weeks. Exception: DTaP-IPV [Kinrix, Quadracel]); 4 years)

Routine vaccination:

- Administer a 5-dose series of DTaP vaccine at ages, 2,4,6, 15–18 months, and 4–6 years. The fourth dose may be administered as early as 12 months of age, provided at least 6 months have elapsed since the third dose.
- Inadvertent administration of 4th DTaP dose early: If the fourth dose of DTaP was administered at least 4 months but less than 6 months after the third dose of DTaP, it need not be repeated.

Catch-up vaccination:

- The fifth dose of DTaP vaccine is not necessary if the fourth dose was administered at age  $\geq 4$  years.
- 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) and Hib-MenCY (MenHibrix)], PRP-OMP [PedvaxHIB or COMVAX], 12 months for PRP-T [Hiberix])

Routine vaccination:

- Administer a 2- or 3-dose Hib vaccine primary series and a booster dose (dose 3 or 4 depending on vaccine used in primary series) at age 12–15 months to complete a full Hib vaccine series.
- The primary series with ActHIB, MenHibrix, or Pentacel consists of 3 doses and should be administered at 2, 4, and 6 months of age. The primary series with PedvaxHib or COMVAX consists of 2 doses and should be administered at 2 and 4 months of age; a dose at age 6 months is not indicated.
- One booster dose (dose 3 or 4 depending on vaccine used in primary series) of any Hib vaccine should be administered at age 12–15 months. An exception is Hiberix vaccine. Hiberix should only be used for the booster (final) dose in children aged 12 months through 4 years who have received at least 1 prior dose of Hib-containing vaccine.
- For recommendations on the use of MenHibrix in patients at increased risk for meningococcal disease, please refer to the meningococcal vaccine footnotes and also to MMWR February 28, 2014;63[RR01]: 1–13, available at <http://www.cdc.gov/mmwr/PDF/rr/rr6301.pdf>.

Catch-up vaccination:

- If dose 1 was administered at age 12–14 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 12–59 months and at least 8 weeks after the second dose.
- If the first dose was administered at age 7–11 months, administer the second dose at least 4 weeks later and a third (and final) dose at age 12–15 months or 8 weeks after second dose, whichever is later.
- If first dose is administered before the first birthday and the second dose at  $<15$  months, a third (and final) dose should be administered 8 weeks later.
- For unvaccinated children aged  $\geq 15$  months, administer only 1 dose.
- For other catch-up guidance, see Figure 2. For catch-up guidance related to MenHibrix, please see the meningococcal vaccine footnotes and also MMWR February 28, 2014;63[RR01]:1–13, available at <http://www.cdc.gov/mmwr/PDF/rr/rr6301.pdf>.

Vaccination of persons with high-risk conditions:

- Children aged 12–59 months who are at increased risk for Hib disease, including chemotherapy recipients and those with anatomic or functional asplenia (including sickle cell disease), human immunodeficiency virus (HIV) infection, immunoglobulin deficiency, or early component complement deficiency, who have received either no doses or only 1 dose of Hib vaccine at  $<12$  months of age, should receive 2 additional doses of Hib vaccine 8 weeks apart; children who received 2 or more doses of Hib vaccine at  $<12$  months of age should receive 1 additional dose.
- For patients  $<5$  years of age undergoing chemotherapy or radiation treatment who received a Hib vaccine dose(s) within 14 days of starting therapy or during therapy, repeat the dose(s) at least 3 months following therapy completion.
- Recipients of hematopoietic stem cell transplant (HSCT) should be revaccinated with a 3-dose regimen of Hib vaccine starting 6 to 12 months after successful transplant, regardless of vaccination history; doses should be administered at least 4 weeks apart.
- A single dose of any Hib-containing vaccine should be administered to unimmunized\* children and adolescents  $\geq 15$  months of age undergoing an elective splenectomy; if possible, vaccine should be administered at least 14 days before the procedure.

- Hib vaccine is not routinely recommended for patients  $\geq 5$  years of age. However, 1 dose of Hib vaccine should be administered to unimmunized\* persons aged  $\geq 5$  years who have anatomic or functional asplenia (including sickle cell disease) and to unvaccinated persons 5–18 years of age with HIV infection.

\* Patients who have not received a primary series and booster dose or at least 1 dose of Hib vaccine after 14 months of age are considered unimmunized.

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

Routine vaccination with PCV13:

- Administer a 4-dose series of PCV13 vaccine at ages 2, 4, and 6 months and at age 12–15 months.
- For children aged 14–59 months who have received an age-appropriate series of 7-valent PCV (PCV7), administer a single supplemental dose of 13-valent PCV (PCV13).

