/ COURSE CONTENT

HIV Prevention

In-depth knowledge of HIV for service providers working with people living with or at risk of HIV.

CATIE Canada's source for HIV and hepatitis C information
La source canadienne de renseignements sur le VIH et l'hépatite C

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1 The biology of HIV transmission

At the end of this unit, the learner will be able to:

1. *Recognize the factors that need to be present for HIV transmission to occur.*
2. *Identify the ways that HIV can be transmitted.*
3. *Describe how HIV is transmitted through sex and identify the factors that facilitate and prevent transmission.*
4. *Describe how HIV is transmitted through drug use equipment and identify the factors that facilitate and prevent transmission.*
5. *Describe how HIV can be transmitted through pregnancy, childbirth and infant feeding.*

HIV transmission equation

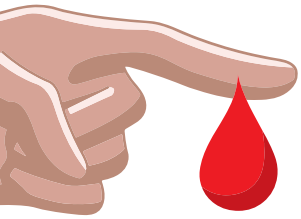
This unit will explore the biology of HIV transmission—how HIV can be transmitted from person to person and how it gets established in the body.

HIV transmission can only happen under a certain set of circumstances. There are three components that are necessary for HIV transmission to occur: a fluid, a route and an activity.

There needs to be a ***fluid*** from a person living with HIV that contains enough HIV to cause infection, a ***route*** within an HIV-negative person that HIV can use to enter that person's body, and an ***activity*** or event that brings the fluid and route together.

Fluid

A bodily ***fluid*** must contain enough HIV to be able to cause infection in another person. The amount of HIV that is present in the blood and other bodily fluids of a person with HIV is called the "viral load." The higher the viral load, the higher the chance of passing HIV. The lower the viral load, the lower the chance of passing HIV. The viral load of a person living with HIV is the most important factor that can increase or decrease the chance of HIV transmission to an HIV-negative person. Viral load is only measured in the blood of people living with HIV, but the amount of virus in the blood is generally correlated with the viral load in other fluids that can transmit HIV.



Only ***five bodily fluids*** can contain enough HIV to transmit the virus. These are blood, semen (including pre-cum), rectal fluid, vaginal fluid and breast milk (also called chest milk or human milk). HIV is not transmitted by saliva, tears, sweat, urine or feces.

Route

A ***route*** is the site of exposure to HIV in an HIV-negative person. HIV can only be passed when virus in one of the five fluids gets into the body of an HIV-negative person through one of the following routes:

1. a mucous membrane (the wet linings of the body), such as the opening of the penis, the foreskin, the vagina or the rectum

2. a break in the skin that creates access to the bloodstream, such as through injection drug use or an accidental prick with a used needle (a needlestick injury)

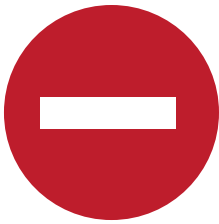
Activity

There needs to be an ***activity*** or event that brings the fluid and route together in order for HIV transmission to occur.

In Canada, the activities that most commonly bring the fluid and route together are unprotected anal or vaginal sex and sharing injection drug use equipment, such as needles and cookers.

HIV can also be transmitted to an infant during pregnancy, birth and breastfeeding (also known as chestfeeding). However, these modes of transmission are less common in Canada due to the benefits of HIV treatment, which can prevent HIV transmission when taken by a person with HIV who is pregnant or nursing.

There are certain activities or events that only rarely result in HIV transmission in Canada. These include oral sex, tattooing, piercing and needlestick injury. They have the potential to transmit HIV but they either have a much lower risk for transmission (i.e., for oral sex) or transmission is much less likely to happen due to protocols or procedures that have been put in place to limit transmission (i.e., for tattooing, piercing and needlestick injury).



HIV cannot be transmitted through casual contact with a person who has HIV (including shaking hands, hugging or kissing) or through objects (such as toilet seats, doorknobs or dishes) used by a person who has HIV. This is because HIV does not survive well outside of the human body once it is exposed to air.

In the past, some people got HIV after receiving a blood transfusion or organ or tissue transplant. However, Canada implemented HIV screening for all blood and tissue donations in 1985.

What happens once HIV gets into the body?

Regardless of the route or activity, once HIV gets into the body it needs to infect immune cells and make copies of itself (replicate) to establish permanent infection.

HIV cannot replicate on its own—it needs to take over cells within the body to replicate. To do this, HIV targets specific immune cells called CD4 cells and other immune cells. HIV enters and takes control of the cell and starts to replicate. New copies of the virus are released into the blood, which can then infect more immune cells.

If the virus infects enough cells and continues replicating for one to three days without being stopped, it can spread through the blood and lymphatic vessels to other parts of the body (for example, the lymph nodes, the gut and other organs). Once HIV has spread and established infection in other parts of the body (also known as reservoirs of infection), the infection becomes permanent.

The body's immune system defenses are sometimes able to defeat HIV before it spreads and causes a permanent infection. Certain prevention strategies can also stop HIV from replicating and being able to establish a permanent infection (e.g., pre- and post-exposure prophylaxis).

How is HIV passed through sex?

HIV can be transmitted during sexual activity with semen, pre-cum, vaginal or rectal fluid and blood that contains enough HIV to cause an infection. The activities include anal sex, vaginal sex, sharing sex toys, and some types of oral sex. The route that HIV uses to get into the body during sexual activity is through mucous membranes.

There are two important steps that HIV needs to take to cause an infection in an HIV-negative person who is exposed to a fluid containing HIV through sex:

1. HIV needs to get across a mucous membrane—these are the wet linings of the body, including the penis, foreskin, vagina, cervix, rectum and the inside of the mouth.

2. After crossing the mucous membrane, HIV needs to replicate within the underlying tissue for one to three days before it spreads throughout the body and causes a permanent infection. It does this by infecting CD4 and other immune cells in the tissue and replicating to produce more virus.

Let's explore these two steps and the other factors in the body that can help to prevent or facilitate HIV transmission through sexual activity.

First, remember that the viral load of a person with HIV affects how much HIV is in the bodily fluid that is exposed to a mucous membrane. A higher viral load will increase the chance of HIV being able to get across a mucous membrane, and a lower viral load will lower the chance of HIV getting across.

When enough HIV to cause infection is present in a fluid, it must overcome the body's natural defenses before it can establish a permanent infection.

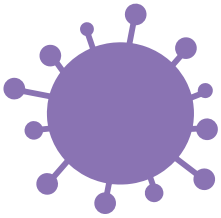
Step 1 – Crossing the mucous membrane

The first natural defense that HIV runs into during sexual transmission are the mucous membranes. Just like the dry layer of skin that protects the outside of our body, mucous membranes (which are covered in a layer of mucus) protect the inside of our body. They are made up of a layer or several layers of cells, called epithelial cells, that are tightly joined together, which creates a partially protective barrier against HIV. The epithelial cell layer can be a single layer of cells (e.g. in the rectum) or it can be multiple layers thick (for example, in the vagina and foreskin). The more epithelial cell layers there are, the more difficult it is for HIV to cross into the body.

Mucous membranes are designed for absorption and secretion, but this can also make it easier for germs or viruses like HIV to pass through them.

Sometimes HIV can pass through the epithelial cell layer on its own, but damage to the mucous membrane makes it easier for HIV to enter the body. Damage can be caused by various factors, including sores from sexually transmitted infections (STIs), such as herpes or syphilis, in the genitals, rectum or mouth; friction causing tears in the mucous membrane during sex; and enemas or douching that can irritate and cause inflammation in the mucous membranes.

Another natural defense against HIV is the mucus produced by the mucous membrane. Mucus helps to protect the tissue from damage, which reduces the ability of HIV to successfully cross the epithelial cell layer. Mucus also contains chemicals and antibodies that can inactivate HIV, so the more mucus there is, the greater the ability of the body to protect itself. However, the amount of mucus produced by a mucous membrane can vary, which means that certain mucous membranes are more protected than others. For example, the vagina secretes extra mucus during sex, but the rectum does not. This gives the vagina an extra level of natural protection that the rectum does not have.



The size of the mucous membrane also matters. The larger the surface area, the greater the likelihood of HIV successfully crossing the epithelial cell layer. For example, the surface areas of the vagina and rectum are much larger than those of the urethra or foreskin, so there are more chances for HIV to cross the mucous membranes of the vagina and rectum. As another example, having a circumcised penis can lower a person's chance of getting HIV because removing the foreskin significantly reduces the available surface area for HIV to cross.

We can apply some of these ideas by looking at the rectum. Receptive anal sex, where an HIV-negative person receives a penis into their rectum (also known as bottoming), is known to have the highest risk of sexual HIV transmission when not protected by an HIV prevention strategy (such as a condom or pre-exposure prophylaxis). Receptive anal sex has a higher risk of HIV transmission than insertive anal sex and vaginal sex, partly due to the following biological factors that make it easier for HIV to cross the epithelial cell layer:

- the rectum has a single layer of epithelial cells;
- the rectum does not produce extra mucus to lubricate and protect the exposed tissue during sex; and
- the surface area of the rectum and gastrointestinal tract is very large.

All of these factors make it easier for HIV to cross the mucous membrane when engaging in receptive anal sex compared to other types of sex.

