



# Perspectives on the use of modelling and economic analysis to guide HIV programmes in sub-Saharan Africa

*The Modelling to Inform HIV Programmes in sub-Saharan Africa (MIHPSA) Working Group\**

HIV modelling and economic analyses have had a prominent role in guiding programmatic responses to HIV in sub-Saharan Africa. However, there has been little reflection on how the HIV modelling field might develop in future. HIV modelling should more routinely align with national government and ministry of health priorities, recognising their legitimate mandates and stewardship responsibilities, for HIV and other wider health programmes. Importance should also be placed on ensuring collaboration between modellers, and that joint approaches to addressing modelling questions, becomes the norm rather than the exception. Such an environment can accelerate translation of modelling analyses into policy formulation because areas where models agree can be prioritised for action, whereas areas over which uncertainty prevails can be slated for additional study, data collection, and analysis. HIV modelling should increasingly be integrated with the modelling of health needs beyond HIV, particularly in allocative efficiency analyses, where focusing on one disease over another might lead to worse health overall. Such integration might also enhance partnership with national governments whose mandates extend beyond HIV. Finally, we see a need for there to be substantial and equitable investment in capacity strengthening within African countries, so that African researchers will increasingly be leading modelling exercises. Building a critical mass of expertise, strengthened through external collaboration and knowledge exchange, should be the ultimate goal.

## Introduction

HIV treatment and prevention programmes have contributed to impressive increases in national life expectancies in sub-Saharan Africa. For instance, life expectancy has increased from age 45 years in 2000 to age 65 years in 2019 in Malawi, from age 45 years to age 62 years in Zimbabwe, and age 56 years to age 64 years in South Africa.<sup>1</sup> Despite this substantial progress, almost 1 million new HIV infections are still occurring each year in the region.<sup>2</sup> HIV policy makers and programme planners, particularly those working at national levels (ie, for ministries of health and national AIDS commissions), face challenging economic choices over the allocation of scarce resources across treatment and prevention interventions, including prioritisation geospatially and among heterogeneous populations. Mathematical disease modelling can guide resource allocation and has played an important role in shaping HIV policies, such as the move towards providing antiretroviral therapy for all people living with HIV,<sup>3-4</sup> the introduction of dolutegravir,<sup>5-6</sup> and scale-up of voluntary medical male circumcision.<sup>7-8</sup> However, to date, there has been relatively little critical reflection on the role of modelling within the institutional arrangements that characterise HIV responses in sub-Saharan Africa.

## Funding of HIV programmes in sub-Saharan Africa

Funding environments for the delivery of HIV services in sub-Saharan Africa are complex and fragmented. Commitments from country governments in sub-Saharan Africa to sustain their own HIV responses have increased over the years;<sup>9</sup> in all countries, governments usually fund health-care worker and facility infrastructure costs, and provide managerial oversight, stewardship, and coordination. Nevertheless, there is a substantial

reliance on overseas development assistance and this calls into question how modelling analyses can best be used, given the differing roles and mandates of national public authorities and their external partners. In 2019, funding from international channels accounted for 59% of total HIV spending in east and southern Africa and 64% in west Africa.<sup>10</sup> The two largest sources of overseas development assistance for HIV in sub-Saharan Africa are The Global Fund to Fight AIDS, Tuberculosis and Malaria and the US President's Emergency Plan for AIDS Relief (PEPFAR) programme, which together accounted for 85% of the US\$6.795 billion spent in 2019.<sup>11</sup> Other international funders (eg, France, the UK, and the Netherlands) also make substantial contributions.

The high reliance of HIV programmes in sub-Saharan Africa on overseas development assistance comes with risks, given the interdependencies between the organisations involved in the funding and delivery of HIV services. Development assistance has plateaued since 2010 and there are signs of reduced commitments to HIV.<sup>11</sup> This has led to talks of an HIV funding transition in which African countries would increasingly fund HIV services through domestic financing. Whether this transition happens, and the speed at which it might take place, are still uncertain, but it could have widespread ramifications for how HIV services are delivered—eg, a shift away from delivery by international non-governmental organisations towards nationally run, public systems. Such a shift would require countries to take on increased responsibility for HIV programme delivery in the face of a myriad of other health challenges.

