Immunizations for Preventable Diseases in Adults and Adolescents 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.

- The following live virus vaccines **are contraindicated** in people with HIV:
  - For CD4 T lymphocyte (CD4) cell count <200 cells/mm^3:
    - Measles
    - Mumps
    - Rubella
    - Varicella (VAR)28
    - Yellow fever
  - For any CD4 counts:
    - Live attenuated influenza vaccine (LAIV)
    - Live attenuated typhoid Ty21a
    - Live attenuated smallpox vaccine (ACAM2000)
- The following vaccines have specific recommendations related to HIV status:
  - COVID-19
  - Hepatitis A (HepA)
  - Hepatitis B (HepB)
  - Meningococcus serogroup A, C, W, Y (MenACWY)
  - Pneumococcal vaccines
  - Human papillomavirus

The National Institutes of Health/Infectious Diseases Society of America/HIV Medicine Association 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. Please see the Recommended Adult Immunization Schedule by Medical Condition and Other Indications table, Recommended Immunizations for Travel table, and Recommended Immunization Schedule for Adults and Adolescents With HIV figure at the end of this chapter for a full overview of vaccines for adults with HIV, including standard vaccines recommended for all individuals.

Specific Immunizations

COVID-19 Vaccine

Available Vaccines

- Adjuvanted protein subunit vaccine
  - Nuvaxovid (Novavax)
- mRNA vaccine
  - mNEXSPIKE (Moderna)
  - Spikevax (Moderna)
  - Comirnaty (Pfizer-BioNTech)

Summary of Recommendations

- For adolescents and adults with HIV, administer a dose of the current season COVID-19 vaccine regardless of their CD4 count, HIV viral load, or pregnancy or breastfeeding status **(AII).**
- Individuals with advanced or untreated HIV are considered moderately or severely immunocompromised and may receive one additional dose 6 months after their last COVID-19 vaccine dose **(AIII).**
  - Note: Advanced HIV is defined as CD4 count <200 cells/mm^3, a history of an AIDS-defining illness without immune reconstitution, or clinical manifestations of symptomatic HIV.
  - The second dose to extend protection throughout the year may be considered given the frequent peaks in circulation outside the winter months. Future guidance may be needed to reflect changes in the seasonality of the virus.
- For never vaccinated and incompletely vaccinated people, refer to published vaccine-specific guidelines.[1]

Evidence Summary

People with HIV and COVID-19 have experienced worse outcomes and greater mortality than people without HIV in studies from the United States, the United Kingdom, and South Africa.[2-9] 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, which included data from 38 countries.[10] In a multicenter cohort study of 286 people with HIV and COVID-19 in the United States, a lower CD4 count (i.e., <200 cells/mm^3) was associated with a higher risk for the composite endpoint of intensive care unit admission, invasive mechanical ventilation, or death, even in those with viral suppression.[7] Similarly, a multisite clinical cohort of people with HIV in clinical care in the United States showed an association between lower current (<350 cells/mm^3) and nadir (<200 cells/mm^3) CD4 counts and risk of hospitalization, intubation, or death, regardless of viral suppression status.[11]

Most people with HIV develop antibody responses to vaccination comparable to responses measured in people without HIV.[12-17] However, responses may be lower and antibody titers decline faster, particularly for individuals[14-16] with CD4 counts <200 cells/mm^3. Rates of breakthrough infections after vaccination are higher among individuals with HIV, with vaccine effectiveness declining sooner

than in HIV-negative matched cohorts.[18-20] Breakthrough infections showed no association with viral load suppression, though fewer breakthroughs[18] were seen in individuals with CD4 counts ≥500 cells/mm^3. Vaccine effectiveness against more severe outcomes (e.g., hospitalization, intensive care unit admission, death) has been more robust than protection against infection or mild disease.[21]

For individuals with advanced or untreated HIV, the lower seroresponse rates and reduced vaccine effectiveness compared with individuals without immunocompromise support recommendations for additional doses to extend protection through the year because there are often peaks in circulation outside the winter season.[22]

Four COVID-19 vaccines are available in the United States: three mRNA formulations (mNEXSPIKE and Spikevax from Moderna and Comirnaty from Pfizer-BioNTech) and one adjuvanted recombinant protein (Nuvaxovid from Novavax). Since 2023, the original vaccines are no longer authorized and have been replaced with updated versions that better match circulating variants. Primary and booster vaccines have been harmonized to a single strain, and annual assessments are anticipated to update vaccine composition and scheduling recommendations.[23]

All adults and adolescents, regardless of their CD4 count or HIV viral load, should receive a dose of the newest updated COVID-19 vaccine when available (at least 4–8 weeks after last dose).[22,24] Those with severe immunosuppression may have a diminished immune response to the vaccine and therefore may receive one additional dose 6 months after the last COVID-19 vaccine dose.

Hepatitis A Vaccine

Available Vaccines

- Single-antigen inactivated hepatitis A vaccines
  - HepA (Havrix, GSK)
  - HepA (Vaqta, Merck)
- Combination inactivated hepatitis A vaccine and recombinant hepatitis B vaccine
  - HepA-HepB (Twinrix, GSK)

Summary of Recommendations

For Vaccination

- For people who are not immune to hepatitis A virus (HAV) (i.e., immunoglobulin G [IgG] negative), administer a two-dose series of HepA vaccine. The dosing interval depends on the vaccine used: at 0 and 6–12 months for Havrix **(AII)** or 0 and 6–18 months for Vaqta **(AIII).**
- For those who are not immune to HAV and hepatitis B virus (HBV), administer a two-dose series of HepA vaccine and two doses of HepBCpG (Heplisav-B) **(AII).** Alternatively, if Heplisav-B is not available, a three-dose series (0, 1, and 6 months) of the combined hepatitis A and hepatitis B vaccine (HepA-HepB, Twinrix) may be administered **(AII).**
- For pregnant women who have chronic HBV infection, are negative for total anti-HAV, and were not previously vaccinated against HAV, administer a two-dose series of HepA vaccine **(AIII).**

- For travelers, some clinicians recommend a four-dose accelerated regimen (0, 7, 21–30 days, and 12 months) of HepA-HepB **(BII).**
- For people with HIV and CD4 count ≥200 cells/mm^3, assess antibody response 1 to 2 months after completion of the series. If negative, a third dose may be administered **(BIII).**
- People with HIV with CD4 count <200 cells/mm^3 who have ongoing risk for HAV infection should be immunized at entry to care and assessed for antibody response 1 to 2 months after completion of the series. If total HAV antibody (anti-HAV) immunoglobulin (IgG and IgM) is negative, revaccinate when their CD4 count is ≥200 cells/mm^3 **(BIII).**
- For people with HIV with CD4 count <200 cells/mm^3 who do not have ongoing risk for HAV infection, waiting for a CD4 count ≥200 cells/mm^3 prior to immunization is an option **(BIII).**
- One study showed lower seroresponse to HepA when coadministered with pneumococcal conjugate vaccine. For patients who need both, clinicians may choose to separate by 1 month **(CIII).**[25]

For Travelers

- For people traveling within 28 days after receipt of the first dose, a four-dose accelerated regimen (0, 7, 21–30 days, and 12 months) of HepA-HepB is recommended **(BII).**
- People who are nonimmune and traveling within 2 weeks to countries with endemic HAV do not have time to complete a vaccine series and mount immune response before travel. Consider administering IgG 0.1 mL/kg if duration of travel is <1 month. If duration of travel is 1 to 2 months, 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 nonimmune, administer HepA and IgG 0.1 mL/kg simultaneously in different anatomical sites as soon as possible, within 2 weeks of exposure. Complete the HepA series following the dosing intervals for the selected vaccine.

Hepatitis B Vaccine

Available Vaccines

- Recombinant hepatitis B vaccine, CpG-adjuvanted
  - HepBCpG (Heplisav-B, Dynavax)
- Recombinant hepatitis B vaccines (conventional monovalent)
  - HepB (Engerix-B, GSK)
  - HepB (Recombivax HB, Merck)
- Combination inactivated hepatitis A and recombinant hepatitis B recombinant vaccine
  - HepA-HepB (Twinrix, GSK)

Summary of Recommendations

For Vaccination

- Indications for hepatitis B vaccination
  - People, including those who are pregnant, without chronic HBV infection and without immunity to HBV (negative for hepatitis B surface antigen, hepatitis B core antibody [anti-HBc], and hepatitis B surface antibody [anti-HBs]) **(AII).**
  - Although vaccine response is better in people with CD4 count >350 cells/mm^3, vaccination should not be deferred in people with a lower CD4 count who are at increased risk of HBV infection, because some people with CD4 <350 cells/mm^3 do respond to vaccination **(AII).**
- Preferred
  - Heplisav-B intramuscularly (IM) at 0 and 4 weeks **(AII)**
- Alternative (if Heplisav-B is unavailable)
  - Engerix-B 40 mcg (two simultaneous injections of 20 mcg each) at 0, 1, and 6 months (these doses are considered a "double-dose," three-dose series) **(AII);** *or*
  - Recombivax HB 20 mcg (two injections of 10 mcg each) at 0, 1, and 6 months (these doses are considered a "double-dose," three-dose series) **(AII);** *or*
  - Twinrix (1 mL IM) as a three-dose series (0, 1, and 6 months) **(AII)**
- Vaccination schedule for prior nonresponders (anti-HBs <10 mIU/mL) 1 month after complete vaccine series
  - If prior Engerix-B or Recombivax HB vaccination failed, administer Heplisav-B IM at 0 and 4 weeks **(AI),** with consideration for a third dose of Heplisav-B at 24 weeks **(BIII).**
  - If prior two-dose Heplisav-B vaccination failed, administer a third dose of Heplisav-B IM at 24 weeks after first dose **(AII).**
- Assess for vaccine response
  - Anti-HBs should be obtained 1 to 2 months after completion of the vaccine series to document response to vaccination, defined as anti-HBs ≥10 mIU/mL **(AII).**
- Vaccination schedule for people with isolated anti-HBc
  - One dose of any HepB vaccine (i.e., Heplisav-B, Engerix-B, Recombivax HB), followed by testing for quantitative anti-HBs 1 to 2 months postdose **(BII)**
    - If the titer is ≥100 mIU/mL, no further vaccination is needed.*
    - If the titer is <100 mIU/mL, a complete series of HepB vaccine should be completed (see above for schedule), followed by repeat anti-HBs testing **(BII).**
    - If an anti-HBs quantitative titer is not available, then a complete HepB vaccine series is recommended, followed by qualitative anti-HBs testing **(BII).**

  * See Evidence Summary regarding rationale for >100 mIU/mL.