Catch-up vaccination with PCV13:

- Administer 1 dose of PCV13 to all healthy children aged 24–59 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 2–5 years of age 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; cerebrospinal fluid leak; cochlear implant; sickle cell disease or 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; solid organ transplantation; or congenital immunodeficiency:
  1. Administer 1 dose of PCV13 if any incomplete schedule of 3 doses of PCV (PCV7 and/or PCV13) were received previously.
  2. Administer 2 doses of PCV13 at least 8 weeks apart if unvaccinated or any incomplete schedule of fewer than 3 doses of PCV (PCV7 and/or PCV13) were received previously.
  3. Administer 1 supplemental dose of PCV13 if 4 doses of PCV7 or other age-appropriate complete PCV7 series was received previously.
  4. The minimum interval between doses of PCV (PCV7 or PCV13) is 8 weeks.
  5. For children with no history of PPSV23 vaccination, administer PPSV23 at least 8 weeks after the most recent dose of PCV13.
- For children aged 6–18 years who have cerebrospinal fluid leak; cochlear implant; 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:
  1. If neither PCV13 nor PPSV23 has been received previously, administer 1 dose of PCV13 now 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 PPSV23 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 6–18 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.

## 6. Inactivated poliovirus vaccine (IPV). (Minimum age: 6 weeks)

Routine vaccination:

- Administer a 4-dose series of IPV at ages 2, 4, 6–18 months, and 4–6 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.

**Figure 2. Catch-up Immunization schedule for persons aged 4 months through 6 years who start late or who are more than 1 month behind**  
United States, 2016

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.

Children age 4 months through 6 years					
Vaccine	Minimum Age for Dose 1	Minimum Interval Between Doses			
		Dose 1 to Dose 2	Dose 2 to Dose 3	Dose 3 to Dose 4	Dose 4 to Dose 5
Hepatitis B <sup>1</sup>	Birth	4 weeks	8 weeks and at least 16 weeks after first dose. Minimum age for the final dose is 24 weeks.		
Rotavirus <sup>2</sup>	6 weeks	4 weeks	4 weeks <sup>2</sup>		
Diphtheria, tetanus, and acellular pertussis <sup>3</sup>	6 weeks	4 weeks	4 weeks	6 mos	6 mos <sup>3</sup>
<i>Haemophilus influenzae</i> type b <sup>4</sup>	6 weeks	4 weeks if first dose was administered before the 1 <sup>st</sup> birthday. 8 weeks (as final dose) if first dose was administered at age 12–14 months. No further doses needed if first dose was administered at age ≥15 months.	4 weeks <sup>4</sup> if current age is <12 months and first dose was administered at age <7 months, and at least 1 previous dose was PRP-T (ActHib, Pentacel) or unknown. 8 weeks and age 12–59 months (as final dose) <sup>4</sup> • if current age <12 months and first dose was administered at age 7–11 months (wait until at least 12 months old); OR • if current age is 12–59 months and first dose was administered before the 1 <sup>st</sup> birthday, and second dose administered at age <15 months; OR • if both doses were PRP-OMP (PedvaxHIB; Comvax) and were administered before the 1 <sup>st</sup> birthday (wait until at least 12 months old). No further doses needed if previous dose was administered at age ≥15 months or older.	8 weeks (as final dose) This dose only necessary for children age 12–59 months who received 3 doses before the 1 <sup>st</sup> birthday.	
Pneumococcal <sup>5</sup>	6 weeks	4 weeks if first dose administered before the 1 <sup>st</sup> birthday. 8 weeks (as final dose for healthy children) if first dose was administered at the 1 <sup>st</sup> birthday or after. No further doses needed for healthy children if first dose administered at age ≥24 months.	4 weeks if current age is <12 months and previous dose given at < 7 months old. 8 weeks (as final dose for healthy children) if previous dose given between 7–11 months (wait until at least 12 months old); OR if current age is ≥12 months 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.	8 weeks (as final dose) This dose only necessary for children aged 12–59 months who received 3 doses before age 12 months or for children at high risk who received 3 doses at any age.	
Inactivated poliovirus <sup>6</sup>	6 weeks	4 weeks <sup>6</sup>	4 weeks <sup>6</sup>	6 months <sup>6</sup> (minimum age 4 years for final dose).	
Measles, mumps, rubella <sup>8</sup>	12 mos	4 weeks			
Varicella <sup>9</sup>	12 mos	3 months			
Hepatitis A <sup>10</sup>	12 mos	6 months			
Meningococcal <sup>11</sup> (Hib-MenCY ≥ 6 weeks; MenACWY-D ≥9 mos; MenACWY-CRM ≥ 2 mos)	6 weeks	8 weeks <sup>11</sup>	See footnote 11	See footnote 11	

**Figure 2. Catch-up Immunization schedule for persons aged 7 through 18 years who start late or who are more than 1 month behind**  
United States, 2016

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.

