Immunizations for Preventable Diseases in Adults and Adolescents **Living** with HIV

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Overview

The Advisory Committee on Immunization Practices (ACIP) recommends immunizing people with HIV similarly to the general population with a few key exceptions:

- Many live virus vaccines are contraindicated in people with HIV.
  - For any CD4 T lymphocyte (CD4) cell count
    - Live attenuated influenza (LAIV)
  - For CD4 count <200 cells/mm^3 or uncontrolled HIV
    - Measles
    - Mumps
    - Rubella
    - Varicella (VAR)
    - Live attenuated typhoid Ty21a
    - Yellow fever
- The following have specific recommendations related to HIV status:
  - COVID-19
  - Hepatitis A (HAV)
  - Hepatitis B (HBV)
  - Meningococcus serogroup A, C, W, Y (MenACWY)
  - Pneumococcal vaccine

The National Institutes of Health (NIH)/Infectious Diseases Society of America (IDSA)/Centers for Disease Control and Prevention (CDC) recommendations described here may differ from ACIP recommendations when the committees interpret data differently or when one guideline has been updated more recently than the other.

Specific Immunizations

COVID-19 Vaccine

Whether people with HIV are at greater risk of acquiring SARS-CoV-2 infection is currently unknown. Data are emerging on the clinical outcomes of COVID-19 in people with HIV.

Worse outcomes for patients with HIV and COVID-19, including high COVID-19 mortality rates have been reported in cohort studies from the United States, the United Kingdom, and South Africa.[1-10] HIV was independently associated with an increased risk of severe and critical COVID-19 in a large trial from the World Health Organization's Global Clinical Platform that included data from 24

countries.[1] In a multicenter cohort study of 286 patients with HIV and COVID-19 in the United States, lower CD4 T lymphocyte (CD4) cell counts (i.e., <200 cells/mm^3) were associated with a higher risk for the composite endpoint of intensive care unit (ICU) admission, invasive mechanical ventilation, or death. This increased risk was observed even in patients who had achieved virologic suppression of HIV.[2]

Individuals ages 5 and older should be vaccinated for COVID-19 regardless of their CD4 count or HIV viral load.[11,12] Those with severe immunosuppression may have a diminished immune response to the vaccine.[12,13] Routine serologic testing following vaccination is not recommended.[14]

COVID-19 is a rapidly evolving situation. For current COVID-19 vaccination recommendations please visit CDC.gov.

Note: People with advanced or untreated HIV are considered moderately or severely immunocompromised. Advanced HIV is defined as people with CD4 counts <200 cells/mm^3, a history of an AIDS-defining illness without immune reconstitution, or clinical manifestations of symptomatic HIV. Further information is available in the NIH COVID-19 Treatment Guidelines.

Hepatitis A Vaccine

See the "Hepatitis A virus (HAV)" section in the table below for detailed guidance for immunization against HAV.

Summary of Recommendations

For vaccination

- Administer a two-dose series (dosing interval depends on the vaccine used: at 0 and 6–12 months for Havrix® or 0 and 6–18 months for Vaqta®) of single-antigen hepatitis A vaccine (HepA) or a three-dose series (0, 1, and 6 months) of the combined hepatitis A and hepatitis B vaccine (HepA-HepB, Twinrix®) to any person without evidence of immunity to HAV (and for the combined vaccine, without evidence of immunity to HAV or HBV) **(AIII).**
- For travelers, some clinicians recommend a four-dose accelerated regimen (days 0, 7, 21–30 days, and 12 months) of HepA-HepB **(AIII).**
- Assess antibody response 1 to 2 months after completion of the series. If negative, revaccinate when CD4 count is >200 cells/mm^3 **(BIII).**
- People with HIV presenting with CD4 cell count <200 cells/mm^3 with ongoing risk for HAV should be immunized and assessed for antibody response 1 to 2 months after completion of the series. For people with HIV without risk factors, waiting for CD4 >200 cells/mm^3 is an option. Assess antibody response 1 to 2 months after completion of the series. If negative, revaccinate when CD4 cell counts are >200 cells/mm^3 **(BIII).**

For pre-exposure prophylaxis (travel)

- For people with HIV who are non-immune and are traveling within 2 weeks to countries with endemic HAV, consider administering immunoglobulin G (IgG) 0.1 mL/kg if duration of travel is <1 month. If duration of travel is 1 to 2 months, then administer IgG 0.2 mL/kg. If duration of travel is ≥2 months, IgG 0.2 mL/kg should be repeated every 2 months.

For post-exposure prophylaxis

- For people with HIV who are non-immune, administer HAV vaccine and IgG 0.1 mL/kg simultaneously in different anatomical sites as soon as possible, ideally within 2 weeks of exposure.

Hepatitis B Vaccine

See the "Preventing Disease" section in Hepatitis B Virus (HBV) Infection for detailed guidance for immunization against HBV, as well as the evidence summary.