It is important to note that while some types of oral sex carry a risk of HIV transmission, the risk is very low. For HIV-negative people giving oral sex on a penis, there is a very small chance of HIV transmission if a person with HIV ejaculates (cums) in their mouth. In this case, transmission is most likely to happen if there are sores or cuts in the HIV-negative person's mouth (i.e., damage to the mucous membrane).

Step 2 – Immune response and replication

If HIV crosses the epithelial cell layer of a mucous membrane, it will begin to infect and replicate within the immune cells of the mucous membrane. At the same time, the body's immune cells will fight the virus and try to clear it from the body.

In many cases, the immune cells are able to clear the virus before it spreads throughout the rest of the body. If this happens, no infection occurs.

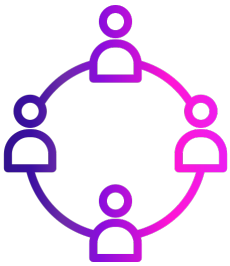
If HIV can infect enough cells and continue replicating for one to three days without being cleared by the immune system, HIV can spread to other parts of the body and establish a permanent infection.

Inflammation

Inflammation in the mucous membrane tissue can facilitate HIV infection and replication. Inflammation is the natural immune response to damage or infection in the mucous membranes, such as cuts and tears, STIs, yeast infections or external irritants like douches or enemas. The immune response brings additional immune cells and activates them to help fight the infection or repair tissue damage.

While inflammation is protective against many infections, it can actually facilitate HIV transmission because HIV targets immune cells for infection and prefers to target activated immune cells. The more activated immune cells present, the more immune cells HIV can infect and replicate within. This allows HIV to replicate more quickly and win the battle against the immune cells.

How is HIV passed through needles and other drug use equipment?



HIV can be transmitted through blood that remains in used needles, other drug injection equipment, and equipment for tattooing or piercing, even if the amount of blood is so small it can't be seen.

In this case, the route that HIV uses to get into the body is a break in the skin that creates access to the bloodstream.

This is an efficient mode of transmission partly because there are no natural barriers and HIV has direct access to the bloodstream. Once HIV is inside the bloodstream, it can spread easily throughout the body. The immune response is the only natural defense against HIV for this type of transmission.

Sharing needles and injection drug use equipment

Sharing needles or other equipment to inject drugs is the most common way that HIV is transmitted through broken skin.

When a person injects drugs, blood can get into the needle/syringe or on other equipment they are using to inject or prepare drugs, such as cookers and filters. When used equipment is re-used by another person to prepare and inject drugs, any residual blood will be injected into the bloodstream when drugs are injected into the body.

Once inside the bloodstream, HIV can begin to infect immune cells, replicate and spread throughout the body to cause a permanent infection.

Factors that can increase the risk of injection-related transmission include a larger amount of residual blood in the needle/syringe and a higher amount of HIV (i.e., a high viral load) in that blood. Both of these factors can contribute to a greater amount of HIV in the fluid that enters the body.

Less common ways of transmission

Although HIV can be transmitted through re-used unsterilized equipment for piercing or tattooing (including ink), this is not common today. In Canada, most tattooing and piercing is done using proper infection control procedures (i.e., universal precautions), which ensure that all equipment is new or properly sterilized between each use. HIV transmission cannot happen when these procedures are used. However, it is possible to get HIV from tattooing or piercing when performed without proper infection control procedures, which may happen in certain settings, such as prisons or at home.

Although HIV can be transmitted through a needlestick injury in healthcare and community-based settings, this is not common today. The use of universal precautions helps to minimize the chance of accidental needlestick injuries in Canada. In addition, there are protocols to help prevent infection after an accidental needle stick, such as the use of post-exposure prophylaxis (PEP).

How is HIV passed through perinatal transmission?

HIV can be transmitted to a fetus or child during pregnancy, childbirth and infant feeding. This is known as perinatal transmission.

HIV in the parent's blood can pass to a fetus through the placenta during pregnancy. However, it is more likely for an infant to get HIV during labour and delivery, when their mucous membranes are exposed to blood and vaginal fluid as they pass through the birth canal.

In Canada, the vast majority of pregnant people with HIV are on effective treatment that significantly reduces their chance of passing HIV. When effective HIV treatment is used throughout pregnancy, and the pregnant person maintains an undetectable viral load and remains engaged in care, HIV will not be transmitted during pregnancy or delivery. Widespread access to HIV treatment and prenatal care has made perinatal transmission extremely uncommon in Canada today.

Infant feeding

HIV can be transmitted to an infant through breast milk, and HIV has also reportedly been passed to young children through food that was prechewed by a parent or caregiver who has HIV.

We know that breast milk can contain high levels of HIV, but we don't perfectly understand how HIV transmission happens through breastfeeding. Transmission of HIV through breastfeeding is thought to occur when HIV in the milk enters an infant's body through the mucous membranes that line the back of the baby's throat and gut. Newborn babies are vulnerable to getting HIV in this way because of the frequency of exposure to HIV in their parent's milk and the fact that their immune systems and bodies (including the linings of their intestines/gut) are still underdeveloped.

Feeding an infant prechewed food (also called premastication) has been reported as a possible route of HIV transmission in a few cases where young children acquired HIV after being born HIV negative. Although none were breastfed, all three children were fed food that had been prechewed by a parent or caregiver with HIV (whose HIV treatment status and viral loads were not reported). Oral bleeding was reportedly present in two of these cases, which may have increased the risk of transmission.

To eliminate the risk of perinatal transmission through infant feeding, parents with HIV in Canada are advised not to breastfeed (but rather to use formula exclusively) and not to feed their infants prechewed food. Free formula programs are available in many but not all provinces and territories. Experts also recommend that people who have a strong desire to breastfeed should receive clinical support to do so as safely as possible, while they are on successful HIV treatment and engaged in regular care, support and monitoring.

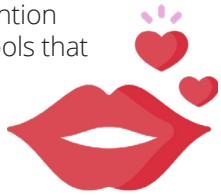
Exposure does not equal infection

It is important to know that many exposures to HIV do not lead to infection because of the body's natural defences, including the immune system response.

Many factors contribute to whether or not HIV will be able to successfully enter the body or replicate and spread to other parts of the body. Both biological factors and prevention tools can impact this process.

Prevention strategies

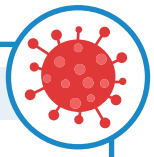
We now have many highly effective prevention strategies and additional risk reduction tools that can be used to prevent HIV transmission through the routes and activities or events described in this unit. Different prevention strategies may be used depending on the route and activity.



Highly effective prevention strategies include condoms for sex, new equipment to inject drugs, pre-exposure prophylaxis (PrEP), post-exposure prophylaxis (PEP), and effective treatment for people living with HIV.

There are additional HIV risk reduction tools that can help minimize risk, such as choosing sexual or drug use activities that have a lower chance of transmitting HIV when possible. Prevention strategies will be discussed in another unit.

2 Understanding and communicating HIV risk



At the end of this unit, the learner will be able to:

1. *Describe why certain populations are disproportionately affected by HIV.*
2. *Identify the risk of HIV transmission associated with common types of exposures.*
3. *Describe factors that can increase or decrease risk.*
4. *Apply different approaches to communicating and mitigating HIV risk.*

What is risk?

Risk refers to the chance or possibility that something will happen. In the context of HIV prevention, risk is the chance that specific activities or events will result in HIV transmission.

Risk is all about uncertainty and it does not happen in a vacuum. It is influenced by many factors that can change over time, including factors that are outside of a person's control. Every individual's risk for HIV infection is unique, for each exposure and over time.

This unit introduces some ways to help clients understand their risk of getting or passing HIV. It focuses on the most common ways that HIV is transmitted in Canada.

What factors can affect a person's HIV risk?

It is important for service providers to have a solid understanding of all the factors that affect the chance of HIV transmission so they can share this information with their clients and help them accurately assess their risk.

Broadly, the following factors can affect a person's HIV risk:

- Whether they participate in activities that can carry a risk of HIV transmission. For example, having certain types of sex or sharing injection drug use equipment.
- How frequently they participate in these activities. For example, how often they have sex without using an effective HIV prevention method or how often they share injection drug use equipment.
- Whether they have biological factors that can increase the risk of HIV transmission, such as a sexually transmitted infection (STI).
- Whether they have access to and choose to use different HIV prevention strategies. For example, taking HIV treatment to maintain an undetectable viral load, using condoms, pre-exposure prophylaxis (PrEP) or post-exposure prophylaxis (PEP).
- Social and structural factors, such as racism and homophobia, that can lead to health inequities (unfair differences in health status between groups).
- Whether they have other personal factors, such as mental health issues or substance use, that may increase their risk in certain ways, such as by affecting their judgment or choice-making and their ability to navigate consent.

Why understand and communicate about risk?

Giving people the information needed to understand and assess their HIV risk can help them make informed decisions about activities they participate in, their use of HIV prevention strategies, and other risk-reduction practices such as regular testing for HIV and other STIs.

With an understanding that HIV risk is produced and reinforced by a variety of factors, service providers can better support their clients by helping to address their holistic needs (e.g., primary care, housing, mental health, food security) and advocating for systemic changes (e.g., policy changes) that affect clients.

Certain populations are disproportionately affected by HIV

HIV can affect anyone—no matter their age, sex, gender, sexual orientation, race or ethnic origin. However, in Canada, certain populations have disproportionately high rates of HIV compared to others.