## Generation and use of evidence to guide HIV resource allocation

It is necessary to consider who should be responsible for the generation and use of evidence on resource

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allocation, including through modelling. Stakeholders involved in funding and planning HIV programmes in sub-Saharan Africa have a strong interest in ensuring their resources are spent to generate the greatest possible beneficial impacts. Although the goals for all major organisations working on HIV in sub-Saharan Africa appear to be broadly the same (ie, to reduce HIV incidence and the adverse health and welfare consequences of HIV), what this means for programme planning can differ depending upon what the specific objective used in modelling is. For instance, models can provide evidence to minimise HIV-related deaths, minimise HIV incidence, maximise equity of access to services, minimise spending to reach a target, or maximise disability-adjusted life-years averted in a population from a budget. Each of these objectives would be considered important to all organisations working on HIV in sub-Saharan Africa, but not all can be met simultaneously. Ultimately, the decision on prioritisation between objectives that are not all attainable introduces subjective judgements that should necessarily be made through a process of deliberation among local stakeholders, informed by the modelling evidence. The meaningful involvement of affected populations in such deliberations is important.

Organisations that use models to inform their own planning processes do so with slightly differing purposes. The Global Fund, for instance, supports countries to develop national strategic plans on which to base their funding requests. The Global Fund explicitly recommends that modelling is used to determine an allocatively efficient configuration of a country's HIV programme.<sup>12</sup> This can comprise health systems requirements, such as staffing and infrastructure needs, which support many interventions, and direct funding to treatment and prevention interventions. Funding allocations from PEPFAR are laid out annually in Country Operational Plans.<sup>13</sup> These are guided by a longer-term strategic plan,<sup>14</sup> informed by modelling, and tend to be highly specific in what interventions are funded and where. UNAIDS is leading the global effort to end AIDS as a public health threat by 2030 and facilitates inclusive processes at country level, to estimate health burdens, track the status of programmes, and monitor progress<sup>11,15</sup>; a new strategy emphasises a people-centred approach and addressing of inequalities.<sup>16</sup> The UNAIDS intervention coverage targets are informed by modelling.<sup>17</sup> The World Bank is also concerned with allocative efficiency across all HIV-related spending, with bundles of interventions differing widely by country. WHO is increasingly incorporating insights from modelling studies into its global guidelines, especially in relation to cost-effectiveness, although it relies mainly on clinical and service delivery data in the development of its clinical guidelines.<sup>18,19</sup>

At the centre of these varied activities are country governments, in particular ministries of health and national AIDS commissions, that often face severe

resource and human capital constraints but continue to engage in grant applications and numerous planning and reporting exercises to meet the requirements of their diverse funders. They receive support from their funders and other technical partners, but each organisation inevitably has slightly differing aims. Country government authorities are recognised through international agreements and conventions as ultimately having the mandate to make decisions on setting policy and resource allocation. The Paris Declaration on Aid Effectiveness and Accra Agenda for Action, for instance, emphasise national ownership of policy formulation, mutual accountability between international funders and host governments, and a focus on results.<sup>20</sup> Most HIV models used in guiding policy in sub-Saharan Africa have been developed by research teams based in universities or other research institutions, mostly in high-income countries. Although some country governments in Africa are already increasing their capacity to use modelling for policy formulation, further development of these capabilities is necessary to fulfil the vision of the Paris Declaration.

### Aligning modelling with HIV and health sector objectives

HIV modelling needs to be grounded in the policy choices faced by countries, led by local health authorities, and directed towards issues of greatest consequence for population health and wellbeing. However, local health authorities currently have a small capacity to fund, commission, conduct, coordinate, and ultimately use modelling analyses. One consequence of this small capacity has been a relatively narrow focus of modelling analyses on addressing questions set by international funders, typically on HIV programmes and their HIV-specific goals, rather than addressing questions arising from country-level policy making processes. Such questions could include how to better integrate funding and delivery mechanisms for HIV services with wider health-care concerns and systems planning, and further exploration of the distributional and equity consequences of different resource allocations. Modelling relies upon the availability and quality of underlying data and international efforts to collate data on model inputs, such as on intervention costs, can be beneficial for constructing models. When data quality is poor, techniques such as expert elicitation to inform model parameters can be used.<sup>21</sup> Moreover, where major uncertainties exist due to a scarcity of data, modelling can highlight where additional data would be most valuable to strengthen the reliability of modelling results to better inform policy making.<sup>22</sup>

The Sustainable Development Goals (SDGs), set for 2030, which all countries are now working towards, include ending AIDS as a public health threat (SDG target 3.3) and also a commitment to universal health coverage (UHC; SDG target 3.8), defined as access to a

basic package of health care to which all citizens are entitled. To meet both objectives requires sustaining and expanding the successful response to HIV while also ensuring this aligns with and contributes to wider expansion of effective health services to all in need.

