

The WHO public health approach to HIV treatment and care: looking back and looking ahead



Nathan Ford, Andrew Ball, Rachel Baggaley, Marco Vitoria, Daniel Low-Beer, Martina Penazzato, Lara Vojnov, Silvia Bertagnolio, Vincent Habiya Mbere, Meg Doherty, Gottfried Hirnschall

In 2006, WHO set forth its vision for a public health approach to delivering antiretroviral therapy. This approach has been broadly adopted in resource-poor settings and has provided the foundation for scaling up treatment to over 19·5 million people. There is a global commitment to end the AIDS epidemic as a public health threat by 2030 and, to support this goal, there are opportunities to adapt the public health approach to meet the ensuing challenges. These challenges include the need to improve identification of people with HIV infection through expanded approaches to testing; further simplify and improve treatment and laboratory monitoring; adapt the public health approach to concentrated epidemics; and link HIV testing, treatment, and care to HIV prevention. Implementation of these key public health principles will bring countries closer to the goals of controlling the HIV epidemic and providing universal health coverage.

Background

In 2006, WHO set forth its vision for a public health approach to antiretroviral therapy (ART) to support its scale-up in resource-poor settings.¹ At the time, about 1·3 million people were receiving ART, and there was considerable variability in which drugs and diagnostics were used, and how treatment was provided. WHO's public health approach aimed to promote standardisation and simplification of ART regimens to support efficient implementation and to accelerate access. The key principles of this public health approach were articulated by WHO in the first guidelines for antiretroviral therapy in 2002.² These principles were refined and expanded in the following years to include approaches to service delivery, in particular to task shifting, decentralisation, and integration of HIV treatment and care.³ Although the public health approach aimed to be grounded in the most rigorous scientific evidence, major research gaps were apparent and some of the approaches promoted, such as task shifting and decentralisation, had insufficient high-quality evidence to formally recommend their use and their promotion was driven by necessity.

Over the past decade major scientific advances and extensive implementation experience have altered the HIV treatment landscape. 16 new antiretroviral drugs and combinations of them have been approved by the US Food and Drug Administration, and new age-appropriate formulations are in development for children; the average cost of first-line therapy has been reduced to less than US\$100 per patient per year, from an initial cost of over \$10 000; point-of-care diagnostics for CD4 cell count, viral load testing, and early infant diagnosis have become available; the HIV prevention benefits of antiretroviral drugs and ART are being realised; and scientific research has provided the justification for starting ART as soon as HIV infection is confirmed (table 1). HIV testing approaches have been diversified beyond the clinic setting, delivering ART to key at-risk populations and remote locations, integrating HIV treatment into other services, and providing chronic care for those people

with HIV and on ART. This approach has helped to reduce HIV-related stigma by normalising HIV care as a part of routine health care.

By the end of 2016, more than 19·5 million people with HIV were receiving ART.¹⁶ The scale-up of ART had averted an estimated 7·8 million deaths and contributed to preventing 30 million new HIV infections in low-income and middle-income countries between 2004 and 2014.¹⁷ With the scale-up of ART, and more effective treatment, people with HIV can expect to have a life expectancy similar to that of the general population.^{18,19}

Key points

- In 2006, WHO set forth its vision for a public health approach to scaling up antiretroviral therapy in resource-poor settings. In that year, around 1·3 million people were receiving antiretroviral therapy in low-income and middle-income settings.
- Key principles of the approach include standardised and simplified antiretroviral therapy regimens and task shifting, decentralisation, and integration of HIV treatment and care.
- The public health approach, supported by a strong evidence base, has enabled delivery of treatment at scale without compromising quality.
- By the end of 2016, more than 19·5 million people with HIV were receiving antiretroviral therapy. With more effective treatment, people living with HIV can expect to have a life expectancy similar to that of the average population.
- The goal of providing antiretroviral therapy has expanded from saving lives to include long-term virus control and to reduce transmission. This shift in focus requires the application of the public health approach across the full system of HIV prevention and care.
- Implementation of the updated public health approach will bring countries closer to achieving the target of ending AIDS as a public health threat and providing universal health-care coverage.

