

Evidence of HIV Treatment and Viral Suppression in Preventing the Sexual Transmission of HIV

HIV treatment has dramatically improved the health, quality of life, and life expectancy of people living with HIV (Cohen, 2011; Farnham, 2013; Farnham, 2013; Samji, 2013). Moreover, since breakthrough research in 2011 also showed the profound impact of HIV treatment in preventing the sexual transmission of HIV among heterosexual HIV-discordant couples, HIV treatment has transformed the HIV prevention landscape (Cohen, 2011). The Centers for Disease Control and Prevention (CDC) has worked with prevention partners across the nation to prioritize efforts to maximize the impact of HIV treatment in prevention and has responded with new initiatives that help diagnose HIV-infected individuals earlier, link or re-engage them to effective HIV care and treatment, and support adherence to HIV treatment, with the ultimate goal of achieving viral suppression (<https://www.cdc.gov/hiv/pdf/funding/announcements/ps18-1802/cdc-hiv-ps18-1802-factsheet.pdf>).

These interventions across the care continuum (<https://www.cdc.gov/hiv/pdf/library/factsheets/cdc-hiv-care-continuum.pdf>) are essential to help those living with HIV stay healthy, live longer, and reduce the risk of further transmission to partners. Additionally, to increase awareness of the full range of prevention strategies now available, CDC has worked to implement multiple education campaigns and provide online risk reduction tools and resources with information on different prevention strategies and their effectiveness (<https://www.cdc.gov/actagainstaids/index.html>; <https://www.cdc.gov/hivrisk/>; <https://effectiveinterventions.cdc.gov/>).

Over the past year, as new research has provided even stronger evidence on the prevention benefit of HIV treatment and viral suppression, CDC has joined with other federal agencies as part of an effort led by the U.S. Department of Health and Human Services (HHS) to review the latest evidence and ensure that these findings are communicated in a way that is consistent and accurate. As part of CDC's continued efforts to communicate evidence around effective prevention strategies, this fact sheet summarizes the latest scientific evidence regarding the effectiveness of HIV treatment and viral suppression in preventing the sexual transmission of HIV, and provides an update on evolving prevention messages developed by the HHS workgroup,¹ as well as CDC's next steps to evaluate and update messages in our communications and prevention activities.

The Evidence

In 2011, the interim results of the HPTN052 clinical trial were released (Cohen, 2011) demonstrating a 96% reduction in HIV transmission risk among heterosexual HIV-discordant couples for those starting antiretroviral therapy (ART) versus those delaying ART initiation. In addition to the powerful initial results, subsequent analyses published in 2016 demonstrated that there were no HIV transmissions between these couples when the HIV-positive partner had a suppressed viral load (defined as having a viral load less than 400 copies per milliliter) (Cohen, 2016).

Some HIV infections were observed among couples in the treatment condition; however, most of these were not genetically linked to the primary HIV-positive partner in the study, indicating that they came from another partner outside the study. Only a limited number of linked sexual transmissions of HIV were observed; however, this

FOR EVERY 100 PEOPLE LIVING WITH DIAGNOSED HIV IN 2014:



* People living with HIV who take HIV medicine as prescribed and get and stay virally suppressed have effectively no risk of sexually transmitting HIV to HIV-negative partners.

1. The HHS workgroup includes senior leaders, communicators, and subject matter experts from the Office of HIV/AIDS Infectious Disease Policy (OHAIDP) in HHS, the Centers for Disease Control and Prevention (CDC), National Institutes for Health (NIH), Health Resources and Services Administration (HRSA), and Substance Abuse and Mental Health Services Administration (SAMHSA).

was while the HIV-positive partner was not virally suppressed. In other words, linked HIV transmissions only occurred either:

- In the months *after* the HIV-positive partner began ART but *before* the HIV-positive partner was virally suppressed, or
- When the ART regimen failed and the HIV-positive partner did not maintain viral suppression.

Two recently conducted studies, PARTNER and Opposites Attract, have reported similar results on the effectiveness of taking ART and achieving and maintaining viral suppression in preventing the sexual transmission of HIV — that is, no linked infections were observed while the HIV-positive partner was virally suppressed while the couples engaged in condomless sex with no exposure to pre-exposure prophylaxis (PrEP) (Rodger, 2016; Bavinton, 2017). In these two studies, viral suppression was defined as less than 200 copies per milliliter, although most HIV-positive participants were undetectable in the PARTNER study (<50 copies/mL; Rodger, 2016). These studies also quantified the extent of sexual exposure. Over 500 heterosexual couples, with about half having a male HIV-infected partner (PARTNER), and more than 650 male-male couples (Opposites Attract) from 14 European countries, Australia, Brazil, and Thailand engaged in over 70,000 episodes of condomless vaginal or anal intercourse, while also not taking PrEP, during approximately 1,500 couple years of observation.

The studies reported transmission risk estimates and their corresponding 95% confidence intervals as:

- PARTNER study (Rodger, 2016): 0.0 (0.00 – 0.30) per 100 couple years
- Opposites Attract study (Bavinton, 2017): 0.0 (0.00 – 1.56) per 100 couple years

When combining the data from both PARTNER and Opposites Attract studies, the combined transmission risk estimate is 0.0 (0.0 – 0.25) per 100 couple years (unpublished data). Relevant person-time data have not been reported for HPTN052 to be combined with these two studies. CDC is now working with HPTN052 investigators to examine these data. When HPTN052 data can be combined with these two studies, the upper bound of a combined transmission risk estimate is expected to be smaller than 0.25 per 100 couple years including additional years of follow-up time.

