CDC Immunization Update 2020- Focus on the Schedule

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Disclosures

Dr. Mary Koslap-Petraco has nothing to disclose

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Learning Objectives

- At the end of this presentation the participant will analyze the changes in the 2020 ACIP schedule
- At the end of this presentation the participant will appraise the efficacy of meningitis b vaccine
- At the end of the presentation the participant will evaluate the safety of HPV vaccine
- At the end of the presentation the participant will interpret the changes in *General Best Practices Guidelines for Immunizations*
- At the end of the presentation the participant will examine shared decision making for vaccine administration

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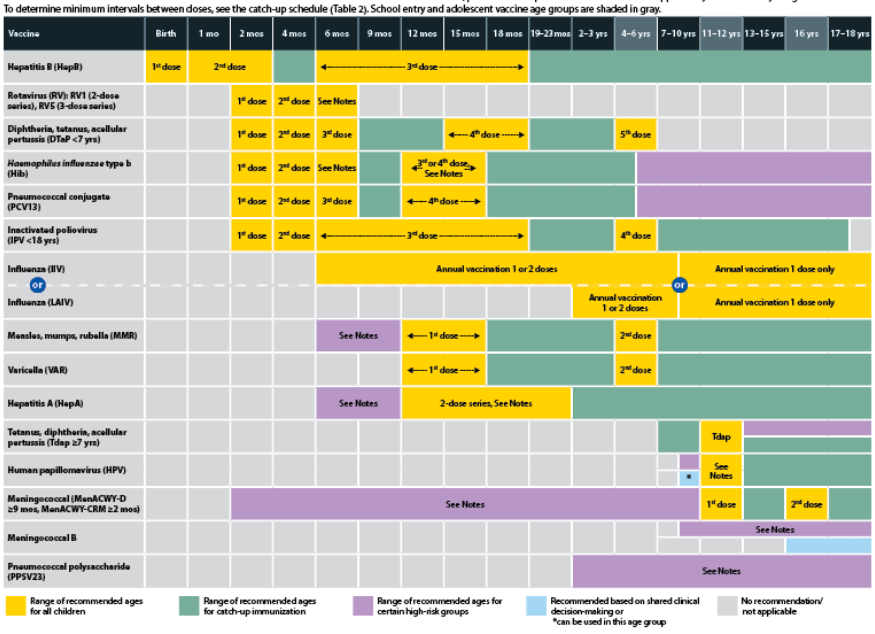
Table 1 Recommended Child and Adolescent Immunization Schedule for ages 18 years or younger, United States, 2020

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



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Helpful Information on Cover Sheet

- Information for reporting vaccine preventable diseases
- Link to Vaccine Adverse Event Reporting System (VAERS)
- Link to complete ACIP recommendations
- Link to *Best Practices*
- Download the CDC Vaccine Schedules app

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Recommended Child and Adolescent Immunization Schedule for ages 18 years or younger — UNITED STATES 2020

Vaccines in the Child and Adolescent Immunization Schedule*

Vaccines	Abbreviations	Trade names
Diphtheria, tetanus, and acellular pertussis vaccine	DTaP	Daptacel® Infanrix®
Diphtheria, tetanus vaccine	DT	No trade name
Haemophilus influenzae type b vaccine	Hib (PRP-T)	ActHIB® Hiberix® PedvaxHIB®
	Hib (PRP-OMP)	
Hepatitis A vaccine	HepA	Havrix® Vaqta®
Hepatitis B vaccine	HepB	Engerix-B® Recombivax HB®
Human papillomavirus vaccine	HPV	Gardasil 9®
Influenza vaccine (inactivated)	IIV	Multiple
Influenza vaccine (live, attenuated)	LAIV	FluMist® Quadrivalent
Measles, mumps, and rubella vaccine	MMR	M-M-R® II
Meningococcal serogroups A, C, W, Y vaccine	MenACWY-D	Menactra®
	MenACWY-CRM	Menveo®
Meningococcal serogroup B vaccine	MenB-4C	Bexsero®
	MenB-FHbp	Trumenba®
Pneumococcal 13-valent conjugate vaccine	PCV13	Prevnar 13®
Pneumococcal 23-valent polysaccharide vaccine	PPSV23	Pneumovax® 23
Poliovirus vaccine (inactivated)	IPV	IPOL®
Rotavirus vaccine	RV1	Rotarix® RotaTeq®
	RV5	
Tetanus, diphtheria, and acellular pertussis vaccine	Tdap	Adacel® Boostrix®
Tetanus and diphtheria vaccine	Td	Tenivac® Tdvax™
Varicella vaccine	VAR	Varivax®
Combination vaccines *(use combination vaccines instead of separate injections when appropriate)*		
DTaP, hepatitis B, and inactivated poliovirus vaccine	DTaP-HepB-IPV	Pediarix®
DTaP, inactivated poliovirus, and *Haemophilus influenzae* type b vaccine	DTaP-IPV/Hib	Pentacel®
DTaP and inactivated poliovirus vaccine	DTaP-IPV	Kinrix® Quadracel®
Measles, mumps, rubella, and varicella vaccine	MMRV	ProQuad®

*Administer recommended vaccines if immunization history is incomplete or unknown. Do not restart or add doses to vaccine series for extended intervals between doses. When a vaccine is not administered at the recommended age, administer at a subsequent visit. The use of trade names is for identification purposes only and does not imply endorsement by the ACIP or CDC.

How to use the child/adolescent immunization schedule

1 Determine recommended vaccine by age **(Table 1)**

2 Determine recommended interval for catch-up vaccination **(Table 2)**

3 Assess need for additional recommended vaccines by medical condition and other indications **(Table 3)**

4 Review vaccine types, frequencies, intervals, and considerations for special situations **(Notes)**

Recommended by the Advisory Committee on Immunization Practices (www.cdc.gov/vaccines/acip) and approved by the Centers for Disease Control and Prevention (www.cdc.gov), American Academy of Pediatrics (www.aap.org), American Academy of Family Physicians (www.aafp.org), American College of Obstetricians and Gynecologists (www.acog.org), and American College of Nurse-Midwives (www.midwife.org).

Report
- Suspected cases of reportable vaccine-preventable diseases or outbreaks to your state or local health department
- Clinically significant adverse events to the Vaccine Adverse Event Reporting System (VAERS) at www.vaers.hhs.gov or 800-822-7967

Download the CDC Vaccine Schedules App for providers at www.cdc.gov/vaccines/schedules/hcp/schedule-app.html

Helpful Information
- Complete ACIP recommendations: www.cdc.gov/vaccines/hcp/acip-recs/index.html
- General Best Practice Guidelines for Immunization: www.cdc.gov/vaccines/hcp/acip-recs/general-recs/index.html
- Outbreak information (including case identification and outbreak response), see Manual for the Surveillance of Vaccine-Preventable Diseases: www.cdc.gov/vaccines/pubs/surv-manual

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

C3310020-A

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Haemophilus Influenza b Vaccine

- The **Hib** note was revised
- Indicates that catch-up vaccination is not recommended for previously unvaccinated children 5 years (60 months) or older
  - Unless they are at high risk.

Notes

Recommended Child and Adolescent Immunization Schedule for ages 18 years or younger, United States, 2020

For vaccine recommendations for persons 19 years of age or older, see the Recommended Adult Immunization Schedule.

Additional Information

- Consult relevant ACIP statements for detailed recommendations at www.cdc.gov/vaccines/hcp/acip-recs/index.html.
- For information on contraindications and precautions for the use of a vaccine, consult the General Best Practice Guidelines for Immunization at www.cdc.gov/vaccines/hcp/acip-recs/general-recs/contraindications.html and relevant ACIP statements at www.cdc.gov/vaccines/hcp/acip-recs/index.html.
- For calculating intervals between doses, 4 weeks = 28 days. Intervals of ≥4 months are determined by calendar months.
- Within a number range (e.g., 12–18), a dash (–) should be read as "through."
- Vaccine doses administered ≤4 days before the minimum age or interval are considered valid. Doses of any vaccine administered ≥5 days earlier than the minimum age or minimum interval should not be counted as valid 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 Table 3-1, Recommended and minimum ages and intervals between vaccine doses, in General Best Practice Guidelines for Immunization at www.cdc.gov/vaccines/hcp/acip-recs/general-recs/timing.html.
- Information on travel vaccine requirements and recommendations is available at www.cdc.gov/travel/.
- For vaccination of persons with immunodeficiencies, see Table 8-1, Vaccination of persons with primary and secondary immunodeficiencies, in General Best Practice Guidelines for Immunization at www.cdc.gov/vaccines/hcp/acip-recs/general-recs/immunocompetence.html, and Immunization in Special Clinical Circumstances (In: Kimberlin DW, Brady MT, Jackson MA, Long SS, eds. *Red Book: 2018 Report of the Committee on Infectious Diseases*. 31st ed. Itasca, IL: American Academy of Pediatrics; 2018:67–111).
- For information regarding vaccination in the setting of a vaccine-preventable disease outbreak, contact your state or local health department.
- The National Vaccine Injury Compensation Program (VICP) is a no-fault alternative to the traditional legal system for resolving vaccine injury claims. All routine child and adolescent vaccines are covered by VICP except for pneumococcal polysaccharide vaccine (PPSV23). For more information, see www.hrsa.gov/vaccinecompensation/index.html.

Diphtheria, tetanus, and pertussis (DTaP) vaccination (minimum age: 6 weeks [4 years for Kinrix or Quadracel])

Routine vaccination

- 5-dose series at 2, 4, 6, 15–18 months, 4–6 years
  - **Prospectively:** Dose 4 may be administered as early as age 12 months if at least 6 months have elapsed since dose 3.
  - **Retrospectively:** A 4th dose that was inadvertently administered as early as 12 months may be counted if at least 4 months have elapsed since dose 3.

Catch-up vaccination

- Dose 5 is not necessary if dose 4 was administered at age 4 years or older and at least 6 months after dose 3.
- For other catch-up guidance, see Table 2.

Haemophilus influenzae type b vaccination (minimum age: 6 weeks)

Routine vaccination

- **ActHIB, Hiberix, or Pentacel:** 4-dose series at 2, 4, 6, 12–15 months
- **PedvaxHIB:** 3-dose series at 2, 4, 12–15 months

Catch-up vaccination

- **Dose 1 at 7–11 months:** Administer dose 2 at least 4 weeks later and dose 3 (final dose) at 12–15 months or 8 weeks after dose 2 (whichever is later).
- **Dose 1 at 12–14 months:** Administer dose 2 (final dose) at least 8 weeks after dose 1.
- **Dose 1 before 12 months and dose 2 before 15 months:** Administer dose 3 (final dose) 8 weeks after dose 2.
- **2 doses of PedvaxHIB before 12 months:** Administer dose 3 (final dose) at 12–59 months and at least 8 weeks after dose 2.
- **Unvaccinated at 15–59 months:** 1 dose
- **Previously unvaccinated children age 60 months or older** who are not considered high risk do not require catch-up vaccination.
- For other catch-up guidance, see Table 2.

Special situations

- **Chemotherapy or radiation treatment:**
  12–59 months
  - Unvaccinated or only 1 dose before age 12 months: 2 doses, 8 weeks apart
  - 2 or more doses before age 12 months: 1 dose at least 8 weeks after previous dose

  Doses administered within 14 days of starting therapy or during therapy should be repeated at least 3 months after therapy completion.
- **Hematopoietic stem cell transplant (HSCT):**
  - 3-dose series 4 weeks apart starting 6 to 12 months after successful transplant, regardless of Hib vaccination history
- **Anatomic or functional asplenia (including sickle cell disease):**
  12–59 months
  - Unvaccinated or only 1 dose before age 12 months: 2 doses, 8 weeks apart
  - 2 or more doses before age 12 months: 1 dose at least 8 weeks after previous dose

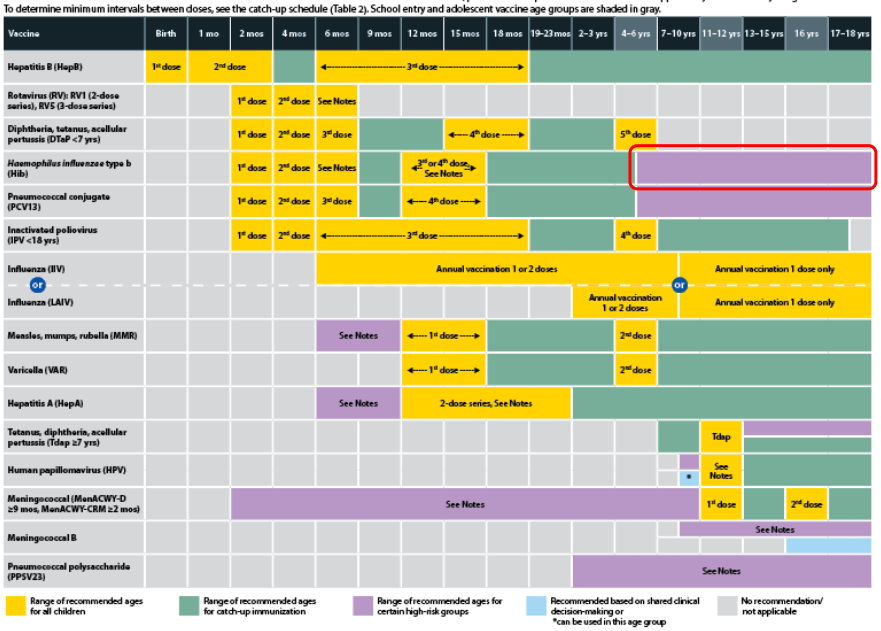
  Unvaccinated persons age 5 years or older*
  - 1 dose
- **Elective splenectomy:**
  Unvaccinated persons age 15 months or older*
  - 1 dose (preferably at least 14 days before procedure)
- **HIV infection:**
  12–59 months
  - Unvaccinated or only 1 dose before age 12 months: 2 doses, 8 weeks apart
  - 2 or more doses before age 12 months: 1 dose at least 8 weeks after previous dose

  Unvaccinated persons age 5–18 years*
  - 1 dose
- **Immunoglobulin deficiency, early component complement deficiency:**
  12–59 months
  - Unvaccinated or only 1 dose before age 12 months: 2 doses, 8 weeks apart
  - 2 or more doses before age 12 months: 1 dose at least 8 weeks after previous dose

**Unvaccinated* = Less than routine series (through 14 months) OR no doses (15 months or older)

Table 1 Recommended Child and Adolescent Immunization Schedule for ages 18 years or younger, United States, 2020

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



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Case Study

- A 5 year old child comes to your office and your review the shot record and you note the child only received one dose of Hib vaccine at age 6 months. What is your course of action for this child.