Summary of Recommendations

For vaccination

- For people with HIV who are non-immune to HBV (surface antibody titer negative) and do not have chronic HBV infection (surface antigen negative), administer a double dose, three-dose series of recombinant hepatitis B vaccine (Engerix® 40 mcg or Recombivax® 20 mcg) **(AII).**
- A two-dose (0 and 1 month) recombinant hepatitis B vaccine that uses a toll-like receptor 9 immunostimulatory adjuvant (HepBCpG, Heplisav-B®) can also be used. Observational data in individuals with HIV suggest superior response rates. A randomized controlled trial of Heplisav-B in people with HIV is enrolling currently. If a two-dose vaccine is preferred, Heplisav-B® is an option for vaccinating people with HIV **(CIII).**
- Anti-HBs should be obtained 1 to 2 months after completion of the vaccine series. People with anti-HBs ≥10 mIU/mL are vaccine responders.
- Because of waning immunity, some experts would check anti-HBs annually and would give a booster dose if levels fall below 10mIU/mL, particularly if patients have on going risk factors for acquiring HBV and are not receiving tenofovir.
- For people with HIV who do not respond to a complete HepB vaccination series—
  - Revaccinate with a second double dose, three-dose vaccine series of recombinant hepatitis B vaccine **(BIII).** Some experts consider that a double dose, four-dose vaccine series of recombinant hepatitis B vaccine (Engerix-B® 40 mcg or Recombivax® 20 mcg at 0, 1, 2, and 6 months) may produce a better immunologic response but this approach has not been demonstrated to be superior to a double-dose three-dose series; *or*
  - Two-dose series of HepBCpG (Heplisav-B®).
  - For people with low CD4 count at the time of first vaccination series, some experts might delay revaccination until after the CD4 count is ≥200 cells/mm^3 **(CIII).**
- For individuals with isolated hepatitis B core antibody (anti-HBc), vaccinate with one standard dose of HBV vaccine **(BII)** and check anti-HBs titers 1 to 2 months afterward **(BII).** If the anti-HBs titer is ≥100 IU/mL, no further vaccination is needed. If the titer is <100 IU/mL, then complete another series of HBV vaccine (double dose) followed by anti-HBs testing **(BII).** If titers are not available, then give a complete vaccine series followed by anti-HBs testing **(BII).**

For post-exposure prophylaxis

- For exposed people who have been vaccinated previously with a complete HepB vaccine series and have documented antibody response, no additional vaccine is needed.
- For exposed people who have received a complete HepB vaccine series without documentation of antibody response, administer a single dose of HepB vaccine.
- For exposed people who have not received any HepB vaccine or have not received a complete HepB vaccine series, administer/complete HepB vaccine series and administer one dose of hepatitis B immune globulin (HBIG) at a separate anatomical site as soon as possible after exposure (ideally within 24 hours, but up to 7 days after percutaneous exposure and up to 14 days after sexual exposure).
- For exposed non-immune people with HIV on tenofovir or lamivudine, HBIG may not be necessary.

Human Papillomavirus Vaccine

See the "HPV Vaccine" section in Human Papillomavirus (HPV) Disease for detailed guidance for immunization against HPV, as well as the evidence summary.

Summary of Recommendations

- Routine HPV vaccination is recommended for people with HIV. Ideally, the series should be initiated at age 11 or 12 years but may be started as early as age 9 years. For all people with HIV aged 13 to 26 years who were not vaccinated previously, regardless of gender, administer three doses of the recombinant HPV nonavalent vaccine (Gardasil®9) at 0, 1 to 2, and 6 months **(AIII).** The two-dose series is **not recommended** in people with HIV.
- For people with HIV aged 27 to 45 years not adequately vaccinated previously, HPV vaccine is not routinely recommended; instead, shared clinical decision-making regarding HPV vaccination is recommended.
- At present, vaccination with commercially available HPV vaccine is **not recommended** during pregnancy **(CIII).**
- For people who have completed a vaccination series with the recombinant HPV bivalent or quadrivalent vaccine, some experts would consider additional vaccination with recombinant HPV nonavalent vaccine, but data are lacking to define the efficacy and cost-effectiveness of this approach **(CIII).**

Influenza Vaccine

Summary of Recommendations[15]

- For all adults and adolescents with HIV, administer age-appropriate inactivated influenza vaccine or recombinant influenza vaccine annually **(AI).**
- For pregnant individuals with HIV, administer inactivated influenza or recombinant vaccine at any time during pregnancy **(AI).**

- The live attenuated influenza vaccine (LAIV) administered via nasal spray **is contraindicated** in people with HIV **(AIII).**
- High-dose and adjuvanted influenza vaccines are recommended for people with HIV aged 65 years or older over standard-dose unadjuvanted vaccines **(AII).**

Evidence Summary

Influenza is a common respiratory disease in adults and adolescents. Annual epidemics of seasonal influenza typically occur in the United States between October and April. Influenza A and B are most frequently implicated in human epidemics. Influenza A viruses are categorized into subtypes based on characterization of two surface antigens: hemagglutinin (HA) and neuraminidase (NA). Although vaccine-induced immunity to the surface antigens HA and NA reduces the likelihood of infection,[16,17] the frequent emergence of antigenic variants through antigenic drift[18] (i.e., point mutations and recombination events within a subtype) is the virologic basis for seasonal epidemics and necessitates revaccination each season.[19]

Some studies of influenza have noted higher hospitalization rates[20-23] and increased mortality[23,24] among people with HIV; however, these findings have not been observed in all settings.[25] Increased morbidity may be greatest for people with HIV not on antiretrovirals (ARV) or with advanced disease. People with HIV are at high risk of serious influenza-related complications. For more information, see the CDC's webpage on Flu & People Living with HIV.