For Post-exposure Prophylaxis

- For people who have been exposed and were vaccinated previously with a complete HepB vaccine series and have documented antibody response, no additional vaccine is needed.
- For people who have been exposed and who received a complete HepB vaccine series without documentation of antibody response, administer a single dose of HepB vaccine.
- For people who have been exposed and have not received any HepB vaccine or have not received a complete HepB vaccine series, administer or complete an HepB vaccine series and administer one dose of hepatitis B immune globulin 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).

Evidence Summary

All family members and sexual contacts of people with chronic HBV infection should be tested, and all susceptible household and sexual contacts should receive HepB vaccination regardless of whether they have HIV **(AII).** All people with HIV who are not immune to HBV infection (anti-HBc and anti-HBs negative) and do not have chronic HBV, as well as those who have failed a prior HepB vaccine series, should receive HepB vaccination with one of the available vaccines **(AII).**

Available adult single-antigen HepB vaccines in the United States that have been studied in people with HIV include two recombinant HBsAg vaccines (sold as Engerix-B and Recombivax HB) and a recombinant HBsAg vaccine conjugated to a cytosine phosphoguanine oligonucleotide adjuvant (HepBCpG, sold as Heplisav-B), which is a toll-like receptor 9 agonist.

Vaccine-Naive Patients

The preferred vaccine in previously unvaccinated patients is Heplisav-B given at 0 and 4 weeks **(AII).** A single-arm study in 68 people with HIV who were naive to HepB vaccine and received Heplisav-B at 0, 4, and 24 weeks demonstrated a seropositivity rate (anti-HBs >10 mIU/mL) of 87% and 98.5%, respectively, at 4 weeks and 20 weeks after the second dose.[26] The seropositivity rate 4 weeks after the third dose was 100%.

If Heplisav-B is not available, then vaccinate either with double-dose vaccine Engerix-B or double-dose Recombivax HB as the primary three-dose series **(AII),** or combined HepA and HepB (i.e., Twinrix) as a three-dose series **(AII).** A meta-analysis of 10 studies in people with HIV demonstrated that compared to a single dose, a double dose of Engerix-B or Recombivax HB had better response rates at 4 to 6 weeks (odds ratio [OR] 1.76; 95% confidence interval [CI], 1.36–2.29) and at >12 months (OR 2.28; 95% CI, 1.73–3.01) after vaccine completion.[27] A double dose of Engerix-B is 40 mcg (two injections of the 20-mcg dose). A double dose of Recombivax HB is 20 mcg (two injections of the 10-mcg dose).

A two-dose Heplisav-B is appropriate only when both doses are Heplisav-B. In other situations, three total doses of vaccine should be given **(AI).**

Prior Nonresponders

In those who failed a prior vaccine series with Engerix-B or Recombivax HB, Heplisav-B at 0 and 4 weeks is recommended **(AI)**, and a third dose at 24 weeks can be considered because three doses

results in higher anti-HBs levels **(BIII).** A study of 561 people with HIV and prior nonresponse to Engerix-B or Recombivax HB were randomized to either Heplisav-B at 0 and 4 weeks; Heplisav-B at 0, 4, and 24 weeks; or Engerix-B at 0, 4, and 24 weeks.[28] Participants had CD4 counts ≥100 cells/mm^3 (median 635 cells/mm^3) and HIV RNA <1,000 copies/mL (94% <40 copies/mL). The primary response of anti-HBs >10 mIU/mL was evaluated 8 weeks after the last dose for the two-dose Heplisav-B and 4 weeks after the last dose for the three-dose Heplisav-B and three-dose Engerix-B. The proportions achieving the primary response were 93.1%, 99.4%, and 80.6% in two-dose Heplisav-B, three-dose Heplisav-B, and three-dose Engerix-B, respectively ($P < 0.05$). Of note, 96% of those who received the three-dose Heplisav-B had anti-HBs titers >100 IU/mL compared with 70% of those who received the two-dose Heplisav-B and 63% who received Engerix-B.[29] These data suggest that a third dose may be beneficial to provide more durable immunity, but further follow-up is needed.

If a prior two-dose Heplisav-B vaccination failed, administer a third dose of Heplisav-B IM at 24 weeks after first dose **(AII).**

Assessing for Vaccine Response

Response to HepB vaccination, defined as anti-HBs ≥10 mIU/mL, should be documented 1 to 2 months after the last dose of vaccine **(AII).** In an observational study of 409 people with HIV who received the HepB vaccine, those with anti-HBs ≥10 mIU/mL were less likely to develop breakthrough HBV infection than those who did not achieve that level.[30] In addition, among those with a breakthrough HBV infection, 0% of those with anti-HBs ≥10 mIU/mL developed chronic infection compared with 35% of those with anti-HBs <10 mIU/mL ($P = 0.02$).

Because of waning immunity, checking anti-HBs annually and administering a booster dose if levels fall below 10 mIU/mL can be considered, particularly if a person has ongoing risk factors for acquiring HBV and is not receiving tenofovir **(CIII).**[31] Waning immunity is typically seen in people with low CD4 counts (<350 cells/mm^3) and may be a consequence of the height of the initial antibody response after immunization. In a study of people with HIV who had antibody titers assessed 4 weeks after completing the three-dose HepB vaccine series, those who had a titer <100 mIU/mL were significantly more likely to have waning immunity over the next 5 years compared with individuals who had higher titers after vaccination.[32]

Less is known about long-term durability of response with Heplisav-B in people with HIV; however, at the end of the study of prior vaccine nonresponders, 86.1% who received two-dose Heplisav-B (68 weeks after the last dose, n = 173), 97.2% who received three-dose Heplisav-B (48 weeks after the last dose, n = 177), and 57.5% who received three-dose Engerix-B (48 weeks after the last dose, n = 174) had anti-HBs ≥10 mIU/mL. A primary response anti-HBs titer 100 mIU/mL predicted durability of anti-HBs ≥10 mIU/mL at the end of the study with Heplisav-B. However, for those with titers between 10 to 99 mIU/mL, 62% remained with titers >10 mIU/mL after two doses of Heplisav-B compared with 0% who received Engerix-B.[28]

Patients With Isolated Anti-HBc

People with isolated anti-HBc should be vaccinated with one standard dose of HepB vaccine (one dose of Heplisav-B, Engerix-B, or Recombivax HB), and anti-HBs titers should be checked 1 to 2 months after vaccination **(BII).** If the anti-HBs titer is ≥100 mIU/mL, no further vaccination is needed, but if the titer is <100 mIU/mL, a complete series of the same HepB vaccine should be

completed and followed by anti-HBs testing **(BII).**[33] If an anti-HBs quantitative titer is not available, then a complete HepB vaccine series is recommended, followed by qualitative anti-HBs testing **(BII).** The cutoff of 100 mIU/mL is used in this situation because one study demonstrated that 100% of people with isolated anti-HBc who achieved a titer ≥100 mIU/mL after a booster dose maintained an anti-HBs response for >18 months compared with only 23% of those who achieved a titer of 10 to 100 mIU/mL.[33] Alternatively, another approach recommended by some experts is revaccination with the complete HepB vaccine series, followed by qualitative anti-HBs testing 1 to 2 months after series completion.

Antiretroviral Therapy Considerations

HBV-active ART (includes tenofovir with lamivudine [3TC] or emtricitabine [FTC]) decreases the risk for acute HBV infection, but it does not eliminate the risk, so taking ART alone is not a recommended strategy for preventing HBV infection. Therefore, HepB vaccine is recommended even if receiving an HBV-active ART regimen **(AIII).** In a study that evaluated HBV incidence in 591 males who have sex with men (MSM) with HIV, the HBV incidence rate for men not on HBV-active ART was 23.8 per 1,000 person-years (PYs) compared with 2.6 per 1,000 PYs for men on HBV-active ART with HIV RNA <400 copies/mL.[34] The protective effect against incident HBV was similar in those taking lamivudine- or tenofovir-containing ART regimens. In another report of 354 people with HIV and without prior HBV, the risk of new HBV infection was substantially reduced in those receiving HBV-active ART (hazard ratio 0.11, 95% CI 0.03–0.39); those receiving HBV-active ART who acquired HBV were taking lamivudine, and some acquired lamivudine-resistant virus.[35] The potential benefit of a tenofovir- versus lamivudine-containing regimen in preventing HBV infection was examined in a study of 381 males with HIV and found HBV incidence rates to be 2.85, 1.36, and 0.14 cases per 100 PYs among those taking ART without HBV activity, lamivudine without tenofovir, and tenofovir, respectively.[36] In another study of 786 MSM on pre-exposure prophylaxis (PrEP), there were fewer incident HBV infections in people who took tenofovir-based PrEP than in those who did not take PrEP (3.8% vs. 0.8%, $P = 0.02$).[37]

Human Papillomavirus Vaccine

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

Available Vaccine

- 9-valent inactivated recombinant vaccine (Gardasil 9, Merck)

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 who are aged 13 to 26 years and who were not vaccinated previously, regardless of sex, administer three doses of HPV vaccine at 0, 1 to 2, and 6 months **(AIII).** The two-dose series **is not recommended** for people with HIV.
- Shared clinical decision-making regarding HPV vaccination is recommended for people with HIV who are aged 27 to 45 years and who were not adequately vaccinated previously **(AIII).**

- At present, vaccination with commercially available HPV vaccine **is not recommended** during pregnancy **(CIII).** However, in post-hoc analyses of clinical trials and population-based studies, HPV vaccines have not been linked to adverse pregnancy outcomes.[38-41]
- 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 9-valent vaccine, but data are lacking to define the efficacy and cost-effectiveness of this approach **(CIII).**

Influenza Vaccine

Available Vaccines*

- Inactivated Influenza vaccine (IIV3) (standard-dose, egg-based vaccine)
  - Afluria (Seqirus)
  - Fluarix (GSK)
  - FluLaval (GSK)
  - Fluzone (Sanofi Pasteur)
- ccIIV3 (standard-dose, cell culture–based vaccine)
  - Flucelvax (Seqirus)
- HD-IIV3 (high-dose, egg-based vaccine)
  - Fluzone High-Dose (Sanofi Pasteur)
- aIIV3 (standard-dose, egg-based vaccine with MF59 adjuvant)
  - Fluad (Seqirus)
- RIV3 (recombinant hemagglutinin [HA] vaccine)
  - Flublok (Sanofi Pasteur)
- LAIV3 (live attenuated, egg-based vaccine)
  - FluMist (AstraZeneca)

* Vaccine formulations are updated yearly to reflect circulating strains.