- A. Do not give any more doses of Hib vaccine. The child is up to date
- B. Give one more dose to complete the series
- C. Give 2 more doses to complete the series
- Answer A Catch up is not recommended for 5 year olds or older unless child is high risk

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Hepatitis A Vaccine

- The **HepA** note revised to recommend catch-up
- All children and adolescents 2 through 18 years of age who have not previously received hepatitis A vaccine
- Should complete a 2-dose series
  - Minimum interval between doses is 6 months

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Notes

Recommended Child and Adolescent Immunization Schedule for ages 18 years or younger, United States, 2020

Hepatitis A vaccination (minimum age: 12 months for routine vaccination)

Routine vaccination

- 2-dose series (minimum interval: 6 months) beginning at age 12 months

Catch-up vaccination

- Unvaccinated persons through 18 years should complete a 2-dose series (minimum interval: 6 months).
- Persons who previously received 1 dose at age 12 months or older should receive dose 2 at least 6 months after dose 1.
- Adolescents 18 years and older may receive the combined HepA and HepB vaccine, **Twinrix***, as a 3-dose series (0, 1, and 6 months) or 4-dose series (0, 7, and 21–30 days, followed by a dose at 12 months).

International travel

- Persons traveling to or working in countries with high or intermediate endemic hepatitis A (www.cdc.gov/travel/):
  - **Infants age 6–11 months:** 1 dose before departure; revaccinate with 2 doses, separated by at least 6 months, between 12 and 23 months of age
  - **Unvaccinated age 12 months and older:** Administer dose 1 as soon as travel is considered.

Hepatitis B vaccination (minimum age: birth)

Birth dose (monovalent HepB vaccine only)

- **Mother is HBsAg-negative:** 1 dose within 24 hours of birth for all medically stable infants ≥2,000 grams. Infants <2,000 grams: Administer 1 dose at chronological age 1 month or hospital discharge.
- **Mother is HBsAg-positive:**
  - Administer **HepB vaccine** and **hepatitis B immune globulin (HBIG)** (in separate limbs) within 12 hours of birth, regardless of birth weight. For infants <2,000 grams, administer 3 additional doses of vaccine (total of 4 doses) beginning at age 1 month.
  - Test for HBsAg and anti-HBs at age 9–12 months. If HepB series is delayed, test 1–2 months after final dose.
- **Mother's HBsAg status is unknown:**
  - Administer **HepB vaccine** within 12 hours of birth, regardless of birth weight.
  - For infants <2,000 grams, administer **HBIG** in addition to HepB vaccine (in separate limbs) within 12 hours of birth. Administer 3 additional doses of vaccine (total of 4 doses) beginning at age 1 month.
  - Determine mother's HBsAg status as soon as possible. If mother is HBsAg-positive, administer **HBIG** to infants ≥2,000 grams as soon as possible, but no later than 7 days of age.

Routine series

- 3-dose series at 0, 1–2, 6–18 months (use monovalent HepB vaccine for doses administered before age 6 weeks)
- Infants who did not receive a birth dose should begin the series as soon as feasible (see Table 2).
- Administration of **4 doses** is permitted when a combination vaccine containing HepB is used after the birth dose.
- **Minimum age** for the final (3rd or 4th) dose: 24 weeks
- **Minimum intervals:** dose 1 to dose 2: 4 weeks / dose 2 to dose 3: 8 weeks / dose 1 to dose 3: 16 weeks (when 4 doses are administered, substitute "dose 4" for "dose 3" in these calculations)

Catch-up vaccination

- Unvaccinated persons should complete a 3-dose series at 0, 1–2, 6 months.
- Adolescents age 11–15 years may use an alternative 2-dose schedule with at least 4 months between doses (adult formulation **Recombivax HB** only).
- Adolescents 18 years and older may receive a 2-dose series of HepB (**Heplisav-B***) at least 4 weeks apart.
- Adolescents 18 years and older may receive the combined HepA and HepB vaccine, **Twinrix**, as a 3-dose series (0, 1, and 6 months) or 4-dose series (0, 7, and 21–30 days, followed by a dose at 12 months).
- For other catch-up guidance, see Table 2.

Special situations

- Revaccination is not generally recommended for persons with a normal immune status who were vaccinated as infants, children, adolescents, or adults.
- **Revaccination** may be recommended for certain populations, including:
  - **Infants born to HBsAg-positive mothers**
  - **Hemodialysis patients**
  - **Other immunocompromised persons**
- For detailed revaccination recommendations, see www.cdc.gov/vaccines/hcp/acip-recs/vacc-specific/hepb.html.

Human papillomavirus vaccination (minimum age: 9 years)

Routine and catch-up vaccination

- HPV vaccination routinely recommended at **age 11–12 years (can start at age 9 years)** and catch-up HPV vaccination recommended for all persons through age 18 years if not adequately vaccinated
- 2- or 3-dose series depending on age at initial vaccination:
  - **Age 9 through 14 years at initial vaccination:** 2-dose series at 0, 6–12 months (minimum interval: 5 months; repeat dose if administered too soon)
  - **Age 15 years or older at initial vaccination:** 3-dose series at 0, 1–2 months, 6 months (minimum intervals: dose 1 to dose 2: 4 weeks / dose 2 to dose 3: 12 weeks / dose 1 to dose 3: 5 months; repeat dose if administered too soon)
- If completed valid vaccination series with any HPV vaccine, no additional doses needed

Special situations

- **Immunocompromising conditions, including HIV infection:** 3-dose series as above
- **History of sexual abuse or assault:** Start at age 9 years.
- **Pregnancy:** HPV vaccination not recommended until after pregnancy; no intervention needed if vaccinated while pregnant; pregnancy testing not needed before vaccination

Influenza vaccination (minimum age: 6 months [IIV], 2 years [LAIV], 18 years [recombinant influenza vaccine, RIV])

Routine vaccination

- Use any influenza vaccine appropriate for age and health status annually:
  - 2 doses, separated by at least 4 weeks, **for children age 6 months–8 years** who have received fewer than 2 influenza vaccine doses before July 1, 2019, or whose influenza vaccination history is unknown (administer dose 2 even if the child turns 9 between receipt of dose 1 and dose 2)
  - 1 dose **for children age 6 months–8 years** who have received at least 2 influenza vaccine doses before July 1, 2019
  - 1 dose **for all persons age 9 years and older**
- For the 2020–21 season, see the 2020–21 ACIP influenza vaccine recommendations.

Special situations

- **Egg allergy, hives only:** Any influenza vaccine appropriate for age and health status annually
- **Egg allergy with symptoms other than hives** (e.g., angioedema, respiratory distress, need for emergency medical services or epinephrine): Any influenza vaccine appropriate for age and health status annually in medical setting under supervision of health care provider who can recognize and manage severe allergic reactions
- **LAIV should not be used** in persons with the following conditions or situations:
  - History of severe allergic reaction to a previous dose of any influenza vaccine or to any vaccine component (excluding egg, see details above)
  - Receiving aspirin or salicylate-containing medications
  - Age 2–4 years with history of asthma or wheezing
  - Immunocompromised due to any cause (including medications and HIV infection)
  - Anatomic or functional asplenia
  - Cochlear implant
  - Cerebrospinal fluid-oropharyngeal communication
  - Close contacts or caregivers of severely immunosuppressed persons who require a protected environment
  - Pregnancy
  - Received influenza antiviral medications within the previous 48 hours

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Table 1 Recommended Child and Adolescent Immunization Schedule for ages 18 years or younger, United States, 2020

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

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 yrs	17–18 yrs
Hepatitis B (HepB)	1st dose	2nd dose			◄---------- 3rd dose ----------►												
Rotavirus (RV): RV1 (2-dose series), RV5 (3-dose series)			1st dose	2nd dose	See Notes												
Diphtheria, tetanus, acellular pertussis (DTaP <7 yrs)			1st dose	2nd dose	3rd dose			◄---- 4th dose ----►				5th dose					
Haemophilus influenzae type b (Hib)			1st dose	2nd dose	See Notes		◄- 3rd or 4th dose, See Notes -►										
Pneumococcal conjugate (PCV13)			1st dose	2nd dose	3rd dose		◄---- 4th dose ----►										
Inactivated poliovirus (IPV <18 yrs)			1st dose	2nd dose	◄---------- 3rd dose ----------►							4th dose					
Influenza (IIV)					Annual vaccination 1 or 2 doses								Annual vaccination 1 dose only				
or													or				
Influenza (LAIV)											Annual vaccination 1 or 2 doses		Annual vaccination 1 dose only				
Measles, mumps, rubella (MMR)					See Notes		◄---- 1st dose ----►					2nd dose					
Varicella (VAR)							◄---- 1st dose ----►					2nd dose					
Hepatitis A (HepA)					See Notes		2-dose series, See Notes										
Tetanus, diphtheria, acellular pertussis (Tdap ≥7 yrs)														Tdap			
Human papillomavirus (HPV)													*	See Notes			
Meningococcal (MenACWY-D ≥9 mos, MenACWY-CRM ≥2 mos)			See Notes											1st dose		2nd dose	
Meningococcal B															See Notes		
Pneumococcal polysaccharide (PPSV23)											See Notes						

Range of recommended ages for all children | Range of recommended ages for catch-up immunization | Range of recommended ages for certain high-risk groups | Recommended based on shared clinical decision-making or *can be used in this age group | No recommendation/ not applicable

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Case Study

- You are caring for an 17 year old adolescent. You notice that the adolescent had one dose of Hepatitis A vaccine at age 11 years. What will you do for this adolescent.
- A. Give nothing. Adolescent is up to date
- B. Start the series again with a dose today
- C. Catch the adolescent up with the second and final dose in the series
- Answer C All children through age 18 should receive catch up Hep A vaccine

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Hepatitis B Vaccine

- The "special situations" section of the **HepB** note contains information regarding:
  - Populations for whom revaccination may be recommended
  - Infants born to hepatitis b positive mothers
  - Hemodialysis patients
  - Other immunocompromised patients
- For detailed revaccination recommendations, please see the HepBMMWRpublications at https://www.cdc.gov/vaccines/hcp/aciprecs/vacc-specific/hepb.html

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Notes Recommended Child and Adolescent Immunization Schedule for ages 18 years or younger, United States, 2020

Hepatitis A vaccination (minimum age: 12 months for routine vaccination)

Routine vaccination
- 2-dose series (minimum interval: 6 months) beginning at age 12 months

Catch-up vaccination
- Unvaccinated persons through 18 years should complete a 2-dose series (minimum interval: 6 months).
- Persons who previously received 1 dose at age 12 months or older should receive dose 2 at least 6 months after dose 1.
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International travel
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Hepatitis B vaccination (minimum age: birth)

Birth dose (monovalent HepB vaccine only)
- **Mother is HBsAg-negative:** 1 dose within 24 hours of birth for all medically stable infants ≥2,000 grams. Infants <2,000 grams: Administer 1 dose at chronological age 1 month or hospital discharge.
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Routine series
- 3-dose series at 0, 1–2, 6–18 months (use monovalent HepB vaccine for doses administered before age 6 weeks)
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Catch-up vaccination
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Special situations
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- **Revaccination** may be recommended for certain populations, including:
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  - **Hemodialysis patients**
  - **Other immunocompromised persons**
- For detailed revaccination recommendations, see www.cdc.gov/vaccines/hcp/acip-recs/vacc-specific/hepb.html

Human papillomavirus vaccination (minimum age: 9 years)

Routine and catch-up vaccination
- HPV vaccination routinely recommended at **age 11–12 years** (**can start at age 9 years**) and catch-up HPV vaccination recommended for all persons through age 18 years if not adequately vaccinated
- 2- or 3-dose series depending on age at initial vaccination:
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- If completed valid vaccination series with any HPV vaccine, no additional doses needed

Special situations
- **Immunocompromising conditions, including HIV infection:** 3-dose series as above
- **History of sexual abuse or assault:** Start at age 9 years.
- **Pregnancy:** HPV vaccination not recommended until after pregnancy; no intervention needed if vaccinated while pregnant; pregnancy testing not needed before vaccination

Influenza vaccination (minimum age: 6 months [IIV], 2 years [LAIV], 18 years [recombinant influenza vaccine, RIV])

Routine vaccination
- Use any influenza vaccine appropriate for age and health status annually:
  - 2 doses, separated by at least 4 weeks, **for children age 6 months–8 years** who have received fewer than 2 influenza vaccine doses before July 1, 2019, or whose influenza vaccination history is unknown (administer dose 2 even if the child turns 9 between receipt of dose 1 and dose 2)
  - 1 dose **for children age 6 months–8 years** who have received at least 2 influenza vaccine doses before July 1, 2019
  - 1 dose **for all persons age 9 years and older**
- For the 2020–21 season, see the 2020–21 ACIP influenza vaccine recommendations.

