

Recommendations for the Use of Antiretroviral Drugs During Pregnancy: Overview

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Panel's Recommendations
<ul style="list-style-type: none">• All pregnant people with HIV should initiate antiretroviral therapy (ART) as early in pregnancy as possible, regardless of their HIV RNA level or CD4 T lymphocyte count, to maximize their health and prevent perinatal HIV transmission and secondary sexual transmission (AI).• In addition to benefiting an individual's health and preventing HIV transmission to sexual partners, the goal of antiretroviral therapy (ART) during pregnancy is to achieve and maintain HIV viral suppression to undetectable levels (HIV RNA <50 copies/mL) to reduce the risk of perinatal transmission (AI).• Pregnant people are often excluded from clinical trials of antiretroviral (ARV) drugs, resulting in limited data regarding pharmacokinetics (PKs), drug safety, and efficacy of new ARVs in pregnancy and lactation. However, pregnancy, lactation, and the potential for pregnancy should not preclude the use of drug regimens that would be chosen for people who are not pregnant, unless adequate drug levels are not likely to be attained in pregnancy or known adverse effects outweigh potential benefits (AIII).• The selection of which ARV drugs to use during pregnancy is best made through shared decision-making between the healthcare provider and patient after discussion of the known and potential risks and benefits to the patient and fetus, acknowledging limited data (AIII). See Appendix C: Antiretroviral Counseling Guide for Health Care Providers, Table 6. What to Start: Initial Antiretroviral Regimens During Pregnancy for People Who Are Antiretroviral-Naive, and Table 7. Situation-Specific Recommendations for Use of Antiretroviral Drugs.• The Panel on Treatment of HIV During Pregnancy and Prevention of Perinatal Transmission (the Panel) uses a variety of data sources to assign ARV drugs to one of five categories for use in pregnancy: <i>Preferred</i>, <i>Alternative</i>, <i>Insufficient Data to Recommend</i>, <i>Not Recommended Except in Special Circumstances</i>, and <i>Not Recommended</i>, as outlined in Table 6. What to Start: Initial Antiretroviral Regimens During Pregnancy for People Who Are Antiretroviral-Naive and Table 7. Situation-Specific Recommendations for Use of Antiretroviral Drugs for a variety of clinical scenarios.• When selecting ARV drugs for use in pregnancy or for people who are trying to conceive, the Panel recommends use of ARV drugs in the <i>Preferred</i> or <i>Alternative</i> categories whenever possible (AIII) but also tailors its recommendations to a variety of clinical scenarios; see Table 7. Situation-Specific Recommendations for Use of Antiretroviral Drugs.• When choosing ARV drug regimen and weighing the benefits and risks of specific ARVs for use during pregnancy or in people who are trying to conceive, providers and pregnant people should consider multiple factors, including adverse effects, drug interactions, PKs, convenience of the individual drugs and drug combinations in the regimen, available pregnancy safety and outcome data, virologic efficacy in nonpregnant adults (and pregnant individuals if available), and the individual's resistance test results and comorbidities (AIII).• The same regimens that are recommended for the treatment of nonpregnant adults should be used in pregnant people when sufficient data suggest that appropriate drug exposure is achieved during pregnancy (AII).• In most cases, people with HIV who are receiving ART and present for pregnancy care should continue their current ART, provided that the regimen is tolerated, safe, and effective in suppressing viral replication (defined as a regimen that maintains an HIV viral load less than the lower limits of detection of the assay) (AII) (see People with HIV Who Are Taking Antiretroviral Therapy When They Become Pregnant).• Important changes in physiology and volume of distribution during pregnancy may impact drug concentrations and effectiveness in suppressing HIV viral replication, especially later in pregnancy when viral rebound may increase transmission risk and impact the need for intrapartum zidovudine or cesarean delivery (See Table 9 in Intrapartum Care for People with HIV). Pregnant people and clinicians should review these potential impacts as early in pregnancy as possible

when choosing to start, modify, or continue an ARV regimen (AIII) (see [People with HIV Who Are Taking Antiretroviral Therapy When They Become Pregnant](#))

- The Panel strongly recommends against discontinuing ART during pregnancy (AII).
 - If an ARV drug regimen must be stopped during pregnancy, all ARV drugs should be stopped simultaneously, and a complete, effective ARV regimen should be reinitiated as soon as possible (AII).
- Throughout the prepregnancy, pregnancy, and postpartum periods, clinicians should discuss current and future reproductive desires and contraceptive options, as well as the risks and benefits of conceiving or conceiving again on the current ARV regimen (AIII). See [Pregnancy Counseling and Care for Persons of Childbearing Age With HIV](#) and [Postpartum Follow-Up of People With HIV](#) for more information.

