Ending AIDS as a public health threat: the imperative for clear messaging on U=U, viral suppression, and zero risk

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To end AIDS as a public health threat by 2030, we must leverage both the impactful message of U=U (undetectable equals untransmittable) and viral suppression to improve the wellbeing of individuals living with HIV, increase engagement with HIV services, and reduce barriers such as stigma, discrimination, and criminalisation. This message requires clear and unambiguous evidence-based narratives that emphasise the message that there is zero risk of sexual transmission when an undetectable viral load is maintained and negligible risk when viral suppression (as defined by 200–1000 copies per mL) is maintained. Dissemination of this information to individuals living with or affected by HIV, health-care workers, communities, the general public, and policy makers will increase awareness and credibility of this message and challenge deep-seated misperceptions. Furthermore, understanding the impact of this evidence underscores the necessity to urgently prioritise universal access to quality care, including viral load testing; leverage community leadership to address structural barriers; and monitor for ongoing success. Responsible and equitable messaging, which includes attention to women and marginalised groups, should be used to realise benefits for personal wellbeing and work towards an AIDS-free future.

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Introduction

Evidence relating to viral load suppression and the U=U (undetectable equals untransmittable) message should be urgently and clearly disseminated, such that it can be used to improve the wellbeing of individuals living with HIV and their partners, prioritise equitable access to quality services, and contribute to ending AIDS as a public health threat. Adherence to effective HIV antiretroviral therapy (ART) to reduce an individual's circulating HIV viral load to undetectable concentrations or concentrations of less than 200 copies per mL eliminates the risk of sexual transmission of HIV and minimises the risk of vertical transmission. From 2011 to 2019, landmark studies such as HPTN052, PARTNER 1, PARTNER 2, and Opposites Attract found no transmission of HIV among 3777 couples with more than 125 000 acts of condomless vaginal or anal sex when the index partner had an undetectable viral load.[1–4] Furthermore, a 2023 meta-analysis of sexual transmission from serodifferent couples showed negligible risk of transmission with viral load of less than 1000 copies per mL, the WHO threshold for viral suppression.[5]

> "People living with HIV and their partners can have confidence that there is unequivocable scientific data proving zero risk of sexual transmission with an undetectable viral load. It's essential that the U=U message is widely communicated clearly and without ambiguity, to improve quality of life and wellbeing in people living with HIV and to support all our efforts to end HIV/AIDS as a public health threat."
>
> *Alison Rodger, PARTNER study (Rodger A, Institute for Global Health, University College London, personal communication)*

The principal goal of ART for health and wellbeing is an undetectable viral load. The concept of elimination of transmission risk is key for public health education and advocacy for prioritising access to effective care as a core aspect of ending AIDS as a public health threat by 2030.[6] In 2016, evidence that individuals with undetectable viral load cannot transmit HIV sexually was found, and a global campaign of U=U messaging began.[7] U=U and other phrases have since been used in a movement for evidence dissemination in more than 100 countries, including Can't Pass It On in the UK and K=K (for *không phát hiện=không lây truyền*, the translation for U=U) in Viet Nam. Positive and clear communication of the U=U message, consistent with evidence, is paramount. In a policy brief from July, 2023, WHO became the first large, globally influential medical institution to clearly state that people living with HIV with an undetectable viral load have zero risk of transmission to their sexual partners.[8] The policy brief indicated minimal risk of vertical transmission for those with an undetectable viral load, and almost zero or negligible sexual transmission when viral load is suppressed but detectable (≤1000 copies per mL). Furthermore, these interpretations apply to all WHO prequalified testing platform assay and sample types, including dried blood spots commonly used in low-income and middle-income countries with resource constraints, allowing scale-up with various approved testing methods.

The aim of this Personal View is to consolidate evidence that shows the importance and impact of clear viral load suppression and U=U messaging, highlight gaps and opportunities to improve dissemination of this evidence, and emphasise the corresponding imperative for high-quality HIV services, including access to viral load testing.