In Canada, the HIV epidemic is concentrated in marginalized communities. The populations that are disproportionately affected by HIV include:

- Two-Spirit, gay, bisexual, trans, queer and other transgender and cisgender men who have sex with men
- transgender women
- people who inject drugs
- Indigenous peoples (First Nations, Inuit and Métis)
- African, Caribbean and Black communities
- sex workers
- people living in or recently released from correctional facilities

While these populations have higher rates of HIV compared to the general population, it does not mean that being a member of one of these populations is a "risk factor" for HIV. It means that other factors are contributing to increased risk at a population level. The intersections of many factors and experiences over an individual's lifetime can lead to increased risk among people within these populations.

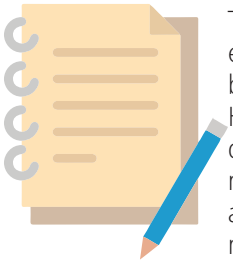
How social and structural inequities affect HIV risk in these populations

Populations that have high rates of HIV disproportionately experience a range of social and structural forms of discrimination and exclusion (e.g., racism, homophobia, transphobia) that influence their social determinants of health (e.g., housing status, income, social isolation) and their ability to access health services. This leads to health inequities. In the context of HIV, health inequities in these populations include increased risk of HIV and poorer health outcomes for people living with HIV.

How prevalence affects HIV risk in these populations

Populations that have a higher prevalence of HIV are more likely to come into contact with HIV. HIV prevalence is the number of people with HIV at a point in time. The more people who are living with HIV in a given population, the more likely it is that a member of that population will be exposed to HIV. For example, a man who has sex with men would have a statistically higher risk of getting HIV than a man who has sex only with women, even if both men are having the same types of sex, because of the higher prevalence of HIV among gbMSM.

Assessing HIV risk – a starting point



There is often some uncertainty in estimating the risk of HIV transmission because no activity has a 100% chance of HIV transmission and the interaction of different factors can be complex. This can make it challenging to explain HIV risk and answer questions about risk in a way that is meaningful to clients.

While talking about risk involves a certain degree of uncertainty, there is one thing we can be certain about! Undetectable equals untransmittable (U=U). This means that a person living with HIV who is on HIV treatment, engaged in care and maintains an undetectable viral load will not pass HIV through sex. When someone has an undetectable viral load, the risk of sexual transmission is zero. We also know that maintaining an undetectable viral load before conception and throughout pregnancy prevents HIV from being passed to a baby during pregnancy and delivery. Service providers should talk about this with clients to help them understand their sexual and perinatal HIV risk and to promote confidence in the U=U message.

With this in mind, let's explore ways to assess and communicate HIV risk with clients.

Clients generally want to know two things about their risk:

1. What is their risk of getting HIV or passing HIV?
2. How do different biological factors or prevention strategies change their risk?

Risk from a single exposure to HIV

Let's begin with risk from one specific act (a single exposure to HIV). The risk of HIV transmission from one single exposure to HIV depends on many factors, which makes it difficult to estimate a person's individual risk.

Research has estimated the ***average risk*** of HIV transmission, meaning the likelihood that an HIV-negative person will get HIV, from ***one exposure*** to HIV. Data from many research studies is pooled together (known as meta-analysis) to come up with risk estimates for different types of exposures to HIV.

Average risk estimates are associated with the activity and do not consider any other factors that might increase or decrease risk, such as having an undetectable viral load or the use of condoms.

Per-act HIV transmission risk from different types of exposures

The estimates below represent the average risk from one exposure to HIV through different types of activities. As you can see, certain activities carry a much greater risk than others.

Average risk of HIV transmission from different types of exposures

Activity/ exposure	Estimate from meta-analysis	Chance of getting HIV per act
Receptive anal sex	1.38%	1 in 72
Insertive anal sex	0.11%	1 in 909
Receptive vaginal (frontal) sex	0.08%	1 in 1250
Insertive vaginal (frontal) sex	0.04%	1 in 2500
Oral sex	Estimated to be much lower than any other type of sex, but unable to calculate	Unable to give an estimate
Needle-sharing injection drug use	0.63%	1 in 159
Pregnancy and childbirth	22.6%	1 in 4

As an example, when it comes to sex, the activity that has the highest chance of HIV transmission is receptive anal sex. The average risk of HIV transmission through one act is estimated to be 1.38%. This means that on average there will be 1 transmission for every 72 exposures to HIV through receptive anal sex.

Since this is an average estimate, it includes sex with HIV-positive people with both very high and very low viral loads. Recall that risk from any type of sex is zero if a person living with HIV is on treatment and has an undetectable viral load.

These estimates might be difficult to interpret or explain. What's important to remember is that these numbers are what help to underpin our understanding of risk. What the numbers help us understand is that, on average, some activities have a higher or lower chance of HIV transmission than others, per act.

For example, when it comes to sex, the activity that has the highest chance of HIV transmission is receptive anal sex, followed by insertive anal sex. While vaginal sex (also known as frontal sex) has a lower risk than anal sex, it is still considered to be an activity with a high risk for HIV transmission. Just like for anal sex, receptive vaginal sex carries a higher risk than insertive vaginal sex.

Factors that can change risk

Data from research studies have helped us learn more about which factors can increase risk or reduce risk, and by approximately how much. Several factors can change a person's risk in measurable ways. These include ***multiple exposures***, ***biological factors*** and ***HIV prevention strategies***.

Risk over time

People may have ***multiple exposures*** to HIV over time, and a person's overall risk of getting HIV increases the more they are exposed.

In HIV prevention, risk assessments tend to focus on a person's risk from a single exposure to HIV and not their risk over time. This may lead people to underestimate their risk because risks that may be considered small in the short term can add up and become larger in the long term.

As an example, the average risk of HIV transmission from one act of unprotected receptive vaginal/frontal sex is estimated to be 0.08%. Although a person might view this risk as low, the risk will grow with more acts of unprotected vaginal/frontal sex. After 100 exposures, the cumulative risk of HIV transmission becomes about 8%.

Biological factors

Certain ***biological factors*** can increase the chance of HIV transmission.

A key biological factor that can increase or decrease the risk of transmission is the amount of HIV in bodily fluids, which is known as viral load. The higher the viral load, the greater the chance of HIV transmission; and the lower the viral load, the lower the chance of HIV transmission. As we know, when someone has an undetectable viral load their risk of HIV transmission to a sexual partner is reduced by 100%. The risk of HIV transmission is also reduced in the context of sharing needles or other drug injection equipment, but we don't know by exactly how much.

Other biological factors can increase the risk of sexual HIV transmission, including the following factors outlined in Unit 1:

- damage or tears in the mucous membranes such as in the vagina, penis or rectum
- sexually transmitted infections (STIs) that cause sores in the genitals (such as herpes or syphilis)
- inflammation in the mucous membranes of the genitals (from other STIs or injury)
- vaginal conditions such as yeast infection or bacterial vaginosis

It is important for clients to understand the effect of these biological factors on their risk because:

- There are ways to address them. For example, a person who is sexually active can get tested regularly for STIs so that if they develop an STI it can be identified and treated as early as possible.
- In addition, it is possible to lower one's risk even when biological factors are present. For example, if a person has an STI, using an HIV prevention strategy such as PrEP or condoms will still lower their risk of HIV transmission.

HIV prevention strategies

HIV prevention strategies can reduce the risk of HIV transmission. Research tells us which HIV prevention strategies are highly effective.

The term "highly effective" means that we can be confident that the risk is significantly reduced, and sometimes even eliminated, when the strategy is used consistently and correctly.

There are many highly effective HIV prevention strategies, including:

- treatment for people living with HIV to maintain an undetectable viral load
- pre-exposure prophylaxis (PrEP) for people who are HIV negative

- post-exposure prophylaxis (PEP) for people who are HIV negative
- condoms for sex
- new equipment for injecting drugs

The effectiveness of different HIV prevention strategies varies according to which strategy is used, how well it is used and the route of exposure to HIV. More information about these highly effective risk-reduction strategies and other strategies is provided later in the course.

Quantitative approaches

Risk can be communicated in different ways. As we've seen, risk can be communicated using numbers.

However, when numbers are used to explain risk, it is sometimes difficult for people to understand what they mean or they might be misinterpreted.

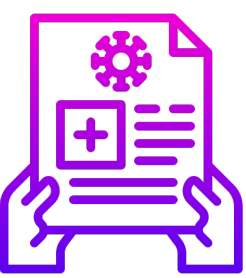
Although some clients may ask about their risk in numbers, it is important to provide additional context when discussing numbers, including the factors that can change risk. This is because numbers represent average estimates that are not static, and most carry some level of uncertainty.

Numbers help us understand that, on average, some activities have a higher or lower chance of HIV transmission than others, and they help us understand how much a risk can change (e.g., whether the risk is increased or decreased considerably).

Qualitative approaches

Qualitative expressions—such as high risk, low risk, very low risk and no risk—can also be used to describe the level of risk associated with different activities.

Qualitative expressions can be easier to communicate than numerical expressions and may reflect the risk of HIV transmission in a way that is more clear or meaningful to a client. However, they are not very precise and can also be misinterpreted by clients. Qualitative terms can be a good starting point for a conversation about risk, before layering in information such as numerical risk estimates and other factors that can change risk.