Rating of Recommendations: A = Strong; B = Moderate; C = Optional

Rating of Evidence: I = One or more randomized trials with clinical outcomes and/or validated laboratory endpoints; II = One or more well-designed, nonrandomized trials or observational cohort studies with long-term clinical outcomes; III = Expert opinion

Selection of Antiretroviral Drugs During Pregnancy

Selection of antiretroviral (ARV) drugs **should be individualized** for people with HIV who are pregnant or are trying to conceive. The availability of data about the use of each medication in pregnancy is a primary consideration. In addition, durability, tolerability, and simplicity of a medication regimen are particularly important for ensuring adherence and preserving future treatment options. Regimen selection should be based on several factors that apply to all people who are pregnant, as well as factors that will vary for individuals.

Pregnancy-related factors include potential short-term and long-term adverse effects on fetuses or newborns, such as possible risk of teratogenicity, preterm birth, or effects on growth and development, and the degree to which data are available about these risks; pharmacokinetic (PK) changes in pregnancy; and potential adverse effects for pregnant people, especially those that may be exacerbated during pregnancy.

Individual-level factors include potential drug interactions with other medications; results of resistance testing and the patient's prior exposure to ARV drugs; comorbidities; ability of the patient to tolerate and adhere to a regimen; and convenience and individual preference, including a pregnant individual's preferences for balancing known and unknown risks and benefits.

This section provides an overview of the key clinical and PK issues that are relevant to the selection of specific ARV drugs for use in pregnancy.

After reviewing key concepts about balancing the risks and benefits and PKs, this section will define the categories of ARV drug recommendations in pregnancy: *Preferred, Alternative, Insufficient Data, Not Recommended Except in Special Circumstances, and Not Recommended.*

The sections that follow this Overview focus on the benefits of antiretroviral therapy (ART) and recommendations for the use of ARV drugs in specific scenarios:

- [Use of Antiretroviral Drugs to Prevent Perinatal HIV Transmission and Improve Maternal Health](#)
- [Antiretroviral Therapy for People With HIV Who Are Trying to Conceive](#)

- [Pregnant People With HIV Who Have Never Received Antiretroviral Drugs \(Antiretroviral Naive\)](#)
- [People With HIV Who Are Taking Antiretroviral Therapy When They Become Pregnant](#)
- [Pregnant People With HIV Who Have Previously Received Antiretroviral Medications but Are Not Currently on Antiretroviral Medications](#)
- [Pregnant People Who Have Not Achieved Viral Suppression on Antiretroviral Therapy](#)
- Discontinuation of ART (see below)

[Table 6. What to Start: Initial Antiretroviral Regimens During Pregnancy for People Who Are Antiretroviral-Naive](#) provides advantages and disadvantages of specific ARV drugs and drug combinations in pregnancy, focusing primarily on considerations for people who are ARV naive, with additional information about other clinical scenarios.

[Table 7. Situation-Specific Recommendations for Use of Antiretroviral Drugs for a variety of clinical scenarios](#) consolidates these scenario-specific recommendations for the use of ARV drugs in people with HIV who are trying to conceive or are pregnant into a single table for ease of reference.

[Table 14. Antiretroviral Drug Use in Pregnant People with HIV Infection: Pharmacokinetic and Toxicity Data in Human Pregnancy and Recommendations for Use in Pregnancy and Appendix B: Supplement: Safety and Toxicity of Individual Antiretroviral Agents in Pregnancy](#) provide information about individual drugs, including dosing and PK data in pregnancy.

For recommendations about the use of ARV drugs in people of childbearing potential who are not actively trying to conceive, see the [Guidelines for the Use of Antiretroviral Agents in Adults and Adolescents with HIV](#).