Enabling people living with HIV to thrive

> "As young people living with HIV, we look forward to a future where U=U becomes a reality in promoting our health and giving us choices and autonomy. U=U is the game-changer for us, not only in making lifetime decisions but having accurate, empowering strategic pathway to live happy and health fulfilled lives."
>
> *Maximina Jokonya (Jokonya M, Global Network of Young People Living with HIV, personal communication)*

The knowledge that a person living with HIV who has an undetectable viral load has zero risk of sexual HIV transmission can profoundly promote wellbeing among individuals living with HIV. In the large Positive Perspectives Study within 25 countries, people living with HIV who were informed of U=U by their provider were statistically significantly more likely to report optimal health than those who were unaware of U=U in terms of optimal mental health (62·5% *vs* 38·2%), physical health (64·1% *vs* 45·3%), and overall health (60·9% *vs* 44·6%), and were 3 times more likely to report always sharing their HIV status with others.[9] Furthermore, among 30 361 sexually minoritised men in the USA, 17 780 (58·6%) stated that U=U made them feel "much better" about their positive HIV status.[10] Among men who have sex with men in Latin America, knowledge of U=U was associated with fewer anxiety and depression symptoms and lower internalised homonegativity.[11] In Thailand, people living with HIV valued most highly that U=U allows them to "live a full life", including in terms of self-respect, opportunities to fulfil family and work life, and feeling empowered in relationships.[12]

Sharing the U=U message can be life-altering to many and promotes a healthy sexual life for individuals and partners. Sexual freedom has often been policed or even penalised,[13] and many living with HIV might have fears and stigma around sexual transmission that are often associated with low satisfaction of sexual wellbeing. Some people living with HIV delay sexual intimacy, choose partners on the basis of HIV status, or avoid relationships altogether, whereas knowledge of U=U reduced internalised stigma and armed them with increased confidence in relationships.[14] Multiple participants of surveys of men who have sex with men living with HIV in Singapore identified being undetectable as a "turning point" after their HIV diagnosis and associated it with coming to terms with their HIV-positive diagnosis.[15]

Addressing stigma, discrimination, and criminalisation

> "The U=U science is a powerful tool to reduce stigma and end discriminatory laws and policies that not only harm people living with HIV but also impede progress to end the epidemic. Widely sharing the U=U message is crucial for changing perceptions and promoting stigma-free access to treatment and care, paving the way for a future without HIV/AIDS."
>
> *Hadad Allan Nuwagaba (Nuwagaba HA, International Community of Women Living with HIV Eastern Africa, personal communication)*

The 2025 UNAIDS targets recognise reduction of stigma and discrimination, decriminalisation of people living with HIV and key populations, and gender equity as key social enabler targets that, if realised, are estimated to avert a staggering 2·5 million new HIV infections and 1·7 million HIV-related deaths between 2020 and 2030.[16] Stigma within both communities and health-care settings diminishes the effectiveness of programmes by reducing care seeking, testing, and adherence.[17–19] Among a multicountry cohort from sub-Saharan Africa, experiencing stigma was associated with a reduced odds ratio of both ART adherence (0·67) and viral suppression (0·64) compared with not experien-cing stigma.[20] Implicit or unconscious stigma of health-care workers can also compromise care, and might be a key barrier to consistent, high-quality U=U client education.[21]

Awareness and adoption of the U=U message serves as a key pillar to reduce discrimination through dismant-ling deeply rooted stigmas and misperceptions around transmission.[22] Messaging must be clear and evidence-based, as evidence-based messaging has been shown to be more effective against stigma than opinion-based framing.[23] Knowledge and acceptance of U=U has been associated with decreased stigma,[23,24] and research shows that interventions increasing the knowledge of treatment as prevention have an impact.[18,25] For example, receiving online information about the U=U message improved social acceptance of people living with HIV in Japan,[25] and a clustered, randomised control trial in rural Malawi showed villages that received education on ART benefits that included its ability to reduce transmission was associated with reduced discriminatory perceptions compared with villages that received education on only the personal benefits of ART.[18] Furthermore, mitigating stigma could in turn encourage care-seeking behaviours, motivate treatment adherence, and reduce barriers to use of the U=U message.[18]

Unjust criminalisation of people living with HIV is harmful to public health, inappropriate, and discriminatory, and yet 80 countries have HIV-specific criminal laws.[26] In these countries, sexual transmission of HIV can be prosecuted in many scenarios, including where no transmission actually occurred, where transmission was not possible or extremely unlikely, and where transmission was neither alleged nor proven.[27,28] Additionally, people living with HIV have had criminal charges and convictions for breastfeeding, despite the minimal risk of transmission when proper medical care is available.[29] Criminalisation laws do not effectively reduce HIV infections; conversely, they undermine treatment efforts[30] and can disproportionately affect minoritised groups, vulnerable groups, and women.[31,32] Targeted education for the public, advocacy organisations, and legislative bodies around the science of U=U could allay fear and show the need for policy makers to remove inappropriate barriers and focus on expanding accessibility of services (figure). Improved public awareness might also ease anxiety and reduce violence around the sharing of HIV status, which can be legally mandated. Additionally, laws should not be contingent upon treatment or health status, which are affected by stigma and access to high-quality care.