Children and adolescents age 7 through 18 years					
Vaccine	Minimum Age for Dose 1	Minimum Interval Between Doses			
		Dose 1 to Dose 2	Dose 2 to Dose 3	Dose 3 to Dose 4	Dose 4 to Dose 5
Meningococcal <sup>11</sup> (Hib-MenCY ≥ 6 weeks; Men-ACWY-D ≥ 9 mos; MenACWY-CRM ≥ 2 mos)	Not Applicable (N/A)	8 weeks <sup>11</sup>			
Tetanus, diphtheria; tetanus, diphtheria, and acellular pertussis <sup>12</sup>	7 years <sup>12</sup>	4 weeks	4 weeks if first dose of DTaP/DT was administered before the 1 <sup>st</sup> birthday. 6 months (as final dose) if first dose of DTaP/DT or Tdap/Td was administered at or after the 1 <sup>st</sup> birthday.	6 months if first dose of DTaP/DT was administered before the 1 <sup>st</sup> birthday.	
Human papillomavirus <sup>13</sup>	9 years	Routine dosing intervals are recommended. <sup>13</sup>			
Hepatitis A <sup>10</sup>	N/A	6 months			
Hepatitis B <sup>1</sup>	N/A	4 weeks	8 weeks and at least 16 weeks after first dose.		
Inactivated poliovirus <sup>6</sup>	N/A	4 weeks	4 weeks <sup>6</sup>	6 months <sup>6</sup>	
Measles, mumps, rubella <sup>8</sup>	N/A	4 weeks			
Varicella <sup>9</sup>	N/A	3 months if age <13 years. 4 weeks if age ≥13 years.			

Inactivated poliovirus vaccine (IPV) (Minimum age: 6 weeks ) cont.

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 4–6 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 and at least 6 months after the previous dose.
- If both 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 were administered, and all doses were given <4 years of age, one dose of IPV should be given at ≥4 years, at least 4 weeks after the last OPV dose.
- IPV is not routinely recommended for U.S. residents aged ≥18 years.
- For other catch-up guidance, see Figure 2.

7. **Influenza vaccines. (Minimum age: 6 months for inactivated influenza vaccine [IIV], 2 years for live, attenuated influenza vaccine [LAIV]). On June 22, 2016, ACIP recommended that LAIV not be used during the 2016-2017 influenza season.**

Routine vaccination:

- Administer influenza vaccine annually to all children beginning at age 6 months. For most healthy, nonpregnant persons aged 2–49 years, either LAIV or IIV may be used. However, LAIV should NOT be administered to some persons, including 1) persons who have experienced severe allergic reactions to LAIV, any of its components, or to a previous dose of any other influenza vaccine; 2) children 2–17 years of age receiving aspirin or aspirin-containing products; 3) persons who are allergic to eggs; 4) pregnant women; 5) immunosuppressed persons; 6) children 2–4 years of age with asthma or who had wheezing in the past 12

months; or 7) persons who have taken influenza antiviral medications in the previous 48 hours. For all other contraindications and precautions to use of LAIV, see MMWR August 7, 2015;64(30):818–25, available at <http://www.cdc.gov/mmwr/pdf/wk/mm6430.pdf>.

For children aged 6 months through 8 years:

- For the 2015–16 season, administer 2 doses (separated by at least 4 weeks) to children who are receiving influenza vaccine for the first time. Some children in this age group who have been vaccinated previously will also need 2 doses. For additional guidance, follow dosing guidelines in the 2015–16 ACIP influenza vaccine recommendations, MMWR August 7, 2015;64(30):818–25, available at <http://www.cdc.gov/mmwr/pdf/wk/mm6430.pdf>.
- For the 2016–17 season, follow dosing guidelines in the 2016 ACIP influenza vaccine recommendations.

For persons aged ≥9 years:

- Administer 1 dose.

## 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 12–15 months and 4–6 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 6–11 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 12–15 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 before departure from the United States for international travel. The first dose should be administered at 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 12–15 months and 4–6 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.

Catch-up vaccination:

- Ensure that all persons aged 7–18 years without evidence of immunity (see MMWR 2007;56 [No. RR-4], available at <http://www.cdc.gov/mmwr/pdf/rr/rr5604.pdf>) have 2 doses of varicella vaccine. For children aged 7–12 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, the minimum interval between doses is 4 weeks.