In the example below, qualitative terms are used to express the level of risk associated with different types of exposures. Note that even though each of these activities has a different numerical estimate of risk, all of them (except for oral sex) are considered high risk. An activity is considered high risk when there is a large amount of evidence for HIV transmission. In other words, it is a common way that HIV is transmitted.

Risk of HIV transmission from different types of exposures (when no effective prevention method is used) in qualitative terms*

Activity/exposure	Level of risk
Receptive anal sex	High risk
Insertive anal sex	High risk
Receptive vaginal (frontal) sex	High risk
Insertive vaginal (frontal) sex	High risk
Giving oral sex	Little to no risk
Receiving oral sex	No risk
Needle-sharing injection drug use	High risk
Pregnancy and childbirth	High risk

*Highly effective HIV prevention strategies can include using condoms, taking PrEP, taking PEP, taking treatment to maintain an undetectable viral load, and using new needles and other equipment when injecting drugs.

Qualitative expressions can also be helpful when discussing risk in the context of different highly effective HIV prevention approaches. While HIV prevention approaches will be discussed in more detail later in the course, we know that when highly effective HIV prevention strategies are used consistently and correctly, the overall risk for HIV transmission ranges from zero to very low, depending on the strategy used.

Support clients with open and non-judgmental discussions about risks and benefits of activities that can lead to HIV transmission

It is important to avoid judgment, which can sometimes come across unintentionally, in conversations about risk. Here are some things to keep in mind to promote non-judgmental conversations about risk with clients:

1. The concept of risk is often used directly or indirectly to place blame on individuals for activities they participate in that are seen as "risky." Labelling activities as "risky" can reinforce experiences of oppression and exclusion.

2 Activities or events that can lead to HIV transmission sometimes happen because of limited choices, beyond a person's control (e.g., sharing drug use equipment because new equipment is not available, or a power imbalance in a sexual relationship that limits the use of HIV prevention strategies).

3 Activities that can transmit HIV (like sex and drug use) are normal and common—we do them because they feel good, because they're fun, because they can contribute to our overall well-being, and for many other reasons. Conversations about risk should include exploring the benefits that people gain from the things they do. This can help to reduce stigma associated with activities that can transmit HIV.

4 It is important to recognize that everyone has the right to decide what activities they feel comfortable participating in and what benefits they weigh against their risks. People can be supported to use strategies that reduce or even eliminate their risk of HIV transmission, but the choice to use a certain prevention strategy is up to them.

5 People will have different levels of risk tolerance and different perceptions of their own risk for HIV (and other STIs or blood-borne infections like hepatitis C). Some people are willing to accept more risk than others. An individual's risk tolerance is influenced by many factors, including their beliefs and their life experiences.

Key points to explore in discussions about risk

Discussions about risk are important starting points for supporting clients to lower their HIV risk, if they wish to. Giving people all the information needed to understand and assess their HIV risk can help them make informed decisions.

Conversations about risk can include a variety of information, starting with the types of activities that people are participating in. The key message is that different activities carry different levels of HIV transmission risk. It's important for people to understand the risk of transmission from the activities they are participating in.

The conversation should also include a discussion of how often people are participating in these activities. The key message is that HIV transmission risk increases with the number of exposures to HIV. However, HIV transmission can happen after a single exposure to HIV or a person can have many exposures and not get HIV.

Once the person understands the risk associated with the type and frequency of activities they are participating in, discuss biological factors that can increase their risk. This discussion can include how to identify, address and prevent some of these factors (such as regularly testing for STIs so that any STIs that occur can be treated).

It is also important for a client to understand that there are many HIV prevention strategies they can choose from to reduce their risk. These will be discussed later in the course.

How else can service providers help support clients to lower their HIV risk?

Service providers can also help support clients to address factors that can affect their vulnerability to HIV, such as homelessness, food insecurity or use of alcohol and other substances.

Service providers can provide linkage to local services that address clients' identified needs. These might include housing supports, mental health care, primary care, access to nutritious food and more. Providing referrals and linkage to other appropriate and relevant support services can help set people up to successfully adopt HIV prevention strategies and help them meet other needs.

We also need to help address HIV health inequities by ensuring that our programs work with affected communities to tackle all facets of wellness. This includes addressing systemic barriers to programs and services (e.g., stigma, racism and homophobia) that exist for communities disproportionately affected by HIV and addressing social factors that contribute to increased risk for HIV. Our programs need to draw on the strengths and protective factors that exist within each of these communities (e.g., traditional Indigenous knowledge and wellness practices, harm reduction knowledge and practices) and work toward building upon those strengths to support and enhance health and wellness.

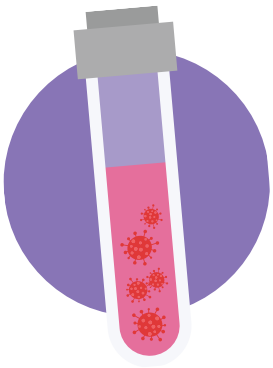
3 HIV treatment as a highly effective HIV prevention strategy

At the end of this unit, the learner will be able to:

1 *Describe how taking HIV treatment and an undetectable viral load work to prevent HIV transmission.*

2 *Outline the evidence for HIV treatment and an undetectable viral load as a prevention strategy through different activities.*

3 *Explain the meaning and importance of U=U (undetectable = untransmittable).*



HIV treatment is a lifesaver—it helps people with HIV live long and healthy lives. Plus, it is now well known that the use of HIV treatment to maintain an undetectable viral load not only improves the health of people living with HIV but also is a highly effective strategy to prevent HIV transmission.

A "highly effective" strategy is one that has strong evidence to support its ability to significantly reduce (and in some cases eliminate) the risk of HIV transmission, when used consistently and correctly.

This unit discusses the importance of HIV treatment and an undetectable viral load in preventing HIV transmission and improving the lives of people living with HIV. We'll also explore what we know about the effectiveness of treatment as a prevention strategy through different types of activities and discuss how to promote awareness and uptake of this important HIV prevention strategy.

How does taking HIV treatment and having an undetectable viral load work to prevent HIV transmission?

HIV treatment, also called antiretroviral therapy (ART), works by controlling the replication of HIV in the body—meaning it reduces the ability of HIV to make copies of itself. HIV treatment usually consists of a combination of two or three antiretroviral drugs taken daily in a single pill. While most people take HIV drugs in pill form every day, long-acting injectable formulations are also now available.

When a person living with HIV takes HIV treatment, the amount of HIV in their blood (also known as the viral load) can become so low that blood tests can't detect it. This is called having an undetectable viral load.

Viral load is measured in the blood as part of routine clinical care for people on HIV treatment. In Canada, an undetectable viral load is typically defined as less than 40 or 50 copies of the virus per mL of blood. Some newer tests can measure viral load down to 20 copies per mL.

Successful HIV treatment can reduce the viral load in the blood and other bodily fluids (such as semen, vaginal fluid and rectal fluid) to undetectable levels. However, HIV treatment does not cure HIV—even when the viral load is undetectable, HIV remains hidden in the body.

The viral load of a person living with HIV is the most important biological factor that can increase or decrease the chance of HIV transmission to an HIV-negative person. As the amount of virus in the body decreases, so does the risk of HIV transmission. When successful treatment lowers the viral load to undetectable levels, the risk of sexual transmission of HIV is eliminated.

What is important for this approach to work?

In order for this approach to work, a person with HIV needs to do all of the following:

- take their HIV medications consistently and correctly, as prescribed (this is also referred to as high adherence);
- achieve and maintain an undetectable viral load; and
- be engaged in regular care, including monitoring of viral load and adherence support if needed.

When a person begins treatment, their viral load typically becomes undetectable within three months, but it can take longer. A viral load test is the only way to know if the viral load has reached undetectable levels.

It is recommended that a person's viral load remains undetectable for at least six months, with two consecutive viral load tests showing undetectable virus, before relying on this approach for HIV prevention. They must continue to have high adherence to treatment and maintain an undetectable viral load over time. The only way for them to know if their viral load remains undetectable over the long term is to have regular viral load tests at routine healthcare visits.

Most people will ultimately have an undetectable viral load if they are using HIV treatment that is effective against their strain of HIV and if they take it as prescribed by their doctor. However, not everyone's viral load becomes and remains undetectable on treatment. The most common reason for this is low adherence to medications.

If treatment fails and a person's viral load becomes detectable again, the person won't know until they get another viral load test. Depending on the reason why the treatment hasn't been effective, a person may require a change in treatment or they may benefit from adherence supports to bring their viral load back down to undetectable levels.

Sexual transmission

As we've seen in prior units, HIV can be transmitted in different ways. Let's explore the evidence showing how well HIV treatment and an undetectable viral load works for different activities, starting with sexual transmission.

People living with HIV who are on treatment, engaged in care and have an undetectable viral load do not transmit HIV through sex. This is what is meant by U=U, or un-detectable=untransmittable. This fact is supported by a strong body of evidence.

The first randomized controlled trial (RCT) to conclusively show that HIV treatment has a prevention benefit was called HPTN 052. This study was conducted in heterosexual mixed-status couples (meaning one partner is HIV positive and the other is HIV negative) who were primarily having vaginal sex. Final results from this study found that no HIV transmissions occurred between couples when the person living with HIV was on treatment and maintained an undetectable viral load. In this study, couples were provided with and encouraged to use condoms.