Improving use and effectiveness of HIV programmes

> "The U=U message has empowered young men living with HIV to prioritize safe love and self-care. It's a beacon of hope, ensuring that they can manage their medication effectively with the knowledge that they cannot sexually transmit HIV to their partners. This assurance fosters a sense of responsibility and optimism, promoting overall well-being and healthier relationships."
>
> *William Matovu, Love to Love Organization, Uganda*[33]

Receiving and embracing U=U messaging can directly improve engagement and success of HIV service programmes (figure). Belief in treatment as prevention messages has been associated with high rates of interaction with both testing and prevention services and has been shown to increase HIV testing rates.[34] Among villages in rural Malawi that had received enhanced educational packages that included information regarding the health and prevention benefits of ART, community members were 36% more likely to test for HIV than those in villages receiving the standard messaging of just the health benefits of ART.[18] In South Africa, men were twice as likely to test if HIV outreach was paired with U=U messaging that emphasised the role of ART in individual health and stopping transmission.[35] Increasing the acceptability and willingness to test is crucial for identifying undiagnosed people living with HIV and reaching the first of the UNAIDS 2025 95-95-95 targets (ie, that 95% of people living with HIV know their HIV status).

Furthermore, counselling on the U=U message is a key component to improving client engagement with ART programmes and treatment success. Better ART adherence and viral suppression are necessary for achieving the second and third UNAIDS targets (ie, that 95% of people living with HIV who know their status initiate HIV treatment and that 95% of people on treatment are virally suppressed). Studies show that U=U knowledge and related behaviour change interventions are associated with high rates of viral load undetectability and ART adherence.[9,34,36,37] Among people living with HIV in 25 countries who reported receiving U=U counselling from providers, self-reported viral suppression was also more than twice as likely and suboptimal adherence less than half as likely as compared with those who were unaware of U=U.[9]

Prioritisation of evidence-based education and promotion

Despite widespread benefits of U=U messaging for individuals and public health programmes, awareness remains low among individuals, health-care providers, and communities. Studies on awareness and knowledge of U=U frequently have been done among men who have sex with men and in high-income countries, and generally show increasing awareness over the past decade.[18] In a 2021–22 survey of 633 sexually minoritised men in the USA, 73 (56%) of 131 men living with HIV and 87 (17%) of 502 HIV-negative men were aware of U=U, 391 (62%) of the full sample found the evidence believable, and rates of awareness were higher when individuals had LGBTQ+ affirming care than when they did not have this care.[38] Important geographical differences exist, for example in India where only 439 (14%) of 3126 people identifying as sexual and gender minoritised surveyed in 2022 were aware of U=U. Once the evidence was explained, 728 (25%) of these surveyed individuals perceived it as completely accurate.[39] A 2024 web-based survey for sexual and gender minoritised people in Brazil found 4077 (80·4%) of 5071 people living with HIV perceived U=U as completely accurate, compared with 10 348 (60·0%) of 17 257 individuals reporting as HIV-negative and 709 (42·9%) of 1653 individuals with unknown HIV status; perceived accuracy was strongly correlated with general knowledge about HIV.[40] Furthermore, among various population samples,

