International Journal of Infectious Diseases 100 (2020) 273–277

Contents lists available at ScienceDirect

International Journal of Infectious Diseases

journal homepage: www.elsevier.com/locate/ijid

Perspective

Ending the epidemic of HIV/AIDS by 2030: Will there be an endgame to HIV, or an endemic HIV requiring an integrated health systems response in many countries?

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ARTICLE INFO

Article history:
Received 13 April 2020
Received in revised form 3 September 2020
Accepted 4 September 2020

Keywords:
HIV/AIDS
Epidemic
Endemic
Ending
Elimination
Eradication
Universal health coverage

ABSTRACT

The third Sustainable Development Goal (SDG-3) has a target to end the epidemic of HIV/AIDS by 2030 (Project 2030). This will be achieved when the number of new HIV infections and 'AIDS-related deaths' decline by 90% between 2010 and 2030. So far, the rate of drop in AIDS-related deaths is on track, whereas the rate of drop in new HIV infections is off track to achieve Project 2030. Even if Project 2030 was achieved, HIV would be an endemic health problem. Hence, HIV prevention and control programmes cannot close down for the foreseeable future. This rather demands a paradigm shift from a fully vertical to an integrated health systems response that provides services according to disease burden towards universal health coverage. This will ensure the sustainability of HIV services in the post-2030 era. These all entail unrelenting political commitment, and increased and sustainable funding from both national and global sources.

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Introduction

Progress in the prevention and control of HIV/AIDS during the last two decades has stimulated a debate on the possibility of ending HIV/AIDS as a public health threat. The Joint United Nations Programme on HIV/AIDS (UNAIDS) has widely promoted a slogan and goal to end HIV/AIDS by 2030 (Joint United Nations Programme on HIV/AIDS (UNAIDS), 2016b). The United Nations General Assembly took up this issue during a High-Level Meeting in 2016, and the third Sustainable Development Goal (SDG-3) included a target to end the epidemic of HIV/AIDS by 2030 (Project 2030) (World Health Organization (WHO), 2015). A successful endgame of Project 2030 is defined, quantitatively, as a decline in the number of both new HIV infections and 'AIDS-related deaths' by 90% between 2010 and 2030 (Joint United Nations Programme on HIV/AIDS (UNAIDS), 2014a).

The United Nations General Assembly also agreed on fast-track targets (90–90–90), to be achieved by 2020, towards Project 2030 (Joint United Nations Programme on HIV/AIDS (UNAIDS), 2014b): 90% of people living with HIV (PLHIV) know their HIV status, 90% of people who know their HIV-positive status are accessing treatment, and 90% of people on treatment have suppressed viral loads. Meeting those targets should result in a reduction of new HIV infections and AIDS-related deaths to fewer than 500 000—approximately a 75% reduction in both measures between 2010 and 2020 (Joint United Nations Programme on HIV/AIDS (UNAIDS), 2017). Responses towards achieving these fast-track targets and Project 2030 call for continued exceptional and additional vertical funding (Kelly et al., 2018).

At the 2018 International AIDS Conference in Amsterdam, 3 years after the launch of Project 2030, there was less optimism on the feasibility of achieving Project 2030 (Joint United Nations Programme on HIV/AIDS (UNAIDS), 2018b). Moreover, the International AIDS Society—Lancet Commission highlighted that the HIV pandemic is not on track to end; it may rebound if corrective action is not taken, and is likely to remain a major global challenge for the foreseeable future (Bekker et al., 2018a).

We agree and think that it is necessary and timely to review progress towards achieving Project 2030, and the lessons learnt so far. There also needs to be some critique of the epidemiological terms and slogans used, and abused, in Project 2030, together with deep consideration of what will happen to HIV and the response after Project 2030. How, for instance, does this, and other vertical disease control programmes like malaria elimination/eradication and end tuberculosis (TB), integrate with universal health coverage (UHC), which is the new paradigm for health services delivery?

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https://doi.org/10.1016/j.ijid.2020.09.011
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In this Viewpoint, we will discuss the progress towards ending the epidemic of HIV/AIDS, contend the feasibilities and argue on the epidemiological transition of HIV, and suggest what needs to happen towards Project 2030 and beyond, as we have endemic HIV for the foreseeable future, in the UHC era.

What does ending the epidemic of HIV/AIDS mean?