Special situations
- **Egg allergy, hives only:** Any influenza vaccine appropriate for age and health status annually
- **Egg allergy with symptoms other than hives** (e.g., angioedema, respiratory distress, need for emergency medical services or epinephrine): Any influenza vaccine appropriate for age and health status annually in medical setting under supervision of health care provider who can recognize and manage severe allergic reactions
- **LAIV should not be used** in persons with the following conditions or situations:
  - History of severe allergic reaction to a previous dose of any influenza vaccine or to any vaccine component (excluding egg, see details above)
  - Receiving aspirin or salicylate-containing medications
  - Age 2–4 years with history of asthma or wheezing
  - Immunocompromised due to any cause (including medications and HIV infection)
  - Anatomic or functional asplenia
  - Cochlear implant
  - Cerebrospinal fluid-oropharyngeal communication
  - Close contacts or caregivers of severely immunosuppressed persons who require a protected environment
  - Pregnancy
  - Received influenza antiviral medications within the previous 48 hours

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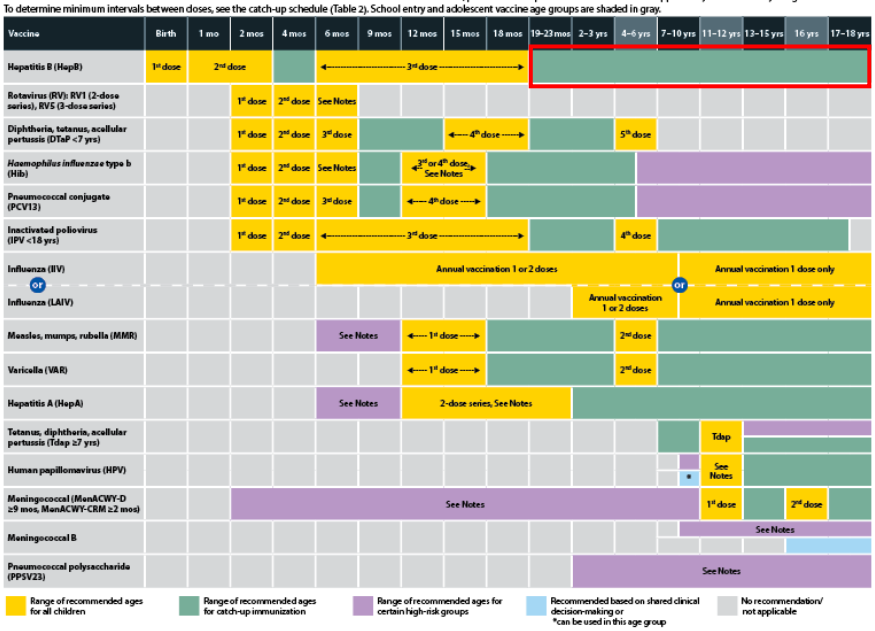
Table 1 Recommended Child and Adolescent Immunization Schedule for ages 18 years or younger, United States, 2020

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



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Case Study

- You are caring for a baby born of a Hepatitis b positive mom. The baby completed the 3 dose Hepatitis b series on time at age 6 months. The baby's titers were checked a month later and you note the baby is still showing positive for hepatitis b infection. What do you do regarding the baby's hepatitis b vaccine status?
- A. Do nothing the baby is fully vaccinated
- B. Repeat the Hepatitis b vaccine series by giving the first dose
- C. Give one dose of Hepatitis b vaccine
- Answer B Repeating the series is appropriate in special situations

Pediatric Nurse Practitioners

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MenACWY Vaccine

- Guidance regarding adolescent vaccination for children who received **MenACWY** prior to age 10 years has been added to the MenACWY note.
- Conditions include
  - Complement component deficiency
  - Compliment inhibitor (i.e. eculizumab, ravulizumab)
  - HIV
  - Asplenia
- Follow booster dose schedule
  - Most recent dose before age 7 years, administer the booster dose 3 years later
  - Most recent dose at age 7 years or older, administer the booster dose 5 years later
  - Administer boosters every 5 years thereafter throughout life;
  - As long as the person remains at increased risk for meningococcal disease

- https://www.cdc.gov/vaccines/vpd/mening/hcp/administering-vaccine.html

MenACWY Vaccine Booster Doses

- Adolescent vaccination of children who received MenACWYprior to age 10 years:
- Children in whom boosters are not recommended due to an ongoing increased risk of meningococcal disease (e.g., a healthy child who traveled to a country where meningococcal disease is endemic)
  - Administer MenACWY according to the recommended adolescent schedule with dose 1 at age 11–12 years and dose 2 at age 16 years

MenACYW Vaccine for High Risk Children

- **DOSING SCHEDULES ARE DIFFERENT FOR MENVEO & MENACTRA**
- **Menveo – Anatomic or functional asplenia(including sickle cell disease), HIV infection, persistent complement component deficiency, persistent complement component deficiency, complement inhibitor (e.g., eculizumab, ravulizumab)**
- Dose 1 at age 8 weeks: 4-dose series at 2, 4, 6, 12 months
- Dose 1 at age 7–23 months: 2-dose series (dose 2 at least 12 weeks after dose 1 and after the 1st birthday)
- Dose 1 at age 24 months or older: 2-dose series at least 8 weeks apart

MenACWY Vaccine for High Risk Children

- **Menactra - Persistent complement component deficiency or complement inhibitor**
- Age 9–23 months: 2 doses at least 12 weeks apart
- Age 24 months or older: 2 doses at least 8 weeks apart
- **Menactra - Anatomic or functional asplenia, sickle cell disease, or HIV infection**
- Age 9–23 months: Not recommended
- 24 months or older: 2 doses at least 8 weeks apart
- Menactra must be administered at least 4 weeks after completion of PCV13 series

Notes — Recommended Child and Adolescent Immunization Schedule for ages 18 years or younger, United States, 2020

Measles, mumps, and rubella vaccination (minimum age: 12 months for routine vaccination)

Routine vaccination
- 2-dose series at 12–15 months, 4–6 years
- Dose 2 may be administered as early as 4 weeks after dose 1.

Catch-up vaccination
- Unvaccinated children and adolescents: 2-dose series at least 4 weeks apart
- The maximum age for use of MMRV is 12 years.

Special situations

International travel
- **Infants age 6–11 months:** 1 dose before departure; revaccinate with 2-dose series with dose 1 at 12–15 months (12 months for children in high-risk areas) and dose 2 as early as 4 weeks later.
- **Unvaccinated children age 12 months and older:** 2-dose series at least 4 weeks apart before departure

Meningococcal serogroup A, C, W, Y vaccination (minimum age: 2 months [MenACWY-CRM, Menveo], 9 months [MenACWY-D, Menactra])

Routine vaccination
- 2-dose series at 11–12 years, 16 years

Catch-up vaccination
- Age 13–15 years: 1 dose now and booster at age 16–18 years (minimum interval: 8 weeks)
- Age 16–18 years: 1 dose

Special situations

Anatomic or functional asplenia (including sickle cell disease), HIV infection, persistent complement component deficiency, complement inhibitor (e.g., eculizumab, ravulizumab) use:
- **Menveo**
  - Dose 1 at age 8 weeks: 4-dose series at 2, 4, 6, 12 months
  - Dose 1 at age 7–23 months: 2-dose series (dose 2 at least 12 weeks after dose 1 and after age 12 months)
  - Dose 1 at age 24 months or older: 2-dose series at least 8 weeks apart
- **Menactra**
  - **Persistent complement component deficiency or complement inhibitor use:**
    - Age 9–23 months: 2-dose series at least 12 weeks apart
    - Age 24 months or older: 2-dose series at least 8 weeks apart
  - **Anatomic or functional asplenia, sickle cell disease, or HIV infection:**
    - Age 9–23 months: Not recommended
    - Age 24 months or older: 2-dose series at least 8 weeks apart
    - **Menactra** must be administered at least 4 weeks after completion of PCV13 series.

Travel in countries with hyperendemic or epidemic meningococcal disease, including countries in the African meningitis belt or during the Hajj (www.cdc.gov/travel):
- Children less than age 24 months:
  - **Menveo (age 2–23 months):**
    - Dose 1 at 8 weeks: 4-dose series at 2, 4, 6, 12 months
    - Dose 1 at 7–23 months: 2-dose series (dose 2 at least 12 weeks after dose 1 and after age 12 months)
  - **Menactra (age 9–23 months):**
    - 2-dose series (dose 2 at least 12 weeks after dose 1; dose 2 may be administered as early as 8 weeks after dose 1 in travelers)
- Children age 2 years or older: 1 dose **Menveo** or **Menactra**

First-year college students who live in residential housing (if not previously vaccinated at age 16 years or older) or military recruits:
- 1 dose **Menveo** or **Menactra**

Adolescent vaccination of children who received MenACWY prior to age 10 years:
- **Children for whom boosters are recommended** because of an ongoing increased risk of meningococcal disease (e.g., those with complement deficiency, HIV, or asplenia): Follow the booster schedule for persons at increased risk (see below).
- **Children for whom boosters are not recommended** (e.g., those who received a single dose for travel to a country where meningococcal disease is endemic): Administer MenACWY according to the recommended adolescent schedule with dose 1 at age 11–12 years and dose 2 at age 16 years.

Note: Menactra should be administered either before or at the same time as DTaP. For MenACWY **booster dose recommendations** for groups listed under "Special situations" and in an outbreak setting and for additional meningococcal vaccination information, see www.cdc.gov/vaccines/hcp/acip-recs/vacc-specific/mening.html.

Meningococcal serogroup B vaccination (minimum age: 10 years [MenB-4C, Bexsero; MenB-FHbp, Trumenba])

Shared clinical decision-making
- **Adolescents not at increased risk** age 16–23 years (preferred age 16–18 years) based on shared clinical decision-making:
  - **Bexsero:** 2-dose series at least 1 month apart
  - **Trumenba:** 2-dose series at least 6 months apart; if dose 2 is administered earlier than 6 months, administer a 3rd dose at least 4 months after dose 2.

Special situations

Anatomic or functional asplenia (including sickle cell disease), persistent complement component deficiency, complement inhibitor (e.g., eculizumab, ravulizumab) use:
- **Bexsero:** 2-dose series at least 1 month apart
- **Trumenba:** 3-dose series at 0, 1–2, 6 months

Bexsero and **Trumenba** are not interchangeable; the same product should be used for all doses in a series.
For MenB **booster dose recommendations** for groups listed under "Special situations" and in an outbreak setting and for additional meningococcal vaccination information, see www.cdc.gov/vaccines/acip/recommendations.html and www.cdc.gov/vaccines/hcp/acip-recs/vacc-specific/mening.html.

Pneumococcal vaccination (minimum age: 6 weeks [PCV13], 2 years [PPSV23])

Routine vaccination with PCV13
- 4-dose series at 2, 4, 6, 12–15 months

Catch-up vaccination with PCV13
- 1 dose for healthy children age 24–59 months with any incomplete* PCV13 series
- For other catch-up guidance, see Table 2.

Special situations

High-risk conditions below: When both PCV13 and PPSV23 are indicated, administer PCV13 first. PCV13 and PPSV23 should not be administered during the same visit.

Chronic heart disease (particularly cyanotic congenital heart disease and cardiac failure), chronic lung disease (including asthma treated with high-dose, oral corticosteroids), diabetes mellitus:

Age 2–5 years
- Any incomplete* series with:
  - 3 PCV13 doses: 1 dose PCV13 (at least 8 weeks after any prior PCV13 dose)
  - Less than 3 PCV13 doses: 2 doses PCV13 (8 weeks after the most recent dose and administered 8 weeks apart)
- No history of PPSV23: 1 dose PPSV23 (at least 8 weeks after any prior PCV13 dose)

Age 6–18 years
- No history of PPSV23: 1 dose PPSV23 (at least 8 weeks after any prior PCV13 dose)

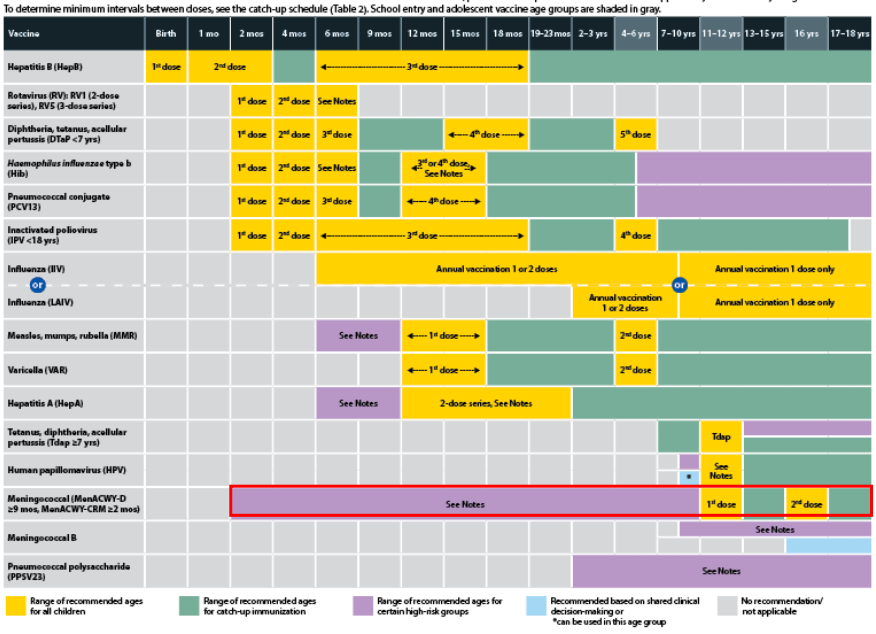
Cerebrospinal fluid leak, cochlear implant:

Age 2–5 years
- Any incomplete* series with:
  - 3 PCV13 doses: 1 dose PCV13 (at least 8 weeks after any prior PCV13 dose)
  - Less than 3 PCV13 doses: 2 doses PCV13 (8 weeks after the most recent dose and administered 8 weeks apart)
- No history of PPSV23: 1 dose PPSV23 (at least 8 weeks after any prior PCV13 dose)

Age 6–18 years
- No history of either PCV13 or PPSV23: 1 dose PCV13, 1 dose PPSV23 at least 8 weeks later
- Any PCV13 but no PPSV23: 1 dose PPSV23 at least 8 weeks after the most recent dose of PCV13
- PPSV23 but no PCV13: 1 dose PCV13 at least 8 weeks after the most recent dose of PPSV23

Table 1 — Recommended Child and Adolescent Immunization Schedule for ages 18 years or younger, United States, 2020

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



Case Study

- You are caring for a 9 year old with sickle cell disease. The child received MCV4 at age 7 years. What do you do regarding other doses of MCV4?
- A. Give another dose at age 12 years
- B. Give another dose now
- C. Give nothing. No further doses are necessary
- Answer A for children immunized at age 7 years or older and are high risk give dose 5 years after previous dose

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Meningitis b Vaccine

- Booster doses are now recommended for persons aged ≥10 years with the following:
  - Complement deficiency
  - Those who use complement inhibitors
  - Persons with asplenia
  - Persons who are microbiologists
  - Persons determined by public health officials to be at increased risk during an outbreak
- **First booster dose should be given 1 year after the primary series**
- **Repeat every 2–3 years as long as the increased risk is present**
- Booster doses are not recommended for healthy adolescents routinely vaccinated with MenB vaccine

https://www.immunize.org/askexperts/experts_meningococcal_b.asp

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Meningitis b Vaccine

- The MenB note has been updated
  - Includes a link to the detailed recommendations For MenB booster dose recommendations for groups listed under “Special situations” and in an outbreak setting
  - For additional meningococcal vaccination information, see www.cdc.gov/vaccines/acip/recommendations.html and www.cdc.gov/vaccines/hcp/acip-recs/vaccspecific/mening.html OR
  - https://www.immunize.org/askexperts/experts_meningococcal_b.asp

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Notes Recommended Child and Adolescent Immunization Schedule for ages 18 years or younger, United States, 2020

Measles, mumps, and rubella vaccination (minimum age: 12 months for routine vaccination)

Routine vaccination
- 2-dose series at 12–15 months, 4–6 years
- Dose 2 may be administered as early as 4 weeks after dose 1.