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Department of HIV and Global Hepatitis Programme, World Health Organization, Geneva, Switzerland (N Ford FRCP, A Ball FChAM,

R Baggaley MBBS, M Vitoria MD, D Low-Beer PhD, M Penazzato PhD, L Vojnov PhD, S Bertagnolio MD, V Habiya Mbere MD, M Doherty PhD, G Hirnschall MD)

Correspondence to:
Dr Nathan Ford, HIV/AIDS Department, World Health Organization, CH-1211 Geneva 27, Switzerland
fordn@who.int

See Online for appendix

	2006	2016	Basis for policy change
When to start ART in adults	CD4 count <200 cells per µL; WHO clinical stage 3 or 4	As soon as possible after diagnosis	Reduced mortality, morbidity, and transmission ⁴⁻⁶
Prevention of mother-to-child transmission for pregnant women	Antepartum: zidovudine starting at 28 weeks; intrapartum: single dose nevirapine + zidovudine + lamivudine; post partum: zidovudine + lamivudine for 7 days	Immediate, lifelong ART for all pregnant women	Reduced transmission, improved maternal health, and programme simplicity ⁷
When to start ART in children and adolescents	Age-based CD4 cell count or percentage thresholds; WHO clinical stage 3 or 4	As soon as possible after diagnosis	Reduced mortality, morbidity, and promoted simplification ^{8,9}
Starting regimen for adults	Six possible preferred regimens based on two NRTIs (zidovudine or tenofovir + lamivudine or emtricitabine) and one NNRTI (nevirapine or efavirenz)	Single preferred regimen tenofovir + lamivudine (or emtricitabine) + efavirenz	Superior effectiveness and safety, better adherence ^{10,11}
Starting regimen for children and adolescents	Six possible regimens based on two NRTIs (zidovudine or stavudine or abacavir + lamivudine) and one NNRTI (nevirapine or efavirenz)	Regimens based on age bands; <3 years: zidovudine or abacavir + lamivudine + lopinavir/ritonavir; 3-10 years: abacavir + lamivudine + efavirenz; >10 years: tenofovir + lamivudine or emtricitabine + efavirenz	Superior efficacy and safety ¹²
Monitoring	Clinical or CD4 count monitoring (every 6 months)	Viral load (annual)	Better assessment of adherence and treatment failure ¹³
Treatment facilities	Health district	All health facilities	Similar clinical outcomes and improved retention ¹⁴
Treatment providers	Clinical team including doctors, clinical officers, and nurses	Doctors, nurses, or midwives	Similar clinical outcomes ¹⁵

ART=antiretroviral therapy. NRTI=nucleoside reverse transcriptase inhibitor. NNRTI=non-nucleoside reverse transcriptase inhibitor.

Table 1: Public health approach policies 2006 versus 2016

To accelerate the progress towards ending the AIDS epidemic as a public health threat by 2030, new targets have been established under the UNAIDS Fast Track approach.²⁰ The 2020 interim targets call for 90% of all people with HIV to know their HIV status, 90% of all people diagnosed with HIV infection to receive sustained ART, and 90% of all people receiving ART to have viral suppression by 2020 (termed the 90-90-90 targets). Modelling projections suggest that the achievement of these targets, together with increased coverage of evidence-based prevention interventions, would avert 21 million deaths and 28 million new infections in the following 15 years.

We review the extent to which the public health approach described in 2006 has been supported by evidence and practice, and reflect on the relevance of this approach and the best ways to adapt it when looking ahead.

Uptake and progress of the public health approach since 2007

Standardised regimens and simplified formularies

WHO guidelines have moved from recommending six preferred options of first-line ART for adults in 2006,²¹ to a single preferred first-line regimen in 2013.²² In 2006, for reasons of high cost and restricted availability of drugs, and insufficient clinical data, WHO recommendations for first-line ART included drugs with substantial long-term toxicity (stavudine, didanosine), drugs that could not be given to pregnant women because of safety concerns (efavirenz), or others that could not be coadministered with drugs to treat tuberculosis (nevirapine).²¹ Reductions in the price of key drugs,²³ together with improved pregnancy safety data,²⁴ allowed for progress towards a reduced formulary in such a

way that, by 2013, WHO was able to recommend a single preferred first-line regimen for all adults and adolescents. This regimen, comprising tenofovir + efavirenz with either lamivudine or emtricitabine, has greatly simplified drug procurement, supply, prescribing, and adherence,¹¹ and is now the preferred first-line regimen in low-income and middle-income settings (figure 1).²⁵

The standardisation and simplification of ART has enabled the delivery of treatment at scale without compromising quality. A study published in 2008,²⁶ comparing the individualised treatment approach in Switzerland (36 first-line regimens) with the public health approach in South Africa (four first-line regimens), found similar effectiveness and safety. Other studies have reported similar clinical outcomes between programmes in high-income settings and resource-poor settings,^{27,28} although early mortality in resource-poor settings remains higher than in high-income settings, mainly because patients generally present to care with a more advanced HIV disease stage.²⁹

For children, although the complexity resulting from varied age approvals for different drugs is still unavoidable, substantial progress has been made in the implementation of an optimal strategy that minimises the number of formulations needed to deliver the preferred ART regimen.³⁰

Simplified clinical decision making and standardised monitoring

The original public health approach framework emphasised the so-called Four Ss of simplified clinical decision making: when to start, when to substitute for toxicity, when to switch treatment after failure, and when to stop (ie, move to end-of-life care).