Public health programmes that aim to end an epidemic can have four scenarios: elimination, eradication, epidemic HIV, or endemic HIV. The amount of a particular disease that is usually present in a population within a geographic area is referred to as the baseline or endemic level of the disease (World Health Organization (WHO), 2013). In a chronic condition like diabetes, hypertension, or HIV, that is treatable but incurable, merely ending the epidemic will inevitably lead to an endemic state that will continue until all prevalent cases have died and no new cases are occurring. In elimination, continued intervention measures are still required to prevent outbreaks and resurgent epidemics, including providing life-long care and treatment for incurable chronic infections like HIV. However, once eradication is achieved, no further disease control interventions are needed. To date, only two diseases have ever been eradicated: smallpox in humans and rinderpest in cattle (Normile, 2010).

With the problematic fusion of HIV with AIDS, responses to end the epidemic of HIV/AIDS have multiple and potentially contradicting targets and slogans: zero or fewer new HIV cases (HIV incidence), zero or fewer cumulative HIV cases (HIV prevalence), zero or slowed clinical progression to AIDS (AIDS incidence), and zero or fewer deaths in PLHIV (as equivalent to 'AIDS-related deaths'). Ending the epidemic of HIV, in epidemiological terms, will be achieved when the total number of PLHIV in the country declines to levels only seen at the start of the epidemic (Over, 2011). This is possible only when the number of new HIV infections is decreasing to a level that is equal to or less than the number of deaths in PLHIV (irrespective of the cause). As a global effort towards ending the HIV/AIDS epidemic, the United States President's Emergency Plan for AIDS Relief (PEPFAR) advocates for and supports a strategy called an epidemic control, which is achieved when the annual number of new HIV infections in a country is less than the number of deaths among PLHIV (President's Emergency Plan for AIDS Relief (PEPFAR), 2017). This is the first milestone towards ending the epidemic of HIV, but is not the end of HIV (Over, 2011).

Ending the epidemic of AIDS requires a reduction of mortality due to AIDS-defining diseases to a locally acceptable level (endemic AIDS). This is equivalent to zero deaths due to AIDS. This depends on reductions in rates of progression of HIV to AIDS and deaths due to AIDS-related diseases. Ending the epidemic of AIDS may be feasible by preventing the progression of HIV to AIDS through universal access to antiretroviral therapy (ART) (Joint United Nations Programme on HIV/AIDS (UNAIDS), 2018a; Queensland Government, 2018). Ascertaining progression of HIV to AIDS (sensu stricto) is a complex endeavour that requires robust surveillance systems and sophisticated diagnostic services. Few low- and middle-income countries have such services and surveillance systems to record and report AIDS cases (Queensland Government, 2018). Hence, many are using deaths in PLHIV as a surrogate to track the progress towards ending the epidemic of AIDS (Joint United Nations Programme on HIV/AIDS (UNAIDS), 2016a).

Ending the epidemic of HIV and the epidemic of AIDS (HIV morbidity and mortality) have both synergistic and antagonistic effects. Ending HIV transmission has a positive effect in the long term on ending the epidemic of AIDS; on the other hand, ending the epidemic of AIDS, in the short- to medium-term, has a negative effect on ending the epidemic of HIV, as prevalence rises with combination ART due to its dramatic impact on mortality (World Health Organization (WHO), 2016b). The optimal response to the epidemic of HIV and epidemic of AIDS should lead to a situation where there is reduced incidence and prevalence of HIV, slowed progression of HIV to AIDS, and declined deaths due to AIDS. This also requires a higher rate of reduction in the incidence of HIV than deaths in PLHIV so that prevalence starts to decline, and the 'beginning of the end' of the epidemic of HIV must happen. However, Project 2030 focuses on HIV incidence, but ignores HIV prevalence. We, therefore, argue that there is fuzzy public health thinking and planning, and imprecise language use, which will lead to a dangerous threat to a sustainable response, in particular beyond 2030.

As HIV is an emerging infection, one could argue that it never had a baseline (endemic) level. Nevertheless, successful HIV control efforts could end the epidemic of HIV towards an endemic HIV (Over, 2011). This is possible only after countries achieve epidemic control, when the annual number of new HIV infections in a country is less than the number of deaths among PLHIV (irrespective of the cause) (President's Emergency Plan for AIDS Relief (PEPFAR), 2017). Hence, ending the epidemic of HIV does not, in the short- to medium-term, equate to elimination of HIV. There would be endemic cases even if countries were able to end HIV transmission. On the other hand, ending the epidemic of AIDS requires a reduction of mortality due to AIDS-related diseases to a locally acceptable level (endemic AIDS), which has not been seen since the beginning of the epidemic.