Catch-up vaccination
- Unvaccinated children and adolescents: 2-dose series at least 4 weeks apart
- The maximum age for use of MMRV is 12 years.

Special situations

International travel
- **Infants age 6–11 months:** 1 dose before departure; revaccinate with 2-dose series with dose 1 at 12–15 months (12 months for children in high-risk areas) and dose 2 as early as 4 weeks later.
- **Unvaccinated children age 12 months and older:** 2-dose series at least 4 weeks apart before departure

Meningococcal serogroup A, C, W, Y vaccination (minimum age: 2 months [MenACWY-CRM, Menveo], 9 months [MenACWY-D, Menactra])

Routine vaccination
- 2-dose series at 11–12 years, 16 years

Catch-up vaccination
- Age 13–15 years: 1 dose now and booster at age 16–18 years (minimum interval: 8 weeks)
- Age 16–18 years: 1 dose

Special situations

Anatomic or functional asplenia (including sickle cell disease), HIV infection, persistent complement component deficiency, complement inhibitor (e.g., eculizumab, ravulizumab) use:
- **Menveo**
  - Dose 1 at age 8 weeks: 4-dose series at 2, 4, 6, 12 months
  - Dose 1 at age 7–23 months: 2-dose series (dose 2 at least 12 weeks after dose 1 and after age 12 months)
  - Dose 1 at age 24 months or older: 2-dose series at least 8 weeks apart
- **Menactra**
  - **Persistent complement component deficiency or complement inhibitor use:**
    - Age 9–23 months: 2-dose series at least 12 weeks apart
    - Age 24 months or older: 2-dose series at least 8 weeks apart
  - **Anatomic or functional asplenia, sickle cell disease, or HIV infection:**
    - Age 9–23 months: Not recommended
    - Age 24 months or older: 2-dose series at least 8 weeks apart
    - **Menactra** must be administered at least 4 weeks after completion of PCV13 series.

Travel in countries with hyperendemic or epidemic meningococcal disease, including countries in the African meningitis belt or during the Hajj (www.cdc.gov/travel/):
- Children less than age 24 months:
  - **Menveo (age 2–23 months):**
    - Dose 1 at 8 weeks: 4-dose series at 2, 4, 6, 12 months
    - Dose 1 at 7–23 months: 2-dose series (dose 2 at least 12 weeks after dose 1 and after age 12 months)
  - **Menactra (age 9–23 months):**
    - 2-dose series (dose 2 at least 12 weeks after dose 1; dose 2 may be administered as early as 8 weeks after dose 1 in travelers)
- Children age 2 years or older: 1 dose **Menveo** or **Menactra**

First-year college students who live in residential housing (if not previously vaccinated at age 16 years or older) or military recruits:
- 1 dose **Menveo** or **Menactra**

Adolescent vaccination of children who received MenACWY prior to age 10 years:
- **Children for whom boosters are recommended** because of an ongoing increased risk of meningococcal disease (e.g., those with complement deficiency, HIV, or asplenia): Follow the booster schedule for persons at increased risk (see below).
- **Children for whom boosters are not recommended** (e.g., those who received a single dose for travel to a country where meningococcal disease is endemic): Administer MenACWY according to the recommended adolescent schedule with dose 1 at age 11–12 years and dose 2 at age 16 years.

Note: Menactra should be administered either before or at the same time as DTaP. For MenACWY **booster dose recommendations** for groups listed under “Special situations” and in an outbreak setting and for additional meningococcal vaccination information, see www.cdc.gov/vaccines/hcp/acip-recs/vacc-specific/mening.html.

Meningococcal serogroup B vaccination (minimum age: 10 years [MenB-4C, Bexsero; MenB-FHbp, Trumenba])

Shared clinical decision-making
- **Adolescents not at increased risk** age 16–23 years (preferred age 16–18 years) based on shared clinical decision-making:
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For MenB **booster dose recommendations** for groups listed under “Special situations” and in an outbreak setting and for additional meningococcal vaccination information, see www.cdc.gov/vaccines/acip/recommendations.html and www.cdc.gov/vaccines/hcp/acip-recs/vacc-specific/mening.html.

Pneumococcal vaccination (minimum age: 6 weeks [PCV13], 2 years [PPSV23])

Routine vaccination with PCV13
- 4-dose series at 2, 4, 6, 12–15 months

Catch-up vaccination with PCV13
- 1 dose for healthy children age 24–59 months with any incomplete[a] PCV13 series
- For other catch-up guidance, see Table 2.

Special situations

High-risk conditions below: When both PCV13 and PPSV23 are indicated, administer PCV13 first. PCV13 and PPSV23 should not be administered during the same visit.

Chronic heart disease (particularly cyanotic congenital heart disease and cardiac failure), chronic lung disease (including asthma treated with high-dose, oral corticosteroids), diabetes mellitus:

Age 2–5 years
- Any incomplete[a] series with:
  - 3 PCV13 doses: 1 dose PCV13 (at least 8 weeks after any prior PCV13 dose)
  - Less than 3 PCV13 doses: 2 doses PCV13 (8 weeks after the most recent dose and administered 8 weeks apart)
- No history of PPSV23: 1 dose PPSV23 (at least 8 weeks after any prior PCV13 dose)

Age 6–18 years
- No history of PPSV23: 1 dose PPSV23 (at least 8 weeks after any prior PCV13 dose)

Cerebrospinal fluid leak, cochlear implant:

Age 2–5 years
- Any incomplete[a] series with:
  - 3 PCV13 doses: 1 dose PCV13 (at least 8 weeks after any prior PCV13 dose)
  - Less than 3 PCV13 doses: 2 doses PCV13 (8 weeks after the most recent dose and administered 8 weeks apart)
- No history of PPSV23: 1 dose PPSV23 (at least 8 weeks after any prior PCV13 dose)

Age 6–18 years
- No history of either PCV13 or PPSV23: 1 dose PCV13, 1 dose PPSV23 at least 8 weeks later
- Any PCV13 but no PPSV23: 1 dose PPSV23 at least 8 weeks after the most recent dose of PCV13
- PPSV23 but no PCV13: 1 dose PCV13 at least 8 weeks after the most recent dose of PPSV23

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Table 1 Recommended Child and Adolescent Immunization Schedule for ages 18 years or younger, United States, 2020

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

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 yrs	17–18 yrs
Hepatitis B (HepB)	1st dose	2nd dose			← 3rd dose →												
Rotavirus (RV): RV1 (2-dose series), RV5 (3-dose series)			1st dose	2nd dose	See Notes												
Diphtheria, tetanus, acellular pertussis (DTaP <7 yrs)			1st dose	2nd dose	3rd dose		← 4th dose →					5th dose					
Haemophilus influenzae type b (Hib)			1st dose	2nd dose	See Notes		3rd or 4th dose, See Notes →										
Pneumococcal conjugate (PCV13)			1st dose	2nd dose	3rd dose		← 4th dose →										
Inactivated poliovirus (IPV <18 yrs)			1st dose	2nd dose	← 3rd dose →							4th dose					
Influenza (IIV)					Annual vaccination 1 or 2 doses								Annual vaccination 1 dose only				
or													or				
Influenza (LAIV)											Annual vaccination 1 or 2 doses		Annual vaccination 1 dose only				
Measles, mumps, rubella (MMR)					See Notes		← 1st dose →					2nd dose					
Varicella (VAR)							← 1st dose →					2nd dose					
Hepatitis A (HepA)					See Notes		2-dose series, See Notes										
Tetanus, diphtheria, acellular pertussis (Tdap ≥7 yrs)														Tdap			
Human papillomavirus (HPV)														See Notes			
Meningococcal (MenACWY-D ≥9 mos, MenACWY-CRM ≥2 mos)			See Notes											1st dose		2nd dose	
Meningococcal B														See Notes			
Pneumococcal polysaccharide (PPSV23)											See Notes						

Range of recommended ages for all children | Range of recommended ages for catch-up immunization | Range of recommended ages for certain high-risk groups | Recommended based on shared clinical decision-making or *can be used in this age group | No recommendation/ not applicable

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Case Study

- You are caring for a 13 year old with asplenia who received a two dose Men b vaccine series one year ago. What is your course of action for this adolescent?
- A. Give nothing. No more doses are indicated
- B. Give another 2 doses separated by 6 months
- C. Give a one dose booster now
- Answer C and give booster every 2-3 years since this is a high risk adolescent

Pediatric Nurse Practitioners

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Meningitis b Vaccine Efficacy

- Study published in *NEJM* evaluated the efficacy of vaccination with the multicomponent meningococcal group B (4CMenB) vaccine for actual versus expected incidence of the disease in young children
  - Results were positive
- Researchers compared the observed incidence of meningococcal group B disease with the expected incidence
  - Based on the incidence during the 4-year prevaccination period in equivalent cohorts
  - They also used disease trends from cohorts of children aged younger than 5 years who were ineligible to get the vaccine

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Meningitis B Vaccine Efficacy

- Incidence of meningococcal disease was significantly lower in the vaccine-eligible cohorts than the expected incidence
  - 63 observed cases compared with 253 expected cases
  - incidence rate ratio, 0.25
  - 95% confidence interval [CI], 0.19-0.36)
- Additionally, there was a 75% reduction of incidence of meningococcal disease in the age groups that were considered fully eligible to receive the vaccine
- Over the course of the 3 years studied, a total of 169 cases of meningococcal group B disease occurred in the vaccine-eligible cohorts and an estimated 277 cases (95% CI, 236-323) were prevented

- Ladhani SN, Andrews N, Parikh SR, et al. Vaccination of infants with meningococcal group B vaccine (4CMenB) in England. *N Engl J Med*. 2020;382(4):309-317

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Meningitis b Efficacy

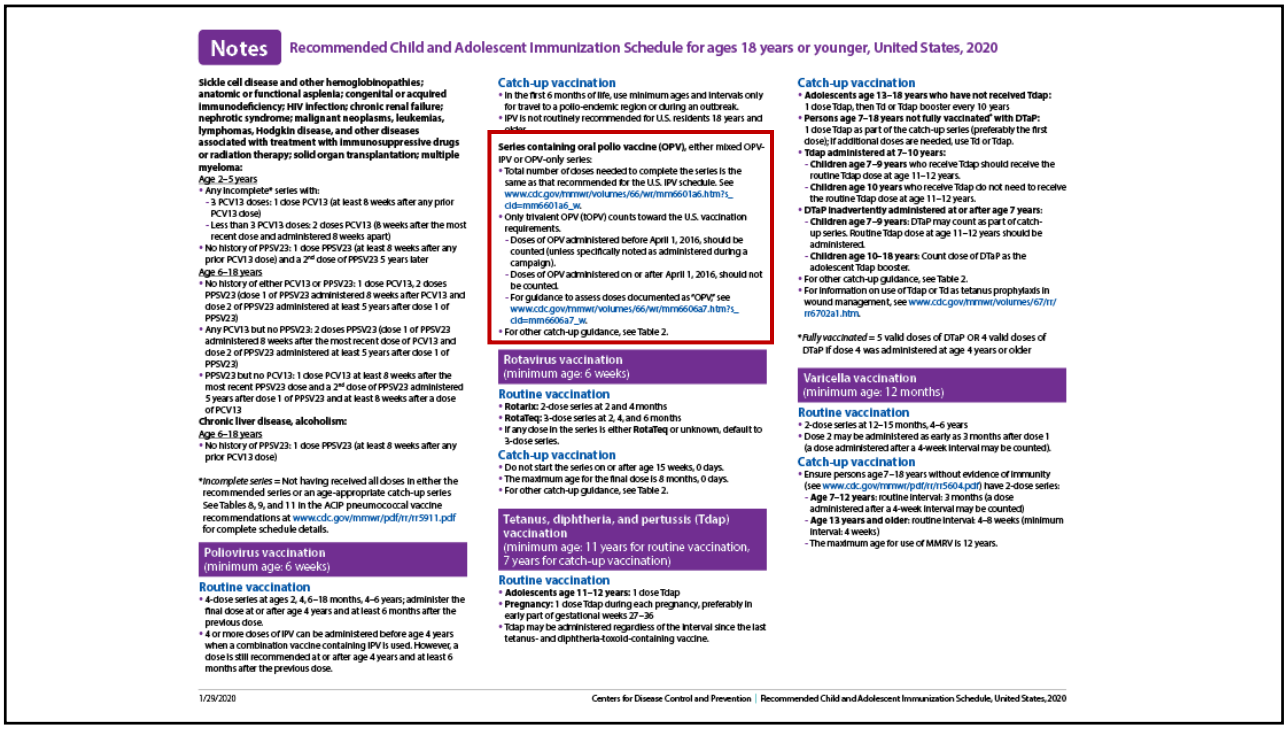
- Concluded that the 4CMenB vaccine had a positive effect against meningococcal group B disease
- Protection from the disease lasted at least 2 years after receiving 3 doses
- Australian study that examined whether the 4CMenB vaccine can build herd immunity in teenagers
  - Results indicated that the vaccine does not, making it even more imperative that children receive the vaccine when they are young.

Ladhani SN, Andrews N, Parikh SR, et al. Vaccination of infants with meningococcal group B vaccine (4CMenB) in England. *N Engl J Med*. 2020;382(4):309-317.

Marshall HS, McMillan M, Koehler AP, et al. Meningococcal B vaccine and meningococcal carriage in adolescents in Australia. *N Engl J Med*. 2020;382(4):318-327.