Balancing Risks and Benefits of ART in the Face of Limited Data

The selection of which ARV drugs to use during pregnancy or when trying to conceive is best made through shared decision-making between the pregnant individual and the health care provider following comprehensive discussion of the known benefits as well as potential risks to the pregnant individual and the fetus,¹ (See [Appendix C: Antiretroviral Counseling Guide for Health Care Providers](#)). Data about the PKs, teratogenicity, and safety of individual ARV drugs during pregnancy are provided in [Appendix B: Supplement: Safety and Toxicity of Individual Antiretroviral Agents in Pregnancy](#).

During discussions, it can be helpful to point out that **ARV regimens taken during pregnancy can be modified after delivery.** After delivery, people may be able to use some regimens that could not be used during pregnancy due to insufficient or problematic safety and or PK data. These decisions should take several factors into consideration, including the current ART recommendations for nonpregnant adults and adolescents, the patient’s plans for contraceptive use and future pregnancies, and individual adherence considerations and medication preferences (see [Adult and Adolescent Antiretroviral Guidelines](#) and [Postpartum Follow-up of People with HIV](#)).

Pregnant people often are excluded from clinical trials of ARVs. As a result, data regarding the PKs, drug safety, and efficacy of new ARVs often are limited to nonpregnant adults.^{2,3} Efficacy of ARVs for treatment of pregnant people can be extrapolated from evidence of efficacy in nonpregnant adults, as long as direct PK evaluation in pregnant people demonstrates drug exposures in pregnancy that are within the effective range in nonpregnant adults. Similarly, ART regimens that result in viral

suppression throughout pregnancy are likely to be effective in preventing vertical transmission of HIV.

In contrast, ART safety cannot be extrapolated and should be evaluated directly in pregnant people. However, drugs with known benefits to people who are not pregnant should not be withheld during pregnancy unless they have known adverse effects in people who are pregnant, fetuses, or infants, and these adverse effects outweigh the benefits to pregnant patients or adequate drug levels are not likely to be attained during pregnancy. Pregnancy and the potential for pregnancy **should not preclude** the use of optimal drug regimens.

It is important to discuss the clear benefits of ART for maternal health and prevention of HIV transmission to the infant and sexual partners, as well as the limitations of available data on individual drugs.⁴ Data about these benefits of ART are summarized and discussed in [Recommendations for the Use of Antiretroviral Drugs to Prevent Perinatal HIV Transmission and Improve Maternal Health](#). Overall, data are limited on the risks associated with using *Preferred* and *Alternative* ARV drugs other than tenofovir disoproxil fumarate (TDF), emtricitabine (FTC), lamivudine (3TC), efavirenz (EFV), and dolutegravir (DTG) when used during preconception or in very early pregnancy. Importantly, this **lack of data indicates neither the presence nor the absence of risk**. For more details and information about other drugs, please see [Teratogenicity, Antiretroviral Drug Regimens and Maternal and Neonatal Outcomes](#), [Appendix C: Antiretroviral Counseling Guide for Health Care Providers](#), and [Appendix B: Supplement: Safety and Toxicity of Individual Antiretroviral Agents in Pregnancy](#).

Birth Defect Risk

While a few concerns exist about teratogenicity of currently used ARVs, the Panel on Treatment of HIV During Pregnancy and Prevention of Perinatal Transmission (the Panel) continues to use a longstanding, systematic approach to evaluating birth defect risk for all ARVs. Large-scale systematic birth defect surveillance data following preconception exposure are available only for TDF, FTC, 3TC, zidovudine (ZDV), EFV, and DTG.^{5,6} To determine whether a drug carries an increased risk of a rare birth defect, more than 2,000 preconception exposures need to be monitored to rule out a threefold increase in risk. Data from more than 1,000 first-trimester exposures are needed to rule out a 1.5-fold increase in the risk of overall birth defects and a twofold increase in the risk of the most common classes (cardiovascular and genitourinary) of birth defects. The [Antiretroviral Pregnancy Registry](#)⁷ is an international registry that also provides data on birth defects with preconception exposures for all available ARV drugs, but reporting is voluntary, and the number of reports to the registry depends on clinicians' reporting. Data are more limited on newer ARV drugs and on preconception exposures. See [Teratogenicity, Appendix B: Supplement: Safety and Toxicity of Individual Antiretroviral Agents in Pregnancy](#), and the [Antiretroviral Pregnancy Registry](#) for information about individual ARV drugs.