## 10. Hepatitis A (HepA) vaccine. (Minimum age: 12 months)

Routine vaccination:

- Initiate the 2-dose HepA vaccine series at 12–23 months of age; separate the 2 doses by 6 to 18 months.
- Children who have received 1 dose of HepA vaccine before age 24 months should receive a second dose 6 to 18 months after the first dose.
- For any person aged ≥2 years who has not already received the HepA vaccine series, 2 doses of HepA vaccine separated by 6 to 18 months may be administered if immunity against hepatitis A virus infection is desired.

Catch-up vaccination:

- The minimum interval between the 2 doses is 6 months.

Special populations:

- Administer 2 doses of HepA vaccine at least 6 months apart to previously unvaccinated persons who live in areas where vaccination programs target older children, or who are at increased risk for infection. This includes persons traveling to or working in countries that have high or intermediate endemicity of infection; men having sex with men; users of injection and non-injection illicit drugs; persons who work with HAV-infected primates or with HAV in a research laboratory; persons with clotting factor disorders; persons with chronic liver disease; and persons who anticipate close personal contact (e.g., household or regular babysitting) with an international adoptee during the first 60 days after arrival in the United States from a

country with high or intermediate endemicity. The first dose should be administered as soon as the adoption is planned, ideally 2 or more weeks before the arrival of the adoptee.

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

Routine vaccination:

- Administer a single dose of Menactra or Menveo vaccine at age 11–12 years, with a booster dose at age 16 years.
- Adolescents aged 11–18 years with human immunodeficiency virus (HIV) infection should receive a 2-dose primary series of Menactra or Menveo with at least 8 weeks between doses.
- For children aged 2 months through 18 years with high-risk conditions, see below.

Catch-up vaccination:

- Administer Menactra or Menveo vaccine at age 13–18 years if not previously vaccinated.
- If the first dose is administered at age 13–15 years, a booster dose should be administered at age 16–18 years with a minimum interval of at least 8 weeks between doses.
- If the first dose is administered at age  $\geq 16$  years, a booster dose is not needed.
- For other catch-up guidance, see Figure 2.

Clinical discretion:

- Young adults aged 16–23 years (preferred age range is 16–18 years) may be vaccinated with either a 2-dose series of Bexsero or a 3-dose series of Trumenba 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.

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):

Meningococcal conjugate ACWY vaccines:

**1. Menveo**

- o *Children who initiate vaccination at 8 weeks of age:* Administer doses at 2, 4, 6, and 12 months of age.
- o *Unvaccinated children who initiate vaccination at 7–23 months of age:* Administer 2 doses, with the second dose at least 12 weeks after the first dose AND after the first birthday.
- o *Children  $\geq 24$  months of age who have not received a complete series:* Administer 2 primary doses at least 8 weeks apart.

**2. MenHibrix**

- o *Children who initiate vaccination at 6 weeks of age:* Administer doses at 2, 4, 6, and 12–15 months of age.
- o If the first dose of MenHibrix is given at or after 12 months of age, a total of 2 doses should be given at least 8 weeks apart to ensure protection against serogroups C and Y meningococcal disease.

**3. Menactra**

- o *Children  $\geq 24$  months of age 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), do not administer Menactra until 2 years of age and at least 4 weeks after the completion of all PCV13 doses.

Meningococcal B vaccines:

**1. Bexsero or Trumenba**

- o Persons  $\geq 10$  years of age who have not received a complete series. Administer a 2-dose series of Bexsero, at least 1 month apart, or a 3-dose series of Trumenba, with the second dose at least 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.

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®):

Meningococcal conjugate ACWY vaccines:

**1. Menveo**

- o *Children who initiate vaccination at 8 weeks of age:* Administer doses at 2, 4, 6, and 12 months of age.
- o *Unvaccinated children who initiate vaccination at 7–23 months of age:* Administer 2 doses, with the second dose at least 12 weeks after the first dose AND after the first birthday.
- o *Children  $\geq 24$  months of age who have not received a complete series:* Administer 2 primary doses at least 8 weeks apart.

**2. MenHibrix**

- o *Children who initiate vaccination 6 weeks of age:* Administer doses at 2, 4, 6, and 12–15 months of age.
- o If the first dose of MenHibrix is given at or after 12 months of age, a total of 2 doses should be given at least 8 weeks apart to ensure protection against serogroups C and Y meningococcal disease.

### 3. Menactra

- o *Children 9–23 months of age:* Administer 2 primary doses at least 12 weeks apart.
- o *Children ≥24 months of age who have not received a complete series:* Administer 2 primary doses at least 8 weeks apart.