Progress towards achieving Project 2030

Table 1 illustrates the progress made towards the fast-track (90–90–90) targets and the extent of actual and expected drops in new HIV infections and AIDS-related deaths between 2010 and 2018 (Joint United Nations Programme on HIV/AIDS (UNAIDS), 2018a). With a composite target, there is both good and bad news.

On track to end the epidemic of AIDS by 2030

Estimated AIDS-related deaths are declining at a rate to achieve the target for ending the epidemic of AIDS in 2030. They have declined from a peak of 1.90 million in 2004 to 1.5 million in 2010 and 0.77 million in 2018. AIDS-related deaths declined by 44% from 2010 to 2018 in Eastern and Southern Africa. Over the same period, steady declines in deaths also continued in Asia and the Pacific (24% reduction) and in Western and Central Europe and North America (35% reduction). In contrast, AIDS-related deaths increased by 9% in the Middle East and North Africa (Joint United Nations Programme on HIV/AIDS (UNAIDS), 2018a).

A number of countries have already achieved the goal of ending AIDS. For instance, AIDS cases (sensu stricto) in Australia have plummeted to the level that the number being diagnosed with AIDS each year is now inconsequential. Moreover, the number of deaths in PLHIV in Australia dropped from its peak (about 1000 each year) in the early 1990s to less than 200 in 2018, although this will inevitably rise with an ageing population (Joint United Nations Programme on HIV/AIDS (UNAIDS), 2018a). On September 4, 2018, the Queensland State Government, Australia, announced that AIDS would no longer be a notifiable health condition. The government highlighted that HIV remained a public health risk, but not AIDS (Queensland Government, 2018).

However, in whatever jurisdiction, the end of AIDS and AIDS-related deaths does not lead to the end of HIV, as reducing AIDS deaths to zero with ART does not rapidly translate to reduced HIV incidence, even though this is theoretically possible with universal treatment as prevention. In Australia, for instance, close to 1000

Table 1
Fast-track targets, new HIV infections, and 'AIDS-related deaths' in 2010 and 2018[a].

Regions	Fast-track targets (90–90–90) (2018)[b]			New HIV infections[b]					AIDS-related deaths[b]				
	HIV testing	ART	Viral suppression	2010 (a)	2018 (b)	Drop (b – a)	% drop	Expected % drop	2010 (c)	2018 (d)	Drop (d – c)	% drop	Expected % drop
Global	79%	78%	86%	2.100	1.700	−0.400	−19.0%	−36%	1.200	0.770	−0.430	−35.8%	−36%
Asia and Pacific	69%	78%	91%	0.340	0.310	−0.030	−8.8%	−36%	0.270	0.200	−0.070	−25.9%	−36%
Eastern and Southern Africa	85%	79%	87%	1.100	0.800	−0.300	−27.3%	−36%	0.550	0.310	−0.240	−43.6%	−36%
Eastern Europe and Central Asia	72%	77%	74%	0.120	0.150	0.030	25.0%	−36%	0.036	0.032	−0.004	−11.1%	−36%
Latin America	80%	78%	89%	0.097	0.100	0.003	3.1%	−36%	0.040	0.035	−0.005	−12.5%	−36%
Caribbean	61%	66%	73%	0.019	0.016	−0.003	−15.8%	−36%	0.110	0.070	−0.040	−36.4%	−36%
Middle East and North Africa	47%	65%	82%	0.016	0.018	0.002	12.5%	−36%	0.077	0.084	0.007	9.1%	−36%
Western and Central Africa	64%	79%	76%	0.320	0.280	−0.040	−12.5%	−36%	0.230	0.160	−0.070	−30.4%	−36%
Western and Central Europe and North America	88%	90%	81%	0.077	0.068	−0.009	−11.7%	−36%	0.019	0.013	−0.006	−31.6%	−36%

ART, antiretroviral therapy.
[a] Adapted from 2019 UNAIDS data: https://www.unaids.org/en/resources/documents/2019/2019-UNAIDS-data.
[b] Green: on track; Yellow: off track; Red: significantly off track.

new cases of HIV are still reported each year (Australian Broad Cast (ABC), 2017).

Off track to end the epidemic of HIV by 2030

The estimated number of new HIV infections globally has continued to decline (Table 1). However, progress is far slower than that required to reach the 2020 global milestone of less than 500 000 new infections. Estimates also show that new infections declined by only 19% between 2010 and 2018: there are numerically more new HIV infections than AIDS-related deaths (Joint United Nations Programme on HIV/AIDS (UNAIDS), 2018a). Therefore, the current speed of response is off track to achieve Project 2030.