Summary of Recommendations

- For all adults and adolescents with HIV, administer age-appropriate inactivated influenza vaccine (IIV) or recombinant influenza vaccine (RIV) annually **(AI).**
- For pregnant women with HIV, administer IIV or RIV at any time during pregnancy **(AI).**
- LAIV administered via nasal spray **is contraindicated** in people with HIV **(AIII).**
- High-dose, recombinant, and adjuvanted influenza vaccines are recommended for people with HIV aged 65 years or older over standard-dose unadjuvanted inactivated vaccines **(AII).**[42]

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 and neuraminidase. Although vaccine-induced immunity to these surface antigens reduces the likelihood of infection,[43,44] the frequent emergence of antigenic variants through antigenic drift[45] (i.e., point mutations and recombination events within a subtype) is the virologic basis for seasonal epidemics and necessitates revaccination each season.[46]

Some studies of influenza have noted higher hospitalization rates[47-50] and increased mortality[50,51] among people with HIV; however, these findings have not been observed in all settings.[52] Increased morbidity may be greatest for people with HIV not receiving effective antiretroviral therapy (ART) or with advanced disease. People with HIV are at high risk of serious influenza-related complications.

In general, people with HIV with minimal AIDS-related symptoms and normal or near-normal CD4 counts who receive IIV develop adequate antibody responses.[53-55] Among people with a low CD4 count or who have advanced HIV disease, IIV might not induce protective antibody titers.[55-57] In one study, markers of inflammation in older people (≥60 years) with HIV were associated with lower post-vaccination influenza antibody titers.[58] In people with HIV, a second dose of vaccine does not improve immune response,[56,59] and intradermal influenza vaccine dosing did not improve the immune response compared with intramuscular dosing.[60]

Influenza vaccines are trivalent (two A components and one B component) in the 2025–2026 season, with formulations and number of components that can change from season to season. 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,[47] vaccination was most effective at preventing influenza-like illness among people with a CD4 count >100 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 people with HIV, including 349 people on ART and 157 who were ART naive, efficacy of trivalent IIV for prevention of culture- or reverse transcription–polymerase chain reaction–confirmed influenza illness was 75% (95% confidence interval, 9% to 96%).[61]

Several clinical studies also have evaluated the immunogenicity of influenza vaccine in people with HIV. In a randomized study[62] comparing the immunogenicity of high-dose (60 mcg of antigen per strain) versus standard-dose (15 mcg of antigen per strain) trivalent IIV among 195 adults with HIV aged ≥18 years (10% of whom had a CD4 count <200 cells/mm^3), seroprotection rates were higher in the high-dose group for influenza A (96% vs. 87%; $P = 0.029$) and influenza B (91% vs. 80%; $P = 0.030$). However, in a comparative study of 41 children and young adults with HIV, high-dose trivalent IIV was no more immunogenic than the standard dose among the recipients with HIV.[63]

Although booster doses can make the influenza vaccine more effective, that benefit is limited to specific groups, such as solid-organ transplant recipients.[64] 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.[59] Based on this study, influenza booster immunizations **are not recommended** for people with HIV.

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.[42] 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. Information on currently available influenza vaccines is obtainable through the Centers for Disease Control and Prevention's (CDC) recommendations on the 2025–2026 influenza season. For adults aged ≥65 years, high-dose IIV,[65] adjuvanted IIV,[66] or RIV[67] are preferentially recommended over standard-dose unadjuvanted vaccines based on data suggesting higher efficacy in preventing invasive pneumococcal disease (IPD) in this age group.[68]

Although a LAIV is available, it **is contraindicated** for people with HIV because of the paucity of safety data and the availability of alternative vaccines.[69] Although unintentional administration of LAIV to adults with HIV has been well tolerated,[70] 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.

Because administration of vaccines can be associated with a transient rise in plasma HIV RNA levels, vaccination of pregnant women is recommended after ART has been initiated to minimize increases in plasma HIV RNA levels that might increase the risk of perinatal transmission of HIV.

Measles, Mumps, and Rubella Vaccine

Available Vaccines

- Live attenuated measles, mumps, and rubella (MMR) combination vaccine
  - M-M-R II (Merck)
  - Priorix (GSK)

Summary of Recommendations

For Vaccination

- Administer two doses of MMR vaccine 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 or has documentation of receipt of MMR vaccine or has laboratory evidence of immunity or disease) **(AIII).**
- The MMR vaccine **is not recommended** during pregnancy **(AII).**
- Women of childbearing potential who get the MMR vaccine should wait 4 weeks before getting pregnant.
- For pregnant women without immunity to rubella, **delay immunization until after pregnancy** and then administer two doses of the MMR vaccine at least 1 month apart if the CD4 count is ≥200 cells/mm^3 and on combination ART **(AIII).**

- If no serologic evidence of immunity exists after two doses of MMR vaccine, consider repeating the two-dose MMR vaccine series, especially if the person is vaccinated while not virologically suppressed **(CIII).**
- **Do not administer** MMR vaccine to people with HIV with CD4 count <200 cells/mm^3 or uncontrolled HIV (not on ART or virologic failure) **(AIII).**

For Post-exposure Prophylaxis

- For measles exposure of nonimmune individuals with CD4 count ≥200 cells/mm^3, administer either 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 nonimmune individuals with CD4 count <200 cells/mm^3 or who are pregnant, administer IG within 6 days of exposure.

Evidence Summary

Measles is a highly contagious and potentially life-threatening disease. Measles is particularly virulent in the immunocompromised host, with a reported mortality rate as high as 40% in people with advanced HIV.[71] Worldwide, the incidence of measles has continued to rise, with several ongoing outbreaks, and the United States has experienced a resurgence of measles. The CDC reported 2,267 measles in 2025, up from 285 cases in 2024 and 59 cases in 2023. Almost 90% of cases were associated with outbreaks, and this increase is largely attributable to decreased rates of vaccination. Current information regarding outbreaks can be found on the CDC website Measles Cases and Outbreaks.[72]

A study from a large urban HIV clinic in the U.S. reported that measles immune status is rarely documented (11.2%) in patient medical records.[73,74] With a resurgence of measles both domestically[75] and globally,[76] all people with HIV should be assessed for immunity or prior vaccination and vaccinated if MMR vaccine is indicated. Acceptable evidence of immunity includes being born before 1957, documented evidence of two doses of the MMR vaccine, or presence of positive antibody titers and this information should be documented.

Several studies from the 1990s found that 90% to 95% of adults with HIV were immune to measles.[77-79] but in a 2020 study, the measles seroprevalence rate was only 70.3%.[80] In these studies, serostatus did not vary by CD4 count, suggesting that people with HIV retained protective immunity even in the context of advanced disease. Similarly, people with HIV appear to retain immunity to mumps and rubella even after acquisition of HIV.[81]

Individuals who do not fulfill any criteria for immunity and have CD4 counts ≥200 cells/mm^3 should receive two doses of MMR vaccine 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 **(AIII).**

The MMR vaccine **is contraindicated** for people with HIV with CD4 counts <200 cells/mm^3 because the 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 a low CD4 count **(AIII).**[82,83] 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.[81,84,85] The MMR vaccine is also contraindicated for people with other immunocompromised conditions.

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

Meningococcal Vaccine

Available Vaccines

- Quadrivalent meningococcal conjugate vaccine (MenACWY)
  - Menveo (GSK)
  - MenQuadfi (Sanofi Pasteur)
- Recombinant meningococcal group B vaccine (MenB)
  - Bexsero (GSK)
  - Trumenba (Pfizer)
- Pentavalent meningococcal vaccine (MenABCWY; combines conjugated MenACWY with recombinant MenB)
  - Penbraya (Pfizer)
  - Penmenvy (GSK)

Summary of Recommendations

- Administer two doses of MenACWY vaccine at least 8 weeks apart to adolescents and adults with HIV who have not been vaccinated previously **(AII).**
- For people with HIV who have been vaccinated previously, repeat vaccination every 5 years throughout life **(BIII).**
- Serogroup B meningococcal vaccination is not routinely indicated for all people with HIV unless they have additional risks for meningococcal disease (e.g., complement component deficiency, asplenia, or receipt of a complement inhibitor) or are at risk during a serogroup B outbreak.
- Adolescents and young adults with HIV (aged 16–23 years) can be offered MenB vaccination with shared decision-making **(CIII).**[86]
- Adults may receive a single dose of MenABCWY vaccine as an alternative to separate administration of MenACWY and MenB when both vaccines would be given on the same clinic day **(BIII).**

Evidence Summary

Meningococcal meningitis, caused by *Neisseria meningitidis*, is a leading cause of bacterial meningitis among children and young adults in the United States.[87] In the 6 years prior to the introduction of MenACWY (2000–2005), the mean annual incidence of serogroups C, W, and Y meningococcal disease among adolescents aged 11 to 15 years was 0.36 cases per 100,000 population, and it decreased to 0.01 cases per 100,000 population in the 6 years following

implementation of the two-dose MenACWY series (2011–2017).[88] Two quadrivalent MenACWY vaccines and two pentavalent MenABCWY meningococcal vaccines are currently licensed and available in the United States. The quadrivalent vaccines include (1) meningococcal groups A, C, W, and Y oligosaccharide diphtheria CRM197 conjugate vaccine (MenACWY-CRM, Menveo) and (2) meningococcal groups A, C, W, and Y polysaccharide tetanus toxoid conjugate vaccine (MenACWY-TT, MenQuadfi). The pentavalent vaccines include (1) a combination of MenACWY-TT plus meningococcal group B recombinant FHbp antigens (MenACWY-TT plus MenB-FHbp; Penbraya) and (2) MenACWY plus meningococcal group B four component recombinant protein vaccine (MenACWY plus MenB-4C; Penmenvy). Meningococcal groups ACWY polysaccharide diphtheria toxoid conjugate vaccine (MenACWY-D, Menactra) is no longer available. A two-dose series of quadrivalent meningococcal vaccination is recommended for all adolescents, with the first dose at age 11 or 12 years and a second dose at age 16 years. Adolescents and adults with HIV who have not had this primary meningococcal vaccination series should receive two doses of MenACWY vaccine at least 8 weeks apart **(AII).** Repeated MenACWY boosters are recommended every 5 years, and MenACWY vaccines are interchangeable **(BIII).** MenACWY vaccines are licensed in the United States for one booster dose. Repeated boosters every 5 years is an off-label use but endorsed by ACIP.[89]

A growing body of evidence supports an increased risk of meningococcal disease in people with HIV. Studies have shown a fivefold to 24-fold increased risk of meningococcal disease in people with HIV compared with people without HIV[90-92]; low CD4 count and high HIV viral load are associated with increased risk.[93,94] Most meningococcal infections among people with HIV in the United States have been caused by serogroups C, W, or Y.[94] 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.[95]

The safety and immunogenicity of MenACWY-D vaccine have been evaluated only in people with HIV who are aged 11 to 24 years. Patients with CD4 percentage ≥15% received either one or two doses (at 0 and 24 weeks) of vaccine, and those with CD4 percentage <15% received two doses (at 0 and 24 weeks). Among people with HIV who received one dose of vaccine, 21% to 63% developed an antibody titer of ≥1:128 at 72 weeks after vaccination. Antibody responses at 72 weeks in individuals with CD4 percentage <15% were less robust,[96] with only 6% to 28% achieving titers ≥1:128. Local site reactions—such as pain and tenderness at the 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 quadrivalent MenACWY-CRM vaccine or the pentavalent vaccine in people with HIV, and clinical outcome data for both vaccines in people with HIV are lacking, as well.