Experience with EFV and DTG highlight the need to obtain sufficient data about use of ARV drugs in pregnancy. Although early data from animal studies of EFV^{8,9} and from an active surveillance study on the use of DTG^{6,10,11} raised concerns about the potential for congenital nervous system abnormalities and neural tube defects (NTDs) when these drugs were taken around the time of conception and in early pregnancy, later data have shown that neither drug is associated with NTDs.^{8,12,13} Recent data from expanded and ongoing surveillance of the use of DTG in Botswana found that the prevalence of NTDs was not significantly different in women receiving DTG and

those receiving other ARVs at the time of conception.¹³ These more recent data are reassuring that DTG use at conception does not increase the risk of birth defects.

Clinicians are encouraged to submit to the [Antiretroviral Pregnancy Registry](#) data for all patients who conceive while receiving ARV drugs or who receive ARV drugs during pregnancy.

Preterm Birth and Other Adverse Pregnancy Outcomes

The risk of other adverse pregnancy outcomes that are more common than birth defects also should be considered when selecting ART regimens (see [Antiretroviral Drug Regimens and Maternal and Fetal Outcomes](#)). For example, the use of some protease inhibitors, particularly lopinavir/ritonavir (no longer recommended except in special circumstances), has been associated with an increased risk of preterm birth, which may lead to an increase in infant morbidity and mortality.^{5,6,14}

Maternal Health Outcomes

Data on maternal health outcomes (e.g., hypertension, weight gain) with all ARV regimens are needed (see [Antiretroviral Drug Regimens and Maternal and Neonatal Outcomes](#)).¹⁵⁻¹⁷ Substantial weight gain on DTG-based regimens has been observed in nonpregnant populations, especially among women and among people also receiving tenofovir alafenamide (TAF) (see [Dolutegravir and Tenofovir Alafenamide](#)).^{18,19} However, it is difficult to extrapolate data about weight gain in nonpregnant adults to determine the effects of ARVs on gestational weight gain. DTG-associated weight gain has been observed in pregnancy, but this may reflect better maternal health (e.g., lower rates of insufficient weight gain or weight loss during pregnancy with DTG-based ART). Some studies have shown greater weight gain during pregnancy with TAF/FTC/DTG (0.08 kg/week)²⁰ and TDF/FTC/DTG (0.03–0.05 kg/week)^{20,21} than with TDF/FTC/EFV, while others found no increased weight gain during pregnancy with DTG.²² However, the weekly weight gain during pregnancy in women on DTG- or EFV-based ART remained less than in women without HIV,²¹ and less than the recommended weight gain in pregnancy for the general population.²⁰ In the Tshilo Dikotla study, postpartum weight gain was greater in women receiving DTG than in those receiving EFV-based ART but was similar to weight gain in postpartum women without HIV infection.²³ The DolPHIN-2 (Dolutegravir in pregnant HIV mothers and their neonates) perinatal trial found no differences in postpartum weight changes between women initiating EFV-based or DTG-based ART late in pregnancy.²⁴

In the International Maternal Pediatric Adolescent AIDS Clinical Trials (IMPAACT) 2010 trial, no differences were observed in viral suppression, grade 3 or higher adverse events, or estimated creatinine clearance among people randomized to initiate TDF/FTC versus TAF/FTC with DTG at >14 weeks gestational age. However, more women in the TAF/FTC arm had high gestational weight gain than in the TDF/FTC arm. High gestational weight gain was not associated with adverse outcomes in this study, but modeling suggests that, over time, excess weight gain with regimens containing TAF and DTG may lead to increased pre-pregnancy weight and obesity-related adverse pregnancy outcomes.²⁵ Additionally, in infants who were exposed to TDF *in utero*, there have been concerns about bone and growth abnormalities, but the duration and clinical significance of study findings require further evaluation (see [Tenofovir Disoproxil Fumarate](#)).²⁶