The reduction in new HIV infections between 2010 and 2018 was variable across regions of the world. It was highest in sub-Saharan Africa, stable in Latin America, and increasing in the Middle East and North Africa and in Eastern Europe and Central Asia. Progress has also varied among countries: three countries (Cambodia, Mongolia, and Nepal) have achieved 50% or more declines in new HIV infections, and another 17 countries have achieved up to 50% declines in HIV infection since 2010. On the other hand, around 50 countries have experienced increases in new infections (Joint United Nations Programme on HIV/AIDS (UNAIDS), 2018a). In certain populations, such as young females in Southern Africa and people who inject drugs in Eastern Europe, there is an increasing trend in incidence of HIV infection that will sustain the HIV epidemic unless concerted and appropriate interventions are implemented (Joint United Nations Programme on HIV/AIDS (UNAIDS), 2018a). These pockets of poor results could pose a risk to the entire HIV pandemic. UNAIDS identifies four factors primarily responsible for the current trend and situation: lack of political commitment, insufficient investment in prevention, structural barriers to safeguard the rights of women and key populations, and failure to systematically scale up proven programmes (Joint United Nations Programme on HIV/AIDS (UNAIDS), 2018a).

Getting Project 2030 back on track

Getting Project 2030 back on track and sustaining it requires that all relevant interventions are arranged and provided in continuum, including reducing vulnerability, preventing and diagnosing infection, linking people to care, and providing ART (Centres for Diseases Control and Prevention (CDC), 2017; World Health Organization (WHO), 2016a). The response should boost the five pillars of combination prevention (condom promotion, programme focused on key populations, pre-exposure prophylaxis (PrEP), voluntary medical male circumcision, and combination prevention for adolescent girls and young women) (Stall et al., 2016) and enhance virological monitoring and provision of second-line ART through increased financing and advocacy (Assefa and Gilks, 2017; Estill et al., 2016). More efforts are needed to 'know the epidemic and the response' and target key populations and locations, while services are differentiated, provided, and managed according to the needs of PLHIV. It is also important that punitive laws, policies, and practices that violate human rights (including stigma and discrimination) are removed (De Cock et al., 2011; Collins et al., 2016). The availability and utilization of a functional cure will also have effects on preventing transmission of the virus through sustained viral remission (Avert).

The success of Project 2030 is predicated on adequate and sustained funding to cover increasing numbers requiring lifelong ART and enhanced combination prevention. Funding is currently flatlining as there is reluctance to continue to invest in HIV/AIDS when other priority health problems are, relatively speaking, starved of resources. Other disease-specific programmes (malaria, TB, hepatitis) are also off track and face similar challenges. Despite these realities, many commentators and agencies are still promoting a siloed approach that unfortunately is perpetuated in the SDGs: in HIV, it is based on 'one more thrust' to generate a final wave of exceptional vertical funding to end the epidemic. This, however, is not sustainable in today's developmental assistance climate. Nor does it address the epidemiological transition and the changing burden of diseases (towards incurable communicable chronic diseases (CCDs)/non-communicable diseases (NCDs)) seen in almost all low- and middle-income countries. We argue that health financing according to disease burden and health systems capacity would be more effective, efficient, and sustainable towards achieving Project 2030 and UHC.

What happens to HIV after 2030?

If we accept that there is, under current circumstances, no possibility of a successful endgame for HIV in 2030, we must now ask what happens after Project 2030. In general, there are four scenarios that could occur at the country, regional, or global level: elimination, eradication, epidemic HIV, or endemic HIV. The first two scenarios are unlikely; elimination remains elusive, and eradication without elimination is impossible by 2030. Elimination and eradication are distinct epidemiological end-points. Elimination is the reduction of incidence and/or prevalence to zero in a certain geographic area, or the reduction of the global incidence and/or prevalence to a negligible level. Eradication, on the other

hand, is the reduction of the global incidence and/or prevalence to zero (Dowdle, 1998). Many communities, such as adolescent females in Southern Africa and people who inject drugs in Eastern Europe, continue to experience epidemic HIV.