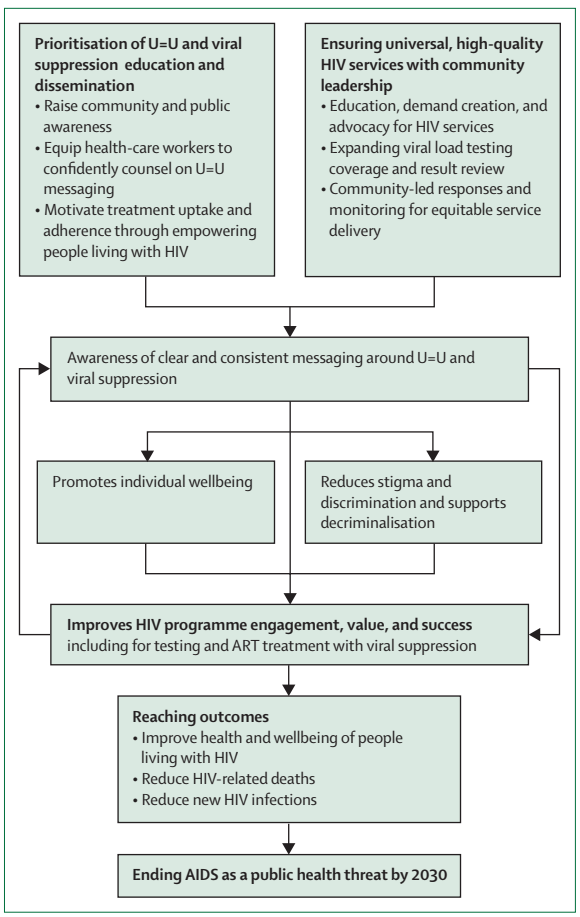

Figure: **U=U is central to ending AIDS as a public health threat**
Prioritisation of U=U and viral suppression messaging and equitable services are imperative to improve knowledge of the U=U message, access to care, and outcomes. Thus, U=U messaging facilitates successful HIV programmes for individuals and communities. ART=antiretroviral therapy. U=U=undetectable equals untransmittable.

marginalised subgroups such as minoritised ethnic populations, Indigenous populations, and people with low income were less likely to have received or have confidence in U=U messaging than non-marginalised subgroups.[41,42] In sub-Saharan Africa, which has the highest burden of HIV prevalence globally, few studies have been performed and many showed little understanding or use of U=U messaging. The multicountry Positive Perspectives Study in 2019–20 showed that one in three participants on ART were not informed by their health-care professionals about U=U.[9]

To improve knowledge and acceptance among people accessing HIV-related care, health-care workers must consistently and confidently communicate the U=U message to clients as part of the wider treatment and health education. A study surveying 407 Australian general practitioners found that 302 (74%) agreed with the U=U message, yet only 138 (34%) reported ever discussing U=U with clients.[43] Similarly, a survey of 195 Brazilian physicians showed that 144 (74%) agreed with U=U evidence but only 128 (66%) thought people living with HIV should be informed about it.[44] Despite robust evidence, providers (including ART providers) are hesitant to use the term zero risk, instead using terms such as very low or like zero to describe sexual HIV transmission risk with an undetectable viral load.[45–47] A 2017–19 survey among providers in Kenya found many did not have confidence in the accuracy of U=U and some providers withheld such counselling or used inconsistent messages, as they reported fear of blame if transmission occurred, and other providers were concerned it could encourage people living with HIV to engage in multiple sexual relationships.[48] Counselling on risk of other sexually transmitted infections and their prevention should be part of discussions and an important consideration; however, withholding or diminishing the science of U=U due to stigma or fear of increased sexual risk behaviour is unethical.[13] Concerningly, health inequities could be perpetuated by bias among health professionals, including unconscious or implicit bias, and the resulting variable education around U=U.[13]

Beyond clinical settings, clear messaging around U=U and viral suppression must reach the public and policy makers to reduce stigma, decriminalise HIV, and improve care access and use.[22] In a 2022 review of US health department websites from the 50 states and Washington, DC, only 33 (65%) mentioned U=U, and just 18 (35%) correctly indicated zero sexual transmission risk with a sustained undetectable viral load.[49] In Australia, journalists noted that easy access to clear, authoritative information on the message of U=U was not available; thus, a community group developed media guidelines that were shared with journalist societies to facilitate better factual reporting and less stigmatising depictions of HIV.[50] Including simple, compelling, unambiguous, and evidence-based narratives could increase overall trust in the evidence, as higher familiarity and knowledge of the message of U=U are associated with higher acceptability of U=U messaging.[18,34]

Acknowledging existing challenges to viral load testing and suppression

Challenges in viral load testing access jeopardise the ability to spread U=U messaging, and unfortunately gaps in testing persist with inequities across geographies and facility types[51] and within subpopulations such as children, pregnant people, marginalised populations, and other groups.[52] In 2023, programmatic data reported by the US President's Emergency Plan for AIDS Relief (PEPFAR) from Angola, Cameroon, Haiti, and Zimbabwe showed that more than 25% of ART clients due for viral load testing did not have a documented test result within 12 months.[53] While addressing challenges in accessing effective testing and care, an approach to developing messaging and communicating viral load evidence must acknowledge the current challenges and experiences from affected communities.[54] Barriers faced by people living with HIV to accessing care and achieving viral suppression are multifaceted and often structural. For example, in Myanmar, identified challenges to accessing testing included inadequate knowledge about viral load testing among clients, wage loss and time constraints in visiting clinics, samples not being collected daily, and gaps in staff availability and training.[55] These challenges contributed to only 56 (11%) of 498 clients receiving viral load testing within 9 months of treatment initiation, despite the national recommendation for viral load monitoring by 6 months.[55] Likewise, viral non-suppression and attrition are associated with systemic factors such as staff unprofessionalism, long travel for clients, and viral load result return time.[56–58] Guidance for viral load testing frequency varies across agencies and countries, with all guidelines recommending at least annual viral load testing when individuals are stably maintained on ART, and evidence around optimal timing could be explored further.