#### Meningococcal B vaccines:

##### 1. Bexsero or Trumenba

- o *Persons ≥10 years of age who have not received a complete series.* Administer a 2-dose series of Bexsero, at least 1 month apart, or a 3-dose series of Trumenba, with the second dose at least 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 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 a community outbreak attributable to a vaccine serogroup

- Administer or complete an age- and formulation-appropriate series of MenHibrix, Menactra, Menveo, Bexsero or Trumenba.

For booster doses among persons with high-risk conditions, refer to MMWR 2013;62[RR02]:1–22, available at <http://www.cdc.gov/mmwr/preview/mmwrhtml/rr6202a1.htm>.

For other catch-up recommendations for these persons, and complete information on use of meningococcal vaccines, including guidance related to vaccination of persons at increased risk of infection, see MMWR 2013;62[RR02]:1–22, and MMWR 2015;64[41]: 1171–76, available at <http://www.cdc.gov/mmwr/pdf/rr/rr6202.pdf>, and <http://www.cdc.gov/mmwr/pdf/wk/mm6441.pdf>.

## 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 11–12 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 (preferred during 27–36 weeks' gestation) regardless of time since prior Td or Tdap vaccination.

#### Catch-up vaccination:

- Persons aged ≥7 years who are not fully immunized with DTaP vaccine should receive Tdap vaccine as 1 (preferably the first) dose in the catch-up series; if additional doses are needed, use Td vaccine. For children 7–10 years of age who receive a dose of Tdap as part of the catch-up series, an adolescent Tdap vaccine dose at age 11–12 years should NOT be administered. Td should be administered instead 10 years after the Tdap dose.
- Persons aged 11–18 years who have not received Tdap vaccine should receive a 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 7–10 years these may count as part of the catch-up series. Such a dose may count as the adolescent Tdap dose, or a child can later receive a Tdap booster dose at age 11–12 years.
  - If administered inadvertently to an adolescent aged 11–18 years, a 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 2vHPV [Cervarix], 4vHPV [Gardasil] and 9vHPV [Gardasil 9])

#### Routine vaccination:

- Administer a 3-dose series of HPV vaccine on a schedule of 0, 1–2, and 6 months to all adolescents aged 11–12 years. 9vHPV, 4vHPV or 2vHPV may be used for females, and only 9vHPV or 4vHPV may be used for males.
- The vaccine series may be started at age 9 years.
- Administer the second dose 1 to 2 months after the first dose (minimum interval of 4 weeks); administer the third dose 16 weeks after the second dose (minimum interval of 12 weeks) and 24 weeks after the first dose.

- Administer HPV vaccine beginning at age 9 years to children and youth with any history of sexual abuse or assault who have not initiated or completed the 3-dose series.

Catch-up vaccination:

- Administer the vaccine series to females (2vHPV or 4vHPV or 9vHPV) and males (4vHPV or 9vHPV) at age 13–18 years if not previously vaccinated.
- Use recommended routine dosing intervals (see Routine vaccination above) for vaccine series catch-up.

## Footnotes

For further guidance on the use of the vaccines mentioned below, see: <http://www.cdc.gov/vaccines/hcp/acip-recs/index.html>. For vaccine recommendations for persons  $\geq 19$  years of age, see the Adult Immunization Schedule <http://www.cdc.gov/vaccines/schedules/hcp/adult.html>.

## Additional information:

- For contraindications and precautions to use of a vaccine and for additional information regarding that vaccine, vaccination providers should consult the relevant ACIP statement available online at <http://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 or less before the minimum interval are considered valid. Doses of any vaccine administered  $\geq 5$  days earlier than the minimum interval or minimum age should not be counted as valid doses and should be repeated as age-appropriate. The repeat dose should be spaced after the invalid dose by the recommended minimum interval. For further details, see the General Recommendations on Immunization, MMWR 2011;60[RR02], Table 1. Recommended and minimum ages and intervals between vaccine doses are available online at <http://www.cdc.gov/mmwr/pdf/rr/rr6002.pdf>.
- Information on travel vaccine requirements and recommendations is available at <http://wwwnc.cdc.gov/travel/destinations/list>.
- For vaccination of persons with primary and secondary immunodeficiencies, see Table 13, “Vaccination of persons with primary and secondary immunodeficiencies,” in ACIP’s General Recommendations on Immunization, available at <http://www.cdc.gov/mmwr/pdf/rr/rr6002.pdf>; and American Academy of Pediatrics, “Immunization in Special Clinical Circumstances,” in Kimberlin DW, Brady MT, Jackson MA, Long SS eds. Red Book: 2015 report of the Committee on Infectious Diseases. 30th ed. Elk Grove Village, IL.



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