The 2021 Political Declaration on HIV and AIDS includes commitments to accelerate integration of HIV services into UHC, and strong and resilient health and social protection systems, synergistic with other SDGs.<sup>23</sup> The Global Fund and PEPFAR have also developed policies to support these efforts and their funding for health systems strengthening has more than doubled between 2010 and 2017.<sup>9</sup> The goals of UHC and Ending AIDS must be met in tandem—bringing HIV epidemics under control helps to limit budgetary demands, freeing up resources for investments towards UHC, and ensuring the long-term financial sustainability of HIV spending. Modelling can play an increasingly prominent role in HIV programme design, but this also needs to be done in cognisance of other health needs. If the right decisions are made, this could lead to HIV services becoming more efficient and better integrated with other health services, supporting patient-centred care and reducing inequalities. Steps in this direction must be evidence-based and careful to ensure that the successes seen in HIV programmes to date are not compromised in the process of integration with broader health-care delivery systems. They could be accompanied by similar changes in other areas of health care that have been reliant on overseas development assistance, such as malaria.<sup>24</sup>

### Recommendations for future practice

For modelling to contribute most effectively to HIV programme design and UHC in future, in our view, requires four things. First, that HIV modelling is more routinely aligned with, and ideally emerges from, national government and ministry of health priorities, recognising their legitimate mandates, and is based on an understanding of country needs. This should be done according to established best practices<sup>25</sup> and use recognised taxonomies of interventions.<sup>26</sup> Even if modelling continues to be predominantly commissioned and funded internationally, in the short term, it is imperative that it is focused on issues emanating from the country perspective. Second, that an environment exists in which collaboration between modellers and joint approaches to addressing modelling questions becomes the norm rather than exception. Such an environment can accelerate translation of modelling analyses into policy formulation because areas where models agree can be prioritised for action, whereas areas over which uncertainty prevails can be slated for additional study, data collection, and analysis. Third, that HIV modelling is integrated with the modelling of health needs beyond HIV, particularly in allocative efficiency analyses, in which focusing on one disease over another might lead to worse

health overall. This integration might also enhance partnership with national governments whose mandates extend beyond HIV and to all of health care, as reflected in national health sector strategic plans, other national policies, and the international commitment to UHC. There is also potential for strengthened regional partnerships within sub-Saharan Africa. Fourth, there needs to be substantial and equitable investment in capacity strengthening within African countries, so that African researchers will increasingly be leading modelling exercises. In addition to being better aligned to local health challenges, African-led studies are also likely to resonate more and lead to better uptake by local policy makers.<sup>27</sup> This can only happen with the commitment of all key stakeholders and, crucially, large and sustained funding. Building a critical mass of expertise, strengthened through external collaboration and knowledge exchange, should be the ultimate goal.

HIV programmes and policy needs are best understood locally, and evidence-informed policy formulation needs to be a continuous endeavour led by local actors. We believe our suggestions, if implemented, would represent a step-change in efforts to attain improvements in population health and wellbeing in countries most adversely affected by HIV. Similar approaches could also be adopted in and have been advocated for other areas of health care, especially those that are reliant on overseas development assistance, such as malaria.<sup>22</sup> This Viewpoint has been developed collaboratively between leading practitioners of HIV modelling and those working on HIV policy focused on sub-Saharan Africa, but the authorship is heavily balanced towards individuals working in high income countries. This is indicative of the challenges faced but also the willingness of key actors to work in better ways. It is in the interests of all that, in future, leadership of analysis and policy decisions that respond to the challenges posed by HIV are increasingly centred in Africa.

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All authors were responsible for the conceptualisation of the paper and substantial input to writing. PR and ANP were the overall study leads. The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the authors' institutions.

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