A large observational study called PARTNER, conducted in both heterosexual and same-sex male mixed-status couples, showed that an undetectable viral load has a prevention benefit for both vaginal and anal sex. In the PARTNER study, couples reported having 112,000 acts of vaginal and anal sex when the HIV-positive partner's viral load was undetectable—and there were no HIV transmissions. Couples did not use any other type of prevention method (such as condoms, PrEP or PEP).

Another observational study called Opposites Attract added proof that having an undetectable viral load has a prevention benefit for anal sex. In this study, same-sex male mixed-status couples had more than 16,800 acts of condomless anal sex when the HIV-positive partner's viral load was undetectable. No HIV transmissions occurred.

In the PARTNER and Opposites Attract studies, an undetectable viral load was defined as less than 200 copies per mL. In the HPTN 052 trial, it was less than 400 copies per mL. Both limits are higher than the "undetectable" threshold for viral load tests commonly used in Canada (at less than 20 to 50 copies per mL), yet still there were no HIV transmissions below those limits. This is important, as it helped to show that viral load "blips" do not create a risk for HIV transmission. A viral load blip is a temporary low-level viral load increase above 50 copies per mL on one viral load test that returns to undetectable on the next test. Blips can sometimes happen to people with an undetectable viral load, but this does not mean that their HIV treatment has stopped working and it does not increase the risk for HIV transmission through sex.

These studies also helped show that sexually transmitted infections (STIs) do not increase the risk of HIV transmission from people who are on treatment and have an undetectable viral load. In the PARTNER and Opposites Attract studies, about 25% of participants contracted STIs during the study period. However, no HIV transmissions occurred when the HIV-positive or HIV-negative partner had an STI.

It is important to note that all participants in these studies received regular follow-up healthcare and comprehensive supports, including regular viral load testing, adherence and prevention counselling, and STI testing and treatment if needed.

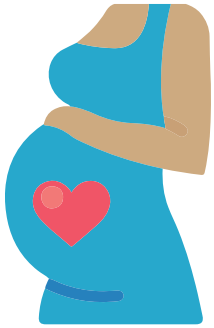
Perinatal transmission

Without HIV treatment, there is about a 15% to 30% chance that a baby born to a person living with HIV will acquire HIV during pregnancy or delivery. However, evidence shows that taking HIV treatment and maintaining an undetectable viral load is highly effective in reducing the risk of perinatal HIV transmission. In fact, when a pregnant person living with HIV is on HIV treatment, engaged in care and maintains an undetectable viral load before conception and throughout their pregnancy, there is no risk of HIV transmission during pregnancy or delivery. Other interventions are also included as part of the care that a pregnant person receives, such as intravenous HIV medication during labour and delivery and a short course of HIV medications for the infant to help prevent HIV transmission.

Evidence also shows that HIV treatment and an undetectable viral load reduces the risk of perinatal transmission even if treatment is started after conception. When HIV treatment is started after conception and an undetectable viral load is achieved and maintained for the rest of a pregnancy, the risk of perinatal transmission is significantly reduced. The sooner that treatment is started, the lower the risk of transmission.

The French Perinatal Cohort, conducted between 2000 and 2017, is the largest study to show the impact of treatment on preventing HIV transmission to a baby. This study showed that no perinatal HIV transmissions occurred among 5,482 cisgender HIV-positive women who were on treatment before they conceived and throughout their pregnancies, who had an undetectable viral load at delivery and who did not breastfeed. This study also showed that when treatment is started after conception the risk of perinatal transmission is still greatly reduced, and the earlier in pregnancy that treatment is started, the lower the risk of transmission. For example, the rate of perinatal transmission was 1.67% among women who started HIV treatment in their third trimester of pregnancy, but this reduced to 0.52% among women who started treatment earlier, in their first trimester.

Once the baby is born, the risk of HIV transmission through breastfeeding (also known as chestfeeding) is estimated to be about 15% if the lactating parent is not on HIV treatment. With HIV treatment, the risk of transmission is greatly reduced. A systematic review of HIV transmission in breastfed infants of cisgender HIV-positive women on treatment found that the risk of transmission was 1% after six months of breastfeeding, rising to almost 3% after one year. However, the women in these studies were not given treatment beyond six months after giving birth and the studies did not account for viral load. This means that we do not know how many of them had an undetectable viral load at the time of transmission through breastfeeding.



There is limited research on the impact of treatment and an undetectable viral load on HIV

transmission during breastfeeding. The PROMISE study, conducted in Africa and India, provided treatment to 2,431 breastfeeding cisgender HIV-positive women or their newborn infants. Among the 1,220women receiving treatment, seven infants acquired HIV by 12 months (for an HIV transmission rate of 0.57%). Two of these cases were among women who appeared to have an undetectable viral load at the time of transmission. Another study found two cases of HIV transmission among breastfeeding women who appeared to have an undetectable viral load at the time of transmission. This suggests that although the risk is significantly reduced when the viral load is undetectable, it is not zero.

Canadian guidelines recommend that HIV-positive parents do not breastfeed their babies, and instead feed them formula, to eliminate the possibility of HIV transmission. However, because of the evidence showing a very low potential risk of transmission, there is a growing movement to support people with HIV who wish to breastfeed to do so as safely as possible. This includes offering unbiased information about HIV transmission risk, providing adherence supports and frequent viral load monitoring, and providing prophylactic treatment for the breastfed infant.

Sharing injection drug use equipment

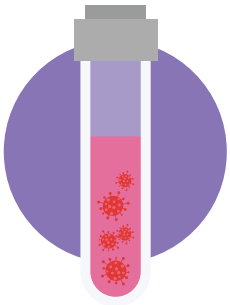
There is limited evidence to support that people living with HIV who are on treatment and have an undetectable viral load have a reduced chance of transmitting HIV through shared injection drug use equipment. However, available evidence does not allow us to conclude that there is no risk.

A few observational studies have found that increases in treatment coverage and viral suppression at the community level among people who use drugs is associated with a reduction in the number of new HIV infections. However, these studies were not designed to look at individual risk of transmission like the studies that evaluated the risk from sexual HIV transmission.

The major studies looking at sexual HIV transmission did not systematically recruit people who use drugs, did not ask whether participants were sharing drug use equipment, and did not provide any analysis related to participants who reported using drugs.

Due to the limited evidence available, the best way to prevent passing HIV through shared injection equipment is to use new needles and other equipment every time. People who use drugs need access to enough new injecting equipment to be able to do this consistently and to avoid having to share with other people.

Understanding U=U



Earlier in this course we introduced the term U=U, which is shorthand for "undetectable equals untransmittable." U=U refers to the fact that a person living with HIV who is on HIV treatment and maintains an undetectable viral load cannot transmit HIV through sex. In other words, when someone has an undetectable viral load, the risk of sexual transmission is zero.

For people living with HIV, U=U can be transformational. U=U has changed what it means to live with HIV and has made a difference to people with HIV in many ways.

U=U can help people living with HIV understand the prevention benefits of having an undetectable viral load in a clear and simple way. This has helped to reduce the shame and fear of passing HIV to sexual partners and can help minimize anxieties around disclosing one's HIV status. It can also provide an additional incentive beyond the health benefits for starting HIV treatment and adhering to it.

Increasing awareness of U=U can help to dismantle HIV-related stigma and reduce discrimination. The U=U message has had an impact on public opinion that has changed the way organizations and people talk and think about HIV risk for people living with HIV.

U=U is based on a solid foundation of scientific evidence that has been promoted by a global community of people living with HIV, researchers, clinicians and community-based organizations since 2016.

It is important to be clear that U=U applies to HIV transmission through sex. As we've seen, the prevention benefit of having an undetectable viral load can depend on the activity.

U=U is not universal

The U=U movement has also drawn attention to the fact that having an undetectable viral load is not universal among people living with HIV. It is important to recognize that some people experience barriers to becoming undetectable.

To become undetectable, a person living with HIV needs to access a range of services, starting with HIV testing. When a person is diagnosed with HIV, they need to be connected to appropriate medical care, be retained in care on a regular basis, have access to HIV treatment, and be supported to adhere to treatment and maintain an undetectable viral load over time. These successive

steps are known as the HIV treatment cascade. People can experience barriers along the cascade, which can limit their ability to ultimately achieve and maintain an undetectable viral load.

Social and structural factors (such as stigma, poverty and housing instability) can create barriers to engagement across the HIV treatment cascade and can affect health outcomes for people living with HIV, including the likelihood of having or maintaining an undetectable viral load. Not everyone is able to achieve an undetectable viral load due to social and structural factors that affect their ability to get equitable healthcare.

Educate on consistent and correct use of this approach

Many people still don't understand the power of having an undetectable viral load. Service providers have an important role to play in improving awareness of the prevention benefits of treatment and an undetectable viral load.

Educational and counselling activities provided for both HIV-negative and HIV-positive clients should include information on the prevention benefits of having an undetectable viral load and how to use this approach consistently and correctly.

Emphasize that the consistent and correct use of HIV treatment to maintain an undetectable viral load includes all of the following:

- high adherence to HIV treatment medications as prescribed;
- achieving and maintaining an undetectable viral load; and
- regular care for the HIV-positive person, including monitoring of viral load and, if needed, adherence supports.

Communicate key information

Remember: when people are on treatment and maintaining an undetectable viral load ***they will not pass HIV through sex***—even when condoms are not used. Everyone benefits from hearing this important message!