In general, people with HIV with minimal AIDS-related symptoms and normal or near-normal CD4 counts who receive inactivated influenza vaccine (IIV) develop adequate antibody responses.[26-28] Among people with low CD4 counts or who have advanced HIV disease, IIV might not induce protective antibody titers.[28-30] In one study, markers of inflammation in older people (≥60 years) with HIV were associated with lower post-vaccination influenza antibody titers.[31] In people with HIV, a second dose of vaccine does not improve immune response,[29,32] and intradermal influenza vaccine dosing did not improve the immune response compared with intramuscular dosing.[33]

Two clinical studies have evaluated influenza vaccine efficacy in people with HIV. In an investigation of an influenza A outbreak at a residential facility for people with HIV,[20] vaccination was most effective at preventing influenza-like illness among people with >100 CD4 cells/mm^3 and among those with HIV RNA <30,000 copies/mL. In a randomized placebo-controlled trial conducted in South Africa among 506 individuals with HIV, including 349 people on ARV treatment and 157 who were ARV treatment-naive, efficacy of trivalent IIV for prevention of culture- or RT-PCR–confirmed influenza illness was 75 percent (95% confidence interval, 9% to 96%).[34]

Several clinical studies also have evaluated the immunogenicity of influenza vaccine in people with HIV. In a randomized study[35] comparing the immunogenicity of high-dose (60 µg of antigen per strain) versus standard-dose (15 µg of antigen per strain) trivalent IIV among 195 adults with HIV aged ≥18 years (10% of whom had CD4 counts <200 cells/mm^3), seroprotection rates were higher in the high-dose group for influenza A (96% versus 87%; $P = 0.029$) and influenza B (91% versus 80%; $P = 0.030$). However, in a comparative study of 41 children and young adults aged 3 to 21 years with cancer or HIV, high-dose trivalent IIV was no more immunogenic than the standard dose among the recipients with HIV.[36]

Optimally, influenza vaccination should occur before onset of influenza activity in the community because it takes about 2 weeks after vaccination for protective antibodies to develop.[15] Health care

providers should offer vaccination by the end of October if possible, and vaccination should continue to be offered as long as influenza viruses are circulating.

Although booster doses can make the influenza vaccine more effective, that benefit is limited to specific groups, such as solid-organ transplant recipients.[37] One study in people with HIV assessed the effectiveness of a two-dose regimen of IIV and found that the second dose of vaccine did not significantly increase the frequency or magnitude of antibody responses.[32] Based on this study, influenza booster immunizations are **not recommended** for people with HIV.

Many licensed injectable influenza vaccine options are available, with no recommendation favoring one product over another.[15] Information on currently available influenza vaccines is obtainable through the CDC recommendation, "Prevention and Control of Seasonal Influenza with Vaccines." For adults aged ≥65 years, high-dose IIV,[38] adjuvanted IIV,[39] or recombinant influenza vaccine[40] are preferentially recommended over standard-dose unadjuvanted vaccines based on data suggesting higher efficacy in preventing invasive pneumococcal disease in this age group.[41]

Influenza vaccines are quadrivalent (two A components and two B components) with formulations that change from season to season. Although a quadrivalent live attenuated influenza vaccine (LAIV4) is available, it **is contraindicated** for people with HIV because of the paucity of safety data and the availability of alternative vaccines.[15] Although unintentional administration of LAIV4 to adults with HIV has been well tolerated,[42] **it is not recommended** for people with HIV.

IIVs can be administered to people receiving influenza antiviral drugs for treatment or chemoprophylaxis. Concurrent administration of influenza vaccine does not interfere with the immune response to other inactivated vaccines or to live vaccines.

Measles, Mumps, and Rubella Vaccine

Summary of Recommendations

For vaccination

- Administer two doses of measles, mumps, and rubella vaccine (MMR) at least 1 month apart to people with a CD4 count ≥200 cells/mm^3 and who have no evidence of immunity to measles, mumps, and rubella (evidence of immunity is defined as: patient was born before 1957, and/or had documentation of receipt of MMR, and/or has laboratory evidence of immunity or disease) **(AIII).**
- The MMR vaccine **is contraindicated** during pregnancy.
- People of childbearing potential who get the MMR vaccine should wait 4 weeks before getting pregnant.
- For pregnant people without immunity to rubella, ***delay immunization until after pregnancy***, then administer two doses of the MMR vaccine at least 1 month apart if the CD4 count is ≥200 cells/mm^3 **(AIII).**
- If no serologic evidence of immunity exists after two doses of MMR vaccine, consider repeating the two-dose MMR series, especially the person if vaccinated while not virologically suppressed **(CIII)**.
- **Do not administer** MMR vaccine to people with HIV with CD4 count <200 cells/mm^3 **(AIII).**

For post-exposure prophylaxis

- For measles exposure of non-immune individuals with CD4 count >200 cells/mm^3, administer the MMR vaccine within 72 hours of exposure **or** immunoglobulin (IG) within 6 days of exposure. Do not administer the MMR vaccine and IG simultaneously.
- For measles exposure of non-immune individuals with CD4 count <200 cells/mm^3 or those who are pregnant, administer IG within 6 days of exposure.

Evidence Summary

Measles is particularly virulent in the immunocompromised host, with a reported mortality rate as high as 40 percent in people with advanced HIV.[43] Recently, measles outbreaks have occurred across the United States. From January 1 to October 3, 2019, 1,250 individual cases of measles were confirmed in 31 states: the most cases in 25 years. Current information regarding outbreaks can be found on the CDC website: Measles Cases and Outbreaks. Measles is a highly contagious and potentially life-threatening disease.

With a resurgence of measles both domestically[44] and globally,[45] people with HIV should be assessed for immunity. Acceptable evidence of immunity includes being born before 1957, documented evidence of two doses of the MMR vaccine, or presence of positive antibody titers.

Individuals who do not fulfill any criteria for immunity and have CD4 count ≥200 cells/mm^3 should receive two doses of MMR separated by at least 28 days. The combination measles, mumps, rubella, and varicella (MMRV) vaccine has not been studied in immunocompromised hosts and should **not be administered** to people with HIV.