Polio Vaccine Notes

- Detailed information has been added regarding which OPV doses may be counted toward the U.S. vaccination requirements
- Series containing oral polio vaccine (OPV), either mixed OPV-IPV or OPV-only series:
  - Total number of doses needed to complete the series is the same as that recommended for the U.S. IPV schedule
  - See www.cdc.gov/mmwr/volumes/66/wr/mm6601a6.htm?s
- Only trivalent OPV (tOPV) counts toward the U.S. vaccination requirements
  - Doses of OPV administered before April 1, 2016, should be counted (unless specifically noted as administered during a campaign)
  - Doses of OPV administered on or after April 1, 2016, should not be counted
  - For guidance to assess doses documented as "OPV," see www.cdc.gov/mmwr/volumes/66/wr/mm6606a7.htm?s_cid=mm6606a7_w



Notes — Recommended Child and Adolescent Immunization Schedule for ages 18 years or younger, United States, 2020

Sickle cell disease and other hemoglobinopathies; anatomic or functional asplenia; congenital or acquired immunodeficiency; HIV infection; chronic renal failure; nephrotic syndrome; malignant neoplasms, leukemias, lymphomas, Hodgkin disease, and other diseases associated with treatment with immunosuppressive drugs or radiation therapy; solid organ transplantation; multiple myeloma:

Age 2–5 years
- Any incomplete* series with:
  - 3 PCV13 doses: 1 dose PCV13 (at least 8 weeks after any prior PCV13 dose)
  - Less than 3 PCV13 doses: 2 doses PCV13 (8 weeks after the most recent dose and administered 8 weeks apart)
- No history of PPSV23: 1 dose PPSV23 (at least 8 weeks after any prior PCV13 dose) and a 2nd dose of PPSV23 5 years later

Age 6–18 years
- No history of either PCV13 or PPSV23: 1 dose PCV13, 2 doses PPSV23 (dose 1 of PPSV23 administered 8 weeks after PCV13 and dose 2 of PPSV23 administered at least 5 years after dose 1 of PPSV23)
- Any PCV13 but no PPSV23: 2 doses PPSV23 (dose 1 of PPSV23 administered 8 weeks after the most recent dose of PCV13 and dose 2 of PPSV23 administered at least 5 years after dose 1 of PPSV23)
- PPSV23 but no PCV13: 1 dose PCV13 at least 8 weeks after the most recent PPSV23 dose and a 2nd dose of PPSV23 administered 5 years after dose 1 of PPSV23 and at least 8 weeks after a dose of PCV13

Chronic liver disease, alcoholism:

Age 6–18 years
- No history of PPSV23: 1 dose PPSV23 (at least 8 weeks after any prior PCV13 dose)

**Incomplete series* = Not having received all doses in either the recommended series or an age-appropriate catch-up series See Tables 8, 9, and 11 in the ACIP pneumococcal vaccine recommendations at www.cdc.gov/mmwr/pdf/rr/rr5911.pdf for complete schedule details.

Poliovirus vaccination (minimum age: 6 weeks)

Routine vaccination
- 4-dose series at ages 2, 4, 6–18 months, 4–6 years; administer the final dose at or after age 4 years and at least 6 months after the previous dose.
- 4 or more doses of IPV can be administered before age 4 years when a combination vaccine containing IPV is used. However, a dose is still recommended at or after age 4 years and at least 6 months after the previous dose.

Catch-up vaccination
- In the first 6 months of life, use minimum ages and intervals only for travel to a polio-endemic region or during an outbreak.
- IPV is not routinely recommended for U.S. residents 18 years and older.

Series containing oral polio vaccine (OPV), either mixed OPV-IPV or OPV-only series:
- Total number of doses needed to complete the series is the same as that recommended for the U.S. IPV schedule. See www.cdc.gov/mmwr/volumes/66/wr/mm6601a6.htm?s_cid=mm6601a6_w.
- Only trivalent OPV (tOPV) counts toward the U.S. vaccination requirements.
  - Doses of OPV administered before April 1, 2016, should be counted (unless specifically noted as administered during a campaign).
  - Doses of OPV administered on or after April 1, 2016, should not be counted.
  - For guidance to assess doses documented as "OPV," see www.cdc.gov/mmwr/volumes/66/wr/mm6606a7.htm?s_cid=mm6606a7_w.
- For other catch-up guidance, see Table 2.

Rotavirus vaccination (minimum age: 6 weeks)

Routine vaccination
- **RotaTrix:** 2-dose series at 2 and 4 months
- **RotaTeq:** 3-dose series at 2, 4, and 6 months
- If any dose in the series is either **RotaTeq** or unknown, default to 3-dose series.

Catch-up vaccination
- Do not start the series on or after age 15 weeks, 0 days.
- The maximum age for the final dose is 8 months, 0 days.
- For other catch-up guidance, see Table 2.

Tetanus, diphtheria, and pertussis (Tdap) vaccination (minimum age: 11 years for routine vaccination, 7 years for catch-up vaccination)

Routine vaccination
- **Adolescents age 11–12 years:** 1 dose Tdap
- **Pregnancy:** 1 dose Tdap during each pregnancy, preferably in early part of gestational weeks 27–36
- Tdap may be administered regardless of the interval since the last tetanus- and diphtheria-toxoid-containing vaccine.

Catch-up vaccination
- **Adolescents age 13–18 years who have not received Tdap:** 1 dose Tdap, then Td or Tdap booster every 10 years
- **Persons age 7–18 years not fully vaccinated* with DTaP:** 1 dose Tdap as part of the catch-up series (preferably the first dose); if additional doses are needed, use Td or Tdap.
- **Tdap administered at 7–10 years:**
  - **Children age 7–9 years** who receive Tdap should receive the routine Tdap dose at age 11–12 years.
  - **Children age 10 years** who receive Tdap do not need to receive the routine Tdap dose at age 11–12 years.
- **DTaP inadvertently administered at or after age 7 years:**
  - **Children age 7–9 years:** DTaP may count as part of catch-up series. Routine Tdap dose at age 11–12 years should be administered.
  - **Children age 10–18 years:** Count dose of DTaP as the adolescent Tdap booster.
- For other catch-up guidance, see Table 2.
- For information on use of Tdap or Td as tetanus prophylaxis in wound management, see www.cdc.gov/mmwr/volumes/67/rr/rr6702a1.htm.

**Fully vaccinated* = 5 valid doses of DTaP OR 4 valid doses of DTaP if dose 4 was administered at age 4 years or older

Varicella vaccination (minimum age: 12 months)

Routine vaccination
- 2-dose series at 12–15 months, 4–6 years
- Dose 2 may be administered as early as 3 months after dose 1 (a dose administered after a 4-week interval may be counted).

Catch-up vaccination
- Ensure persons age 7–18 years without evidence of immunity (see www.cdc.gov/mmwr/pdf/rr/rr5604.pdf) have 2-dose series:
  - **Age 7–12 years:** routine interval: 3 months (a dose administered after a 4-week interval may be counted)
  - **Age 13 years and older:** routine interval: 4–8 weeks (minimum interval: 4 weeks)
  - The maximum age for use of MMRV is 12 years.

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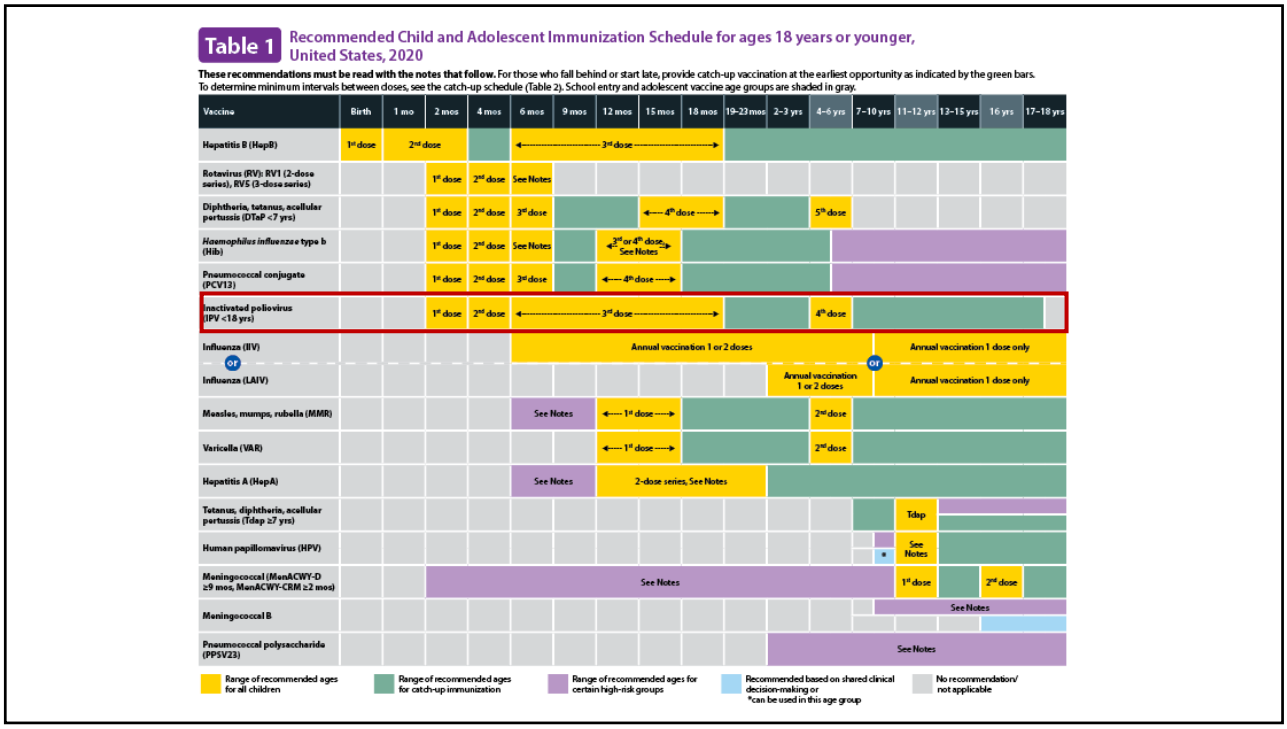

Table 1 — Recommended Child and Adolescent Immunization Schedule for ages 18 years or younger, United States, 2020

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

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 yrs	17–18 yrs
Hepatitis B (HepB)	1st dose	2nd dose			3rd dose												
Rotavirus (RV): RV1 (2-dose series), RV5 (3-dose series)			1st dose	2nd dose	See Notes												
Diphtheria, tetanus, acellular pertussis (DTaP <7 yrs)			1st dose	2nd dose	3rd dose			4th dose				5th dose					
Haemophilus influenzae type b (Hib)			1st dose	2nd dose	See Notes		3rd or 4th dose, See Notes										
Pneumococcal conjugate (PCV13)			1st dose	2nd dose	3rd dose		4th dose										
Inactivated poliovirus (IPV <18 yrs)			1st dose	2nd dose	3rd dose							4th dose					
Influenza (IIV)					Annual vaccination 1 or 2 doses								Annual vaccination 1 dose only				
or													or				
Influenza (LAIV)												Annual vaccination 1 or 2 doses	Annual vaccination 1 dose only				
Measles, mumps, rubella (MMR)					See Notes		1st dose					2nd dose					
Varicella (VAR)							1st dose					2nd dose					
Hepatitis A (HepA)					See Notes		2-dose series, See Notes										
Tetanus, diphtheria, acellular pertussis (Tdap ≥7 yrs)														Tdap			
Human papillomavirus (HPV)													*	See Notes			
Meningococcal (MenACWY-D ≥9 mos, MenACWY-CRM ≥2 mos)			See Notes											1st dose		2nd dose	
Meningococcal B														See Notes			
Pneumococcal polysaccharide (PPSV23)											See Notes						

Range of recommended ages for all children
Range of recommended ages for catch-up immunization
Range of recommended ages for certain high-risk groups
Recommended based on shared clinical decision-making or *can be used in this age group
No recommendation/ not applicable

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Case Study

- You are caring for a 7 year old child who is from Pakistan. The child received 3 doses of OPV. The series was started in July 2016. The doses were administered at 0, 1, and 6 months. What will you do for this child at this visit?
- A. Give nothing since the series was completed
- B. Give IPV at this visit and make an appointment to give another dose in 4 weeks
- C. Give one booster dose at this visit
- Answer B This child will need 3rd dose in series 6 months after 2nd dose. Any OPV vaccine given after 4/1/16 outside US does not count toward US vaccine series

Tdap Vaccine

- The **Tdap** note has been updated to allow **either Td or Tdap**
  - Option for decennial tetanus booster doses and catch-up series doses in persons who have previously received Tdap
- Additionally, the note has been edited to reflect recent updates to the clinical guidance for children 7 through 18 years of age who received doses of Tdap or DTaP at age 7 through 10 years
  - A dose of Tdap or DTaP administered at 10 years of age may now be counted as the adolescent Tdap booster
  - A dose of Tdap or DTaP administered at 7 through 9 years of age should **not** be counted as the adolescent dose and Tdap should be administered at 11–12 years of age
- The DTaP note has been updated to note that dose 5 is not necessary if dose 4 was administered at age 4 years or older AND at least 6 months after dose 3

Notes — Recommended Child and Adolescent Immunization Schedule for ages 18 years or younger, United States, 2020

Sickle cell disease and other hemoglobinopathies; anatomic or functional asplenia; congenital or acquired immunodeficiency; HIV infection; chronic renal failure; nephrotic syndrome; malignant neoplasms, leukemias, lymphomas, Hodgkin disease, and other diseases associated with treatment with immunosuppressive drugs or radiation therapy; solid organ transplantation; multiple myeloma:

Age 2–5 years
- Any incomplete* series with:
  - 3 PCV13 doses: 1 dose PCV13 (at least 8 weeks after any prior PCV13 dose)
  - Less than 3 PCV13 doses: 2 doses PCV13 (8 weeks after the most recent dose and administered 8 weeks apart)
- No history of PPSV23: 1 dose PPSV23 (at least 8 weeks after any prior PCV13 dose) and a 2nd dose of PPSV23 5 years later

Age 6–18 years
- No history of either PCV13 or PPSV23: 1 dose PCV13, 2 doses PPSV23 (dose 1 of PPSV23 administered 8 weeks after PCV13 and dose 2 of PPSV23 administered at least 5 years after dose 1 of PPSV23)
- Any PCV13 but no PPSV23: 2 doses PPSV23 (dose 1 of PPSV23 administered 8 weeks after the most recent dose of PCV13 and dose 2 of PPSV23 administered at least 5 years after dose 1 of PPSV23)
- PPSV23 but no PCV13: 1 dose PCV13 at least 8 weeks after the most recent PPSV23 dose and a 2nd dose of PPSV23 administered 5 years after dose 1 of PPSV23 and at least 8 weeks after a dose of PCV13

Chronic liver disease, alcoholism:

Age 6–18 years
- No history of PPSV23: 1 dose PPSV23 (at least 8 weeks after any prior PCV13 dose)

**Incomplete series* = Not having received all doses in either the recommended series or an age-appropriate catch-up series See Tables 8, 9, and 11 in the ACIP pneumococcal vaccine recommendations at www.cdc.gov/mmwr/pdf/rr/rr5911.pdf for complete schedule details.