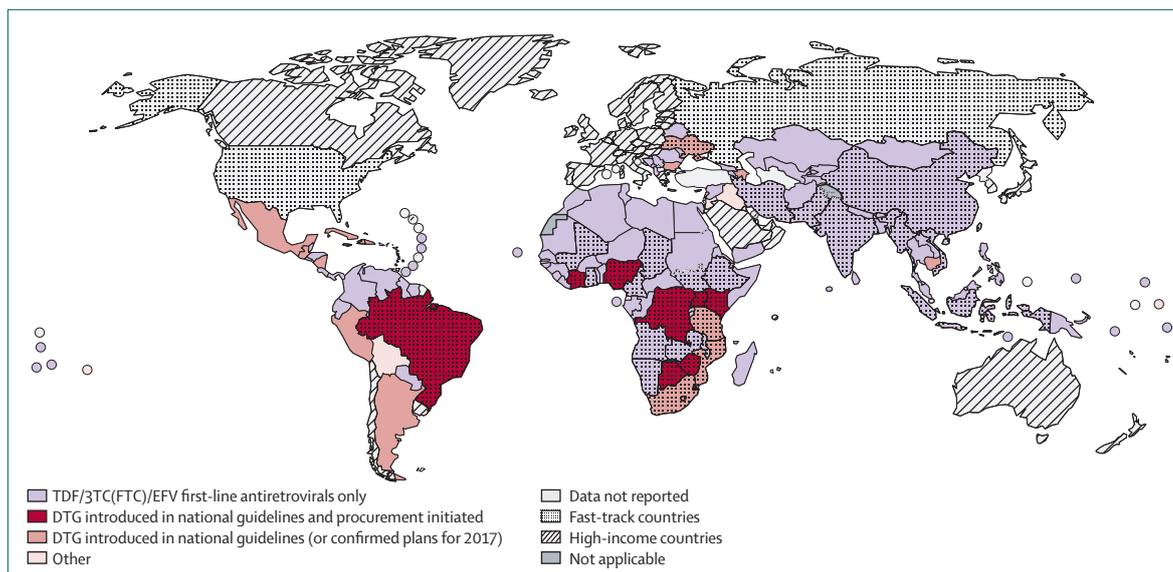


Figure 1: Map of uptake of WHO first-line antiretroviral therapies as of July, 2017

Distribution of the preferred first-line antiretroviral combination among adults and adolescents, and initial shifts towards dolutegravir in low-income and middle-income countries (situation as of July, 2017). The boundaries and names shown and the designations used on this map do not imply the expression of any opinion whatsoever on the part of WHO concerning the legal status of any country, territory, city, or area or of its authorities, or concerning the delimitation of its frontiers or boundaries. Dotted and dashed lines on maps represent approximate border lines for which there may not yet be full agreement. Data source: WHO. Map production: Information Evidence and Research. DTG=dolutegravir. TDF/3TC(FTC)/EFV=tenofovir/lamivudine (emtricitabine)/efavirenz.

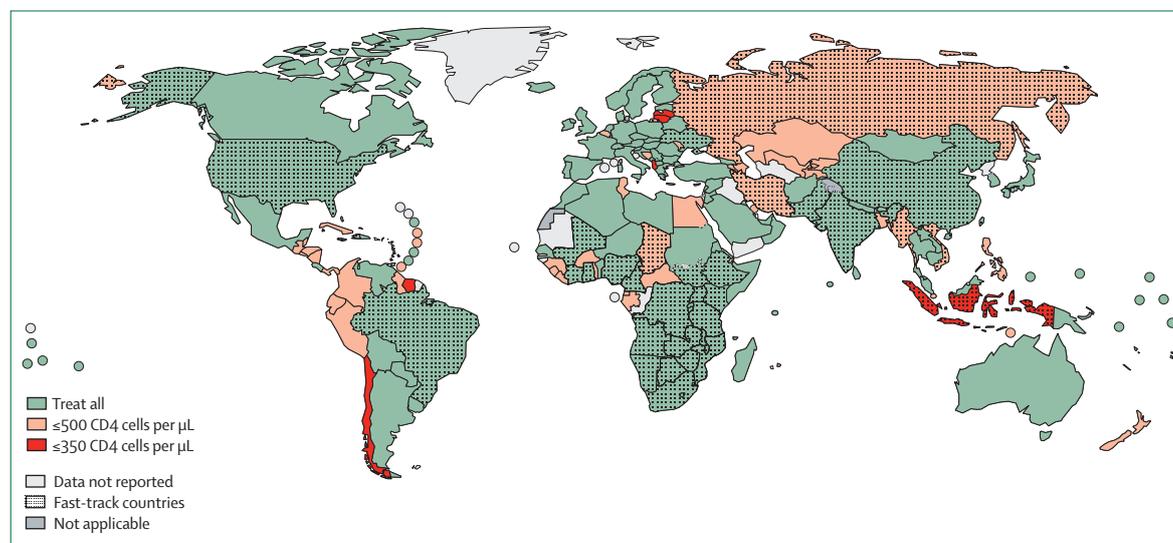


Figure 2: Map of uptake of treat-all policy among adults and adolescents as of July, 2017

