The HIV treatment cascade is a model that outlines the steps of care that people living with HIV go through from initial diagnosis to achieving viral suppression, and shows the proportion of individuals living with HIV who are engaged at each stage.

When someone is virally suppressed as long as they continue to adhere to their treatment regime, they are likely to be in good health and are unlikely to pass HIV onto anyone else. For both of these reasons, achieving viral suppression, and attending regular viral load monitoring appointments to check that the virus remains suppressed, is the ultimate aim of the HIV treatment cascade.

For viral suppression to happen, people living with HIV, once diagnosed and on treatment, need to continuously engage with treatment services, adhere to medication, and have their treatment appropriately managed if they have any difficulties. If any of these steps are missed the benefits of treatment for the individual, and the prevention benefits for their sexual partners and for the wider population, can be lost.

ART requires tablets to be taken as prescribed, without missing doses. If people do not adhere to this, HIV can mutate, which is when it changes its genetic make-up, and treatment can become ineffective. This means people’s viral load will increase and they may pass drug resistant HIV on to others. For this reason a strong treatment cascade is essential for limiting the prevalence of drug resistant HIV.

In 2015, the World Health Organization (WHO) began recommending a ‘treat all’ policy for people living with HIV in order to ensure all people testing positive for HIV enter the treatment cascade as soon as possible. Before this, people only began ART when the level of HIV in their body reached a certain level.\footnote{1}

Despite these treatment guidelines, there are still many parts of the world where large gaps exist along the treatment cascade, with too few people being aware of their status, attending services, and receiving effective treatment.
For weak health systems, maintaining a strong HIV treatment cascade is particularly challenging. Monitoring the treatment cascade can identify weaknesses at different stages or unacceptable variations between different groups or countries. This can focus the attention of policy makers or help persuade political leaders that more needs to be done.

**Testing and diagnosis – the gateway to the cascade**

The first step in the treatment cascade is for individuals who are living with HIV to be diagnosed and made aware of their status. In 2019, 81% of all people living with HIV were diagnosed, but wide variations between countries and regions remain. For example, in West and Central Africa only 68% of people living with HIV were diagnosed in 2019 and only 52% in the Middle East and North Africa whereas most other regions have similar diagnosis levels to the global level. There can also be huge variation between countries in a region. For instance, in East and Southern Africa, where in 2019 87% of HIV positive people overall were aware of their status, only 27% of people living with HIV in South Sudan were diagnosed, compared to 90% in Malawi.2

Effective testing programmes should enable people living with HIV who are unaware of their status to test for HIV then be linked to HIV care and treatment. It should also enable those who are particularly at risk of HIV to test and be linked to treatment if they test positive, or prevention services if they do not.

In the past decade there has been a shift away from relying on people to seek out testing for themselves (known as ‘opt in’ testing) to offering an HIV test alongside other services, which people can decline if they want to (known as ‘opt out’). The opt out approach is now the predominant strategy used in antenatal, tuberculosis and sexual health clinics and during multi-disease campaigns for less stigmatised conditions such as diabetes.3

Services that test and diagnose people need to be more accessible. Many at-risk people are criminalised and stigmatised, and may fear being arrested, mistreated or discriminated against should they make themselves visible by attending health services. This reduces the opportunity for them to come into contact with HIV testing in clinical settings. Other at-risk people may believe that they are at a low-risk of infection or there is little benefit from knowing their status. This is why education on HIV, particularly the importance of viral suppression, and programmes to reduce HIV-related stigma form an important part of HIV prevention; both may encourage people to test and seek treatment.

Technological developments are also helping to increase the number of people testing. These include point-of-care tests (also known as ‘rapid’ tests), which tend to use a pinprick of blood from a finger or a saliva swab, and can be delivered by trained lay providers in more settings. These can be carried out in clinical settings such as general health centres, and nonclinical settings such as workplaces, churches, social spaces and homes. In some contexts, in order to reach more at-risk people, people living with or most affected by HIV will be trained to carry out tests on their peers or link them to friendly-testing services.

HIV self-testing kits, which enable people to test in private, without fear, have also been approved for use and are now recommended by WHO.4 Evidence suggests this is increasing the number of people who have previously been resistant to testing for HIV. For instance, the first phase of the STAR initiative, which has seen 750,000 self-testing kits distributed in Malawi, Zambia and Zimbabwe – all of which have generalised epidemics – found between 22-28% of those testing had not previously
tested before.5

Services are encouraged to propose HIV testing to both members of a couple, or seek out sexual and injecting partners of individuals who have themselves been recently diagnosed. Similarly, it is important to provide testing for the infants and children of people living with HIV.6

**Linking to HIV care**

In order to strengthen the treatment cascade, services offering HIV testing need to be closely linked to those offering treatment. An increasing number of testing facilities are offering immediate ART to people they diagnose, often referred to as ‘treat all’ or ‘test and treat’.