Several studies from the 1990s found that approximately 90 percent to 95 percent of adults with HIV were immune to measles.[46-48] In these studies, serostatus did not vary by CD4 count, suggesting people with HIV retained protective immunity even in the context of advanced disease. However, in a more recent study, the measles seroprevalence rate was 70.3 percent.[49] Similarly, people with HIV appear to retain immunity to mumps and rubella even after acquisition of HIV.[49]

MMR vaccine **is contraindicated** for people with HIV with CD4 count <200 cells/mm^3 because MMR vaccine is a live attenuated formulation that has been linked to fatal cases of measles-associated pneumonitis following administration to people with HIV with low CD4 counts.[50,51] For people with HIV with CD4 count ≥200 cells/mm^3, the vaccine has been shown to be safe, although antibody response may be lower than for patients without HIV.[49,52,53]

For more detailed information regarding post-exposure prophylaxis, please see Measles (Rubeola).

Meningococcal Vaccine

Summary of Recommendations

- Administer two doses of quadrivalent meningococcal conjugate vaccine, at least 8 weeks apart to all people with HIV age ≥18 years **(AII).**
- For people with HIV receiving primary vaccination, administer two doses given at least 8 weeks apart.

- For individuals with HIV who have been vaccinated previously and are age ≥7 years, repeat vaccination every 5 years throughout life **(BIII).**
- Serogroup B meningococcal vaccination (MenB) is not routinely indicated for adults and adolescents with HIV at this time.

Evidence Summary

Meningococcal meningitis, caused by *Neisseria meningitidis*, is the most common cause of bacterial meningitis among children and young adults in the United States. Surveillance data collected during 1998 to 2007 identified 2,262 cases of meningococcal disease from a sample of 13 percent of the U.S. population from several states. All available formulations of meningococcal vaccine are inactivated. Three quadrivalent meningococcal conjugate (MenACWY) vaccines are currently licensed and available in the United States: (1) Meningococcal groups A, C, W, and Y polysaccharide diphtheria toxoid conjugate vaccine (MenACWY-D, Menactra®); (2) Meningococcal groups A, C, W, and Y oligosaccharide diphtheria CRM197 conjugate vaccine (MenACWY-CRM, Menveo®) and (3) Meningococcal groups A, C, W, and Y polysaccharide tetanus toxoid conjugate vaccine (MenACWY-TT, MenQuadfi®). These vaccines are recommended for all adolescents aged 11 to 18 years and people aged 2 to 55 years who are at increased risk for disease.

A growing body of evidence supports an increased risk of meningococcal disease in people with HIV. Studies have shown a 5- to 24-fold increased risk of meningococcal disease in people with HIV compared with people without HIV; low CD4 count and high HIV viral load are associated with increased risk.[54] The average annual incidence rate of invasive meningococcal disease (IMD) was 0.39 cases per 100,000 people. People with HIV with lower CD4 counts are at higher risk of invasive disease.[55] In addition, a cohort study found that uptake of the MenACWY vaccine among people with a new diagnosis of HIV infection was low and time to receipt of first vaccination was long.[56]

The safety and immunogenicity of MenACWY-D vaccine have been evaluated only in people with HIV aged 11 to 24 years. Patients with CD4% ≥15% received either one or two doses (at 0 and 24 weeks) of vaccine, and those with CD4% <15% received two doses (at 0 and 24 weeks). Among people with HIV who received one dose of vaccine, 21 percent to 63 percent developed an antibody titer of ≥1:128 at 72 weeks after vaccination. Antibody responses at 72 weeks in individuals with CD4% <15% were less robust,[57] with only 6 percent to 28 percent achieving titers ≥1:128. Local site reactions—such as pain and tenderness at injection site—were uncommon (3.1%) as were grade 3 or greater events (2.2%). No vaccine-related deaths or cases of meningitis were noted. No safety or immunogenicity studies are available for MenACWY-CRM in people with HIV, and clinical outcome data for both vaccines in people with HIV are lacking as well.

Menactra®, Menveo®, and MenQuadfi® are recommended for all adults with HIV, regardless of age.

MenB is not routinely indicated for adults and adolescents with HIV at this time. MenB vaccine may be administered to adolescents and young adults with HIV aged 16 to 23 years (preferred range, ages 16–18 years) for short-term protection against most strains of serogroup B meningococcal disease and for patients at increased risk (e.g., those living in dormitories or barracks) and during outbreaks. Those with functional or anatomic asplenia should also be vaccinated. For more information, see the CDC's webpage on Asplenia and Adult Vaccination. Two MenB vaccines are available, MenB-4C (Bexsero®; two-dose series given at 0 and 1 month) and MenB-FHbp (Trumenba®; people with HIV should receive the three-dose series given 0, 1–2, and 6 months and not the two-dose option). MenB vaccines are not interchangeable; the same product must be used for all doses in the series.

Urban outbreaks of meningococcal meningitis have been reported among men who have sex with men in the United States, in men both with and without HIV. Several outbreaks were associated with clubs and bathhouses. Some public health jurisdictions now recommend meningococcal vaccine for all men who have sex with men, regardless of HIV status; however, ACIP has not adopted this recommendation for men who have sex with men without HIV.[58]

Pneumococcal Vaccine

See the "Preventing Disease" section in Community-Acquired Pneumonia for detailed guidance for immunization against pneumococcal disease, as well as the evidence summary.

Summary of Recommendations

For all people with HIV without history of pneumococcal vaccination or unknown vaccine history:

- Administer either 15-valent pneumococcal conjugate vaccine (PCV15) or 20-valent pneumococcal conjugate vaccine (PCV20) **(AII).**
- If PCV15 is used, a dose of 23-valent pneumococcal polysaccharide vaccine (PPSV23) should be administered at least 8 weeks later **(AII).** No additional pneumococcal vaccine doses are recommended.