The boundaries and names shown and the designations used on this map do not imply the expression of any opinion whatsoever on the part of WHO concerning the legal status of any country, territory, city, or area or of its authorities, or concerning the delimitation of its frontiers or boundaries. Dotted and dashed lines on maps represent approximate border lines for which there may not yet be full agreement. Data source: WHO. Map production: Information Evidence and Research.

Until 2015, decisions on when to start ART were based on clinical staging and CD4 cell count. The recommended CD4 cell count threshold for starting ART has gradually increased in national and international guidelines,^{31,32} in line with data from randomised trials^{4-6,33,34} and observational cohorts.³⁵ WHO recommends starting ART in all individuals with HIV, irrespective of CD4 cell count, to reduce mortality, morbidity, and viral transmission,³⁶

and most countries have adopted or are in the process of adopting this recommendation (figure 2).²⁵ Although WHO still recommends CD4 cell count at baseline to support clinical risk assessments,³⁷ the fact that CD4 cell count is no longer required for ART initiation greatly simplifies clinical decision making, to the point that it is possible to consider starting ART on the same day that HIV is diagnosed.³⁸ This simplification has been the

main driver for expanding treatment to all pregnant and breastfeeding women,⁷ and HIV-infected infants and children in resource-poor settings.¹²

Recommendations regarding when to switch ART in case of treatment failure have progressed since 2007, with preference given to viral-load monitoring over clinical or immunological monitoring.³⁹ Major efforts are underway to improve access to viral-load monitoring through increased donor investments, negotiated price reductions, the development of point-of-care technologies, and technical assistance to strengthen laboratory services.⁴⁰

Decentralised, integrated delivery of care

In 2006, the delivery of ART at scale was recognised to require moving beyond specialist tertiary centres to the health district, supported by medical teams and engaging both people with HIV and community health workers.¹ At the time, there was insufficient evidence to support this approach, and many countries were reluctant to adopt it. A growing body of evidence subsequently showed that ART delivery at the primary care level resulted in equivalent or better outcomes for adults and children with HIV than did delivery restricted to specialist centres.^{14,41–45} Relatedly, the integration of ART into a broad range of services has been shown to be mutually reinforcing, with improved clinical outcomes across services.^{46–48} As such, the decentralisation and integration of ART is strongly recommended by WHO,⁴⁹ and decentralisation has been widely adopted, particularly in high-burden settings.

Task shifting and specialist support

For ART delivery to be effective at primary care level, the responsibility for clinical management decisions needed to be shifted to the nurses and clinical officers who run these primary care services, supported by community health-care workers and peer counsellors. Driven by the dire shortage of physicians in countries with a high burden of HIV,⁵⁰ task shifting was promoted by WHO and adopted as national policy by some countries.^{1,51} In 2008, WHO published guidelines detailing what tasks could be shifted, while continuing to call for rigorous comparative evaluations.³ However, in the absence of a strong recommendation supported by high-quality evidence, the adoption of task shifting into policy was slow and variable. A randomised trial validating the safety and efficacy of this approach was published in 2010,⁵² and subsequent studies have shown the equivalence of this approach for both adults and children with HIV.^{15,53,54} Subsequent WHO guidelines have recommended task shifting of ART delivery, for both adults and children, including recommending a role for lay workers in undertaking HIV and other point-of-care testing, specimen collection, and dispensing of ART.⁴⁹ Nowadays, most countries in low-income and middle-income settings have adopted task shifting for ART delivery.

ART provided for free at the point of care

The financial barriers associated with ART lead to weak adherence, poor clinical outcomes, and catastrophic health-related expenditures.^{55,56} These concerns, together with human rights principles, supported the notion that ART should be available for free at the point of care.¹ The cost of providing ART for both health services and patients has decreased substantially through reductions in the cost of antiretroviral drugs, the cost and frequency of laboratory investigations, the distance to clinic services due to decentralisation, and the illness associated with earlier ART initiation.