In contrast, in situations where testing and treatment services are provided at separate locations and without effective communication channels, people newly diagnosed with HIV may not engage with treatment services or delay doing so.

When people are not given support to adjust to an HIV-positive diagnosis or there are practical barriers to accessing health services, people may not get prompt access to treatment.7 Even when initial contact with a service providing HIV treatment is made, if a person is told they do not need medication yet they may disengage with care. The risk is that, by the time they do make contact again, their health will have considerably deteriorated.

**Offering immediate treatment**

Immediately offering treatment to people newly diagnosed with HIV can plug a gap in the HIV treatment cascade; reducing the number of people lost between diagnosis and treatment initiation.

Past experience with programmes to prevent the mother to child transmission of HIV has shown that the immediate offer of HIV treatment can lead to more people beginning treatment and prevent delays. When only an HIV diagnosis is required to start ART, it is possible to provide treatment at the smallest and most remote health centres.8

Offering HIV care at sites where women are diagnosed – rather than referring them to specialised ART facilities elsewhere – can also improve uptake among expectant mothers.9

**Keeping people in care**

Many of the same barriers that may discourage an individual from engaging with healthcare in the first place can also make on-going retention in care challenging, including HIV stigma, distrust of health services, concerns about confidentiality, the time and cost of transport to a clinic, loss of income due to attending healthcare, waiting times in clinics, lack of support from partners and family – as well as other personal priorities.10 11

As a result, many people receiving HIV treatment drop out of care. WHO estimates that most people living with HIV who leave care do so in the first few years of starting treatment. On average, between 64% and 94% of people will still be in care one year after starting treatment. At 60 months, only 60% of people will still be in treatment in some resource-limited countries.12 For example a longitudinal study from Tanzania showed that only 54.5% of patients enrolled in the study at diagnosis, were still in HIV care at the end of three years. This, however, was evidence of improvement as in 2008 only 10
% were still in care compared to just over 50% in 2016. 13

Retention of children and adolescents is often poor and heavily influenced by the attitudes of families, caregivers and the wider community.14 Gaps between child and adult services, and inadequate support for young people moving from to adult care, can result in loss to follow up.

The World Health Organisation’s guidelines include recommendations on how to organise services in order to promote engagement and retention in care.

They state that HIV programmes should provide people-centred services that are organised around the health needs and preferences of people living with HIV. Some examples of this include decentralisation, reduction in clinic visits and clinic waiting times, and “upholding individual dignity and respect, especially for vulnerable populations.”15

The importance of having respectful HIV care is evident in findings from Zambia where researchers interviewed a random sample of people living with HIV who had left treatment. Participants were asked to choose between two hypothetical clinics in with a variety options for the following attributes: clinic waiting times, distance from home to clinic, how many months ART supply was given at each refill, opening hours and staff attitude. Above all factors, people expressed a strong preference for nice providers and were willing to spend considerable time and effort and accept substantial inconvenience if they could access friendly HIV care.16

A wide-ranging evidence review of studies conducted across Africa found that being diagnosed and starting treatment is made problematic by poverty, marginalised social identities, damaging gender norms and stigma. For those who make it to HIV care, a punishing and uninviting health system can cause them to leave treatment. For those who continue to adhere, the challenges of adapting and incorporating a treatment regimen into daily life depend on whether people have adequate emotional, practical and financial support. Together, all these factors can lead people to either engage or disengage in care, with many HIV positive people moving in and out of care throughout time in response to these factors.17

CASE STUDY: Supporting young people to start and stay in HIV care

Community Adolescent Treatment Supporters (CATS) are young people living with HIV who support their peers to start and stay on treatment. A key focus of the CATS is to improve people’s quality of life, self-esteem and well-being.

CATS operate in Zimbabwe, Mozambique, Tanzania and Swaziland. To assess the effectiveness of CATS researchers in Zimbabwe followed around 100 HIV positive 10-15-year-olds, half of whom were being supported by CATS. It found those supported by CATS were almost four times more likely to adhere to treatment compared to those receiving a standard care package.18

Treatment adherence

WHO also makes recommendations on how to support adherence to medication. Antiretroviral treatment requires tablets to be taken at the same time once or twice daily, but if doses are missed
or taken late it can become ineffective. Adherence may be affected by individual factors (such as changes in daily routines, depression), medication-related factors (like side-effects, complex dosing regimens) and health system factors (including requiring the patient to visit facilities frequently to receive medication, asking the patient for out-of-pocket payments).

WHO recommends interventions such as support on adherence from peer counsellors, support using mobile phone text messages, reminder devices such as alarms, cognitive behavioural therapy, behavioural skills training, and medication adherence training. Moreover, they recommend simpler once-a-day regimens which combine several drugs in one pill.  

This importance of having simple treatment regimens is demonstrated by a study from Brazil. Researchers were examining treatment adherence among heterosexual people living with HIV in stable relationships compared to those who were single. Although they found no difference between the two groups, they found that being on a single-tablet regime instead of a multi-tablet regime was the only predictor of adherence.