Pharmacokinetic Considerations for ARV Drugs

Physiologic changes that occur during pregnancy can affect drug absorption, distribution, biotransformation, and elimination; thereby also affecting requirements for drug dosing and potentially increasing the risk for virologic failure or drug toxicity.²⁷⁻²⁹ During pregnancy, gastrointestinal transit time becomes prolonged, and body water and fat increase throughout gestation. These changes are accompanied by increases in cardiac output, ventilation, and liver and renal blood flow. Plasma protein concentrations also decrease, which can reduce the total plasma drug levels but not necessarily the free or unbound plasma drug levels. Furthermore, renal sodium reabsorption increases, and changes occur in cellular transporters and drug metabolizing enzymes in the liver and intestine. Placental transport of drugs, compartmentalization of drugs in the embryo/fetus and placenta, biotransformation of drugs by the fetus and placenta, and elimination of drugs by the fetus can also affect drug PKs in the pregnant woman.

In general, the PKs of nucleoside reverse transcriptase inhibitors and non-nucleoside reverse transcriptase inhibitors (NNRTIs) are similar in pregnant and nonpregnant women (although PK data for **some drugs** are limited or not available). PI and INSTI PKs are more variable, particularly during the second and third trimesters. Because dosing may differ in pregnancy, clinicians should review the currently available data on the PKs and dosing of ARV drugs in pregnancy (see [Appendix B: Supplement: Safety and Toxicity of Individual Antiretroviral Agents in Pregnancy](#) and [Table 14. Antiretroviral Drug Use in Pregnant People with HIV Infection: Pharmacokinetic and Toxicity Data in Human Pregnancy and Recommendations for Use in Pregnancy](#)) and information about how PK changes affect recommendations for use of specific ARV drugs in pregnancy (see Categories for Drug Recommendations in Pregnancy below, [Table 6. What to Start: Initial Antiretroviral Regimens During Pregnancy for People Who Are Antiretroviral-Naive](#), and [Table 7. Situation-Specific Recommendations for Use of Antiretroviral Drugs](#)).

Categories of Drug Recommendations in Pregnancy

The Panel assigns U.S. Food and Drug Administration–approved ARV drugs to one of five categories, described below, for use in people who are pregnant. [Table 6. What to Start: Initial Antiretroviral Regimens During Pregnancy for People Who Are Antiretroviral-Naive](#) lists all ARV drugs and drug combinations and summarizes advantages and disadvantages of each. [Table 7. Situation-Specific Recommendations for Use of Antiretroviral Drugs](#) provides an overview of Panel recommendations for ARV drugs in different clinical scenarios that are described in the following sections: trying to conceive, currently receiving ARV drugs, ARV naive, previously received ARV drugs, and when ARV is not well tolerated or suppressive. It is important for health care providers to read all the information on each drug in the Perinatal Guidelines before administering any of these medications to patients (see [Appendix B: Supplement: Safety and Toxicity of Individual Antiretroviral Agents in Pregnancy](#)) and provide appropriate patient counseling to support informed shared decision-making (see [Appendix C: Antiretroviral Counseling Guide for Health Care Providers](#)).

- **Preferred:** Drugs or drug combinations are designated as *Preferred* for therapy in pregnant people when clinical trial data in adults have demonstrated efficacy and durability with acceptable toxicity and ease of use and when pregnancy-specific PK data are available to guide dosing. In addition, the available data must suggest a favorable risk-benefit balance for the drug or drug combination compared to other ARV drug options; this assessment of risks and benefits should incorporate outcomes for pregnant people, fetuses, and infants. Some

Preferred drugs or regimens may have minimal toxicity or **incompletely evaluated** teratogenicity risks that are offset by other advantages for people with HIV who are pregnant or trying to conceive.

- **Alternative:** Drugs or drug combinations are designated as *Alternative* options for therapy in pregnant people when clinical trial data in adults show efficacy and the data in pregnant individuals are generally favorable but limited. Most *Alternative* drugs or regimens are associated with more PK, dosing, tolerability, formulation, administration, or interaction concerns than those in the *Preferred* category, but they are acceptable for use in pregnancy. Some *Alternative* drugs or regimens may have known risks that are offset by other advantages for people with HIV who are pregnant or trying to conceive.
- **Insufficient Data to Recommend:** The drugs and drug combinations in this category are approved for use in adults, but pregnancy-specific PK or safety data are too limited to make a recommendation for use in pregnant people. In some cases, it may be appropriate to continue using these drugs or drug combinations in patients who become pregnant on ART that has been well tolerated.
- **Not Recommended Except in Special Circumstances:** Although some drugs are not recommended for initial ART in ART-naïve people because of specific safety concerns or very limited safety and efficacy data in pregnancy, there may be circumstances in which ART-experienced people need to initiate or continue using specific drugs to reach or maintain viral suppression.
- **Not Recommended:** Drugs and drug combinations listed in this category are not recommended for use in pregnancy because of inferior virologic efficacy or potentially serious maternal or fetal safety concerns. This category includes drugs or drug combinations for which PK data demonstrate low drug levels and risk of viral rebound during pregnancy. Levels of these drugs are often low in late pregnancy (during the second and third trimesters) when risk for perinatal transmission is high if maternal viremia occurs.