MenB is not routinely indicated for all people with HIV unless they have additional risks for meningococcal disease. Adolescents and young adults (aged 16–23 years) with HIV can be offered MenB vaccination with shared decision-making **(CIII).**[86] MenB vaccine provides short-term protection against most strains of serogroup B meningococcal disease and has been used for patients at increased risk (e.g., those living in dormitories or barracks) and during outbreaks. People with functional or anatomic asplenia (including sickle cell disease), with persistent complement component deficiency, or using a complement inhibitor (e.g., eculizumab, ravulizumab) should receive MenB vaccination.[89] Two MenB vaccines are available: MenB-4C (Bexsero) and MenB-FHbp (Trumenba). People with HIV should receive the three-dose series for MenB, given at 0, 1–2, and 6 months, rather than the two-dose option recommended for healthy adolescents and young adults. MenB-4C consists of three recombinant proteins in addition to outer membrane

vesicles that contain outer membrane protein porin A. MenB-FHbp consists of two purified recombinant lipidated FHbp antigens. MenB vaccines are not interchangeable; the same product must be used for all doses in the series. A MenB vaccine booster may be indicated if a person has ongoing high risk for serogroup B meningococcal disease. In this situation, a single dose of the same vaccine is recommended ≥1 year after the MenB primary series completion and every 2 to 3 years thereafter. A booster dose may also be recommended by public health authorities for people at increased risk of exposure during a serogroup B meningitis outbreak.

Urban outbreaks of meningococcal meningitis (several different serogroups) have been reported in the United States among men both with and without HIV who have sex with men. 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 without HIV who have sex with men.[97]

During pregnancy and when lactating, women with HIV should receive MenACWY vaccine if indicated **(AIII).** No safety signals related to maternal and neonatal adverse events (including spontaneous abortion and birth defects) with MenACWY vaccine are evident in clinical trials or post-licensure surveillance.[98-102] Because only limited data are available for MenB vaccination during pregnancy, vaccination with MenB should be deferred unless the pregnant woman is at increased risk and, after consultation with their health care provider, the benefits of vaccination are considered to outweigh the potential risks **(CIII).**[89]

Mpox Vaccine

Available Vaccines

- Live nonreplicating smallpox and mpox vaccine
  - JYNNEOS (Bavarian Nordic)

Summary of Recommendations

For Vaccination

- Indications
  - Regardless of CD4 count, all people with HIV and no prior mpox infection should be offered mpox vaccination if they have or anticipate potential exposure to mpox, per CDC clinical considerations **(BII).**[103]
  - JYNNEOS should be provided to any other people with HIV who request vaccination **(CII).**
  - People who have received smallpox vaccination should receive mpox vaccination **(CIII).**
- Vaccine
  - Modified vaccinia Ankara-Bavarian Nordic (MVA-BN) vaccine, sold in the United States as JYNNEOS, is the preferred vaccine before mpox exposure for people with HIV because it uses a live attenuated, nonreplicating virus **(AII).**
  - Administer JYNNEOS in two doses 28 days apart, either 0.5 mL subcutaneously (SQ) or 0.1 mL intradermally (ID). SQ administration is preferred for people with a history of keloids and recommended for people aged <18 years.

- In situations where the second dose was not administered during the recommended interval, administer a second dose as soon as possible **(CIII).** Restarting or adding doses to the series when an extended interval between doses occurs is not necessary **(CIII).**
- At this time, booster doses, including for people with prior mpox or who were vaccinated at CD4 counts <200 cells/mm^3, **are not recommended (CIII).**
- Administration of the smallpox vaccine (ACAM2000, a live replicating vaccinia vaccine) to people with HIV **is contraindicated (AII).**
- Available human data on JYNNEOS administered to pregnant women are limited, and the risks and benefits of JYNNEOS should be discussed with the patient using shared decision-making **(CIII).**
- If mpox vaccination is sought during pregnancy or while breastfeeding, administer JYNNEOS because it contains nonreplicating virus **(AII).**

For Post-exposure Prophylaxis

- Indications
  - Post-exposure vaccination is recommended for all unvaccinated people with HIV who experience a known or presumed exposure **(BII).**
  - Post-exposure vaccination is recommended as soon as possible, ideally within 4 days after exposure; however, administration as long as 14 days after exposure may still provide some protection against mpox and should be offered **(BII).**
  - People who have received smallpox vaccination should still receive mpox post-exposure vaccination **(CIII).**
- Vaccine
  - JYNNEOS is the preferred vaccine before mpox exposure for people with HIV because it uses a live attenuated, nonreplicating virus **(AII).**
  - Administer JYNNEOS in two doses 28 days apart either 0.5 mL SQ or 0.1 mL ID. SQ administration is preferred for people with a history of keloids and recommended for people aged <18 years.
  - When there is adequate supply of JYNNEOS, clinicians may preferentially administer via SQ route. Local side effects may be less severe with SQ administration than with ID administration.

Evidence Summary

Mpox (formerly monkeypox) is a zoonotic viral disease caused by monkeypox virus (MPXV) that belongs to the *Orthopoxvirus* genus of the Poxviridae family, which also includes the causative agent of smallpox. Two main clades of MPXV have been described in different geographic regions of Africa; clade I (previously called Congo Basin clade) was classically associated with more severe disease and more human-to-human transmission than clade II (previously called West African clade).[104-106]

Vaccination is the principal biomedical means of preventing mpox, regardless of clade. Vaccines active against clade II mpox are expected to be equally active against clade I. Indications for mpox

vaccination are the same for people with and without HIV. Mpox vaccination should be offered to all people with HIV who have not had prior mpox and who have or anticipate potential exposure to mpox, regardless of CD4 count.[103]

People with HIV who are eligible for vaccination against mpox should receive MVA-BN vaccines **(AII).** These are live attenuated, nonreplicating viral vaccines, sold as JYNNEOS in the United States and as IMVANEX or IMVAMUNE elsewhere. Vaccination consists of two doses given 4 weeks (28 days) apart. The CDC's considerations for mpox vaccination recommend either SQ or ID vaccine administration; both routes of administration have been shown to be similarly effective.[107] SQ administration of JYNNEOS is preferred for people with a history of keloids and recommended for people aged <18 years.

JYNNEOS has been demonstrated to be both safe for people with HIV and equally immunogenic compared with people without HIV.[108-110] Several studies indicate that JYNNEOS is effective against mpox.[111-116] Matched case control study data indicate that vaccine effectiveness against symptomatic infection ranges from 36% to 75% after one dose to 66% to 89% after two doses.[112,115,116]

However, these studies were limited to virologically suppressed people with CD4 counts ≥100 cells/mm^3. Studies to date have had insufficient data to assess the effectiveness of JYNNEOS against mpox stratified by CD4 count, although one study reported high effectiveness regardless of CD4 count.[117] Immunogenicity among people with HIV who are not virologically suppressed or who have lower CD4 counts remains unknown.

The durability of immunity after mpox vaccination is unknown, including among people with HIV. Serological studies have shown declining antibody titers post-vaccination. However, the roles of innate and cell-mediated immunity remain unclear, and immunologic correlates of protection have not yet been established.[118] Breakthrough infections are rare but have been documented after vaccination.[119] A global case study from nine countries described 29 individuals who experienced mpox infections following completion of two appropriately spaced doses of JYNNEOS vaccine; of these individuals, eight had HIV and were virologically suppressed[120] with a median CD4 count of 555 cells/mm^3. Data collected from May 2022 to May 2024 during the clade II outbreak in the United States observed 271 cases (<1% of people vaccinated) occurring at disparate time intervals after vaccination; this low proportion of post-vaccination infections suggests that immunity is not waning to date.[121] In both reports, vaccine-breakthrough cases experienced less severe illness with fewer lesions. Hence, at this time, booster doses **are not recommended,** including for people who were vaccinated at CD4 counts <200 cells/mm^3 **(CIII).**

For people with a prior history of mpox infection, including people with HIV, vaccination **is not recommended** because mpox infection confers protective immunity **(CIII).**[103] No clinical correlates of immunity have yet been established to guide when additional vaccination might be needed following prior mpox infection. Although the durability of immunity is unknown, reinfection with mpox remains very rare. Very limited observational data indicate that people who become reinfected in the United States (i.e., have acquired immunity due to infection) tend to have a self-limited illness with a lower burden of lesions that can be managed in outpatient settings.[122,123] At this time, people who had mpox with moderate-to-severe immune suppression (CD4 <200 cells/mm^3) **are also not recommended (CIII)** to receive additional vaccinations after they achieve immune reconstitution on HIV treatment.