Viral non-suppression or treatment adherence issues for any reason do not warrant shame or stigma, particularly as shame and stigma can deter effective engagement.[59] All individuals with detectable viral load should receive non-judgemental counselling for treatment adherence, and optimal support packages should be defined, including consideration for additional diagnostics such as drug resistance and objective adherence testing. U=U messaging should centre on mutual respect and collaboration throughout the care journey, recognising the idea of the coined corollary that viral load does not equal value.[45] The phrase treatment as prevention was conceived in 2007 and used in various public health programmes, but might not be favourable due to its singular focus on prevention, and the public health burden of disease control should not be placed on individuals, nor should their bodies be pathologised.[50]

Although clear messaging on the benefits of treatment and prevention are highly valuable for both people living with HIV and communities, coercion to receive ART and blame for inconsistent treatment, which is often due to diverse barriers beyond a client's control, are unacceptable. The value of ART for individual health should remain focal in counselling to ensure people living with HIV can have reliable access to quality treatment and realise health benefits, as this is a paramount focus of their clinical care.

The imperative for quality universal HIV services

Equitable access to high-quality HIV services must be prioritised and is essential to realise the potential of U=U messaging and reach the global goal of ending AIDS as a public health threat by 2030 (figure). Almost 75% of HIV transmission in sub-Saharan Africa is modelled as attributable to cases of undiagnosed HIV or people who are diagnosed with untreated HIV,[8] which highlights the urgent need to make prevention options available, identify new cases of HIV, link individuals to treatment, and ensure appropriate services for continued engagement with HIV-related care. A 2022 UNAIDS report emphasised that U=U messaging is underused and, when community-led, has powerful potential to advance the public health and equity argument for universal access to HIV prevention, testing, treatment, and care.[50]

Leadership and meaningful engagement of communities living with or affected by HIV are essential components for equitable HIV service delivery and appropriate HIV monitoring. Global AIDS targets call for expanded partnership in response, including that community-led organisations deliver 30% of testing and treatment services,[60] as community-led responses have been associated with improved treatment adherence and viral suppression.[61] Additionally, community-led monitoring ensures a more holistic evaluation of HIV service components such as quality, adequacy of service provision, and appropriate structural and policy enablers,[62] which can serve a crucial role in highlighting addressable health system barriers. Community-led monitoring has been associated with fewer stockouts of vital ART medicines, improved rates of viral suppression, and increased quality of care ratings.[63]

Community-led monitoring is an effective mechanism to pinpoint where site-specific or systemic issues for routine viral load testing need to be addressed and facilitate the targeted action required for change. As such, community-led monitoring of laboratories and results should be aligned to and matched with monitoring, reporting, and accountability frameworks that are supported by national and subnational health systems to ensure that policies translate into practice and that laboratories that convey results are an important part of person-centred care. Community leadership and tailored interventions are crucial to designing appropriate models for education, demand generation, and advocacy.[64] Return of results to clients must be prioritised and improved to enable the benefits of engaging individuals on viral suppression as, currently, results can take months to be returned, and many clients then receive late or inadequate explanations of their results. One multicountry analysis showed only 4172 (27%) of 15 271 clients received their viral load test result within 90 days of testing,[65] and a community-led monitoring project in Kenya showed that less than 41 (8%) of 536 surveyed clients reported receiving an explanation about their results.[66]

Scaling up sustainable viral load testing is paramount to ensuring effective treatment and enabling U=U messaging. Using innovative diagnostics and systems can address barriers to the availability of viral load testing and result access. Diagnostic integration across often siloed health programmes can expand molecular testing access on multidisease testing analysers. Although many near point-of-care analysers have been deployed for tuberculosis testing, integration of HIV molecular testing has been associated with more on-site HIV viral load, faster results, and more timely action for high viral load, as well as potential efficiencies for the tuberculosis programmes.[67,68] Where infrastructure for sample processing or transport is not optimised for use of serum or plasma samples, dried blood spot testing can be conducted in rural sites and even within communities.[69] Accelerated development of low-technology molecular diagnostics that leverage COVID-19 device advancements could enable future home-based testing and autonomy around real-time data on viral suppression.