Poliovirus vaccination (minimum age: 6 weeks)

Routine vaccination
- 4-dose series at ages 2, 4, 6–18 months, 4–6 years; administer the final dose at or after age 4 years and at least 6 months after the previous dose.
- 4 or more doses of IPV can be administered before age 4 years when a combination vaccine containing IPV is used. However, a dose is still recommended at or after age 4 years and at least 6 months after the previous dose.

Catch-up vaccination
- In the first 6 months of life, use minimum ages and intervals only for travel to a polio-endemic region or during an outbreak.
- IPV is not routinely recommended for U.S. residents 18 years and older.

Series containing oral polio vaccine (OPV), either mixed OPV-IPV or OPV-only series:
- Total number of doses needed to complete the series is the same as that recommended for the U.S. IPV schedule. See www.cdc.gov/mmwr/volumes/66/wr/mm6601a6.htm?s_cid=mm6601a6_w.
- Only trivalent OPV (tOPV) counts toward the U.S. vaccination requirements.
  - Doses of OPV administered before April 1, 2016, should be counted (unless specifically noted as administered during a campaign).
  - Doses of OPV administered on or after April 1, 2016, should not be counted.
  - For guidance to assess doses documented as "OPV," see www.cdc.gov/mmwr/volumes/66/wr/mm6606a7.htm?s_cid=mm6606a7_w.
- For other catch-up guidance, see Table 2.

Rotavirus vaccination (minimum age: 6 weeks)

Routine vaccination
- **Rotarix:** 2-dose series at 2 and 4 months
- **RotaTeq:** 3-dose series at 2, 4, and 6 months
- If any dose in the series is either **RotaTeq** or unknown, default to 3-dose series.

Catch-up vaccination
- Do not start the series on or after age 15 weeks, 0 days.
- The maximum age for the final dose is 8 months, 0 days.
- For other catch-up guidance, see Table 2.

Tetanus, diphtheria, and pertussis (Tdap) vaccination (minimum age: 11 years for routine vaccination, 7 years for catch-up vaccination)

Routine vaccination
- **Adolescents age 11–12 years:** 1 dose Tdap
- **Pregnancy:** 1 dose Tdap during each pregnancy, preferably in early part of gestational weeks 27–36
- Tdap may be administered regardless of the interval since the last tetanus- and diphtheria-toxoid-containing vaccine.

Catch-up vaccination
- **Adolescents age 13–18 years who have not received Tdap:** 1 dose Tdap, then Td or Tdap booster every 10 years
- **Persons age 7–18 years not fully vaccinated* with DTaP:** 1 dose Tdap as part of the catch-up series (preferably the first dose); if additional doses are needed, use Td or Tdap.
- **Tdap administered at 7–10 years:**
  - **Children age 7–9 years** who receive Tdap should receive the routine Tdap dose at age 11–12 years.
  - **Children age 10 years** who receive Tdap do not need to receive the routine Tdap dose at age 11–12 years.
- **DTaP inadvertently administered at or after age 7 years:**
  - **Children age 7–9 years:** DTaP may count as part of catch-up series. Routine Tdap dose at age 11–12 years should be administered.
  - **Children age 10–18 years:** Count dose of DTaP as the adolescent Tdap booster.
- For other catch-up guidance, see Table 2.
- For information on use of Tdap or Td as tetanus prophylaxis in wound management, see www.cdc.gov/mmwr/volumes/67/rr/rr6702a1.htm.

**Fully vaccinated* = 5 valid doses of DTaP OR 4 valid doses of DTaP if dose 4 was administered at age 4 years or older

Varicella vaccination (minimum age: 12 months)

Routine vaccination
- 2-dose series at 12–15 months, 4–6 years
- Dose 2 may be administered as early as 3 months after dose 1 (a dose administered after a 4-week interval may be counted).

Catch-up vaccination
- Ensure persons age 7–18 years without evidence of immunity (see www.cdc.gov/mmwr/pdf/rr/rr5604.pdf) have 2-dose series:
  - **Age 7–12 years:** routine interval: 3 months (a dose administered after a 4-week interval may be counted)
  - **Age 13 years and older:** routine interval: 4–8 weeks (minimum interval: 4 weeks)
  - The maximum age for use of MMRV is 12 years.

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Notes — Recommended Child and Adolescent Immunization Schedule for ages 18 years or younger, United States, 2020

For vaccine recommendations for persons 19 years of age or older, see the Recommended Adult Immunization Schedule.

Additional Information
- Consult relevant ACIP statements for detailed recommendations at www.cdc.gov/vaccines/hcp/acip-recs/index.html.
- For information on contraindications and precautions for the use of a vaccine, consult the General Best Practice Guidelines for Immunization at www.cdc.gov/vaccines/hcp/acip-recs/general-recs/contraindications.html and relevant ACIP statements at www.cdc.gov/vaccines/hcp/acip-recs/index.html.
- For calculating intervals between doses, 4 weeks = 28 days. Intervals of ≥4 months are determined by calendar months.
- Within a number range (e.g., 12–18), a dash (–) should be read as "through."
- Vaccine doses administered ≤4 days before the minimum age or interval are considered valid. Doses of any vaccine administered ≥5 days earlier than the minimum age or minimum interval should not be counted as valid 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 Table 3-1, Recommended and minimum ages and intervals between vaccine doses, in General Best Practice Guidelines for Immunization at www.cdc.gov/vaccines/hcp/acip-recs/general-recs/timing.html.
- Information on travel vaccine requirements and recommendations is available at www.cdc.gov/travel/.
- For vaccination of persons with immunodeficiencies, see Table 8-1, Vaccination of persons with primary and secondary immunodeficiencies, in General Best Practice Guidelines for Immunization at www.cdc.gov/vaccines/hcp/acip-recs/general-recs/immunocompetence.html, and Immunization in Special Clinical Circumstances (In: Kimberlin DW, Brady MT, Jackson MA, Long SS, eds. *Red Book: 2018 Report of the Committee on Infectious Diseases*. 31st ed. Itasca, IL: American Academy of Pediatrics; 2018:67–111).
- For information regarding vaccination in the setting of a vaccine-preventable disease outbreak, contact your state or local health department.
- The National Vaccine Injury Compensation Program (VICP) is a no-fault alternative to the traditional legal system for resolving vaccine injury claims. All routine child and adolescent vaccines are covered by VICP except for pneumococcal polysaccharide vaccine (PPSV23). For more information, see www.hrsa.gov/vaccinecompensation/index.html.

Diphtheria, tetanus, and pertussis (DTaP) vaccination (minimum age: 6 weeks [4 years for Kinrix or Quadracel])

Routine vaccination
- 5-dose series at 2, 4, 6, 15–18 months, 4–6 years
  - **Prospectively:** Dose 4 may be administered as early as age 12 months if at least 6 months have elapsed since dose 3.
  - **Retrospectively:** A 4th dose that was inadvertently administered as early as 12 months may be counted if at least 4 months have elapsed since dose 3.

Catch-up vaccination
- Dose 5 is not necessary if dose 4 was administered at age 4 years or older and at least 6 months after dose 3.
- For other catch-up guidance, see Table 2.

Haemophilus influenzae type b vaccination (minimum age: 6 weeks)

Routine vaccination
- **ActHIB, Hiberix, or Pentacel:** 4-dose series at 2, 4, 6, 12–15 months
- **PedvaxHIB:** 3-dose series at 2, 4, 12–15 months

Catch-up vaccination
- **Dose 1 at 7–11 months:** Administer dose 2 at least 4 weeks later and dose 3 (final dose) at 12–15 months or 8 weeks after dose 2 (whichever is later).
- **Dose 1 at 12–14 months:** Administer dose 2 (final dose) at least 8 weeks after dose 1.
- **Dose 1 before 12 months and dose 2 before 15 months:** Administer dose 3 (final dose) 8 weeks after dose 2.
- **2 doses of PedvaxHIB before 12 months:** Administer dose 3 (final dose) at 12–59 months and at least 8 weeks after dose 2.
- **Unvaccinated at 15–59 months:** 1 dose
- **Previously unvaccinated children age 60 months or older** who are not considered high risk do not require catch-up vaccination.
- For other catch-up guidance, see Table 2.

Special situations
- **Chemotherapy or radiation treatment:**
  12–59 months
  - Unvaccinated or only 1 dose before age 12 months: 2 doses, 8 weeks apart
  - 2 or more doses before age 12 months: 1 dose at least 8 weeks after previous dose

  Doses administered within 14 days of starting therapy or during therapy should be repeated at least 3 months after therapy completion.
- **Hematopoietic stem cell transplant (HSCT):**
  - 3-dose series 4 weeks apart starting 6 to 12 months after successful transplant, regardless of Hib vaccination history
- **Anatomic or functional asplenia (including sickle cell disease):**
  12–59 months
  - Unvaccinated or only 1 dose before age 12 months: 2 doses, 8 weeks apart
  - 2 or more doses before age 12 months: 1 dose at least 8 weeks after previous dose

  Unvaccinated persons age 5 years or older*
  - 1 dose
- **Elective splenectomy:**
  Unvaccinated persons age 15 months or older*
  - 1 dose (preferably at least 14 days before procedure)
- **HIV infection:**
  12–59 months
  - Unvaccinated or only 1 dose before age 12 months: 2 doses, 8 weeks apart
  - 2 or more doses before age 12 months: 1 dose at least 8 weeks after previous dose

  Unvaccinated persons age 5–18 years*
  - 1 dose
- **Immunoglobulin deficiency, early component complement deficiency:**
  12–59 months
  - Unvaccinated or only 1 dose before age 12 months: 2 doses, 8 weeks apart
  - 2 or more doses before age 12 months: 1 dose at least 8 weeks after previous dose

**Unvaccinated* = Less than routine series (through 14 months) OR no doses (15 months or older)

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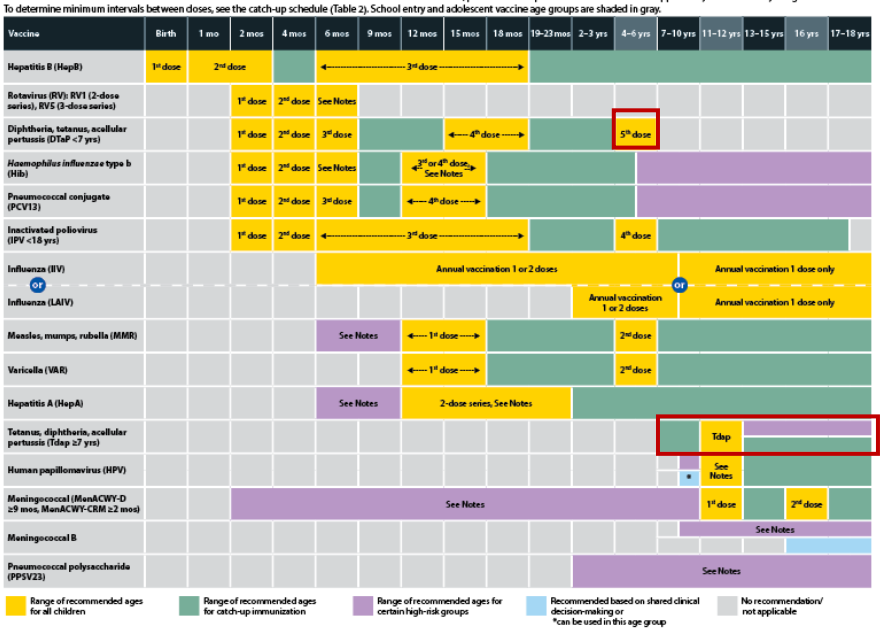
Table 1 Recommended Child and Adolescent Immunization Schedule for ages 18 years or younger, United States, 2020

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



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Case Study

- You are seeing a 11 year old in your office. This adolescent received Tdap at age 10 years. What will you do for this child?
- A. Give another dose of Tdap
- B. Give nothing
- C. Give another dose when the child is 12 years old
- Answer B Child is up to date since Tdap given at age 10 or older is considered the booster dose

Pediatric Nurse Practitioners

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Influenza Preliminary Data as of 3/21/20

- 38 - 54 million flu illnesses
- 18 - 26 million flu medical visits
- 400,000 - 730,000 flu hospitalizations
- 24,000 - 62,000 flu deaths
- 155 Pediatric deaths
- Nationally, influenza A (H1N1) viruses are most common at this time. Previously, influenza B/Victoria viruses predominated nationally

https://www.cdc.gov/flu/weekly/?deliveryName=USCDC_7_3%20-%20DM10907&blm_aid=6801426

Quadrivalent Recombinant Influenza Vaccine

- **Flublok Quadrivalent** recombinant influenza vaccine
- First licensed by the FDA in the United States for use in adults 18 years and older in 2017
- An earlier trivalent version was licensed in 2013
- Quadrivalent version replaces trivalent presentation
- For use in people 18 years of age and older
- Use in people with severe egg allergy

New Influenza Vaccine NanoFlu

- Recombinant quadrivalent seasonal influenza vaccine candidate, adjuvanted with Matrix-M™, for adults **65 years of age and older**
- Phase III clinical trial data showing **recombinant quadrivalent seasonal influenza vaccine** candidate, **NanoFlu**, met all primary endpoints in adults aged 65 and older against Sanofi's Fluzone Quadrivalent
- Improvement over egg-based vaccines, which frequently result in mismatch and poor effectiveness
- Does not require an egg-grown vaccine virus and does not use chicken eggs in the production process
- As a result of the successful data, the company will submit to US Food and Drug Administration (FDA) under the agency's accelerated approval pathway

http://ir.novavax.com/news-releases/news-release-details/novavax-granted-fast-track-designation-nanoflu-older-adults

Benefits & Safety of Recombinant Influenza Vaccine

- Manufacturing process might be faster than that of egg-based vaccines
- Eggs not needed to grow virus so could be faster to produce vaccines
  - Especially in a pandemic
  - Can contain vaccine viruses that cannot be grown in eggs
  - Avoids mutations when viruses are grown in eggs which can limit how well the finished vaccine works
- Safety comparable to that of other injectable influenza vaccines

Universal Influenza Vaccine

- New progress in the development of a universal influenza vaccine candidate, using a novel approach called chimeric hemagglutinin
- Interim results indicate that this is the first human trial able to generate antibodies
- Antibodies will target a different area of the hemagglutinin protein
- Protein binds the influenza virus to target cells different from traditional influenza vaccines
- Adjuvanted inactivated vaccine induced a substantial immunoglobulin G (IgG) antibody response after the prime immunization, with a 7-time increase in anti-H1 stalk titers on day 29
- Additional results rom the study will be available upon completion of the research at the conclusion of 2019

Bernstein, et al. (2019).