For people with HIV who previously started or completed a pneumococcal vaccination series, there is no need to restart the series.

- People with HIV who previously received only the 13-valent pneumococcal conjugate vaccine (PCV13) should receive PPSV23 at least 8 weeks later **(BIII).**
- People with HIV who have received PCV13 and PPSV23 should receive a booster PPSV23 at least 5 years after the first dose. If they were <65 at the time of the second dose, they should receive a third and final dose at or after age 65, at least 5 years after the second PPSV23 dose **(BIII).**
- People with HIV who have only received PPSV23 may receive a PCV (either PCV20 or PCV15) ≥1 year after their last PPSV23 dose. When PCV15 is used in those with history of PPSV23 receipt, it need not be followed by another dose of PPSV23 (**BIII).**

Tetanus, Diphtheria, and Pertussis Vaccine

Summary of Recommendations

- Administer the combination tetanus toxoid, reduced diphtheria toxoid, and acellular pertussis vaccine (Tdap) once if person with HIV had not been vaccinated at age 11 or older, and then tetanus and diphtheria toxoids vaccine (Td) or Tdap every 10 years thereafter **(AII).**
- For pregnant individuals with HIV, administer one dose of Tdap during each pregnancy, preferably between 27 weeks and 36 weeks gestation **(AIII).**
- For adolescents and adults with HIV who have not received primary vaccination series for tetanus, diphtheria, or pertussis: administer one dose Tdap followed by one dose Td or Tdap at least 4 weeks after Tdap, and another dose Td or Tdap 6 months to 12 months after the last Td or Tdap. Tdap can be substituted for any Td dose but is preferred as first dose **(AIII).**

Evidence Summary

Antibody response to tetanus and diphtheria vaccination varies by CD4 count. For individuals with advanced HIV and low CD4 counts, immunologic response is attenuated for both tetanus and diphtheria when compared to HIV-uninfected controls.[59,60] For people with CD4 counts >300 cells/mm^3, antibody response to tetanus vaccination is similar to the general population, whereas response to diphtheria remains diminished.[59-61] Limited data exist on the efficacy of pertussis vaccination in this population.

Two Tdap vaccines for individuals aged ≥10 years are available in the United States (Adacel® and Boostrix®). Both vaccines are inactivated and considered safe to administer at any CD4 count. People with HIV should receive vaccination for tetanus, diphtheria, and pertussis on the same schedule as individuals without HIV. All adults not previously vaccinated should receive a single dose of Tdap, followed by a Td or Tdap booster every 10 years.

Varicella Vaccine

See "Vaccination to Prevent Primary Infection (Varicella)" in the Varicella-Zoster Virus Disease section for detailed guidance for immunization against varicella, as well as the evidence summary.

Summary of Recommendations

- People with HIV with any of the following have presumed immunity to varicella: receipt of two doses of varicella vaccine (VAR or MMRV), diagnosis of varicella or herpes zoster (shingles) by a health care provider, or laboratory evidence of immunity or disease.
- For people with HIV who are varicella non-immune with CD4 count ≥200 cells/mm^3, administer two doses of VAR 3 months apart **(BIII).**
- VAR is **contraindicated** for people with HIV with CD4 count <200 cells/mm^3 **(AIII).**

Herpes Zoster Vaccine

See "Vaccination to Prevent Re-activation Disease (Herpes Zoster)" in the Varicella-Zoster Virus Disease section for detailed guidance for immunization against zoster, as well as the evidence summary.

Summary of Recommendations

- For people with HIV ≥18 years, administer RZV two doses at 0 and 2 to 6 months **(AIII).**
- Consider delaying vaccination until the patient is virologically suppressed on ART **(CIII)** or until the CD4 count ≥200 cells/mm^3 to ensure a robust vaccine response **(CIII).**
- People with HIV ≥18 years should receive RZV regardless of previous history of herpes zoster or previous receipt of zoster vaccine live (no longer available).

Recommended Adult Immunization Schedule by Medical Condition and Other Indications

Vaccine	Indication	Recommendations	Additional Comments	ACIP Recommendations
COVID-19	All people regardless of CD4 count or viral load (AIII)	PWH should receive a complete COVID-19 vaccine series regardless of their CD4 count or HIV viral load (AIII). For current COVID-19 vaccination recommendations please visit CDC.gov.	People with advanced or untreated HIV are considered moderately or severely immunocompromised. Advanced HIV is defined as people with CD4 counts <200 cells/mm^3, a history of an AIDS-defining illness without immune reconstitution, or clinical manifestations of symptomatic HIV.	No difference in recommendations.
Hepatitis A virus (HAV)	HAV susceptible with HIV infection (AIII)	2-dose series of either single antigen vaccine: • Havrix®: 1.0 mL IM (0, 6–12 months) (AII) OR • Vaqta®: 1.0 mL IM (0, 6–18 months) (AIII) Alternative for individuals susceptible to both HAV and HBV: • Twinrix®: 1.0 mL IM o 3-dose series (0, 1, 6 months) (AII)	Assess antibody response (total or IgG anti-HAV) 1–2 months after completion of the series, and if negative, revaccinate, preferably after the CD4 count is ≥200 cells/mm^3 (BIII). For travelers, some clinicians recommend: • 4-dose series (0, 7, 21–30 days, 12 months) of Twinrix® (BII)	No difference in recommendations.
	Post-exposure prophylaxis	Administer HAV vaccine and HepA IgG (0.1 mg/kg) simultaneously in different anatomical sites as soon as possible within 2 weeks of exposure to HAV in people who are non-immune.		