Sex

Inform clients that people who have an undetectable viral load are still at risk for getting or passing other STIs, such as syphilis, chlamydia or gonorrhea. Only condoms help to prevent these STIs. Regular STI testing is important for people at risk, so people can be diagnosed and treated as soon as possible.

It is important to help clients understand that some other activities carry a risk for HIV transmission even when the viral load is undetectable. The information about this strategy and the supports that you provide to clients who are using it will differ depending on how they may be at risk for getting or passing HIV.

Pregnancy

If someone is thinking of becoming pregnant and is not currently on treatment, talk to them about the health and prevention benefits of starting treatment and being undetectable before conception.

Canadian guidelines recommend that, ideally, people living with HIV should have an undetectable viral load before conception. However, some people become pregnant without having an undetectable viral load, including people who learn they are HIV positive during pregnancy and people who face barriers to accessing care and adhering to treatment. Whether a person is planning for pregnancy or already pregnant, if they are not on treatment they should be encouraged to start as soon as possible for their own health and to prevent transmission to their baby. Those who have difficulty adhering to treatment should be supported to address this issue. It is important to support people in a way that is nonjudgmental and encouraging.

All pregnant clients should be encouraged to access pregnancy care from a provider who is knowledgeable about HIV. Canadian guidelines provide recommendations for care providers on how to support people living with HIV to become pregnant and how to support them during pregnancy, including choosing HIV medications that are appropriate for use in pregnancy. These guidelines also recommend other interventions that are important for reducing the chance of perinatal transmission. This includes intravenous HIV medication during labour and delivery, four to six weeks of HIV medication for the newborn baby and regular HIV testing for the baby. If the viral load is detectable at or near the time of delivery, a C-section may be needed to help reduce the risk of HIV transmission to the baby.

Breastfeeding

Educate clients about the Canadian recommendation that people with HIV exclusively formula feed their babies. Refer clients to free formula programs if they are available in your community.

Some clients may have a strong desire to breastfeed for personal reasons or because of social or cultural pressures. It is important to listen to clients' concerns without judgment. Clients who decide to breastfeed should be encouraged to get support from an HIV specialist. An HIV specialist can help a person breastfeed as safely as possible.

Drug use

The best way to prevent passing HIV through drug use is to use new needles and other equipment every time. Offer your clients a full range of single-use safer injecting equipment (including needles and syringes, cookers, sterile water, filters and alcohol swabs) without requiring exchange of used supplies, or refer clients to harm reduction programs for supplies and other supports. Note that using new equipment will also prevent transmission of hepatitis B and C and other blood-borne infections.

Support clients to address barriers to treatment access and social determinants of health

Some clients may need support to overcome barriers along the HIV treatment cascade of care, including barriers to testing, linkage to care, starting treatment and staying adherent to treatment.

Service providers need to work with clients to help address barriers they may be experiencing along the cascade of care. This includes addressing their holistic needs, such as housing, mental health support and primary care. Addressing these challenges is key to improving the health of people living with HIV and realizing the prevention benefits of treatment.

Although the personal health benefits will always be the primary purpose of HIV treatment, it is vital that the prevention benefits of HIV treatment are fully understood and communicated to people living with HIV in order to raise awareness, help prevent HIV transmission and challenge stigma.

4 Highly effective HIV prevention strategies

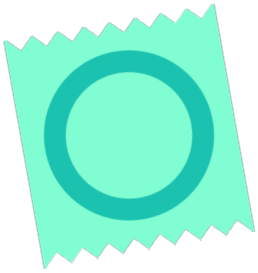
At the end of this unit, the learner will be able to:

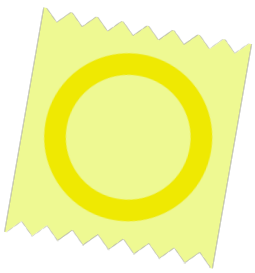
1 *Summarize the effectiveness and safety of highly effective HIV prevention strategies.*

2 *Describe the factors that are important to ensure consistent and correct use of highly effective HIV prevention strategies.*

3 *Describe additional HIV risk reduction strategies.*

4 *Facilitate uptake and correct use of highly effective HIV prevention strategies.*





In the previous unit we learned about how treatment and an undetectable viral load can be a highly effective HIV prevention strategy. In this unit, we will learn about four other highly effective prevention strategies and some additional ways to help reduce the risk of HIV transmission. Highly effective strategies are the backbone of HIV prevention; there is strong evidence to show that they can significantly reduce the risk of HIV transmission when used consistently and correctly. Additional risk reduction strategies can be used as part of a comprehensive plan for health to help minimize HIV risk.

Advances in our understanding of HIV, and the drugs used to treat HIV, have led to greater knowledge about how to help prevent HIV transmission. We now have more HIV prevention options that we know can significantly reduce the risk of getting or passing HIV.

In this unit, we describe four highly effective HIV prevention approaches and their effectiveness:

- condoms for sex
- using new needles and other equipment for injecting drugs
- pre-exposure prophylaxis (PrEP)
- post-exposure prophylaxis (PEP)

Condoms

Condoms have been a key part of HIV prevention efforts for a long time. Condoms continue to have an important role to play in reducing HIV transmission in Canada. They are a highly effective strategy to help prevent HIV transmission through sex when used consistently and correctly.

There are two main types of condoms: external condoms, which are worn over the penis, and internal (also known as insertive) condoms, which are inserted in the vagina or anus.

Condoms can play an important role as part of a comprehensive strategy for sexual health because they also reduce the risk of other sexually transmitted infections (STIs) such as gonorrhea, chlamydia, herpes and syphilis, as well as unintended pregnancy.

How well do condoms work?

Condoms made of latex, nitrile, polyurethane and polyisoprene prevent exposure to HIV because they are impermeable to HIV, meaning that HIV cannot pass through them. However, HIV can pass through condoms made of lambskin, which can be used to prevent pregnancy but not HIV.

Even though condom materials do not let HIV pass through, condoms can fail to prevent an exposure to HIV if they break, slip or leak during sex. The chance of this happening is relatively low, with studies estimating that external condoms fail between 0.4% and 6.5% of the time and that internal condoms fail between 0.1% and 5.6% of the time.

In these studies, it was not possible to know how often condoms were used correctly, so we don't know how often condoms break, slip or leak when used correctly. We do know that using a condom correctly reduces the chance of a condom breaking, slipping or leaking. However, this can happen even for experienced condom users who use condoms correctly.

The effectiveness of external condoms has been evaluated in observational studies among mixed-status couples (meaning where one person is HIV positive and the other is not) by comparing rates of HIV transmission in couples who said they use condoms consistently compared to those who did not. Studies in heterosexual couples have estimated that consistent condom use is 69% to 94% effective at reducing the risk of HIV transmission. Similar results of 70% to 91% effectiveness have been observed in studies of same-sex male couples.

These estimates include a wide range of effectiveness and may seem lower than expected. This is because there are some limitations in the way the data was gathered that may not accurately measure how effective condoms actually are when used consistently and correctly. For example, consistent condom use was determined based on whether participants said they used condoms consistently, every time they have sex. Self-reports can be an unreliable way to measure behaviours that people may be uncomfortable disclosing, such as having sex without a condom. Couples may not have used a condom for every sex act, even though they said they did, and this would artificially lower the effectiveness estimate.

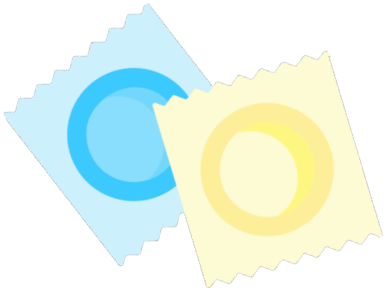
What is consistent and correct use of condoms?

When condoms are used consistently and correctly, the risk for HIV transmission is very low.

Consistent use of condoms means using a new condom for every act of vaginal or anal sex.

Using condoms correctly can prevent them from breaking, slipping or leaking during sex and can maximize effectiveness. The ***correct use*** of condoms means:

- storing condoms at room temperature and regularly replacing condoms that are kept in a wallet, purse or pocket
- checking the expiry date and making sure the packaging isn't damaged
- putting on and removing the condom correctly
- using an external condom with the right fit and feel
- applying sufficient and appropriate lubrication (only water- or silicone-based lubricants should be used with latex condoms; saliva should not be used as lubrication)
- using a condom for the entire act of sex (no delayed application or early removal)
- using a new condom for every partner, if having sex with more than one partner



New injection drug use equipment

Using new needles and other equipment for injecting drugs is a highly effective strategy to prevent HIV transmission. This includes using new needles, syringes, filters, cookers, acidifiers, alcohol swabs and sterile water for every injection. All of this equipment should not be shared or re-used.

There is some evidence to show that smoking drugs can increase the risk for HIV, but evidence suggests this is due to sexual behaviours that are associated with smoking certain drugs (e.g., multiple sex partners or condomless sex) and not transmission through the equipment. However, sharing equipment used to smoke or snort drugs carries a risk of transmitting other infections such as hepatitis C.

How well does using new drug use equipment work?

There is no chance of getting HIV through injection drug use if all new equipment is used each time someone injects drugs. This is because new sterile equipment will not contain any amount of blood, which can transmit HIV.

Using new equipment for every injection will also prevent transmission of other blood-borne infections such as hepatitis B and C.

What is consistent and correct use of new drug use equipment?