In some situations, it may be appropriate to continue using drugs or drug combinations designated as *Insufficient Data*, *Not Recommended Except in Special Circumstances*, or *Not Recommended* in people who become pregnant on fully suppressive ART that has been well tolerated, although viral load monitoring and, in some cases, safety monitoring should be performed more frequently in these instances. See [People With HIV Who Are Taking Antiretroviral Therapy When They Become Pregnant](#) and [Initial Evaluation and Continued Monitoring of HIV-Related Assessments During Pregnancy](#).

In assigning these categories, the Panel uses information from several sources to develop recommendations on specific drugs or regimens for pregnant people. These sources include—

- Data from randomized clinical trials and prospective cohort studies that demonstrate durable viral suppression in pregnancy, as well as immunologic and clinical improvement;
- Incidence rates and descriptions of short-term and long-term drug toxicity of ARV regimens;
- Evidence from clinical studies on the risk of maternal toxicity, teratogenicity, adverse pregnancy outcomes, and adverse infant outcomes;

- Specific knowledge about drug tolerability and simplified dosing regimens;
- Known efficacy of ARV drug regimens in reducing perinatal transmission of HIV when data are available, evidence of high rates of viral suppression during pregnancy, or evidence of high rates of viral suppression in nonpregnant patients with PK (drug exposure) data in pregnancy demonstrating exposures similar to those in nonpregnant patients;
- PK (drug exposure) data during pregnancy;
- Data from animal teratogenicity studies; and
- Antiretroviral Pregnancy Registry data and other post-marketing surveillance data.⁷

Discontinuation of ART

The Panel strongly recommends against discontinuing ART. However, if an ARV drug regimen must be stopped for any reason, all ARV drugs should be stopped simultaneously. ART should be reinitiated as soon as possible, whether the patient restarts the same regimen or initiates a new regimen. If an ARV drug that is known to have a long serum half-life (e.g., NNRTIs) must be stopped for more than a few days, clinicians should consider assessing the patient for rebound viremia after a new regimen is started and viral suppression would be expected; if optimal viral suppression has not been achieved, potential drug resistance should be assessed (see [Antiretroviral Drug Resistance and Resistance Testing in Pregnancy](#)).³⁰

Temporary discontinuation of ARV drug regimens during pregnancy may be indicated in some situations, including cases of serious drug-related toxicity, pregnancy-induced hyperemesis that is unresponsive to antiemetics, or acute illnesses or planned surgeries that prevent a patient from taking oral medications. Possible toxicity or intolerance to a single ARV agent should prompt discussion about options for modifying rather than stopping an entire ARV regimen (see [People With HIV Who Are Taking Antiretroviral Therapy When They Become Pregnant](#)).³⁰

Discontinuation of therapy could lead to an increase in viral load, with possible disease progression and decline in immune status for the mother and increased risk of *in utero* transmission of HIV. An analysis from a prospective cohort of 937 mother–child pairs from the Italian Registry for HIV infection in children found that interruption of ART during pregnancy, including interruption in the first and third trimesters, was independently associated with an increased rate of perinatal HIV transmission.³¹ Although the perinatal transmission rate for the entire cohort was only 1.3%, transmission occurred in 4.9% of mother–child pairs with first-trimester interruption (95% confidence interval [CI], 1.9% to 13.2%; adjusted odds ratio [aOR] 10.33; $P = 0.005$) and 18.2% of mother–child pairs with third-trimester interruption (95% CI, 4.5% to 72.7%; aOR 46.96; $P = 0.002$).³¹

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