In many low-income countries, ART costs are, to a large degree, covered by external donors. In recent years, the focus on domestic funding and the inclusion of ART into national health benefit packages (essential health services covered through state budgets and compulsory health insurance) has been increasing. The free access to ART and other HIV services at the point of care must be ensured as costs are transferred from donors to national governments. However, even in settings in which ART is provided for free, the costs of drugs for opportunistic infections, diagnostic testing, and other associated costs such as transport to clinics, represent a substantial financial burden for patients.^{57–59}

Procurement and supply management

The coordinated, regular ART forecasting and the widespread adoption of a single fixed-dose combination for first-line ART have contributed to improving drug supply management and the ability of national programmes, donors, and manufacturers to predict demand.^{43,44} Nevertheless, important challenges remain, including improving accuracy of quantification and forecasts, procurement plans, and logistic management information systems, and reducing delays in the release of funds for drug procurement.

The WHO Prequalification Programme has helped to improve procurement by providing a list of quality antiretroviral drugs produced by both originator and generic manufacturers, which, as of 2017, includes 220 antiretroviral drugs and formulations.⁴⁵ The WHO Prequalification Programme has been expanded to include diagnostic tests for HIV and other diseases. Major donors, including the Global Fund to Fight AIDS, Tuberculosis and Malaria and the US President's Emergency Plan for AIDS Relief, are working together with large national programmes, such as in South Africa, to improve the sourcing and supply of antiretroviral drugs, increase efficiency and economies of scale, and reduce the risk of stockouts and poor quality medicines and diagnostics.^{60,61}

Tracking progress

In 2006, it was noted that, to properly track progress in ART scale-up, programmes needed to transition from the process of counting numbers of people starting ART

to the more complex task of tracking progress over time.¹ Efforts to better ascertain outcomes, for both patients who are receiving ART and those who have tested positive but are not yet receiving ART, have led to a broad acceptance of the need for programme monitoring across the range of care, from HIV testing to long-term virological suppression and chronic care (figure 3).⁶² This development is reflected in the latest global targets for ART expansion, which have advanced from counting numbers of people on treatment (represented by the goals termed 3 by 5 and 15 by 15) to challenging countries to achieve the 90-90-90 targets by 2020.⁶³

Where next for the public health approach?

The first phase of the public health approach rightly focused on enrolling people with advanced HIV disease on ART at a time when treatment coverage was low, access uneven, and HIV-associated diseases were a leading cause of mortality in low-income and middle-income countries. Since then, the goals of providing antiretroviral drugs have expanded from saving lives to long-term virus control to reduce illness and transmission. The need to provide treatment as soon as possible following HIV infection is challenging HIV programmes to find new ways to test people early and to accelerate ART initiation. This shift in focus requires an expansion of the public health approach across the full range of HIV-care provision from prevention to testing, and to sustained viral suppression.

Integrating HIV testing into the public health approach

The drive to provide ART to all who are diagnosed with HIV as soon as possible has placed a renewed emphasis on the need to improve HIV testing access and coverage. Globally, only around 70% (range 51–84) of people who are HIV-infected are aware of their status,¹⁶ and many people only learn of their status once they have developed advanced disease and sought emergency care.⁶⁴ WHO and national guidelines emphasise the need to expand testing through a strategic mix of clinic-based and community-based services. Within health services, testing should be prioritised for individuals with the highest risk of infection, including people infected with common co-infections (notably tuberculosis) and pregnant women in generalised epidemics, key at-risk populations (including men who have sex with men, people who inject drugs, people in prisons and closed settings, sex workers, and transgender people), and partners of HIV-positive individuals. Recommended HIV testing strategies beyond the clinic include community-based and home-based testing, and self-testing.⁶⁵ For children, the sustained reduction of mother-to-child HIV transmission requires strategic active case-finding approaches in settings with the highest yield, such as malnutrition clinics and inpatient services.⁶⁶

Further simplification and improvement of treatment

The availability of a once-daily single pill for first-line ART for most patients has become the gold standard

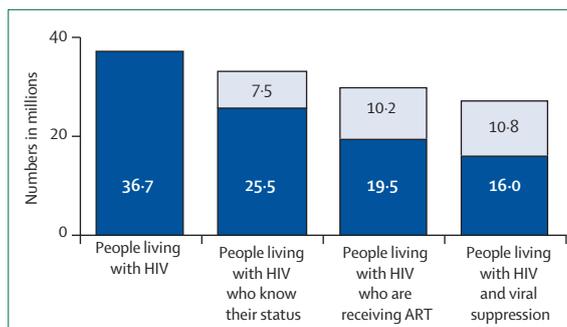


Figure 3: The treatment cascade, 2016

Dark blue represents the number of people (in millions) reached. Light blue represents the additional number of people who need to be reached to meet global targets.