Consistent and correct use requires people who inject drugs to have access to enough new equipment for all of their injections so that they do not need to re-use or share any equipment. Ideally, people should be able to access a full range of free supplies in unrestricted quantities from a variety of sources, such as needle and syringe programs, vending machines, supervised consumption services, pharmacies, clinics or hospitals. Access to equipment for safer injecting can vary greatly depending on where a person lives, and not all provinces and territories have programs that distribute a full range of free supplies.

People who inject drugs also need to know how to prepare and inject drugs as safely as possible in order to reduce the risk of HIV and hepatitis B and C as well as other harms such as bacterial infections. They may benefit from education on: how and why each piece of equipment is used, how to prepare different types of drugs for injection, and how to inject as safely as possible.

HIV medications to prevent HIV transmission for people who are HIV negative

There are two highly effective ways for HIV-negative people to prevent getting HIV using HIV medications: ***pre-exposure prophylaxis*** (PrEP) and ***post-exposure prophylaxis*** (PEP).

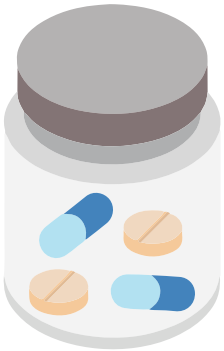
Both PrEP and PEP interfere with the pathways that HIV uses to cause a permanent infection after HIV gets into the body. When PrEP or PEP are taken, the HIV drugs enter the bloodstream and the genital and rectal tissues. If HIV gets into the body, the drugs can prevent the virus from replicating within the body's immune cells in the bloodstream and genital and rectal tissues. This helps to prevent a permanent infection.

To help stop HIV from replicating, drug levels in the body must be high. PrEP and PEP need to be taken consistently as prescribed so there is enough medication in the body to reduce the risk of HIV infection.

PrEP and PEP only help to prevent HIV; they do not prevent other sexually transmitted infections (such as chlamydia, gonorrhea or syphilis) or other blood-borne infections (such as hepatitis C).

PrEP

PrEP is used by people who are HIV negative to help prevent them from getting HIV. PrEP needs to be started before and continued after a potential exposure to HIV. It is intended for regular use as an ongoing HIV prevention method.



There are a few types of PrEP that have been studied, using different PrEP drugs and different regimens (or ways of taking PrEP). The table below gives a snapshot of the differences among types of PrEP.

PrEP administration	PrEP drugs	Regimen
Oral	TDF + FTC (brand name Truvada)	1 pill taken daily
	TDF + FTC (brand name Truvada)	On-demand (2-1-1 regimen)
	TAF + FTC (brand name Descovy)	1 pill taken daily
Injection* (administered by a healthcare provider)	Cabotegravir	Every 8 weeks

*Not yet approved for use in Canada

PrEP is currently available in Canada as a combination of two HIV medications in a single pill that a person takes orally on a regular basis (either every day or on-demand). Health Canada has approved two pills for PrEP. Both contain emtricitabine (also called FTC) plus one other drug—either tenofovir disoproxil fumarate (TDF) or tenofovir alafenamide (TAF). Health Canada has approved these two pills for prescription in certain ways, however they are also prescribed in other recommended ways. This is called "off-label" prescribing.

The Health Canada–approved ways to prescribe PrEP drugs include ***daily*** use of:

- ***TDF + FTC*** (Truvada) – for preventing the ***sexual*** transmission of HIV in people at high risk for getting HIV through sex. This could include people who have condomless anal or vaginal (or frontal) sex with partners of unknown HIV status or with partners who have HIV and have a detectable or unknown viral load
- ***TAF + FTC*** (Descovy) – for preventing the ***sexual*** transmission of HIV, ***only*** in gay, bisexual and other men who have sex with men (***gbMSM***)

However, "off-label" prescription of TDF + FTC is recommended for:

- ***daily*** use by people who inject drugs to help prevent HIV transmission via shared drug use equipment
- ***on-demand*** use by gbMSM and transgender women (only)

On-demand PrEP means taking pills only on days before and after having sex. It is sometimes referred to as 2-1-1 dosing. This involves taking:

- 2 pills between 2 and 24 hours before sex
- 1 pill 24 hours after the first dose
- 1 pill another 24 hours later

If a person continues to have sex, they should continue to take a pill every 24 hours until two days after the last time they have sex.

It is important to note that using PrEP involves more than just taking medication. A person using PrEP must also attend regular medical appointments to be tested for HIV and other STIs, be monitored for drug side effects and receive ongoing adherence support and other support as needed.

A newer form of PrEP to be studied is an injectable formulation using a drug called cabotegravir. This has not been approved for use as PrEP by Health Canada but is approved for use as PrEP in the United States. This long-acting form of PrEP is injected into muscle every eight weeks, with the first two shots given one month apart. Injectable PrEP has been tested in gbMSM, transgender women and cisgender women.

How well does PrEP work?

In this section we will outline what we know about the effectiveness of different PrEP drugs and regimens, highlighting any known differences in effectiveness for specific populations.

Daily TDF + FTC for sexual transmission

A large body of evidence shows that daily PrEP using TDF + FTC (Truvada) is highly effective at reducing the risk of getting HIV through sex when it is used consistently and correctly.

Daily PrEP using TDF + FTC was proven effective for sexual transmission based on evidence from randomized controlled trials (RCTs) conducted in gbMSM, transgender women and heterosexual men and women. There is very strong evidence in people taking daily TDF + FTC that adherence to PrEP is essential for PrEP to be highly effective. If adherence is low, PrEP is significantly less effective.

When taken consistently as prescribed, PrEP appears to prevent nearly 100% of sexual HIV transmission.

Among all the studies and the many thousands of people now using daily PrEP globally, there have been only a handful of documented cases of sexual transmission in people who are adherent to PrEP. In some of these cases, people taking PrEP acquired a rare strain of HIV that was resistant to the drugs in PrEP, and in certain cases the reasons for PrEP failure were unclear. This highlights that PrEP does not work 100% of the time, however these are very rare events.

Daily TAF + FTC for sexual transmission

Evidence shows that daily PrEP using TAF + FTC (Descovy) is also highly effective at reducing the risk of getting HIV through sex when it is used consistently and correctly. Data on its effectiveness as PrEP comes from one RCT with gbMSM and a small number of transgender women. This trial found that this newer version of PrEP was "non-inferior" to the original PrEP formulation of TDF + FTC—meaning it works just as well in the population studied. The efficacy of the TAF + FTC PrEP formulation has not been studied for preventing HIV among people who have vaginal (or frontal) sex or among people who use drugs.

Daily TDF + FTC for transmission through injection drug use

There is evidence to suggest that daily PrEP using TDF + FTC is effective for people who inject drugs. One RCT found that daily PrEP was effective at reducing the risk of HIV transmission among people who inject drugs when used consistently and correctly. HIV risk was reduced by 84% among people who used TDF + FTC consistently compared with those who did not.

On-demand TDF + FTC for sexual transmission

Evidence shows that the on-demand 2-1-1 strategy for PrEP is highly effective at reducing the risk of sexual HIV transmission among gbMSM and transgender women who take it consistently and correctly. On-demand PrEP has only been studied using TDF + FTC and has only been studied in gbMSM and transgender women.

An RCT known as IPERGAY was the first to test the on-demand PrEP strategy in gbMSM. In this study, two participants acquired HIV and they were found to not be adherent to PrEP. Since IPERGAY, other studies have also found no HIV infections among gbMSM and transgender women taking on-demand PrEP consistently and correctly.

An on-demand PrEP strategy is a good option for gbMSM who usually know in advance when they will have sex. Since on-demand PrEP has not been evaluated in other populations, people who have vaginal (or frontal) sex and people who inject drugs are recommended to take daily PrEP.

PrEP safety

Side effects

The drugs used in PrEP can cause mild gastrointestinal side effects (such as nausea or diarrhea), but they usually resolve quickly and usually do not cause people to stop taking PrEP. In some people, TDF + FTC is associated with small decreases in kidney and bone health, which are both usually reversible after stopping the medication. The TAF + FTC formulation is generally not associated with these kidney and bone risks but there appears to be a higher risk of weight gain.

Drug resistance

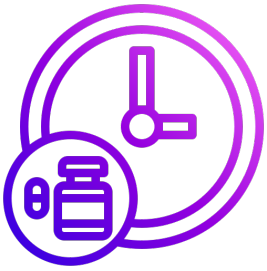
Very rarely, a person may develop resistance to the drugs in PrEP. This can happen if a person is already HIV positive (but unaware of their status) when they start taking PrEP or if they acquire HIV while taking PrEP. Drug resistance can limit a person's future treatment options, so it is important to ensure that people are HIV negative before starting PrEP and to test for HIV regularly while taking PrEP in order to diagnose an HIV infection as soon as possible.

If a person using PrEP gets HIV, they should stop taking PrEP immediately and consult a healthcare provider about starting HIV treatment.

What is consistent and correct use of PrEP?

Using PrEP consistently and correctly will maximize its effectiveness and safety. Consistent and correct use of PrEP includes:

- Obtaining PrEP from a healthcare provider. PrEP can be prescribed by a doctor or nurse practitioner who is able to provide the necessary medical follow-up.
- Taking PrEP medications consistently, as prescribed. PrEP effectiveness is strongly linked to adherence. High adherence to daily PrEP may be more important for people have vaginal or frontal sex because some evidence shows that drug concentrations are lower and take longer to build up in vaginal tissues compared to rectal tissues.
- Testing for the following before starting PrEP: HIV, hepatitis A, B and C, other STIs and kidney function. People should be vaccinated for hepatitis A and B if they are not immune.
- Regular clinic visits with a healthcare provider, typically every three months. During these visits, people should be tested for HIV and other STIs, monitored for kidney function and side effects, and offered adherence and risk-reduction supports, if necessary.