Available human data on JYNNEOS administered during pregnancy are insufficient to determine vaccine-associated risks. Animal studies of JYNNEOS have shown no evidence of harm to the developing fetus.[124] The risks and benefits of JYNNEOS should be discussed with the patient using shared decision-making **(CIII).** If vaccination is sought during pregnancy or breastfeeding, JYNNEOS should be used because it contains nonreplicating virus **(AII).** Vaccination with ACAM2000, which contains a replication-competent virus, **is contraindicated** during pregnancy or while breastfeeding due to risk of pregnancy loss, congenital defects, and vaccinia virus infection in fetuses and newborns and the availability of an alternative nonreplicating viral vaccine **(AII).**[125]

Pneumococcal Vaccine

Available Vaccines

- Pneumococcal conjugate vaccines (PCVs)
  - PCV15 (Vaxneuvance, Merck)
  - PCV20 (Prevnar 20, Pfizer)
  - PCV21 (Capvaxive, Merck)
- Pneumococcal polysaccharide vaccine (PPSV)
  - PPSV23 (Pneumovax, Merck)

Summary of Recommendations

Our recommendations are generally consistent with ACIP.[126] All people with HIV without a history of pneumococcal vaccination or with unknown vaccine history should be vaccinated as follows:

- Administer PCV21, PCV20, or PCV15 **(AII).** After PCV21 or PCV20, no additional pneumococcal vaccine is currently recommended.
  - In the expert opinion of the Community-Acquired Pneumonia Section Group of the Adult and Adolescent Opportunistic Infection Guidelines Panel, PCV21 **is not recommended** for adults with HIV if the prevalence of serotype 4 is over 30% in the region.[127] As of September 2024, high levels of serotype 4 have been reported in Alaska, Colorado, the Navajo Nation, New Mexico, and Oregon. In these locations, people with HIV should receive PCV20 or, if PCV20 is not available, PCV15 **(AIII).** This guidance will be reviewed and updated as pneumococcal disease epidemiology evolves and data from other geographic areas become available.
- If PCV15 is used, administer a dose of PPSV23 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. Specific cases are as follows:
  - Adults who have received both PCV13 and PPSV23:
    - Adults who received PPSV23 before the age of 65 can be administered PCV21 or PCV20 at least 5 years after the last pneumococcal vaccine dose.
    - Adults who received PPSV23 at age 65 or older do not require further doses of PPSV23. Their pneumococcal vaccination can be considered complete.

        - Shared clinical decision-making is recommended regarding administration of PCV21 or PCV20 for immunocompromised persons aged ≥65 years who completed their vaccine series with both PCV13 and PPSV23. If a decision to administer PCV21 or PCV20 is made, it should be given at least 5 years after the last pneumococcal vaccine dose **(CIII).**
    - Adults who previously received only PCV13 may receive one dose of PCV21 or PCV20 at least 1 year later **(BIII)**
    - Adults who have only received PPSV23 may receive PCV21 or PCV20 (or PCV15 if the former are not available) at least 1 year after their last PPSV23 dose to complete their pneumococcal vaccination series **(BIII).**

- Pneumococcal vaccine can be administered during pregnancy **(AIII).**

Evidence Summary

Some observational studies have reported benefits of PPSV against IPD[128,129] (e.g., bacteremia, meningitis) and all-cause pneumonia[130-132] in people with HIV; however, results have been variable.[128,133-135] One randomized placebo-controlled trial of PPSV in Africa paradoxically found that vaccination was associated with an increased risk of pneumonia, and there was no evidence of reduced risk of IPD among vaccinated participants.[136] Follow-up of this cohort confirmed the increase in pneumonia in vaccinated participants but also showed a decrease in all-cause mortality, although participants in this study were not treated with ART.[137] A study[138] evaluating the impact of PCV13 vaccination on the rates of IPD in adults with HIV between 2008 and 2018 found that IPD rates remained high despite reductions with the introduction of PCV13. However, use of higher-valent conjugate vaccines might reduce IPD: 11.2% of cases of IPD consisted of additional serotypes contained in PCV15 but not PCV13, and 16.5% of cases of IPD consisted of serotypes in PCV20 but not in PCV15.

In 2021, PCV15 and PCV20 were licensed by the U.S. Food and Drug Administration (FDA) for use in adults[139] based on safety and immunogenicity data compared with data on PCV13 or PPSV23. Effectiveness data of these vaccines against pneumococcal disease or their durability in providing immunoprotection in adults with HIV currently are not available. One Phase 3 clinical trial of PCV15 followed by PPSV23 8 weeks later in people with HIV demonstrated safety and immunogenicity of this approach.[140] No clinical data exist for the use of PCV20 in people with HIV.

In 2024, PCV21, which was developed specifically for adults, was approved in the United States. It includes the serotypes that are currently responsible for most cases of IPD in adults.[141] Overall, 77% to 85% of IPD cases in adults are due to serotypes in PCV21, compared with 54% to 62% in PCV20 and 60% to 67% in PPSV23. However, PCV21 does not include some serotypes contained in previously approved vaccines. One example is serotype 4, which is included in all other PCV formulations and in PPSV23; serotype 4 has recently reemerged in certain geographic areas (Alaska, Colorado, the Navajo Nation, New Mexico, and Oregon), causing outbreaks of pneumococcal disease, especially among people with certain risk factors that often are more common in people with HIV (e.g., homelessness, alcoholism, cigarette smoking, injection drug use, chronic lung disease)[142]

Immune responses to PCV21 were evaluated among adults aged ≥18 years with HIV in one study. When recipients of PCV15 followed by PPSV23 8 weeks later were compared with recipients of PCV21 followed by placebo 8 weeks later, immunogenicity for shared serotypes was comparable,

and PCV21 was immunogenic for unique serotypes.[143] There are currently no data on clinical effectiveness of PCV21 in people with HIV.

Recommendations for PCV and PPSV23 in people with HIV depend on their age, receipt of prior doses of pneumococcal vaccine, number of prior doses, and specific vaccines received. In addition, the region's prevalence of IPD (>30% of IPD cases) caused by serotype 4, patients' risk factors, and local health department recommendations need to be considered when deciding between PCV21 or PCV20 for vaccine-naive individuals. For people with HIV and CD4 counts >200 cells/mm^3, pneumococcal vaccination should not be delayed while awaiting a response to ART. For people with HIV who have a CD4 count <200 cells/mm^3, immunogenicity may be improved if pneumococcal vaccination is administered when the CD4 count increases to 200 cells/mm^3 or higher on ART. However, data are inconsistent. In some studies, immune responses have been shown to be decreased in response to PCV or to PPSV23 among people with HIV and lower CD4 counts (e.g., <200 or <350 cells/mm^3)[144,145]; other studies have demonstrated no difference according to CD4 count at the time of vaccination or with delaying vaccinations until after 6 months of ART.[146-148] Thus, delaying administration of pneumococcal vaccines to optimize immune response in those with CD4 counts <200 cells/mm^3 must be considered against an increased risk of pneumococcal disease and IPD in this group and any potential barriers to retention in care.

A study comparing administration of pneumococcal conjugate vaccine 10 (PCV10), PPSV23, or control (1:1:1) among 347 women during Weeks 13 through 34 of pregnancy found that PCV10 and PPSV23 were equally safe and immunogenic in pregnant women with HIV and conferred similar levels of seroprotection to their infants.[149] Women who did not receive vaccines during pregnancy were vaccinated postpartum and demonstrated higher antibody responses than women vaccinated antepartum, suggesting that postpartum booster doses may be beneficial and require further study.[150] No human data are available on PCV15, PCV20, or PCV21 in pregnancy.

Respiratory Syncytial Virus Vaccine

Available Vaccines

- Adjuvanted protein subunit vaccine (Arexvy, GSK)
- Bivalent protein subunit vaccine (Abrysvo, Pfizer)
- mRNA vaccine (mRESVIA, Moderna)

Summary of Recommendations

- Administration of a single respiratory syncytial virus (RSV) vaccine (Abrysvo, Arexvy, or mRESVIA) to all people with HIV aged ≥75 years is recommended **(BIII).**
- Administration of a single RSV vaccine for people ages 50 to 74 with HIV and CD4 count <200 cells/mm^3 or with comorbid chronic conditions that increase risk for severe RSV disease is recommended.
- For pregnant women with HIV, administration of a single RSV vaccine (Abrysvo) between 32 and 36 weeks' gestation with seasonal administration during September through January in most of the continental United States is recommended **(BIII).**
- No booster doses are currently recommended (**BIII).**

Evidence Summary

RSV is a significant cause of lower respiratory tract infection and bronchiolitis worldwide in children aged <5 years and adults aged ≥60 years. RSV vaccine development began in the 1960s; however, early formaldehyde-inactivated RSV vaccines induced a life-threatening inflammatory response during subsequent natural RSV infection in infants.[151] Following an improved understanding of the structure of RSV, modern vaccine research has developed a myriad of safer approaches, including live attenuated, chimeric, vector-based, subunit proteins, nanoparticle, and nucleic acid vaccines.[152] Currently, at least 19 RSV vaccines are in clinical trials evaluating efficacy in pediatric, maternal, and adult populations.[153]

In May 2023, the FDA approved the first two RSV vaccines for adults aged ≥60 years: RSVPreF3 (Arexvy) and RSVpreF (Abrysvo). Both vaccines target the prefusion F protein on the viral surface.[154]

RSVPreF3 (Arexvy) is an $AS01_E$-adjuvanted RSV prefusion F protein–based vaccine, approved based on results of a large clinical trial comparing the candidate vaccine to placebo over a median follow-up of 6.7 months.[155] The study included 17,922 participants. People with HIV were excluded from the study. Relative to placebo, RSVPreF3 was efficacious in reducing RSV-related lower respiratory tract disease, severe lower respiratory tract disease, and acute respiratory infection by 83%, 94%, and 72%, respectively. Further, this vaccine was generally safe, with most adverse events being transient, mild to moderate, and related to local pain and fatigue. Rare inflammatory neurologic events were reported in three trial participants within 42 days of receipt of the RSVPreF3; all events occurred in trials without a placebo arm. These included one case of Guillain-Barré syndrome (GBS) and two cases of acute disseminated encephalomyelitis (ADEM). Both ADEM cases were based on symptoms and clinical findings, and one case was fatal.