Vaccine	Indication	Recommendations	Additional Comments	ACIP Recommendations
Hepatitis B virus (HBV)	HBV susceptible and never vaccinated (i.e., anti-HBs <10 mIU/mL)	Patients may receive any of the following single-antigen vaccines: • Double dose of Engerix-B® (40 mcg) or Recombivax® (20 mcg) in a 3-dose series (0, 1, 6 months) (AII), or • Heplisav®: 2-dose series (0, 1 month) 20 µg in 0.5 mL IM (CIII) Alternative for individuals susceptible to both HAV and HBV: • Twinrix®: 1.0 mL IM: 3-dose series (0, 1, 6 months) (AII)	Anti-HBs should be obtained 1 to 2 months after completion of the vaccine series. Vaccinate individuals with isolated anti-HBc with 1 standard dose of HepB (BII) and check anti-HBs titers 1–2 months afterward. If anti-HBs ≥100 IU/mL, no further vaccination is needed, but if the titer is <100 IU/mL, then vaccinate with a complete series of HepB (double dose) followed by anti-HBs testing (BII). If titers are not available, then give a complete vaccine series followed by anti-HBs testing (BII). Safety and efficacy of Heplisav® has not yet been studied in PWH. If a 2-dose vaccine is preferred, Heplisav® is an option. If a significant delay occurs between doses, there is no need to restart the series. For travelers, some clinicians recommend: • 4-dose series (0, 7, 21–30 days, 12 months) of Twinrix® (BII) Some experts consider that a double dose, four-dose vaccine series of recombinant hepatitis B vaccine (Engerix-B® 40 mcg or Recombivax® 20 mcg at 0, 1, 2, and 6 months) may produce a better immunologic response but this approach has not been demonstrated to be superior to a double dose, three-dose series.	ACIP does not recommend the use of double dose Engerix-B® or Recombivax® for PWH.
	Vaccine nonresponder (if anti-HBs <10 mIU/mL after 3-dose series)	Revaccinate with either: • Second double dose, 3-dose series of Engerix-B® (40 mcg) or Recombivax® (20 mcg) (BIII) OR • 2-dose series of Heplisav-B® (BIII) Delay repeat vaccination until after the CD4 count is ≥200 cells/mm^3 (CIII).		
	Post-exposure prophylaxis	For exposed people who have been previously vaccinated with complete series and have documented antibody response, no additional vaccine needed. For exposed people who have received complete series without documentation of antibody response, administer a single dose of HepB vaccine. For exposed people who have not received a vaccine or have not received the complete series, administer or complete the HepB vaccine series and		

Vaccine	Indication	Recommendations	Additional Comments	ACIP Recommendations
		administer a dose of HBIG at a separate anatomical site as soon as possible after exposure (ideally within 24 hours, but up to 7 days after percutaneous exposure and up to 14 days after sexual exposure).		
Human papillomavirus (HPV)	Adults and adolescents through age 26	Recombinant 9-valent human papillomavirus vaccine (Gardasil®9): 0.5 mL IM 3-dose series (0, 1–2, 6 months) (AIII)	If a significant delay occurs between doses, there is no need to restart the series. Routine vaccination is not recommended for people ages 27–45 years (AI). Some PWH may benefit from vaccination in this age group, and shared clinical decision-making between the provider and patient is recommended in these situations.	No difference in recommendations.
	Adults and adolescents who previously received bivalent or quadrivalent vaccine	For patients who have completed a vaccination series with the recombinant bivalent or quadrivalent vaccine, no recommendations exist for additional vaccinations; some experts would give an additional full series of recombinant 9-valent vaccine, but no data currently define who might benefit or how cost effective this approach might be (CIII).	Vaccination is not recommended during pregnancy (CIII). Delay until after pregnancy.	
Influenza	All	1 dose of age appropriate IIV or RIV annually (AI). LAIV is contraindicated (AIII).	Information on currently available influenza vaccines is available through the CDC recommendation, "Prevention and Control of Seasonal Influenza with Vaccines." Influenza vaccines are quadrivalent, with formulations that change from season to season. Adults age ≥65 years are recommended to receive high-dose IIV (Fluzone® High-Dose) or adjuvanted IIV	No difference in recommendations.

Vaccine	Indication	Recommendations	Additional Comments	ACIP Recommendations
			(FLUAD®) over standard-dose unadjuvanted vaccine (AII). People age ≥18 years also may use RIV (Flublok® Quadrivalent). For people with egg allergy, use IIV or RIV appropriate for age (if the allergy is more severe than hives, give the vaccine in a medical setting appropriate to manage severe allergic reaction). For pregnant individuals with HIV, administer inactivated influenza or recombinant vaccine at any time during pregnancy (AI).	
Measles, mumps, and rubella (MMR)	CD4 count ≥200 cells/mm^3 and no evidence of immunity to measles, mumps, or rubella	2-dose series of MMR vaccine at least 1 month apart (AIII) MMR is contraindicated if CD4 count <200 cells/mm^3. MMR vaccine is contraindicated during pregnancy.	Evidence of immunity to MMR: • Birth date before 1957, OR • Documentation of receipt of MMR, OR • Laboratory evidence of immunity or disease for each pathogen For pregnant people without immunity to rubella, after pregnancy administer 2 doses of MMR vaccine at least 1 month apart if CD4 count >200 cells/mm^3 (AIII).	No difference in recommendations.
	Post-exposure prophylaxis	For measles non-immune individuals with CD4 counts >200 cells mm^3, administer MMR vaccine within 72 hours of exposure or IG within 6 days of exposure. Do not administer MMR vaccine and IG simultaneously.		