PEP

The other highly effective strategy that uses HIV medications to prevent HIV is post-exposure prophylaxis (PEP). PEP is used by people who are HIV negative to help prevent getting HIV after a potential exposure to HIV, such as through unprotected sex, sexual assault, having a condom break during sex, or sharing equipment used to inject drugs. PEP is also used by people who have an exposure to blood and/or body fluids that may contain HIV in their workplace—for example, a healthcare worker who has a needlestick injury.

PEP is normally prescribed as a combination of three HIV medications taken orally for 28 days. In the first one to three days following exposure to HIV, there is a "window of

opportunity" when taking PEP might prevent HIV infection from occurring. This is why, to be effective, PEP needs to be taken ***as soon as possible*** after a potential exposure and no later than 72 hours after.

A person must have high adherence to the full course of PEP drugs, as prescribed, so that drug levels remain high in the body. They should also have no further exposures to HIV while taking PEP, as PEP only works to prevent HIV after a single exposure to HIV.

PEP can be safely taken by all populations—including gbMSM, women, trans people, people who use drugs and people who are pregnant or breastfeeding — after consulting with a healthcare provider. A doctor or nurse practitioner will conduct a risk assessment to determine if PEP is required based on the nature of the HIV exposure.

How well does PEP work?

Research shows that when PEP is taken as prescribed and within 72 hours after exposure, the chance of getting HIV is low, although it does not prevent 100% of HIV infections.

Observational research suggests that PEP can reduce the risk of getting HIV by more than 80%, which means that some people in the studies got HIV despite taking PEP. Many of these HIV transmissions among people taking PEP occurred because of low adherence (meaning they did not take PEP every day for 28 days) and/or they had ongoing exposures to HIV. However, some of these people reported high adherence to PEP and no further exposures to HIV, and they still got HIV.

Therefore, we know that the effectiveness of PEP is likely much higher than 80% when PEP is used consistently and correctly, but it is not 100% effective.

PEP safety

As with PrEP, the main safety concerns associated with taking PEP are side effects and drug resistance.

The HIV drugs in PEP can cause side effects, such as nausea, diarrhea and fatigue. The nature and severity of side effects depend on the type of drugs prescribed and the person who is taking them. The HIV drugs that are recommended for PEP in Canada are generally well tolerated and associated with minimal side effects.

A person who acquires HIV while taking PEP could develop resistance to the drugs in PEP. If a person's HIV becomes resistant to the PEP drugs, those same drugs may not work for treating their HIV. If a person using PEP gets HIV, they should stop taking PEP immediately and consult a healthcare provider about starting HIV treatment.

What is consistent and correct use of PEP?

Consistent and correct use of PEP includes:

- Obtaining PEP from a healthcare provider. PEP is usually accessed through hospital emergency rooms and sexual health clinics.
- Testing for the following before starting PEP: HIV, hepatitis A, B and C, kidney function and possibly other STIs.
- Taking PEP medications as prescribed every day for 28 days. PEP will be less effective if doses are missed or if medication is stopped early.
- Starting PEP as soon as possible after a potential exposure to HIV, but not more than 72 hours afterwards. The sooner PEP is started after an exposure to HIV, the more likely it is to work because the drugs need to start interrupting HIV replication as soon as possible.
- Taking extra precautions (for example, using condoms) to reduce the risk of being exposed to HIV again while on PEP. PEP only reduces the risk from a single exposure to HIV.

PEP is meant to be used for emergencies and should not be used as an ongoing HIV prevention strategy. People who may be exposed to HIV on a regular basis, or who find themselves using PEP frequently, might consider using PrEP to prevent HIV instead. However, there is an approach called PEP-in-pocket (also called PIP) that is recommended for people who recognize that they are sometimes at risk for HIV but not enough for them to want to take PrEP on an ongoing basis. PIP involves providing a person with a PEP prescription, before any exposure has occurred, so that they can obtain PEP medications quickly if needed after a potential exposure to HIV. Anyone using PIP should be counselled to start the medications and seek medical care as soon as possible after an exposure.

Additional risk reduction

In addition to these highly effective strategies, there are other risk reduction tools that people can use to reduce their chance of getting HIV. This includes choosing to have sex or use drugs in ways that have a lower chance for HIV transmission.

Choosing types of sex that have a lower risk for HIV

Some types of sex have a lower chance for HIV transmission than others. In some situations, people may choose to avoid having vaginal or frontal or anal sex and instead choose a type of sex with either no chance or a lower chance of HIV transmission. For example, oral sex has little to no chance of passing HIV. Fingering, hand jobs and mutual masturbation have no chance of transmitting HIV. However, other STIs can be transmitted through some of these types of sex.

Using drugs in ways that have a lower risk for HIV

People may choose to change the way they use drugs to lower their chance of getting HIV. Taking drugs by swallowing, snorting or smoking them carries little chance of getting HIV. However, there may be a risk for hepatitis B and C, so people should still make sure to use their own equipment (such as a new straw or pipe).

Prevention counselling

Access to counselling and resources for safer sex and safer drug use can help people lower their chances of HIV transmission. This includes learning how HIV can be transmitted and how to make decisions around safer sex and safer drug use.

Improve awareness of highly effective strategies

Service providers have an important role to play in improving awareness of and knowledge about highly effective HIV prevention strategies among clients and in the community. This should include how and where people can access these prevention strategies in their communities. Educational and counselling activities provided for HIV-negative and HIV-positive clients should include information on the HIV prevention benefits of highly effective strategies and how to use them consistently and correctly.

Service providers can also lead or support efforts to improve awareness of and knowledge about highly effective prevention strategies among other local service providers, such as doctors, nurses, pharmacists and non-clinical staff at community-based organizations.

Address underlying health and social factors

Underlying health and social factors may impact a person's ability to use HIV prevention strategies consistently and correctly, which can lead to an increased risk of HIV transmission. Service providers can help clients to address underlying factors—such as mental health concerns, access to housing, social isolation, poverty or the use of alcohol or other substances—while reinforcing safer sex and drug use strategies. Providing referrals and linkage to other appropriate and relevant support services that clients are looking for can help set people up to successfully adopt HIV prevention strategies.

Support uptake and proper use of highly effective strategies

Clients may need support in deciding whether or not a particular strategy is right for them, and whether they will be able to use a given strategy consistently and correctly. For example, not everyone wants to take PrEP, and not everyone should. You can help clients to consider their level of HIV risk and the possible side effects of PrEP, as well as their ability to cover the cost, access a knowledgeable healthcare provider, adhere to PrEP as prescribed and attend regular medical visits.

Once a person decides which strategy or strategies they wish to use, support may be needed to take up these strategies consistently and correctly. For example:

- Clients may experience barriers to using condoms consistently and correctly, such as difficulty negotiating use, reduced pleasure or intimacy, or lack of availability at the time of sex. You can support them by offering free condoms and lube, providing suggestions to overcome barriers and engaging them in a discussion about other highly effective prevention strategies, such as the use of PrEP.
- Clients may need help to find a healthcare provider who will prescribe PrEP or PEP and may need support talking to a provider about the activities they participate in. Clients may also need help figuring out how to pay for PrEP or PEP, and they may need additional supports related to adherence or ongoing engagement in care.
- Clients who inject drugs need access to new sterile drug use equipment in quantities that allow them to use all new equipment every time they inject drugs. They may also need education on how to use all the supplies and how to inject drugs as safely as possible. If your organization does not provide safer drug use equipment or education, be prepared to refer clients to local harm reduction programs that do.

Encourage combination prevention strategies

Encourage clients to think about how multiple prevention strategies can be part of a comprehensive plan for health. People can use different HIV prevention methods based on their needs in different situations. For example, using new equipment to inject drugs will prevent HIV through injection drug use, but another strategy must be used to prevent sexual HIV transmission.

Combining prevention approaches can help to reduce HIV risk more than just relying on one approach. Combining multiple approaches is particularly important when a prevention strategy is not being used consistently and correctly. For example, if PrEP doses are missed, the use of condoms can help protect against HIV during a period of greater risk.

Help clients consider their risk for other infections besides HIV that can be passed through sex or from sharing drug use equipment. Some of the most common STIs are human papillomavirus (HPV), herpes, chlamydia, gonorrhea and syphilis. Hepatitis B and C can also be passed through sex and by sharing drug use equipment. Sexual transmission of hepatitis C is not common, but it is possible under certain circumstances.

If a client is worried about getting an STI or other infection, certain strategies can help them to prevent both HIV and other infections. Condoms are the only highly effective strategy that can also reduce the risk for other STIs, and using new drug use equipment prevents transmission of hepatitis B and C and other infections that can be passed through the blood.

Regular STI testing and treatment is important to maintain overall health. STIs and other infections often do not have symptoms, so the only way to know if a person has them is to get tested. Some infections (such as gonorrhea, chlamydia, syphilis and hepatitis C) can be cured, while others (such as herpes) can't be cured but can be treated.