RSVpreF (Abrysvo) is a bivalent RSV prefusion F protein–based vaccine that demonstrated efficacy in a large, randomized clinical trial with a mean follow-up of 7 months.[156] Immunocompromised patients were excluded from this trial. People with well-controlled HIV (viral load <50 copies/mL and CD4 counts >200 cells/mm^3 on ART) were eligible, but the number of people with HIV in the trial is not reported. Compared with placebo, RSVpreF reduced RSV-related lower respiratory tract illness with at least two signs or symptoms and with at least three signs or symptoms by 67% and 86%, respectively. RSVpreF reduced RSV-associated acute respiratory illness by 62%. RSVpreF was relatively safe, with higher rates of local reactions in the vaccine (12%) versus placebo (7%), but rates of systemic events were similar. Rare inflammatory neurologic events were reported in three of 34,284 participants, including one case of GBS, one case of Miller Fisher syndrome (GBS variant), and one case of undifferentiated motor-sensory axonal polyneuropathy. A separate clinical trial evaluated maternal RSVpreF versus placebo to determine efficacy in reducing RSV-related illness in newborns and infants.[157] In interim analysis, RSVpreF was effective in reducing medically attended severe RSV-associated lower respiratory tract illness in infants within 90 days after birth, and no safety concerns were identified. Pregnant women with HIV were excluded from this trial.

mRNA-1345 (mRESVIA) is an mRNA-based RSV vaccine encoding the stabilized RSV prefusion F glycoprotein. In a trial of more than 35,000 participants aged ≥60 years, the vaccine demonstrated greater than 80% efficacy against RSV-related lower respiratory tract disease.[158] Participants with HIV and CD4 count ≥350 cells/mm^3 and an undetectable HIV viral load within the past year were permitted to enroll in the trial. The vaccine was generally well tolerated, and no cases of ADEM or GBS were observed.

In June 2024, ACIP recommended that adults aged ≥75 years and adults aged 60 to 74 years with comorbid conditions that increase risk for severe RSV disease receive a single dose of an approved RSV vaccine. A full list of qualifying conditions can be found on the CDC's Clinical Overview of RSV webpage.[159] In September 2023, ACIP and the American College of Gynecology both recommended seasonal administration of one dose of RSV vaccine for pregnant women during weeks 32 through 36 of pregnancy, ideally at least 14 days before delivery.

In the absence of additional data regarding immunologic response, clinical efficacy, and safety in people with HIV, these recommendations are aligned with the ACIP guidance for the general population. For people with HIV, offer a single RSV vaccine (Abrysvo, Arexvy, or mRESVIA) to individuals aged ≥75 years and those aged 50 to 74 years with qualifying comorbid conditions **(BIII).** Individuals aged 50 to 74 years with HIV and CD4 <200 cells/mm^3 are eligible for RSV vaccination, although the vaccines have not been studied in this population, and many clinicians may choose to wait for immune reconstitution prior to administering the vaccine **(BIII).** Optimally, vaccination should occur before the onset of the fall and winter RSV season.

For pregnant women with HIV, administer a single RSV vaccine (Abrysvo) between 32 to 36 weeks gestation with seasonal administration during September through January in most of the continental United States **(BIII).** The adjuvanted vaccine, Arexvy, and the mRNA vaccine, mRESVIA, have not been studied in pregnancy and should not be used as an alternative. In locations where the seasonality of RSV differs from the continental United States (e.g., tropical climates, the Southern hemisphere), providers should follow local guidance on timing of administration. Data regarding immunologic response to the vaccine and clinical outcomes are notably lacking in people with HIV.

Tetanus, Diphtheria, and Pertussis Vaccine

Available Vaccines

- Tdap: Tetanus, diphtheria, and pertussis
  - Adacel (Sanofi Pasteur)
  - Boostrix (GSK)
- Td: Tetanus and diphtheria
  - TENIVAC (Sanofi Pasteur)

Note: DTaP vaccines (diphtheria, tetanus, and pertussis) are only for babies and young children and therefore are not covered in these guidelines.

Summary of Recommendations

- Administer Tdap once if the person with HIV has not been vaccinated at age 11 or older, and then either Td or Tdap every 10 years thereafter **(AII).**
- For pregnant women 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 the primary vaccination series for tetanus, diphtheria, or pertussis, administer one dose of Tdap followed by one dose of Td or Tdap at least 4 weeks after Tdap, and another dose of Td or Tdap 6 months to 12 months after the last

Td or Tdap. Tdap can be substituted for any Td dose and is always preferred as the first dose **(AIII).**

Evidence Summary

Antibody response to tetanus and diphtheria vaccination varies by CD4 count. For individuals with advanced HIV and a low CD4 count, immunologic response is attenuated for both tetanus and diphtheria when compared with people without HIV.[160,161] For people with CD4 count >300 cells/mm^3, antibody response to tetanus vaccination is similar to the general population, whereas response to diphtheria remains diminished.[160-162] 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

Available Vaccine

- Live attenuated varicella vaccine (VAR)
  - Varivax (Merck)

Summary of Recommendations

- People with HIV with any of the following have presumed immunity to varicella: receipt of two doses of either Varivax or MMRV, diagnosis of varicella or herpes zoster (shingles) by a health care provider, or laboratory evidence of immunity or disease.
- For adults and adolescents with HIV who are varicella nonimmune with CD4 count ≥200 cells/mm^3, administer two doses of VAR 4 to 8 weeks apart **(BIII).**
- VAR **is contraindicated** for people with HIV with CD4 count <200 cells/mm^3 **(AIII).**
- VAR **is contraindicated** during pregnancy **(AIII).** However, for nonimmune pregnant women with HIV and CD4 count ≥200 cells/mm^3, VAR should be administered immediately after delivery with a subsequent dose administered at the 6-week postpartum visit **(AIII).**
- If vaccination results in disease due to live attenuated vaccine virus, antiviral treatment is recommended **(AIII).** See the Treating Disease section of the Varicella-Zoster Virus Disease chapter for dosing.
- If post-exposure varicella-zoster immune globulin (VariZIG) has been administered, an interval of at least 5 months is recommended before varicella vaccination **(CIII).**
- If post-exposure acyclovir, famiclovir, or valacyclovir have been administered, an interval of at least 24 hours is recommended before varicella vaccination **(CIII).**
- Post-exposure varicella vaccination for people with HIV **is not recommended (CIII).**

Evidence Summary

The live attenuated varicella vaccine (sold as Varivax) is safe and immunogenic in children and adolescents with HIV who have relatively preserved immune systems (CD4 percentage ≥15%)[163-166] and is recommended for this population of children and adolescents with HIV.[167] Varicella vaccination of children and adolescents with HIV also reduces the risk of subsequent herpes zoster.[166,168]

Adults who are seronegative for varicella-zoster virus (VZV) are potential candidates for varicella vaccination. Given the high prevalence of VZV seropositivity in adults, administration of varicella vaccine for adults will be infrequent. Some experts would serologically screen adults with HIV without a history of prior varicella infection or varicella vaccination for VZV IgG. However, the value of this approach may be limited by the lack of sensitivity of commercially available VZV antibody assays (particularly for vaccine-induced antibody).[169,170] No studies have evaluated the clinical efficacy of the vaccine in adolescents or adults with HIV, but varicella vaccination (two doses, administered 4 to 8 weeks apart) is recommended for VZV-susceptible people with HIV at least age 18 years with CD4 counts ≥200 cells/mm^3 **(BIII).**[171]

If post-exposure VariZIG has been administered (see below), an interval of at least 5 months is recommended before varicella vaccination **(CIII).**[172] If post-exposure acyclovir, famciclovir, or valacyclovir has been administered, an interval of at least 24 hours after the last dose is recommended before varicella vaccination **(CIII).**

Herpes Zoster Vaccine

Available Vaccine

- Recombinant adjuvanted zoster vaccine (RZV)
  - Shingrix (GSK)

Summary of Recommendations

- For people with HIV aged ≥18 years, regardless of CD4 count or previous history of herpes zoster, administer two doses of RZV 2 to 6 months apart **(AIII).**
- For individuals who are expected to have worsening immunosuppression (e.g., initiating immunosuppressive therapy, ART nonadherence, or ineffective ART) in the near future, a shorter vaccination schedule can be used: two doses administered 1 to 2 months apart **(CIII).**
- Following initiation of ART, some experts would administer the RZV vaccination series after CD4 count recovery (≥200) and/or virologic suppression are achieved, to ensure a robust vaccine response **(CIII).**
- Individuals with herpes zoster who did not previously receive RZV vaccine can be vaccinated after their episode resolves to provide protection from recurrent episodes **(CIII).** Vaccination is recommended following resolution of primary episode, preferably within 1 year, but may be administered at any point after the primary episode has resolved **(CIII).**
- Do not administer RZV to people experiencing an acute episode of herpes zoster **(AIII)** or an episode of active inflammation due to VZV-related inflammatory eye disease **(AIII).**

- People who were previously vaccinated with attenuated zoster vaccine live (ZVL, previously sold as Zostavax) should be revaccinated with RZV **(AIII).**
- Data on RZV during pregnancy is insufficient. Consider administering after delivery **(BIII).**
- RZV vaccine **is not recommended** or approved for prevention of primary varicella infection **(AIII).**

Evidence Summary

Initial FDA approval for Shingrix was based on pivotal Phase 3 randomized, placebo-controlled clinical trials involving >30,000 participants aged ≥50 years in which the vaccine efficacy against herpes zoster in vaccinated participants was 97.2% overall and 91.3% in those aged ≥70 years.[173,174] The most common solicited adverse reactions in vaccine recipients were pain (78% of recipients), myalgia (45%), and fatigue (45%), with Grade 3 injection site reactions (pain, redness, and swelling) reported in 9.4% of vaccine recipients and Grade 3 solicited systemic events (myalgia, fatigue, headache, fever, and gastrointestinal symptoms) reported by 10.8% of vaccine recipients.[175,176] Systemic Grade 3 reactions were reported more frequently after Dose 2 than after Dose 1.[176]

Data on use of RZV in people with HIV are limited, but two studies of immune response to the recombinant zoster vaccine in people with HIV are ongoing.[177,178] Two studies in people with HIV have demonstrated that RZV increased humoral and cell-mediated immunity to VZV after two doses, including among people with CD4 counts <200 cells/mm^3.[179,180] Based on the available data in people with HIV, the vaccine appears safe and immunogenic[181]

No data identify the optimal timing of vaccination for people with HIV with a CD4 count <200 cells/mm^3 or who are not suppressed virologically on ART, but ACIP recommends vaccination of all people with HIV regardless of CD4 count and HIV viral load. Following initiation of ART, some experts would administer the RZV vaccination series after CD4 count recovery (≥200) and/or virologic suppression are achieved **(CIII).**

Post-infection vaccination has been shown to be safe and immunogenic in the general population,[182] and most recurrences occur after 1 year (interquartile ranges vary from 1–2.3 years to 1.4–4.1 years based on age group studied).[183] Therefore, vaccination is recommended any time between resolution of primary episode and 1-year later if possible, but can be given at any point in the future as well **(CIII).** The optimal timepoint for vaccination in this scenario has not been studied in any population.