Vaccine	Indication	Recommendations	Additional Comments	ACIP Recommendations
		For measles non-immune individuals with CD4 counts <200 cells mm^3 or those who are pregnant, administer IG.		
Meningococcus serogroup A, C, W, Y (MenACWY)	Not received any polyvalent meningococcal vaccine	Menactra® or Menveo® or MenQuadfi®: 2-dose series given at least 8 weeks apart (AIII) • Revaccinate with a dose of same MenACWY vaccine every 5 years (BIII).	MenACWY vaccine is routinely recommended. If Menactra® is used in a person (of any age) with functional or anatomic asplenia or HIV infection, it should not be administered until at least 4 weeks after completion of all PCV doses.	No difference in recommendations.
Meningococcus serogroup B	MenB is not routinely indicated for individuals with HIV, except for those at increased risk for serogroup B meningococcal disease (asplenia, complement deficiency, eculizumab use, occupational exposure).	2-dose series of Bexsero® or 3-dose series of Trumenba® Even if they are not at increased risk for serogroup B meningococcal disease, MenB may be given to adolescents and young adults ages 16–23 years (preferred age range, 16–18 years).	Two MenB vaccines are available and not interchangeable, MenB-4C (Bexsero®) and MenB-FHbp (Trumenba®).	No difference in recommendations.
Pneumococcal	No prior pneumococcal vaccine or vaccination history unknown	Administer either of the following: • PCV20 (Prevnar20®): 0.5 mL IM x 1 (AII) OR • PCV15 (Vaxneuvance®): 0.5 mL IM × 1 (AII) Followed at least 8 weeks later by: • PPSV23 (Pneumovax®): 0.5 mL IM × 1 (AII)	Administer PCV (15 or 20) to PWH, on ART with CD4 count >50 cells/mm^3 (AII). In those who received PCV13 when their CD4 count was <200 cells/mm^3, some experts may choose to defer PPSV23 until CD4 count is >200 cells/mm^3 to optimize vaccine efficacy (CIII). In contrast to prior recommendations, after the initial vaccine series is complete, there is no longer a recommendation for additional doses (boosters).	No difference in recommendations.

Vaccine	Indication	Recommendations	Additional Comments	ACIP Recommendations
	Previously received PCV13 and PPSV23	Revaccinate the following with PPSV23 0.5 mL IM x 1 (BIII): • Adults aged 19–64 years if ≥5 years since the first PPSV23 dose • If age ≥65 years and if ≥5 years since the previous PPSV23 dose at least 8 weeks after receipt of PCV13	Patients should receive a maximum of 3 doses of PPSV23. There is no need to give additional doses of PPSV23 every 5 years.	
	Previously received only PCV13	Administer initial dose of PPSV23 0.5 mL IM × 1 (AII). Revaccinate the following with PPSV23 0.5 mL IM x 1 (BIII): • Adults aged 19–64 years if ≥5 years since the first PPSV23 dose • Adults ages ≥65 years if ≥5 years since the previous PPSV23 dose.		
	Previously received only PPSV23	Administer either of the following: • PCV20: 0.5 mL IM x 1 (BIII) OR • PCV15: 0.5 mL IM × 1 (BIII)	When PCV15 is used in those with history of PPSV23 receipt, it need not be followed by another dose of PPSV23.	
Polio	Not routinely recommended (AIII)			No difference in recommendations.
	Those at higher risk for exposure to poliovirus—such as those traveling to countries where polio is epidemic or endemic—can be vaccinated with IPV (CIII).	3 doses IPV IM at 0, 1–2 months, and third dose given 6–12 months after second dose (CIII)		

Recommended Adult Immunization Schedule by Medical Condition and Other Indications

Vaccine	Indication	Recommendations	Additional Comments	ACIP Recommendations
	Previously vaccinated with 1–2 doses of vaccine	Give remaining doses of vaccine at recommended intervals (CIII).		
Tetanus, diphtheria, and pertussis	Did not receive Tdap at age 11 years or older	1 dose Tdap (Adacel® or Boostrix®), then Td or Tdap every 10 years (AII)	If indicated, give Tdap regardless of when the last dose of Td was given.	No difference in recommendations.
	Pregnancy	Give Tdap preferably in early part of gestational weeks 27–36 (AIII). 1 dose of Tdap is indicated for each pregnancy.	Give Td or Tdap booster every 10 years after Tdap.	
Varicella (chickenpox)	CD4 count ≥200 cells/mm^3 with no evidence of immunity to varicella	2-dose series of VAR 3 months apart (BIII) VAR **is contraindicated** if CD4 count <200 cells/mm^3 (AIII).	Evidence of immunity to varicella: • Documented receipt of 2 doses of VAR or MMRV, or • Diagnosis of varicella or zoster by a health care provider, or • Laboratory evidence of immunity or disease If vaccination results in disease because of vaccine virus, treatment with acyclovir is recommended (AIII).	No difference in recommendations.
Zoster	Age ≥18 years, regardless of past episode of herpes zoster or receipt of attenuated ZVL (Zostavax®) and regardless of CD4 count	Give 2-dose series of RZV (Shingrix®) IM 2–6 months apart (AIII).	Consider delaying vaccination until patient is virologically suppressed on ART (CIII) or wait for immune reconstitution in those who had a CD4 count <200 cells/mm^3 (CIII) to maximize immunologic response to the vaccine. **Do not give** RZV (Shingrix®) during an acute episode of herpes zoster (AIII).	ACIP recommends RZV for adults ≥19 years who are or will be at risk for herpes zoster. [this difference in age selected by ACIP was made to align with the age range in the adult immunization schedule]

Recommended Adult Immunization Schedule by Medical Condition and Other Indications