Treatment management for children living with HIV is even more challenging than for adults due to number of reasons. One of the reasons for this is that those prescribing ART for children may not get the medication dosage correct, due to how diverse in weight children can be. A study from Zimbabwe found over a third of children were given incorrect antiretroviral doses of at least one drug. This highlights the importance of weight monitoring to ensure children have adequate drug levels in their blood so that their treatment is effective.

Innovative programmes in specific settings may also bolster adherence. Community and peer groups can support people to adhere to their medications (see our case study on Community Adolescent Treatment Supporters above). Food and nutrition support, including cash transfers, may help individuals on low incomes.

Adherence interventions can also tackle health system factors. To ensure a continued supply of medication and prevent stock-outs, the WHO recommends that pharmaceutical supply management systems used to forecast, procure and deliver ARV drugs are optimised.

Adherence is also essential for limiting the onset of drug resistant HIV, which can develop when people deviate from their treatment plan. People with HIV drug resistance will find that treatment becomes ineffective and they may also pass drug-resistant HIV on to others. To combat rising HIV level in their blood they may be offered a different treatment regimen (sometimes known as ‘second-line’ or ‘third-line’ treatment). However, alternative regimens are often more expensive and in some countries they are hard to obtain.

In 2017 WHO found that in 6 of the 11 high HIV prevalence countries it surveyed in Africa, Asia and Latin America, over 10% of people starting ART had drug resistant HIV. Mathematical modelling suggests 135,000 more people could die and 105,000 could become newly infected in the next five years if drug resistant HIV is not properly addressed. HIV treatment costs could also increase by an additional US$ 650 million.

Viral suppression

The aim of HIV treatment and the final step on the treatment cascade is viral suppression. If maintained, someone who is virally suppressed will not pass HIV on to others and is likely to be in
Evidence on the preventative effects of viral suppression is growing. For example, the PARTNER2 study ran between 2014 and 2017 and included gay mixed-status couples in which the HIV positive partner was virally suppressed. Over a total of around 76,000 condomless sex acts, no new infections occurred.\textsuperscript{25}

The goal of sustained viral suppression cannot be achieved unless people living with HIV can access viral load monitoring. WHO recommends that viral load testing should be carried out six and 12 months after starting antiretroviral treatment, and for patients stable on ART, every twelve months after that.\textsuperscript{26} However, while point-of-care and dried blood spot versions of these tests are now available and their price is falling, they remain inaccessible for many health services and clinics.

Viral load tests are important because they give an early indication of difficulties with adherence and/or treatment failure, allowing patients to be switched promptly to an alternative treatment – so long as effective second-line treatments or third-line treatments are available. Delays in switching treatment risks allowing drug resistance to develop. While the WHO treatment guidelines recommend HIV drug resistance testing when assessing first-line ARV failures, laboratory facilities for these complex tests are even less readily available than viral load tests in low- and middle-income countries.

**Viral suppression around the world**

When provided appropriately, modern HIV treatment is highly effective. Globally, 92% of people living with HIV who are diagnosed and on treatment were virally suppressed in 2019.\textsuperscript{27}

However, the actual proportion of people living with HIV who have a suppressed viral load is much lower due to people remaining undiagnosed or not receiving treatment, predominately in low- and middle-income countries. In 2019, 59% of all people living with HIV in the world were virally suppressed.\textsuperscript{28}

That said, a number of resource-limited countries have been able to achieve good rates of viral suppression in those who receive treatment. This is the case for 96% in Botswana, 94% in Brazil and 91% in Georgia.\textsuperscript{29} Nonetheless it is important to look at the overall treatment cascades in these countries to get a fuller picture. For example, in Brazil 88% of people living with HIV have been diagnosed and 78% of those diagnosed receive treatment. This means 69% of HIV-positive Brazilians are actually virally suppressed. In Georgia, only 64% of HIV positive people have been diagnosed, 87% of whom are on treatment. This means only around 56% of people living with HIV in the country are virally suppressed. In contrast, in Botswana 92% of people living with HIV have been diagnosed, more than 89% of whom are on treatment. This means that 82% of all people living with HIV in the country are virally suppressed.\textsuperscript{30}

**The HIV treatment cascade: looking to the future**

As HIV treatment programmes continue to expand, attention to each step in the treatment cascade and high-quality health services will be needed for them to succeed. These services must to respond to the specific and diverse contexts and needs of people living with HIV.

Countries that are unable to deliver evidence-based, person-centred diagnostic, treatment and care
programmes, particularly in relation to adherence support, may see HIV transmission increase, including drug resistant HIV. This could lead to a resurgence of national HIV epidemics and escalating treatment costs. But those countries that get it right have the potential to control HIV as a public health problem, ensuring increasing numbers of people live healthy lives.

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