Influenza Vaccine Composition 2020-21

- Influenza A (H1N1) component:
  - The egg-based H1N1 vaccine component was updated from an A/Brisbane/02/2018 (H1N1)pdm09-like virus to an A/Guangdong-Maonan/SWL1536/2019 (H1N1)pdm09-like virus.
  - The cell- or recombinant-based H1N1 vaccine component was updated from an A/Brisbane/02/2018 (H1N1)pdm09-like virus to an A/Hawaii/70/2019 (H1N1)pdm09-like virus.
- Influenza A (H3N2) component:
  - The egg-based H3N2 vaccine component was updated from an A/Kansas/14/2017 (H3N2)-like virus to an A/Hong Kong/2671/2019 (H3N2)-like virus.
  - The cell- or recombinant-based H3N2 vaccine component was updated from an A/Kansas/14/2017 (H3N2)-like virus to an A/Hong Kong/45/2019 (H3N2)-like virus.
- Influenza B/Victoria component:
  - The B/Victoria lineage vaccine component was updated from a B/Colorado/06/2017 (B/Victoria lineage)-like virus to a B/Washington/02/2019 (B/Victoria lineage)-like virus.
- Influenza B/Yamagata component:
  - The influenza B/Yamagata lineage vaccine component was not updated. It remains a B/Phuket/3073/2013-like virus (Y3).

Xofluza

- Genentech is seeking approval of Xofluza (baloxavir marboxil) for the treatment of acute uncomplicated influenza in otherwise healthy children aged one to less than 12 years of age who have been symptomatic for no more than 48 hours
- FDA has licensed Xofluza (baloxavir marboxil) as one-dose granules for oral suspension (2 mg/mL)
- More convenient option for children and those who have difficulty swallowing
- The FDA also accepted application for post-exposure prophylaxis of influenza in people one year of age and older for both the oral suspension and currently-available tablet formulation
- FDA is expected to make a decision on these approvals by November 23, 2020
- Shortens course of influenza by 72 hours

https://www.biospace.com/article/releases/fda-accepts-genentech-s-new-drug-application-for-xofluza-for-the-treatment-of-influenza-in-children-/

Human Papilloma Vaccine Safety - AAP

- Two independent safety studies support safety of HPV vaccine
- VAERS received 7244 reports after 9vHPV
  - 31.2% among females
  - 21.6% among males
  - 47.2%, sex was not reported
- Overall, 97.4% of reports were nonserious
- Dizziness, syncope, headache, and injection site reactions were most commonly reported
- Most commonly reported AEs were similar between females and males
- Two reports of death after 9vHPV were verified
  - No information in autopsy reports or death certificates suggested a causal relationship with vaccination
- Approximately 28 million 9vHPV doses were distributed during the study period

Shimabukuro, T., Su, J., Marquez, P.L., Mba-Jonas, A., Arana, J.E., & Cano, M. Safety of the 9-Valent Human Papillomavirus Vaccine. *Pediatrics* Dec 2019, 144 (6) e20191791; **DOI:** 10.1542/peds.2019-1791

Human Papilloma Vaccine Safety - AAP

- No new or unexpected safety concerns or reporting patterns of 9vHPV with clinically important AEs were detected
- Safety profile of 9vHPV is consistent with data from prelicensure trials and from postmarketing safety data of its predecessor, the quadrivalent human papillomavirus vaccine
- Second study near real-time vaccine safety surveillance for 24 months after the vaccine became available in the Vaccine Safety Datalink
- Prespecified adverse events included anaphylaxis, allergic reaction, appendicitis, Guillain-Barré syndrome, chronic inflammatory demyelinating polyneuropathy, injection site reaction, pancreatitis, seizure, stroke, syncope, and venous thromboembolism
- Observed and expected numbers of events after 9vHPV were compared weekly by using sequential methods
- Both historical and concurrent comparison groups were used to identify statistical signals for adverse events
- Unexpected signals were investigated by medical record review and/or additional analyses.

Donahue, J. G., Kieke, B. A., Lewis, E. M., Weintraub, E. S., Hanson, K. E., Mcclure, D. L., … Belongia, E. A. (2019). Near Real-Time Surveillance to Assess the Safety of the 9-Valent Human Papillomavirus Vaccine. *Pediatrics*, *144*(6). doi: 10.1542/peds.2019-1808

Human Papilloma Vaccine Safety - AAP

- During 105 weeks of surveillance, 838 991 doses of 9vHPV were administered
- Identified unexpected statistical signals for 4 adverse events
  - Appendicitis among boys 9 to 17 years old after dose 3
  - Pancreatitis among men 18 to 26 years old
  - Allergic reactions among girls 9 to 17 years old and women 18 to 26 years old after dose 2
- On further evaluation, which included medical record review, temporal scan analysis, and additional epidemiological analysis no signals for any adverse events were confirmed

- Donahue, J. G., Kieke, B. A., Lewis, E. M., Weintraub, E. S., Hanson, K. E., Mcclure, D. L., … Belongia, E. A. (2019). Near Real-Time Surveillance to Assess the Safety of the 9-Valent Human Papillomavirus Vaccine. *Pediatrics*, *144*(6). doi: 10.1542/peds.2019-1808

Human Papilloma Vaccine Safety - AAP

- After 2 years of near real-time surveillance of 9vHPV and several prespecified adverse events, no new safety concerns were identified
- Both of these studies included very large number of subjects
  - 28 million and more than 830,000 respectively
- Such large studies should reassure parents that HPV vaccine is safe for their children

Donahue, J. G., Kieke, B. A., Lewis, E. M., Weintraub, E. S., Hanson, K. E., Mcclure, D. L., … Belongia, E. A. (2019). Near Real-Time Surveillance to Assess the Safety of the 9-Valent Human Papillomavirus Vaccine. *Pediatrics, 144*(6). doi: 10.1542/peds.2019-1808

Shared Clinical Decision Making

- Difference between routine, catch-up, and risk-based recommendations and shared clinical decision-making recommendations
  - Default decision is **to vaccinate**
  - Based on age group or other indication, unless contraindicated
- For shared clinical decision-making
  - **No default**
- Decision about **whether or not to vaccinate**
  - May be informed by the best available evidence of who may benefit from vaccination
  - Individual's characteristics, values, and preferences
  - Health care provider's clinical discretion
  - Characteristics of the vaccine being considered
- There is no prescribed set of considerations or decision points in the decision-making process
- ACIP makes SCDM recommendations when individuals may benefit from vaccination, but broad vaccination of people in that group is unlikely to have population-level impacts

https://www.cdc.gov/vaccines/acip/acip-scdm-faqs.html#scdm

Shared Clinical Decision Making

- Some vaccinations are not recommended for everyone in a particular age group or everyone in an identifiable risk group
- Shared clinical decision-making recommendations are individually based
  - Informed by a decision process between the health care provider and the patient or parent/guardian
- ACIP recommends shared decision making for **Meningococcal B (MenB)** vaccination for adolescents and young adults aged 16–23 years
  - For persons at increased risk of meningococcal b disease
  - Preferably at 16 through 18 years old
- Must get the same brand for all doses
  - MenB-4C (Bexsero) 2-dose series 0 and 1 month
  - MenB-FHbp (Trumenba) 0, 1–2, and 6 months and a 2-dose series (administered at 0 and 6 months)

- https://www.cdc.gov/vaccines/acip/acip-scdm-faqs.html#scdm

Shared Clinical Decision Making

- Those at increased risk for meningitis b include:
  - Persistent complement component deficiencies (including inherited or chronic deficiencies in C3, C5–C9, properdin, factor D, factor H
  - Taking eculizumab [Solaris]
  - Anatomic or functional asplenia (including sickle cell disease)
  - Microbiologists routinely exposed to isolates of Neisseria meningitidis
  - Persons identified as at increased risk because of a serogroup B meningococcal disease outbreak

Patton ME, Stephens D, Moore K, MacNeil JR. Updated Recommendations for Use of MenB-FHbp Serogroup B Meningococcal Vaccine — Advisory Committee on Immunization Practices, 2016. MMWR Morb Mortal Wkly Rep 2017;66:509–513. DOI: http://dx.doi.org/10.15585/mmwr.mm6619a6

YES Vaccine Preventable Diseases ARE Still a Threat!

- As of 4/5/20 **TWELVE Measles** cases were reported to CDC
- According to GAVI measles is the number one worry
- World is preoccupied w COVID-19
- Routine immunization is critical
- Measles outbreak during pandemic will overwhelm already stressed health systems
- World is facing a resurgence of the once all-but-eradicated disease, which is a highly contagious, sometimes fatal viral infection
- Last year marked highest number of measles cases in single year in US since 1992
  - **Total of 1,282 confi**rmed cases
  - **More than 73% of cases were linked to outbreaks in NY affecting under vaccinated communities**
- Measles was declared eliminated in US in 2000
  - Sustained transmission of almost 12 months nearly led to loss of US elimination status

UN News. (2020, March 26) https://news.un.org/en/story/2020/03/1060402

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Measles Outbreak in NY 2018-2019

- What was learned after the outbreak
  - Vaccine hesitancy
  - Targeted anti-vaccine activity and misinformation
  - Multiple importations following large outbreak in Israel
  - Large gatherings
  - Close-knit communities
  - Large families
  - Underreporting and unidentified transmission
  - Families did not always seek medical care
  - Lab testing limitations
- Blima Marcus ANP lead Orthodox Nurses to combat misinformation
  - Parents Educating and Advocating for Children's Health, or PEACH (antivaxx) book vs. PIE (pro vaxx) Parents Informed and Educated book

https://www.cdc.gov/grand-rounds/pp/2020/20200218-measles-elimination-vaccine.html

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YES Vaccine Preventable Diseases ARE Still a Threat!

- A **measles** outbreak in the Congo led to more than twice as many deaths there than the ebola outbreaks that preceded it
- **COVID-19** is forcing parents in vulnerable places across the world to skip routine immunization, and others are opting to wait to vaccinate their children for fear of the vaccine
  - The **Polio Eradication Campaign** has been shut down due to COVID-19
- **Hepatitis A** outbreaks are already spreading in places such a Georgia, USA, with nearly a quarter of the almost 90 cases there requiring hospitalization

https://www.cdc.gov/grand-rounds/pp/2020/20200218-measles-elimination-vaccine.html

SARS-CoV-2 in Children

- Better known as COVID-19
- Some evidence of vertical transmission from study in Wuhan, China
- Neonate born to mother infected with SARS-CoV-2 had elevated levels of IgM and IgG antibodies and abnormal cytokine results 2 hours after birth
  - Suggests newborn was infected in utero
- Children at all ages appeared susceptible
  - No significant gender difference
- Clinical manifestations of children's COVID-19 cases were generally less severe than those of adults' patients
- Young children, particularly infants, were most vulnerable
- Distribution of children's COVID-19 cases varied with time and space
  - Most of the cases concentrated in Hubei province and surrounding areas
- Study provides strong evidence for human-to-human transmission

Dong Y, Mo X, Hu Y, et al. Epidemiological characteristics of 2143 pediatric patients with 2019 coronavirus disease in China. Pediatrics. 2020; doi: 10.1542/peds.2020-0702

SARS-CoV-2 in Children

- Less severe illness may be attributed to
  - Less exposure or sensitivity to COVID-19
  - Different immune response mechanisms
  - Higher levels of antibodies to viruses than in adults due to broader exposures to respiratory infections in winter
- 6% of children were critical
  - Most had underlying medical conditions
  - Infection seems more severe in infants
- 1 child died according to published study results
- **2572** cases documented in children (>18 years) in **US as of 4/2/20**
- 73% had cough, fever, dyspnea
  - 93% of adults had same symptoms
- Children may be asymptomatic and spreading virus

Dong Y, Mo X, Hu Y, et al. Epidemiological characteristics of 2143 pediatric patients with 2019 coronavirus disease in China. Pediatrics. 2020; doi: 10.1542/peds.2020-0702

Pediatric Nurse Practitioners

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SARS-CoV-2 in Children

- Children represent <2% of US cases
- Infants represent 15% of US cases but may be underrepresented
- Median age is 11 years
- Rhinorrhea is slightly more prevalent in children than adults
- **Three** US deaths in children reported
  - Review of cases is ongoing to confirm covid-19 as likely cause of death
- CDC stressed that children with **mild symptoms or asymptomatic cases are likely playing a part in the spread of the virus**

Coronavirus Disease 2019 in Children — United States, February 12–April 2, 2020. MMWR Morb Mortal Wkly Rep. ePub: 6 April 2020. DOI: http://dx.doi.org/10.15585/mmwr.mm6914e4

Pediatric Nurse Practitioners

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Latest on COVID in Children

- U.K. is warning that the coronavirus could be linked to Kawasaki disease
- Kawasaki can develop after influenza or any viral infection
- A number of children diagnosed with COVID-19 died despite having no underlying health issues in U.K.
- Northern Italy reported "extraordinarily large numbers" of children under age 9 with severe cases of what looks to be Kawasaki
- Study not yet published peer review journals
  - Not all of the children studied who had Kawasaki were diagnosed with COVID-19
- COVID-19 can cause just about any symptom and attack any part of the body
  - Particularly the vasculature
  - It causes a lot of inflammation

https://www.cbsnews.com/news/coronavirus-kawasaki-rare-disease-children-pediatrician-dyan-hes/

Latest on COVID in Children

- **64** suspected cased of **pediatric multisystem inflammatory syndrome** being investigated in NY as of 5/5/20
- Syndrome has features which overlap with Kawasaki Disease and Toxic Shock Syndrome.
- Inflammatory markers may be elevated
- Fever and abdominal symptoms may be prominent
- Rash also may be present
- Myocarditis and other cardiovascular changes may be seen
- Some patients have developed cardiogenic or vasogenic shock and required intensive care
- This inflammatory syndrome may occur days to weeks after acute COVID-19 illness
- https://www.health.ny.gov/press/releases/2020/docs/2020-05-06_covid19_pediatric_inflammatory_syndrome.pdf

QUESTION

Which of the following is true of a potential corona virus vaccine

A. It will be easy to manufacture because the US has the genome sequence
B. It will have to be administered every year
C. It will be a one time only vaccine
D. It will be available in a year or less

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Which of the following is true of a potential corona virus vaccine

- ANSWER: C. It will probably be a one-time only vaccine because the virus does not mutate very much

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"Finding a safe and effective vaccine to prevent infection with SARS-CoV-2 is an urgent public health priority," said NIAID Director Anthony S. Fauci, M.D.