Prior to availability of RZV, a 1-dose attenuated live-zoster virus vaccine (Zostavax) for prevention of herpes zoster was FDA-approved and recommended for use in immunocompetent adults aged ≥50 years. It is no longer available or recommended for use in the United States. Those who previously received ZVL should be revaccinated with RZV **(AIII).**

Recommended Adult Immunization Schedule by Medical Condition and Other Indications

Vaccine Preventable Infection	Indication	Recommendations	Additional Comments
COVID-19	All adults and adolescents regardless of CD4 count or viral load (AII)	Adults and adolescents with HIV should receive a current season COVID-19 vaccine regardless of their CD4 count or HIV viral load or their pregnancy or breastfeeding status (AII). For never vaccinated and incompletely vaccinated people refer to published vaccine-specific guidelines.	People with advanced or untreated HIV are considered moderately or severely immunocompromised and may get a second dose 6 months after their last (AIII).
Hepatitis A Virus (HAV)	HAV nonimmune (AII)	Two-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 in three-dose series (0, 1, 6 months) (AII)	Assess total antibody response (IgG and IgM) 1 to 2 months after completion of the series, and if negative, revaccinate, preferably after the CD4 count is ≥200 cells/mm^3 (BIII). People with HIV whose CD4 count is <200 cells/mm^3 and who have ongoing risk for HAV should be immunized at entry to care, followed by assessment and revaccination as above. For people with HIV whose CD4 count is <200 cells/mm^3 who do not have ongoing risk for HAV, waiting for CD4 count >200 cells/mm^3 prior to immunization is an option (BIII). For people traveling within 28 days after receipt of the first dose, the following accelerated regimen is recommended: • Twinrix: four-dose series (0, 7, 21–30 days, 12 months) (BII)
	Post-exposure prophylaxis	Administer HepA vaccine and HepA IgG (0.1 mg/kg) simultaneously in different anatomical sites as soon as possible within 2 weeks of exposure to HAV to people who are nonimmune. Complete the HepA vaccine series following the dosing intervals for the selected vaccine.	

Vaccine Preventable Infection	Indication	Recommendations	Additional Comments
			People who are nonimmune and traveling within 2 weeks to countries with endemic HAV do not have time to complete a vaccine series and mount immune response before travel. Consider administering IgG 0.1 mL/kg if duration of travel is <1 month. If duration of travel is 1 to 2 months, administer IgG 0.2 mL/kg. If duration of travel is ≥2 months, IgG 0.2 mL/kg should be repeated every 2 months. One study showed lower seroresponse to HepA when coadministered with pneumococcal conjugate vaccine. For patients who need both, clinicians may choose to separate by 1 month (CIII). Pregnant women who have chronic HBV infection, are negative for total anti-HAV, and were not previously vaccinated against hepatitis A should receive the HepA vaccine series (AIII).

Vaccine Preventable Infection	Indication	Recommendations	Additional Comments
Hepatitis B Virus (HBV)	HBV nonimmune and no active HBV (i.e., negative for HBsAg, anti-HBc, and anti-HBs), including during pregnancy	Preferred: • Heplisav-B IM at 0 and 4 weeks (AII) Alternative (if Heplisav-B is unavailable): • Engerix-B (40 mcg*): three-dose series (0, 1, 6 months) (AII); *or* • Recombivax HB (20 mcg*): three-dose series (0, 1, 6 months) (AII); *or* • Twinrix 1.0 mL IM: three-dose series (0, 1, 6 months) (AII) *These doses are considered a "double dose"	Anti-HBs should be obtained 1 to 2 months after completion of the vaccine series to document response to HepB vaccination, defined as anti-HBs ≥10 mIU/mL (AII). Vaccinate individuals with isolated anti-HBc with one standard dose of HepB (BII) and check anti-HBs titers 1 to 2 months afterward. If a significant delay occurs between doses, there is no need to restart the series. For travelers, some clinicians recommend an accelerated schedule: • Twinrix: four-dose series (0, 7, 21–30 days, 12 months) (BII)
	Vaccine nonresponder (if anti-HBs <10 mIU/mL at 1 month after complete series)	If failed prior Engerix-B or Recombivax HB: • Heplisav-B IM at 0 and 4 weeks (AI) with consideration for third dose of HepBCpG at 24 weeks (BIII) If failed prior two-dose Heplisav-B vaccination: • Administer a third dose of Heplisav-B IM at 24 weeks after first dose (AII).	
	Isolated anti-HBc	• One dose of any HepB vaccine (i.e., Heplisav-B, Engerix-B, or Recombivax HB) followed by testing for quantitative anti-HBs 1 to 2 months postdose (BII) o If the titer is ≥100 mIU/mL, no further vaccination is needed. o If the titer is <100 mIU/mL, a complete series of HepB vaccine should be completed (see above for schedule), followed by repeat anti-HBs testing (BII). o If an anti-HBs quantitative titer is not available, then a complete HepB vaccine series is recommended, followed by qualitative anti-HBs testing (BII).	

Vaccine Preventable Infection	Indication	Recommendations	Additional Comments
	Post-exposure prophylaxis	For exposed people who have been previously vaccinated with a complete series and have documented antibody response, no additional vaccine is needed. For exposed people who have received a 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 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 years	Recombinant 9-valent human papillomavirus vaccine (Gardasil 9): • 0.5 mL IM three-dose series (0, 1–2, and 6 months) (AIII)	If a significant delay occurs between doses, there is no need to restart the series. Some people with HIV ages 27–45 years may benefit from vaccination, and shared clinical decision-making between the provider and patient is recommended in these situations. Vaccination is not recommended during pregnancy (CIII). Delay until after pregnancy.
	Adults and adolescents who previously received bivalent or quadrivalent vaccine	For people 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).	

Recommended Adult Immunization Schedule by Medical Condition and Other Indications

Vaccine Preventable Infection	Indication	Recommendations	Additional Comments
Influenza	All	One dose of age-appropriate IIV or RIV annually (AI) LAIV is contraindicated (AIII).	Influenza vaccines are trivalent, with formulations that change from season to season. Information on currently available influenza vaccines is available through the CDC's recommendations on the 2025–2026 influenza season. Adults aged ≥65 years are recommended to receive high-dose IIV (Fluzone High-Dose), RIV (Flublok), or adjuvanted IIV (FLUAD) over standard-dose unadjuvanted vaccine (AII). People aged ≥9 years also may use RIV (Flublok). 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 women with HIV, administer IIV or RIV at any time during pregnancy (AI).

Vaccine Preventable Infection	Indication	Recommendations	Additional Comments
Measles, Mumps, and Rubella (MMR)	CD4 count ≥200 cells/mm^3 and no evidence of immunity to MMR	Two-dose series (0.5 mL SQ) of MMR vaccine at least 1 month apart (AIII) MMR vaccine **is contraindicated** if CD4 count <200 cells/mm^3 (AIII). MMR vaccine **is not recommended** during pregnancy (AII).	Evidence of immunity to MMR vaccine • Birth date before 1957, *or* • Documentation of receipt of MMR vaccine, *or* • Laboratory evidence of immunity or disease for each pathogen For pregnant women without immunity to rubella, after pregnancy, administer two doses of MMR vaccine at least 1 month apart if CD4 count ≥200 cells/mm^3 and on ART (AIII).
	Post-exposure prophylaxis	For measles, nonimmune individuals with CD4 count ≥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. For measles, nonimmune individuals with CD4 count <200 cells mm^3 or who are pregnant, administer IG within 6 days of exposure.	
Meningococcus Serogroup A, C, W, Y (MenACWY)	No prior polyvalent meningococcal vaccine	MenACWY vaccine (Menveo or MenQuadfi): • Two-dose series (0.5 mL IM) given at least 8 weeks apart (AII)	MenACWY vaccine is routinely recommended. During pregnancy and when lactating, women with HIV should receive MenACWY vaccine if indicated (AIII).
	Prior MenACWY vaccination	Administer a booster dose of MenACWY vaccine every 5 years (BIII). MenABCWY vaccine should be used if MenACWY and MenB vaccines are both indicated (BIII).	MenACWY vaccines are interchangeable; the same vaccine product is recommended, but not required, for all doses.

Vaccine Preventable Infection	Indication	Recommendations	Additional Comments
Meningococcus Serogroup B (MenB)	No prior MenB vaccine and increased risk for serogroup B meningococcal disease from a medical condition (e.g., complement component deficiency, asplenia, receipt of a complement inhibitor) or an outbreak	Administer either MenB vaccine (Bexsero or Trumenba) as a three-dose series (0.5 mL IM) at 0, 1–2, and 6 months (AIII) • If the second dose was administered ≥6 months after the first dose, a third dose is not needed. • If the third dose is administered <4 months after the second dose, the dose should be repeated ≥4 months after the last dose.	Bexsero and Trumenba are not interchangeable. MenB vaccination during pregnancy should be deferred (CIII).
	Prior MenB vaccination (≥1 year) and at increased risk during an outbreak	Administer booster dose of same MenB vaccine (CIII).	Licensed in the United States only for a primary series. Administration of booster doses is considered off-label.
	Adolescents and young adults with HIV (aged 16–23 years) can be offered MenB vaccination with shared decision-making.	Administer either MenB vaccine as a three-dose series (0.5 mL IM) administered at 0, 1–2, and 6 months (CIII).	
Mpox	All people with HIV, regardless of CD4 count, with no prior mpox infection but who have or anticipate exposure to mpox per CDC clinical considerations (BII), or those who request vaccination (CII)	Administer a two-dose series of JYNNEOS given 28 days apart (AII): • 0.5 mL SQ (preferred for people with a history of keloids or aged <18 years), *or* • 0.1 mL ID (alternative) In situations where the second dose was not administered during the recommended interval, administer a second dose as soon as possible (CIII). Administration of live replicating vaccinia vaccines (ACAM2000) is contraindicated in people with HIV (AII).	JYNNEOS can be coadministered with most other vaccines. Adolescent and young adult men might consider a 4-week interval between receiving JYNNEOS vaccine and a COVID-19 vaccine because of potential risk for myocarditis and pericarditis (CIII). People who have received smallpox vaccination should receive mpox vaccination (CIII). Booster doses, including for people with prior mpox or who were vaccinated at CD4 counts <200 cells/mm^3, are not recommended (CIII). Data on JYNNEOS administered to pregnant women are limited; if mpox vaccination is indicated, the risks and benefits of JYNNEOS should be discussed using shared decision-making (CIII).