Updating Prevention Messages

Given the significance of these recent findings, HHS convened scientific and communication leadership across several federal agencies to review the latest evidence and develop updated messages to communicate that evidence to the public in a clear, concise, consistent, and accurate manner.

In September 2017, the HHS workgroup agreed on the following interim message, to be tested with multiple audiences, which summarizes the scientific evidence of the effectiveness of HIV treatment and viral suppression in preventing the sexual transmission of HIV:

People living with HIV who take HIV medicine as prescribed and get and keep an undetectable viral load have effectively no risk of transmitting HIV to their HIV-negative sexual partners.

The term “effectively no risk” was selected by the HHS workgroup as the interim language to describe the magnitude of the estimated risk of transmitting HIV to a sexual partner when an HIV-positive individual is taking ART daily as prescribed and then achieves and maintains an undetectable viral load. “Effectively no risk” was chosen to reflect the fact that there have been no linked infections observed in studies among thousands of sexually active HIV-discordant couples engaging in female-male and male-male sex without a condom or PrEP over several thousand person-years of follow-up, while the HIV-positive partner is virally suppressed.

Although these studies provide extremely strong evidence, they are based on a finite number of observations that result in point estimates (zero) and corresponding 95% confidence intervals that indicate the precision or uncertainty associated with those estimates. In these studies, the lower bounds of confidence intervals are all zero, but the upper bounds of the confidence intervals are very small but greater than zero, which implies the possibility of a non-zero risk. Although these three studies found no cases of HIV transmission over several thousand person-years of follow-up, these data, even when combined, cannot statistically rule out the possibility that the true risk is greater than zero.

Because “effectively no risk” might have different meanings in different audiences or populations, the HHS workgroup agreed that message testing was critical to evaluate the understanding of this interim message and to determine how best to communicate the evidence and potential challenges with successfully implementing this prevention strategy among people living with HIV and their sexual partners.

Maximizing the Effectiveness of the Prevention Strategy in Practice

The success of this prevention strategy is contingent on achieving and maintaining an undetectable viral load. Data show, however, that not all HIV-positive individuals on ART are virally suppressed, while even fewer maintain viral suppression over time. CDC’s national surveillance data estimate that 58% of persons living with diagnosed HIV in the United States in 2014 were virally suppressed, defined as less than 200 copies/mL at most recent test (CDC, 2017). In addition, while most (about 80%) HIV-positive persons in the United States in HIV clinical care (defined as either receiving HIV medical care or having a viral load test) were virally suppressed at their last test, almost 20% were not (CDC, 2016; CDC, 2017; Marks, 2016). Also, about two-thirds achieved and maintained viral suppression over twelve months, which means about one-third (or about 33%) did not maintain viral suppression over that time period (CDC, 2016; Marks, 2016).

To help all individuals living with HIV and their partners get maximal benefit from this prevention strategy, it will be important to give providers, those living with HIV, and their partners clear information regarding the challenges with achieving and maintaining viral suppression. These challenges include the following:

- **Time to viral suppression:** Most people will achieve an undetectable viral load within 6 months of starting ART. Many will become undetectable very quickly, but it could take more time for some.
- **Importance of regular viral load testing:** Regular viral load testing is critical to confirm that an individual has achieved and is maintaining an undetectable viral load. Just because someone was virally suppressed in the past does not guarantee they are still virally suppressed. It is not known if viral load testing should be conducted more frequently than currently recommended for treatment to achieve maximal protection if relying on treatment and viral suppression as a prevention strategy.
- **Adherence challenges:** Taking HIV medicines as prescribed is the best way to achieve and maintain an undetectable viral load. Poor adherence, such as missing multiple doses in a month, could increase a person’s viral load and their risk for transmitting HIV. People who are having trouble taking their HIV medicine as prescribed can work with health care providers to improve their adherence. If an individual is experiencing adherence challenges, other prevention strategies could provide additional protection until the individual’s viral load is confirmed to be undetectable.
- **Stopping HIV medication:** If an individual stops taking their HIV medicine, their viral load can increase very quickly (e.g., within a few days) and eventually returns to around the same level it was before starting their HIV medicine. People who have stopped taking their HIV medicine should talk to their health care provider as soon as possible about their own health and consider using other strategies to prevent sexual HIV transmission.
- **Protection against other STIs:** Taking HIV medicine and achieving and maintaining an undetectable viral load does not protect you or your partner from getting other sexually transmitted infections. Other prevention strategies are needed to provide protection from STIs.

Next Steps in Communicating the Evidence

To help ensure prevention partners are aware of the effectiveness of this powerful HIV prevention strategy, CDC summarized the scientific evidence and the interim HHS-wide prevention message in a Dear Colleague Letter (<https://www.cdc.gov/hiv/library/dcl/dcl/092717.html>) for National Gay Men’s HIV/AIDS Awareness Day (NGMHAAD) on September 27, 2017. CDC is currently updating key web pages to summarize the evolving science and message updates (<https://www.cdc.gov/hiv/risk/art/index.html>).

CDC is currently conducting message testing to better understand how to most effectively communicate the science on optimal use of HIV treatment and viral suppression for prevention and the real world requirements for its success. We will continue to update campaigns, websites, and other communications materials as messaging evolves and is improved based upon research findings.

For More Information

**Call 1-800-CDC-INFO (232-4636)
Visit www.cdc.gov/hiv**

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