Vaccine	Indication	Recommendations	Additional Comments	ACIP Recommendations
Immunizations for Travel				
Cholera	Not routinely recommended for most travelers (CIII). Age 18–64 years old with CD4 counts >200 cells/mm^3 traveling to an area where cholera is epidemic or endemic within the past year	Lyophilized CVD 103-HgR (Vaxchora®) single oral dose at least 10 days prior to potential exposure (CIII)	Safety and efficacy have not been established in individuals with HIV. No adverse effects reported with older formulation of vaccine in individuals with HIV infection without an AIDS diagnosis.	No current recommendations for individuals with HIV infection.
Typhoid	At risk of *Salmonella* serotype typhi infection (travel, intimate exposure to a chronic carrier, occupational exposure) Revaccination only if continued or renewed exposure to *Salmonella* serotype typhi is expected.	1 dose Vi capsular polysaccharide vaccine (Typhim Vi®) via intramuscular injection at least 1 week before exposure (AIII) Revaccinate every 2 years if risk remains (BIII). The live attenuated oral typhoid vaccine (Vivotif®) is contraindicated in PWH (AIII).	Provide education on other preventive measures against foodborne illness in addition to typhoid vaccination (AIII). Safety of typhoid vaccination in pregnancy is unknown. Consider avoiding during pregnancy (AIII).	ACIP has no position on the use of typhoid vaccine in PWH except not to give immunocompromised people the live attenuated vaccine.
Yellow fever (YF)	Age ≤59 years and at risk for YF virus acquisition (travel to or live in areas at risk based on season, location, activities, and duration)	If indicated, provide vaccination at least 10 days prior to expected exposure. Age <59 years and asymptomatic with CD4 >500 cells/mm^3: 1 dose of YF vaccine, revaccinate in >10 years if risk remains (BIII). Any age and asymptomatic with CD4 200–499 cells/mm^3: YF vaccine may be considered depending on risk (BIII). YF vaccine is contraindicated for people with CD4 counts <200 cells/mm^3. This recommendation is based on a theoretic increased risk for encephalitis in this population (AII).	Provide vaccination as an adjunct to other protective measures against mosquito bites. Pregnancy and age ≥60 years may increase risk of complications from YF vaccine administration. If international travel requirements rather than an increased risk for acquiring YF infection are the only reason to vaccinate PWH, excuse the person from vaccination and issue a medical waiver to fulfill health regulations.	No difference in recommendations.

Vaccine	Indication	Recommendations	Additional Comments	ACIP Recommendations
			Closely monitor PWH who have received YF vaccine for evidence of adverse events.	

Key: ACIP = Advisory Committee on Immunization Practices; anti-HBc = hepatitis B core antibody; anti-HBs = hepatitis B surface antibody; ART = antiretroviral therapy; CD4 = CD4 T lymphocyte; CDC = Centers for Disease Control and Prevention; FDA = U.S. Food and Drug Administration; HAV = hepatitis A virus; HBIG = hepatitis B immune globulin; HBV = hepatitis B virus; HepA = hepatitis A vaccine; HepB = hepatitis B vaccine; HPV = human papillomavirus; IG = immunoglobulin; IgG = immunoglobulin G; IIV = inactivated influenza vaccine; IM = intramuscular; IPV = inactivated polio vaccine; LAIV = live attenuated influenza vaccine; MenACWY = meningococcus serogroup A, C, W, Y; MenB = serogroup B meningococcal vaccination; MMR = measles, mumps, and rubella; MMRV = measles, mumps, rubella, and varicella; PCV13 = 13-valent pneumococcal conjugate vaccine; PCV15 = 15-valent pneumococcal conjugate vaccine; PPSV23 = 23-valent pneumococcal polysaccharide vaccine; PWH = people with HIV; PVC13 = 13-valent pneumococcal conjugate vaccine; RIV = recombinant influenza vaccine; RZV = recombinant zoster vaccine; Td = tetanus and diphtheria toxoids vaccine; Tdap = combination tetanus toxoid, reduced diphtheria toxoid, and acellular pertussis vaccine; VAR = varicella vaccine; YF = yellow fever; ZVL = zoster vaccine live

Note: Recommendations may vary from the Advisory Committee on Immunization Practices.

Vaccine	All People	Where Varies by Age	Where Varies by CD4 Cell Count (cells/mm^3)	
			< 200	≥ 200
Hepatitis A	2–3 doses (varies by formulation)			
Hepatitis B	2–4 doses (varies by formulation and indication)			
Human papillomavirus (HPV)		3 doses for ages 18–26*		
Influenza	1 dose annually			
Measles, mumps, rubella (MMR)			Contraindicated	2 doses if born after 1956 with no history of vaccination or positive antibody titer
Meningococcal A,C,W,Y conjugate (MenACWY)	2 doses, booster every 5 years			
Meningococcal B (MenB)	2–3 doses (varies by formulation)			
Pneumococcal conjugate (PCV15 or PCV20)	1 dose			
Pneumococcal polysaccharide (PPSV23)	1 dose (if conjugate vaccine was PCV-15)			
COVID-19	For current COVID-19 vaccination recommendations, please visit CDC.gov.		Recommendations differ with advanced or untreated HIV infection	
Tetanus, diphtheria, pertussis (Tdap/Td)	Tdap once, then Td or Tdap booster every 10 years			
Varicella (VAR)			Contraindicated	2 doses
Zoster recombinant (RZV)		2 doses for ages 18 and older		

Recommended for all adults and adolescents with HIV who meet the age requirement or lack documentation of vaccination or evidence of past infection.

Recommended for adults and adolescents with HIV with another risk factor (medical, occupational, or other indication) or in select circumstances.

Contraindicated

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