Vaccine Preventable Infection	Indication	Recommendations	Additional Comments
	Post-exposure prophylaxis	For unvaccinated people with HIV who experience a known or presumed exposure (BII), administer complete JYNNEOS series (see above), with the first dose given ideally within 4 days but as long as 14 days after exposure (BII).	
Pneumococcal	No prior pneumococcal vaccine or unknown vaccination history	Administer one of the following: • PCV21 (Capvaxive) 0.5 mL IM x 1 (AII); *or* • PCV20 (Prevnar20): 0.5 mL IM x 1 (AII); *or* • PCV15 (Vaxneuvance): 0.5 mL IM × 1 followed at least 8 weeks later by PPSV23 (Pneumovax) 0.5 mL IM × 1 (AII).	PCV21 is not recommended for adults with HIV if local prevalence of serotype 4 is more than 30% (as of September 2024, high rates of serotype 4 have been reported in Alaska, Colorado, the Navajo Nation, New Mexico, and Oregon). Pneumococcal vaccine can be administered during pregnancy (AIII).
	Previously received PCV13 and PPSV23	If <65 years when received dose of PPSV23: • Administer PCV21 *or* PCV20 0.5 mL IM x 1 at least 5 years after the last pneumococcal vaccine (CIII).	PPSV23 is no longer recommended as preferred booster dose for patients who previously started the vaccine series.
		If ≥65 years when received dose of PPSV23: • No further doses of PPSV23 are required. • Shared decision-making is recommended regarding administration of PCV21 or PCV20 for adults aged ≥65 years who have completed both PCV13 and PPSV23. If PCV21 or PCV20 given, administer at least 5 years after last pneumococcal vaccine dose (CIII).	
	Previously received only PCV13	Administer PCV21 *or* PCV20 0.5 mL IM x 1 at least 1 year after PCV13 (BIII).	PPSV23 is no longer recommended as preferred booster dose for patients who previously started the vaccine series.
	Previously received only PPSV23	Administer either of the following at least 1 year after last PPSV23 dose: • PCV21: 0.5 mL IM x1 (BIII); *or* • PCV20: 0.5 mL IM x 1 (BIII); *or* • PCV15: 0.5 mL IM x 1 (BIII)	PPSV23 is no longer recommended as a preferred booster dose for patients who previously started the vaccine series.

Vaccine Preventable Infection	Indication	Recommendations	Additional Comments
Respiratory Syncytial Virus (RSV)	Age ≥75 years	One dose 0.5 mL IM of RSV vaccine (Arexvy, Abrysvo, or mRESVIA) (CIII)	Limited data on efficacy and safety for people with HIV.
	Age 50–74 years with a comorbid condition increasing the risk for severe RSV disease	One dose 0.5 mL IM of RSV vaccine (Arexvy, Abrysvo, or mRESVIA) (CIII)	Individuals aged 50–74 years with CD4 count <200 cells/mm^3 are eligible, but limited data exist on immune response. Some clinicians may elect to wait for immune reconstitution prior to vaccination (CIII).
	Pregnant women between 32 and 36 weeks' gestation	One dose 0.5 mL IM of RSV vaccine (Abrysvo) (CIII)	Limited data exists on efficacy and safety for people with HIV. Seasonal administration recommended. RSV season in the continental United States is typically September–January but differs by year and geography. Ideally, dose should be given at least 14 days prior to delivery.
Tetanus, Diphtheria, and Pertussis	Not previously vaccinated	One dose 0.5 mL IM Tdap (Adacel or Boostrix), followed by one dose of Td or Tdap at least 4 weeks after Tdap and another dose of Td or Tdap 6 months to 12 months later, then give Td or Tdap every 10 years (AII)	Tdap can be substituted for any Td dose and is always preferred as the first dose.
	Did not receive Tdap at age 11 years or older	One dose 0.5 mL IM 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.
	Pregnancy	Give Tdap preferably in early part of gestational weeks 27–36 (AIII). One dose of Tdap is indicated for each pregnancy.	Give Td or Tdap booster every 10 years after Tdap.

Vaccine Preventable Infection	Indication	Recommendations	Additional Comments
Varicella (Chickenpox)	CD4 count ≥200 cells/mm^3 with no evidence of immunity to varicella	Two-dose (0.5 mL SQ) series of VAR (Varivax) 4–8 weeks apart (BIII) VAR **is contraindicated** if CD4 count <200 cells/mm^3 (AIII). If post-exposure VariZIG was administered: wait ≥5 months before vaccination (CIII). If post-exposure acyclovir, famciclovir, or valacyclovir was administered, wait ≥24 hours before vaccination (CIII).	Evidence of immunity to varicella: • Documented receipt of two 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, antiviral treatment is recommended (AIII).
	Pregnancy	VAR **is contraindicated** in pregnancy (AIII).	Pregnant women with HIV found to be nonimmune with CD4 count ≥200 cells/mm^3 should be administered VAR immediately after delivery and at the 6-week postpartum visit (AIII).
Zoster	Age ≥18 years, regardless of a past episode of herpes zoster or receipt of attenuated ZVL (Zostavax)	Two-dose (0.5 mL IM) series of RZV (Shingrix) IM 2–6 months apart (AIII). Limited data on RZV during pregnancy exists; consider administering RZV after delivery (BIII).	To maximize immunologic response to the vaccine, 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). **Do not give** RZV during an acute episode of herpes zoster (AIII) or an episode of active inflammation due to VZV-related inflammatory eye disease (AIII).

Vaccine Preventable Infection	Indication	Recommendations	Additional Comments
Immunizations for Travel			
Cholera	Not routinely recommended for most travelers (CIII). Age 18–64 years with CD4 count >200 cells/mm^3 and traveling to an area where cholera has been 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 people with HIV. No adverse effects reported with older formulation of vaccine in people with HIV without an AIDS diagnosis.
Typhoid	At risk of *Salmonella* serotype Typhi infection (e.g., through travel, intimate exposure to a chronic carrier, occupational exposure) Revaccination only if continued or renewed exposure to *Salmonella* serotype Typhi is expected.	One dose 0.5 mL (25 mcg) IM Vi capsular polysaccharide vaccine (Typhim Vi) via IM 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 people with HIV (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 or, if necessary, give Vi capsular polysaccharide vaccine (AIII).
Yellow Fever (YF)	Age ≤59 years and at risk for YF virus acquisition (e.g., by traveling to or living 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 count >500 cells/mm^3: One dose of YF vaccine; revaccinate in >10 years if risk remains (BIII).	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 people with HIV, excuse the person from vaccination and issue a medical waiver to fulfill health regulations.

Vaccine Preventable Infection	Indication	Recommendations	Additional Comments
Immunizations for Travel			
		Any age and asymptomatic with CD4 count 200–499 cells/mm^3: YF vaccine may be considered depending on risk (BIII). YF vaccine is contraindicated for people with CD4 count <200 cells/mm^3. This recommendation is based on a theoretic increased risk for encephalitis in this population (AII).	Closely monitor people with HIV who have received YF vaccine for evidence of adverse events.
Polio	Not routinely recommended (AIII) Those at higher risk for exposure to poliovirus—such as those traveling to countries where polio is endemic—can be vaccinated with IPV (CIII).	Three doses IPV 0.5 mL IM at 0 and 1–2 months, with third dose given 6–12 months after second dose (CIII)	None.
	Previously vaccinated with one to two doses of vaccine	Give remaining doses of vaccine at recommended intervals (CIII).	None.

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; HAV = hepatitis A virus; HBIG = hepatitis B immune globulin; HBsAg = hepatitis B surface antigen; HBV = hepatitis B virus; HepA = hepatitis A vaccine; HepB = hepatitis B vaccine; HPV = human papillomavirus; ID = intradermal; IG = immunoglobulin; IgG = immunoglobulin G; IgM = immunoglobulin M; 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; PCV20 = 20-valent pneumococcal conjugate vaccine; PCV21 = 21-valent pneumococcal conjugate vaccine; PPSV23 = 23-valent pneumococcal polysaccharide vaccine; RIV = recombinant influenza vaccine; RSV = respiratory syncytial virus; RZV = recombinant zoster vaccine; SQ = subcutaneous; 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

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Summary Immunization Schedule for Adults and Adolescents With HIV (See Text for Full Recommendations and Evidence)

Vaccine	All People With HIV	Where Varies by Age	Where Varies by Pregnancy Status	Where Varies by CD4 Cell Count (Cells/mm^3)	
				<200	≥200
COVID-19	One dose annually			Consider an additional dose 6 months after the last dose.	
Hepatitis A (HepA, HepA-HepB)	Two to three doses (varies by formulation)		Two dose series recommended for pregnant women who have chronic HBV and who are nonimmune to HAV		
Hepatitis B (HepBCpG, HepB, HepA-HepB)	Two to three doses (varies by formulation and indication)				
Human Papillomavirus (HPV)		Three doses for ages 18–26 years Consider for ages 27–45 years with shared decision-making	Not recommended during pregnancy		
Influenza (Multiple Vaccines)	One dose annually				
Measles, Mumps, Rubella (MMR)			Not recommended during pregnancy	Contraindicated	Two doses if born after 1956 and no history of vaccination or positive antibody titer
Meningococcal A, C, W, Y Conjugate (MenACWY)	Two doses				
Meningococcal B (MenB)	Three doses		Not recommended during pregnancy		
Mpox (MVA-BN, Attenuated)	Two doses	Subcutaneous route preferred for people aged <18 years	Shared decision-making		
Pneumococcal Conjugate (PCV15, PCV20, PCV21)	One dose				
Pneumococcal Polysaccharide (PPSV23)	One dose (if conjugate vaccine was PCV15)				
Respiratory Syncytial Virus (RSV)		One dose for people aged ≥75 years One dose for people aged 50–74 years with a comorbid condition that increases risk for severe RSV disease	One dose between 32 and 36 weeks' gestation		
Tetanus, Diphtheria, Pertussis (Tdap/Td)	Tdap once, then Td or Tdap booster every 10 years		Recommend booster with each pregnancy		
Varicella (VAR)			Contraindicated	Contraindicated	Two doses
Zoster Recombinant (RZV)		Two doses for ages ≥18 years	Not recommended during pregnancy		

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 or Not Recommended

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

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