Correspondence

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The influence of constraints on the efficient allocation of resources for HIV prevention

The recent article by Stopard *et al.* [1] investigated how 'real-world' constraints in mathematical modelling analyses affect recommendations for resource allocation. This is an important question: the guidance that models provide on optimal HIV responses should always be considered in light of the full health system context, which may differ greatly from what would be modelled if the realities of logistic, political, ethical and programmatic constraints were ignored. Recommending an unconstrained 'optimal' HIV response is unhelpful at best and counterproductive at worst.

Although we commend Stopard *et al.* [1] for bringing attention to this topic, it is already well-trodden territory for both HIV resource allocation studies and health economics modelling overall. A recent review by Mikkelsen *et al.* [2] provided suggestions for integrating supply- and demand-side health system constraints into HIV cost-effectiveness analyses, including improved discussion between researchers and policymakers. Other examples include Chiu *et al.* [3], who investigated the importance of constraints regarding how interventions interact, leading to diminishing returns; and the STDSIM model, which allows supply- and demand-side constraints for antiretroviral therapy [4]. In Disease Control Priorities' broad health system analyses [5], model-based recommendations on cost-effectiveness are constrained by the need to advance other objectives including equity of access and financial risk protection, as well as the capacity of delivery platforms to provide these services. The International Society for Pharmacoeconomics and Outcomes Research (ISPOR) series of Good Practices for Outcomes Research reports have described guidelines for addressing real-world constraints [6], and have applied these to a range of problem types [7].

The examples cited in the previous paragraph make a case for incorporating constraints based on real-world data. However, the constraints considered by Stopard *et al.* [1] do not seem to fit this description. The authors, first, make the assumption, without citing evidence, of 12.5–45.0% maximum coverage for certain programmes (which the authors term 'technical efficiency', although this may be more appropriately considered as a supply- and demand-side constraint) while continuing to assume 100% coverage is attainable for other programmes, even those targeting vulnerable populations such as female sex workers, who are often hardest to reach; second, include a constraint – pre-exposure prophylaxis (PrEP) for all heterosexual women – that no country or funding body has or would be likely to implement; and third, assume that supply-side constraints remain constant over the 15-year simulation period.

In our own work, we developed the Optima HIV model to address practical policy questions in the context of realistic constraints. Stopard *et al.* [1] claim that allocative efficiency studies 'tend to be naïve to the constraints under which health programmes operate'. However, the study they cite from our group, by Kelly *et al.* [8], explicitly included numerous constraints, namely, first, that funding to antiretroviral therapy, prevention of mother-to-child transmission and opiate substitution therapy could not decrease due to the ethical requirements to maintain people on treatment once initiated (what Stopard *et al.* [1] term 'earmarking'); second, domestic versus various sources of international financing could not be arbitrarily reallocated ('minimizing change'); and third, programmes could not exceed maximum coverage constraints (what Stopard *et al.* [1] term 'technical efficiency'). Indeed, constraints have been a continuous theme of our group's publications since the early 2000s [9–16]. Other constraints available in Optima HIV include, first, demand and supply-side constraints in programme scale-up and scale-down, including both rate of change and overall values [17]; second, political preferences for certain programmes; third, constraints on programme coverage, such as scaling up treatment to meet targets; fourth, Pareto-type constraints to protect particular groups, such as vulnerable populations [18]; fifth, constraints on service provision due to human capital and/or infrastructure [19]; and sixth, scaling nontargeted programmes, such as management, administration, surveillance, enabling environment and so on. We typically analyse these programme costs separately as part of a technical efficiency analysis, based on appropriate benchmarking and/or detailed cost accounting, which can help countries understand whether their attention is best focused on allocative or technical efficiency [20].

We will continue to recommend that users conducting analyses using Optima models consider and utilize appropriate constraints. Furthermore, we will continue to include constraints in our model-based analyses, whether using Optima models or otherwise, and we encourage other modelling groups to do the same, critically ensuring that constraints are informed by real-world data, so they do not merely remain a 'naïve' modelling exercise.

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Conflicts of interest

There are no conflicts of interest.

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The influence of constraints on the efficient allocation of resources for HIV prevention: authors' response

We thank Stuart *et al.* [1] for their thoughtful comments on our article [2]. We are in strong agreement with them on the importance of this issue. Recent analyses do indeed highlight the need for much better integration of constraints into cost-effectiveness analyses (CEAs) and priority setting, including those cited in our original article [3,4] and others [5,6]. We regret that, owing to the constraint of the article's concise format, we could not provide a discussion of each of the authors' useful and insightful prior analyses in this area.

We would also certainly agree that in the application of a model for the purposes of directly informing a programme in country, it is important to rely on data, and for the analysis to be conducted in close collaboration with the programme managers. However, it is widely recognized, including by Mikkelsen *et al.* [3], that mathematical modelling is also useful to conduct 'explorative analyses, even when detailed data are not available', in order that important insights can be drawn. Accordingly, our article [2] aimed to provide a clear,