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Corona Virus Vaccine

- Only around four to ten genetic differences between the coronavirus strains that have infected Americans and those of the original virus in Wuhan
- 'That's a relatively small number of mutations for having passed through a large number of people,' according to Peter Thielen, a Johns Hopkins molecular geneticist
- The mutation rate of the virus would suggest that the vaccine developed for SARS-CoV-2 would be a single vaccine, rather than a new vaccine every year like the flu vaccine
- A potential coronavirus vaccine would act more like those for the measles or chickenpox, in which one shot grants immunity for a substantial amount of time

https://www.washingtonpost.com/health/the-coronavirus-isnt-mutating-quickly-suggesting-a-vaccine-would-offer-lasting-protection/2020/03/24/406522d6-6dfd-11ea-b148-e4ce3fbd85b5_story.html

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Corona Virus Vaccine

- Dr. Paul Offit, vaccine expert who heads Vaccine Information Center at Children's Hospital of Philadelphia, cautions that a vaccine could be multiple years, not months away
- FDA looks to see that those in vaccinate group of clinical trial have less of targeted disease than those in control group
  - That the vaccine is safe
  - Causes few and mild side effects
- Skepticism in order to temper layperson optimism is OK right now

https://mail.google.com/mail/u/0/#search/karen/FMfcgxwHMZTKShVcZZnlZXxNXgZWBjnG

Candidate Vaccine in Development

- Phase 1 clinical trial evaluating an investigational vaccine designed to protect against coronavirus disease 2019 (COVID-19)
  - at Kaiser Permanente Washington Health Research Institute (KPWHRI) in Seattle
- National Institute of Allergy and Infectious Diseases (NIAID), part of the National Institutes of Health, is funding the trial
- Open-label trial will enroll 45 healthy adult volunteers ages 18 to 55 years over approximately 6 weeks
- The first participant has received the investigational vaccine
- First of multiple steps in the clinical trial process for evaluating the potential benefit of the vaccine

NIH clinical trial of investigational vaccine for COVID-19 begins. (2020, March 16). https://www.nih.gov/news-events/news-releases/nih-clinical-trial-investigational-vaccine-covid-19-begins Retrieved from the web April 28, 2020

Candidate Vaccine in Development

- Study is evaluating different doses of the experimental vaccine for safety and its ability to induce an immune response in participants
- Investigational vaccine was developed using a genetic platform called mRNA (messenger RNA)
- Investigational vaccine directs the body's cells to express a virus protein that it is hoped will elicit a robust immune response
- The mRNA-1273 vaccine has shown promise in animal models
- First trial to examine mRNA vaccine in humans

NIH clinical trial of investigational vaccine for COVID-19 begins. (2020, March 16). https://www.nih.gov/news-events/news-releases/nih-clinical-trial-investigational-vaccine-covid-19-begins Retrieved from the web April 28, 2020

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Other Vaccine in Development

- Old-fashioned formulation consisting of a chemically inactivated version of the virus in development in China
- Tried on an animal model which is first step in vaccine production
- Produced no obvious side effects
- Human trials began on 16 April
- Limitations of the study
  - Number of animals was too small to yield statistically significant results
  - Also raised concerns about the way the stock of novel coronavirus was grown that was used to challenge the animals
    - It may have caused changes that make it less reflective of the virus that infect humans.
- Another concern is that animals do not develop the most severe symptoms that SARS-CoV-2 causes in humans
- Currently 90 vaccine candidates are in development throughout the world

https://www.sciencemag.org/news/2020/04/covid-19-vaccine-protects-monkeys-new-coronavirus-chinese-biotech-reports

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Keep Immunizing in the Face of a Pandemic

- DO NOT FORGET to keep children up to date with routine child health vaccines
- See well children in the morning and sick children in the afternoon
  - Less cross contamination
- Clean all touch surfaces after sick children leave
- Separating patients spatially, such as by placing patients with sick visits in different areas of the clinic or another location from patients with well visits
- Collaborating with providers in the community to identify separate locations for holding well visits for children
- **Prioritize newborn care and vaccination of infants and young children (through 24 months of age) when possible**
  - Drive up appointments

Coronavirus Disease 2019 in Children — United States, February 12–April 2, 2020. MMWR Morb Mortal Wkly Rep. ePub: 6 April 2020. DOI: http://dx.doi.org/10.15585/mmwr.mm6914e4

https://www.cdc.gov/coronavirus/2019-ncov/hcp/pediatric-hcp.html?deliveryName=USCDC_2070-DM25408

COVID Hoax Conspiracy Theories

- Anti-vaxxers and other conspiracy theorists are promoting the idea that the pandemic is a hoax because they have **video proof** that hospitals are empty and not overrun right now

  The facts:
  Most laypeople, especially those who have had elective and non-emergent surgeries canceled, understand that none of this is part of a hoax or a conspiracy
- **Canceling non-essential procedures** frees up workers and hospital beds in preparation for a surge of critical COVID-19 patients.

  In the meantime, **hospitals in hotspots** such as New York City are being overrun by the very real COVID-19

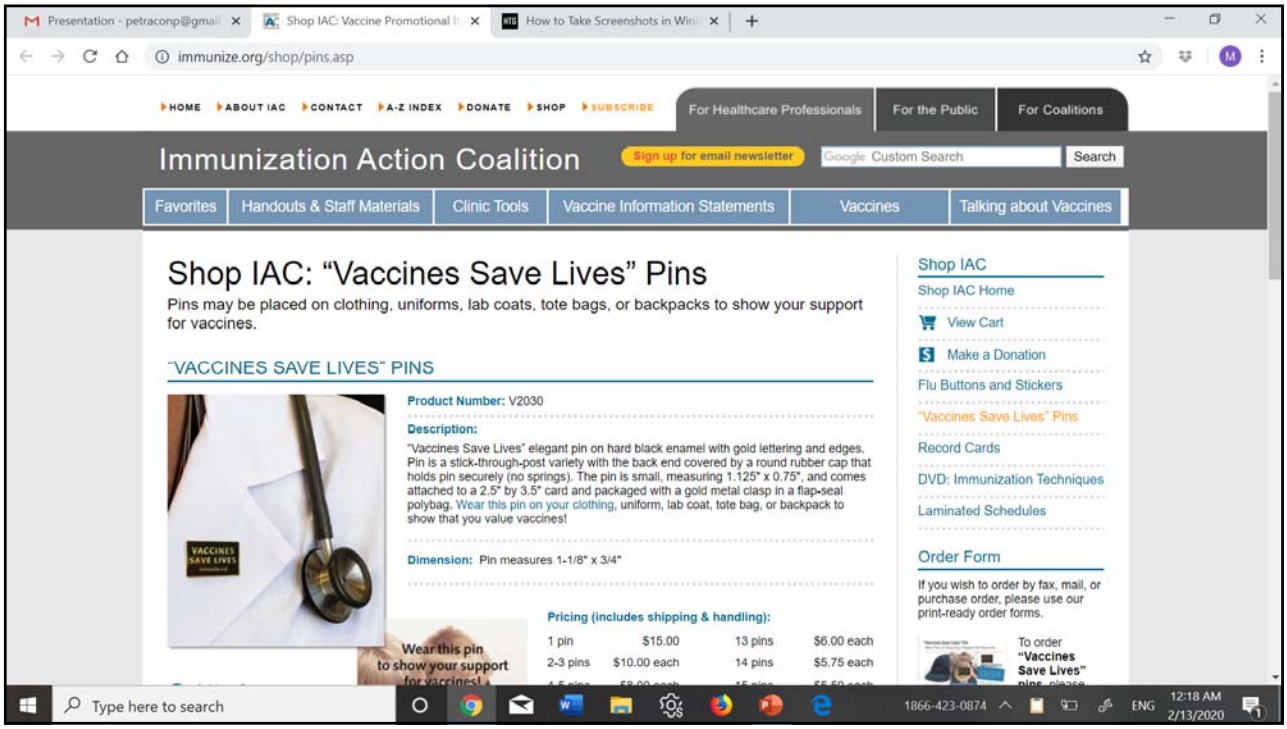
Voices for Vaccines. (April 4, 2020). *This week in vaccine hesitancy.* https://mail.google.com/mail/u/0/#search/karen/FMfcgxwHMZTKShVcZZnlZXxNXgZWBjnG Retrieved from the web April 4, 2020Information

General Best Practices Updates Published 2/21/20

- PAGE 23 [38 pages]
  Timing and Spacing of Immunobiologics
  The recommendation was changed to allow providers to administer a dose of live, injectable vaccine even if the interval after an antibody-containing blood product is not complete. The dose should be invalidated and repeated. Serology is no longer recommended to ascertain whether the dose provided protection.
- PAGE 39 [38 pages]
  Timing and Spacing of Immunobiologics
  Table 3-5 Footnotes
  The specific source material for understanding antibody quantities in antibody products is now listed. Also listed is the process for determining how to calculate the interval between antibody product and live, injectable vaccine, based on the quantity of antibody in the product.
- https://www.cdc.gov/vaccines/hcp/acip-recs/general-recs/general-recs-errata.html

General Best Practices Update Published 2/21/20

- PAGE 55 [19 pages]
  Contraindications and Precautions
  Table 4-1
  A footnote is placed after HPV vaccine to clarify that HPV vaccine is not recommended during pregnancy.
- PAGE 115 [6 pages]
  Storage and Handling of Immunobiologics
  For response to out-of-range temperature readings, if a non-live vaccine is administered and then found out to have been stored at a deviated temperature, the dose should be repeated and does not need to wait an interval from the invalid dose. Shingrix is a non-live vaccine, this dose needs to be repeated and does need to wait 4 weeks after the invalid dose.
- https://www.cdc.gov/vaccines/hcp/acip-recs/general-recs/general-recs-errata.html



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IMMUNIZE

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Immunization Action Coalition's Honor Roll for Patient Safety

https://www.immunize.org/honor-roll/influenza-mandates/

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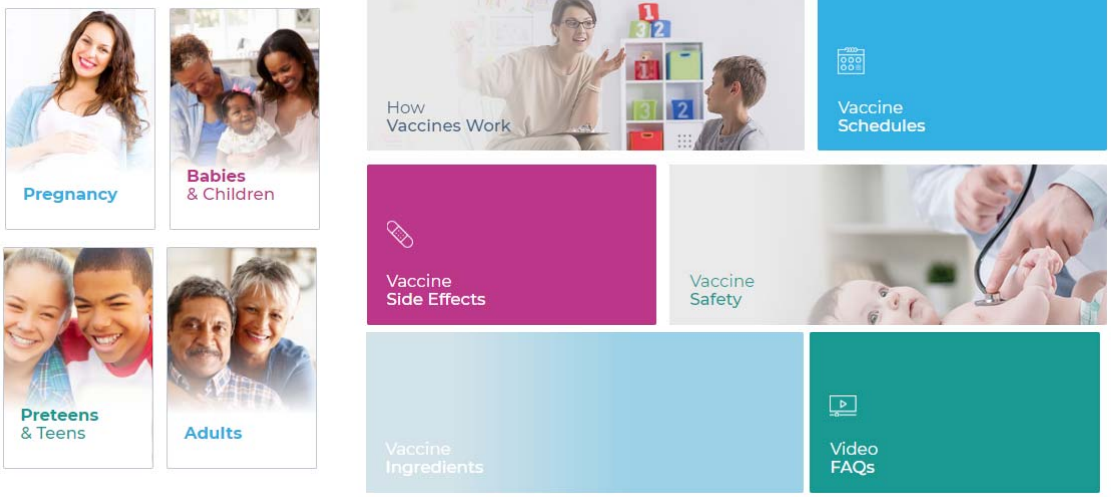
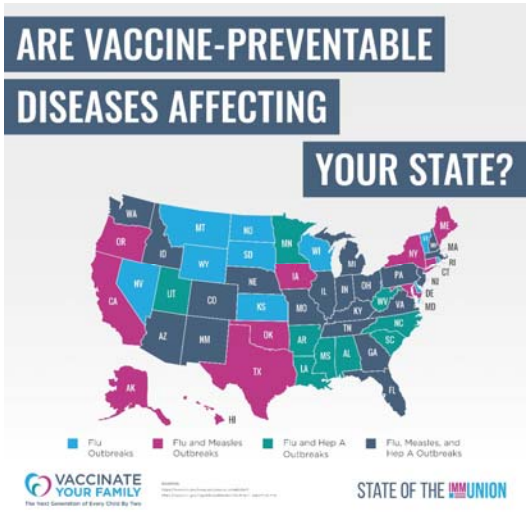
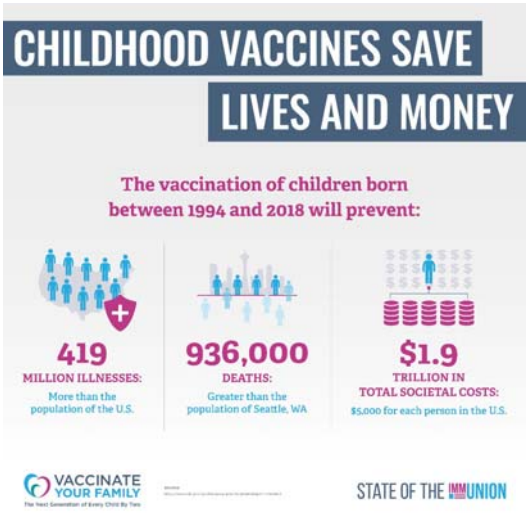
Vaccinate Your Family (VYF) has Information by Age, FAQs



80

VYF Released its 2020 *State of the ImmUnion* Report





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You Can Find VYF Online and on Social Media

VACCINATE YOUR FAMILY
The Next Generation of Every Child By Two

Website: Vaccinateyourfamily.org
Blog: Shotofprevention.com
Facebook: Vaccinate Your Family
Twitter: @Vaxyourfam
Instagram: Vaccinate Your Family
YouTube: Vaccinate Your Family

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- Please stay safe everyone and thank you for all you do for the children and their families!!