Ensuring continuous and equitable access to ART options is crucial for reliable and durable viral suppression. Long-acting regimens offer a new option to improve adherence and viral suppression outcomes, particularly in situations where use of daily oral medications is impractical or unsafe, such as unstable housing, incarceration, and hostile home environments. Participants in trials for long-acting regimens described logistical and psychosocial freedom with reduced stigma.[70] System-level barriers should be addressed to increase prescription of long-acting treatment regimens in high-income countries and, importantly, advocates and global agencies should call for equitable access to approved and emerging long-acting formulations, which will remain largely unavailable in low-income and middle-income countries without pharmaceutical negotiation.

Attention to responsible and equitable messaging

Communication around U=U should reflect the diversity of affected communities and individuals to ensure appropriate messaging, with particular attention for marginalised groups. The success of education and campaigns requires monitoring of their reception and interpretation, which can be complex and cultural and

Search strategy and selection criteria

References for this Personal View were identified through searches of PubMed from Jan 1, 2010, to Dec 6, 2023, using the search terms "HIV" and "U=U" or "Undetectable = Untransmittable" or "treatment as prevention" without language restriction. Articles and relevant public health publications were also identified through searches of the authors' own files. The final reference list was generated on the basis of originality and relevance to the scope of this Personal View.

shift with time.[71] In many areas, HIV response and U=U messaging might focus on sexually minoritised men, and communication must be thoughtfully extended to all affected individuals, address implicit biases of health-care workers, and consider larger human rights and gender-related factors.[45,72,73] When effective ART is used before and throughout pregnancy and delivery with an undetectable viral load, there is no risk of vertical transmission.[74,75] During breastfeeding and chestfeeding, the risk of vertical transmission is estimated to be less than 1% when taking ART and maintaining an undetectable viral load.[76] Although global guidance for breastfeeding and chestfeeding varies, it has advantages for infants and carries strong sociocultural implications. Discussions on treatment and health literacy should allow informed choices and enable parents to safely conceive, deliver, and breastfeed or chestfeed without shame. People who inject drugs have been commonly excluded from studies around ART treatment and transmission risk, and evidence is insufficient on the risk of parenteral transmission. Regardless, all people who use drugs should have adequate access to the full spectrum of harm-reduction services and care, along with appropriate counselling for their sexual and reproductive health choices that leverages existing evidence and U=U messaging. Services should be designed that are inclusive of all groups, and particularly those who are traditionally marginalised in health systems and those who are at risk of viral non-suppression. Providing gender-affirming care for transgender clients, for example, has been associated with both high treatment adherence and high rates of viral suppression.[77,78] To ensure effective, inclusive, and relevant messaging, the communities intended for engagement should be meaningfully involved at every stage of the process, from initial design to evaluation.

Conclusion

After more than a decade of supportive research, the message of U=U and the value of viral suppression must continue to be promoted clearly as key components in public health programmes, policies, and strategies for HIV. Understanding this evidence is associated with improved health of individuals living with HIV, reduced stigma and discrimination, and supporting decriminalisation, all of which enable success of HIV programmes. Stakeholders must prioritise dissemination of the U=U message in public health campaigns and education. Large international funders PEPFAR and the Global Fund to Fight AIDS, Tuberculosis and Malaria now require the message of U=U to be part of literacy and counselling in HIV care. Gaps in U=U research require further discussion, including the need for more research on the effects of U=U messaging on clinical, public health, and cost-effectiveness outcomes; identifying interventions to promote U=U acceptance among policy makers, health-care providers, and other stakeholders who are integral to U=U message delivery; and addressing the insufficient and inequitable access to HIV information, treatment, and diagnostics. Increasing demand creation and consistent access to viral load services, including through community engagement and use of alternative testing, are required, which underscores the imperative to improve access to equitable, high-quality HIV services and address persistent societal and structural barriers to fully realise the benefit of U=U messaging in terms of ending AIDS as a public health threat.

Contributors

All authors contributed to concept development by drawing on diverse work with community and civil society groups, including advocacy and programming for the message of undetectable equals untransmittable and viral suppression. EEO led development of the outline and search strategy and drafted manuscript versions. BR led coordination among contributors and supervision during manuscript development. All authors contributed to reviews and editing and provided critical evaluation of the language and nuance used in this Personal View.

Declaration of interests

We declare no competing interests.

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