	Advantages over current first-line regimen	Disadvantages	Anticipated timeframe for more data
Dolutegravir ¹⁰	Improved efficacy, reduced toxicity, and provides a higher barrier to resistance	Safety and efficacy in pregnancy is not fully established, can potentially interact with tuberculosis treatment (needs dose adjustment), and is only approved for children older than 6 years	2017/2018
Efavirenz 400 mg ⁶⁸	Reduced toxicity and cost	Efficacy when co-administered with tuberculosis treatment not fully established	2017/2018
Tenofovir alafenamide ⁶⁹	Reduced toxicity and cost	Efficacy in pregnancy is not established, can potentially interact with tuberculosis treatment, and is not currently approved for children	2018/2019
Long-acting formulations (cabotegravir + long-acting rilpivirine) ⁷⁰	Improved adherence	Need oral induction phase, scarce safety and efficacy data, no clinical data for children and adolescents	2019/2020

Table 2: Potential new antiretroviral drugs and formulations for first-line therapy

when considering the introduction of new drugs and regimens into first-line therapy. New antiretroviral drugs⁶⁷ and improved formulations of existing ones,⁶⁸ for both first-line and second-line therapy, offer potential advantages in terms of improved safety, effectiveness, tolerability, and acceptability.¹⁰ However, there are outstanding clinical questions that still need to be resolved. Table 2 summarises the key antiretroviral drugs and formulations of relevance for resource-poor settings, on the basis of an expert assessment of considerations specific to resource-poor settings, notably cost, safety in pregnancy, interaction with drugs to treat tuberculosis, and availability of paediatric formulations.⁶⁹

The management of treatment failure and the treatment of children need further simplification. No once-daily, fixed-dose combination exists for patients needing to switch to second-line medication. This combination is a priority for research because most patients failing first-line medication are more likely to face adherence challenges than others continuing first-line treatment.⁷¹ The treatment of HIV in children has been complicated by substantial delays in the registration

of antiretroviral drugs for use in the younger age groups, and by a need for more fixed-dose combinations and palatable formulations. Policies have been proposed to accelerate the introduction of optimised drugs and formulations for children, but implementation is slow and more efforts are needed to ensure that age-appropriate formulations are developed in a timely manner.¹²

New treatment strategies are emerging, including weekends off treatment for adolescents as a potential way to improve adherence,⁷² maintenance therapy with fewer drugs for patients who are virally suppressed,⁷³ and long-acting formulations.^{70,74} The incorporation of these new approaches into future ART guidelines for resource-poor settings will depend on the extent to which they can be integrated into the public health principle of simplification and standardisation of treatment for most people on ART.

Embracing new technology to support diagnostic expansion

The initial design of the public health approach to ART expansion was premised on the fact that routine laboratory monitoring was inadequate in most resource-poor settings with a high burden of HIV,¹ and successive WHO guidelines have emphasised that insufficient laboratory monitoring should not be a barrier to starting ART.³⁹ As the global cohort of people on ART has grown, management of treatment failure has become increasingly important and viral load monitoring, the standard way to monitor ART effectiveness in high-income settings, is being expanded across most low-income and middle-income countries.²⁵ New technologies (such as point-of-care devices) and strategies (such as sample transport and electronic communication of results) are needed to further improve access to viral load monitoring and action on the subsequent results.

The development of point-of-care technologies has shown a strong potential for improving quality of care, including CD4 cell count, viral load monitoring, and diagnosis of tuberculosis.⁷⁵⁻⁷⁷ Future opportunities include qualitative CD4 cell count tests to diagnose patients presenting with advanced HIV disease, simplified tools to measure adherence and drug resistance, multiplex point-of-care platforms capable of performing a range of assessments (for example tuberculosis diagnosis and HIV and hepatitis C viral load monitoring), and the use of electronic technology to reduce turnaround time for receipt of results.

Improved patient monitoring to support engagement and retention in care

Patient monitoring needs to be adapted to support people on treatment over the medium term and to provide the basis for chronic care in resource-poor settings. This support includes the strengthening of individual-level monitoring systems, the use of unique identifiers to

better ascertain the true outcomes of patients who have disengaged from care,⁷⁸ and the support to patients as they move between health-care facilities or disengage from care.^{79,80} Monitoring of treatment outcomes has also progressively improved from clinical and CD4 cell count monitoring to the measurement of viral load as the preferred way to assess treatment effectiveness.⁸¹