In the best case scenario, in which new HIV infections remain lower than the number of deaths among PLHIV, the number of PLHIV will naturally decline. It will then be possible to end the epidemic, and the burden of prevalent HIV will gradually decrease over time. A number of countries have achieved epidemic control, and it is likely that many more countries will be able to achieve this (Joint United Nations Programme on HIV/AIDS (UNAIDS), 2018a). However, this still leaves the community or country with endemic HIV, with or without AIDS. Hence, even with a largely successful Project 2030, HIV will be evolving from a generalized epidemic to a generalized endemic condition, which will inevitably remain as a major global public health problem for the foreseeable future and well beyond 2030 (Piot et al., 2015; Bekker et al., 2018b; Joint United Nations Programme on HIV/AIDS (UNAIDS), 2018a).

It is also important to note that with the utilization of ART but without cure, HIV infection has become a chronic disease, with much in common with many incurable NCDs that also require complex chronic care services. It is additionally important to recognize that PLHIV on ART are now living longer and developing NCDs (Weber et al., 2013), often at a faster rate than the general population (Justice, 2010; Nixon et al., 2011).

Moving forward: a health systems response towards universal health coverage

As HIV is becoming a generalized endemic health problem, a paradigm shift in its response is required. The response to the HIV epidemic was initially steered by exceptionalism, emergency response, and with slogans calling for more and peculiar resources. However, this approach is not pertinent to endemic HIV, particularly in a context where the disease burden is fast shifting towards NCDs. It is thus crucial that the response is moving away from the emergency, exceptionality and verticality approach to a more normalized, integrated and health systems approach (Assefa et al., 2018).

HIV has striking similarities with NCDs: they are incurable, they require behaviour and lifestyle changes, screening for diagnosis, lifelong medication, clinical and laboratory monitoring, patient education, adherence support, and self-management, and they also require a public health approach to service delivery (Gilks et al., 2006). HIV can be located within a broader health services delivery, which requires health systems that are robust, flexible, resilient, and people-centred, and can deliver universal health services, rather than patchy disease-specific interventions (Assefa et al., 2017).

We understand that integrating health programmes into broader health systems may have both benefits and potential risks. Thus, the initial choices in programme management and service delivery do not need to be confined to the fully vertical (exceptional) or fully horizontal (integration). National ministries of health may provisionally prefer to employ the 'diagonal' (a mix of vertical and horizontal) approach to service delivery and investment (Assefa et al., 2018). We argue that targeted, phased and incremental integration, combining learning and doing, should be the way forward as Project 2030 evolves and moves towards its completion (Frenk, 2006).

The response to endemic HIV also requires a paradigm shift in the overall global health architecture and financing for SDG-3. This will entail approaching SDG-3 more holistically by moving beyond the individual diseases or programmes. Funding is currently flatlining as there is reluctance to continue to invest in HIV/AIDS when other priority health problems are, relatively speaking, starved of resources. Other disease-specific programmes (malaria, TB, hepatitis) are also off track and face similar challenges. Despite these realities, many commentators and agencies are still promoting a siloed approach that unfortunately is perpetuated in the SDGs. This, however, is not sustainable in today's developmental assistance climate. Nor does it address the epidemiological transition and the changing burden of diseases (towards incurable CCDs/NCDs). We argue that health financing according to disease burden and health systems capacity would be more effective, efficient, and sustainable towards achieving Project 2030 and UHC.

Existing funding mechanisms should align themselves with the transitions in HIV and the SDG-3 targets towards UHC. For instance, the Global Fund to Fight AIDS, Tuberculosis and Malaria should transform itself and become 'the Global Fund for Health'. This, of course, requires political support at both national and global levels, and visionary leadership in apex international health bodies. The World Health Organization and other global health initiatives may also need to progressively reorganize and restructure away from vertical, disease-specific silos. To us, this is the best, and perhaps only way, to move forward and realize UHC.

Conclusions

Enormous gains have been made towards Project 2030; however, progress is off track to end HIV. Even if we achieve Project 2030, HIV would remain an endemic public health problem; consequently, there is no endgame for HIV prevention and control beyond 2030. A paradigm shift, from a vertical and exceptional response to an integrated and normalized health systems response, is required to provide services according to disease burden and population need. This entails unrelenting political commitment, and increased and sustainable funding from both national and global sources, redirected towards health systems strengthening.

Author contributions

YA and CFG conceived the idea of the analysis. YA collected and analysed the data, and prepared the first and subsequent drafts. CFG provided comments and guidance during the revision. Both authors approved the final version for submission.

Funding source

The University of Queensland.

Ethical approval

Not applicable.

Conflict of interest

None.

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