Response to drug resistance

High and durable rates of viral suppression have been reported among people on ART.⁸² However, after more than a decade of ART scale-up and with more than 19.5 million people on treatment, an increase in drug resistance is inevitable. Data from several national surveys from low-income and middle-income countries between 2014 and 2016 have shown prevalences of pretreatment HIV drug resistance to non-nucleoside reverse-transcriptase inhibitors (NNRTIs) above 10%, triggering the threshold for public health action recommended by WHO.⁸³ WHO has developed guidelines to support public health interventions in response to pretreatment HIV drug resistance in patients initiating ART, and is supporting countries in generating more data derived from similar, nationally representative surveys.⁸⁴ Because drug resistance testing is largely unavailable in low-income and middle-income countries, WHO recommends that countries revise their first-line ART regimens when the national prevalence of pretreatment HIV drug resistance to NNRTIs in people starting ART reaches 10%.⁸⁵

Differentiated service delivery

The public health approach was conceived so that as many people with advanced HIV disease as possible were on ART, to reduce acute mortality. Nowadays, HIV programmes are faced with a dual challenge of continuing to enrol patients onto ART while ensuring long-term retention for the growing cohort of people on ART. Although the immunological status of patients presenting to care has improved, advanced disease management remains a challenge.²⁹

To rationalise service delivery for both providers and patients, WHO, major donors, and implementing agencies like Médecins Sans Frontières are promoting a differentiated service delivery to meet the needs of different patient populations, while maintaining a public health approach. This differentiation implies reducing unnecessary clinical care for people who are stable on ART, which has been shown to improve patient retention⁸⁶⁻⁸⁸ and to free up health service capacity to enrol new patients and provide more intensive clinical care for people with advanced HIV disease.⁸⁹

The latest WHO guidelines include key recommendations in support of differentiated care, including clinic visits and ART dispensing every 3-6 months for stable patients, and provision of ART at community sites.^{90,91} Until now, models of differentiated care have largely been applied to non-pregnant adults.

As evidence and experience accumulates, both WHO and national guidelines on differentiated care will progress to accommodate the needs of different patient groups, including pregnant women, adolescents, children, key at-risk populations, and patients with some comorbidities and co-infections. To further support differentiated care within a public health approach, WHO has developed guidelines for the management of advanced HIV disease that define a minimum package of interventions that can be delivered to this group of patients with high rates of mortality.^{92,93}

Integration of HIV care into chronic disease care

In the initial phase of the HIV response, ART was mainly provided through vertical programmes to rapidly respond to high mortality. The shift towards treating more people earlier in their HIV infection with less clinical care requirements than before, together with the growing burden of co-infections and non-communicable diseases,⁹⁴ requires HIV treatment and care services to be more fully integrated into health-care services. WHO recommendations have developed towards recommending integration of care for HIV-related health services. These services include not only tuberculosis, as the leading cause of death among people with HIV, but also maternal and child health-care services, settings providing opioid substitution therapy and other services related to drug use disorders, sexually transmitted infection services, and family planning services.⁶² The increasing contribution of viral hepatitis to mortality and morbidity worldwide⁹⁵ means that integration of HIV and viral hepatitis services requires particular attention in settings and populations in which rates of co-infection are high. There is a growing body of evidence supporting the integration or linkage of HIV and chronic non-communicable disease care, including cardiovascular diseases, hypertension, and diabetes,⁹⁶ which will become an increasingly important approach as the life expectancy of people with HIV approaches that of the general population.^{18,19}

From treating the sickest to treating all

Decisions about when to start ART have been greatly simplified by removing clinical and immunological eligibility criteria. Where resources are scarce, WHO continues to emphasise the importance of treating the sickest and the youngest as a priority.⁹⁷ Additionally, the growing appreciation of the effectiveness of ART in preventing HIV infection³³ has led to further considerations of whom to prioritise for treatment, notably HIV serodiscordant couples, pregnant women, and key at-risk populations.

The benefits of offering immediate ART to people who are HIV positive will only be realised if patients are supported in linking to care following diagnosis and achieving long-term retention in care and viral suppression.⁹⁸ Identifying further strategies to minimise the losses in the range of HIV care, from HIV testing to

long-term viral suppression, will be a major challenge for the years to come.^{99–101} There is good evidence that peer counsellors and support groups improve rates of adherence and retention in care,^{80,102} and ensuring the sustainability of these approaches will be important for HIV programmes.¹⁰³ Earlier diagnosis and treatment can further support stigma reduction by promoting a vision of HIV infection as a manageable, chronic condition.

Adapting the public health approach to concentrated epidemics

The public health approach to ART delivery was aimed primarily at countries with a high burden of HIV, and much of the evidence supporting the key approaches has come from sub-Saharan Africa. Not all approaches are universally applicable: in concentrated epidemics, decentralising HIV testing and treatment across the entire health-care system might not be efficient, and strategic assessments are needed to ensure optimal efficiency according to where the burden of disease is greatest. Nevertheless, most strategies can be universally applied: task shifting, which is supported by high-quality evidence from a range of settings, has the potential to improve service efficiency in all settings, and differentiating service delivery to reduce clinic visits for stable, adherent patients, also makes sense everywhere.

In settings with concentrated epidemics, there are important social and structural barriers for accessing HIV prevention, testing, treatment, and health-care services among socially marginalised populations, including people who use drugs,^{104,105} transgender populations,¹⁰⁶ people in prisons or other closed settings,¹⁰⁷ sex workers,¹⁰⁸ and men who have sex with men.^{109,110} Criminalisation and stigma undermine efforts to engage these populations in HIV care services, with the greatest impact being noted in many low-income and middle-income countries, where HIV epidemics are often concentrated among these populations. Addressing the social and structural barriers associated with criminalisation and stigmatisation in these settings is crucial to increasing access to HIV treatment and care.

Linking HIV testing, treatment, and care to HIV prevention

Major progress has been achieved in HIV prevention since 2007, with voluntary male medical circumcision,¹¹¹ pre-exposure prophylaxis,¹¹² and early initiation of ART,^{6,33,113} all showing strong protective effectiveness.¹¹⁴ These approaches add to more established behavioural interventions that have been shown to reduce HIV transmission.^{115–117} However, uptake and implementation of prevention interventions remains low and the targets for HIV elimination by 2030 will only be achieved if HIV prevention efforts are accelerated, intensified, and integrated. The prevention benefits of antiretroviral drugs and ART need to be maximised and complement other evidence-based prevention interventions and efforts, since no single approach can produce the level of incidence

Search strategy and selection criteria

We searched MEDLINE, Embase, and the Cochrane Database of Systematic Reviews for systematic reviews and original research articles describing key components of the public health approach. We combined terms for antiretroviral therapy and public health approach, and terms for key principles of the public health approach: standardisation and simplification of ART regimens, task shifting and decentralisation, and integration of HIV treatment and care. Articles published in English between Jan 1, 2006, and June 1, 2017, were reviewed for relevance in describing the effects and progress of the WHO public health approach to HIV treatment and care since 2006. Relevant viewpoint and review articles were also screened as further sources of potentially relevant information.

reduction required to achieve epidemic control. Improving HIV testing coverage is the essential first step to ensuring that HIV-positive individuals are identified as soon as possible after infection, and linked to care.

HIV and universal health coverage

There is broad agreement that the available knowledge and tools make ending AIDS as a major public health concern a feasible goal. However, despite enormous progress, crucial shortfalls remain in ensuring adequate access to prevention, treatment, and chronic care services, in particular for key at-risk populations and other marginalised groups.¹¹⁸

Universal health coverage is the aspirational and practical goal that all people have access to the health services they need, of sufficient quality to be effective, and without experiencing financial hardship. The emphasis is on providing holistic care, in which the scope of services is expanded to cover the health-care needs of individuals and populations. The chronic care needs of people with HIV illustrate the importance of strengthening health systems to deliver integrated and person-centred care across the full life course, from pregnancy to an ageing population. The response to HIV has promoted innovation in the delivery and funding of health services, including defining comprehensive intervention and service delivery packages funded through the public system; strengthening quality assurance and quality improvement systems; developing and applying multisector costing approaches; promoting strategies to reduce costs, improve access, and maximise patient and programme outcomes; pioneering innovative financing models; and addressing health inequities.¹¹⁹

There are further opportunities to use the universal health coverage framework to strengthen and accelerate HIV programmes. These opportunities include ensuring that financial protection schemes cover the full range of HIV interventions, integrating HIV into broader health planning, identifying new approaches for sustainable financing, removing financial and other structural

barriers to enable equitable access to services, and promoting greater service efficiencies.

Conclusions

The public health approach to ART delivery has supported a rapid coverage increase in resource-poor settings and contributed to the expansion of HIV treatment and care services globally.¹²⁰ Over the past decade, decisions about when to start treatment, what ART to use, how to switch, and where treatment should be provided and by whom, have all been simplified, supported by drug and diagnostic innovations and high-quality evidence from experimental and observational studies. Compared with a decade ago, there is now a far broader range of diagnostic and therapeutic options to respond to HIV, and a more nuanced understanding of the varying challenges faced by different population groups in different epidemiological settings. Nevertheless, the public health approach remains as relevant as ever, and the implementation of its key principles to ART delivery will bring countries closer to the goals of controlling the HIV epidemic and providing universal health coverage.

Contributors

All authors were involved in the initial planning of the report, subsequent draft, and the final text. The first draft of the paper was written by NF.

Declaration of interests

All authors have contributed to the ongoing development of the public health approach to antiretroviral therapy. We declare no further competing interests.

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