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Put in Context: The Concurrency Intervention Simulation Study of McCreesh et al

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To the editor

McCreesh et al. [1] is one of the first studies to move concurrency modeling from basic science to intervention programming support (see also [2]). It is worth noting that this change in purpose raises a different set of questions, and the modeling strategies themselves need to change. In particular, it changes the goal of the counterfactual used to estimate intervention impact. Evidence from Zimbabwe [3], and common sense, suggest that concurrency reductions, *in vivo*, will be accompanied by reductions in numbers of partners. McCreesh et al. have chosen to preserve the *in vitro* assumption that partnerships will not be reduced by the intervention, just reallocated to others. While this is an appropriate counterfactual for a lab study, it is not appropriate for an intervention simulation study. The impact of the assumption in this context is to bias the intervention impact estimate downwards.

Despite this, the McCreesh et al. study has much to offer, when the implications are carefully drawn, and the findings are placed in the right context:

1. **The estimates of concurrency point prevalence used by McCreesh et al. are low, even in the maximum concurrency scenario.** The estimates of concurrency from the 2009–10 Masaka data used by McCreesh et al. are 9.6% for men, and women's rates are arbitrarily set to be 25% of the men's, at 2.4%. The authors use a sensitivity analysis to examine the potential impact of under-reporting of concurrency by 50%: raising prevalence to 14.4% and 3.6% for men and women respectively. These rates are comparable to those reported by African Americans and Hispanics in US surveys [4]. Concurrency rates observed in populations with HIV hyper-epidemics are much higher than the maximum scenario in McCreesh et al.:

- 32% for men in KwaZulu-Natal, South Africa [5],
- 21% and 20% for men and women in Botswana [6],
- 43.9% for men in Lesotho in 2009 [7],
- 18.6% for men and 2.2% for women in Manicaland, Zimbabwe in 1998–2000 before both HIV and concurrency prevalence declined by 50% [3], and
- 21.3% for men and 4.5% for women in Nyanza province, Kenya [8].

This suggests the paper's findings are limited to settings with relatively low rates of concurrency, and more moderate generalized epidemics. The authors are careful to avoid over-generalizing from their study findings, but the accompanying editorial

by Go and Blower (G&B) is not [9]. G&B state that this and one other study “indicate that concurrency is not a major driver of HIV epidemics in sub-Saharan Africa” and they “recommend ending the debate on the importance of concurrency as a driver of HIV epidemics in sub-Saharan Africa.” With some modifications, McCreesh et al.’s model could be used to investigate the potential impact of concurrency reduction in the higher prevalence settings above, but until it is, G&B’s generalization to all sub-Saharan African epidemics is speculative and their call to end the debate on concurrency unwarranted.

2. **The results presented by the authors do not represent the final incidence reductions that can be achieved by the intervention.** The concurrency reduction is phased in from 2010 to 2020, and the simulation estimates of impact cover the same period. As the graphs in Figure 1E and S2 indicate, incidence is still declining in 2020, before and after the introduction of the intervention. The longer term intervention impact may therefore continue to rise.
3. **Despite this, the results are actually pretty impressive for a single behavioral prevention intervention.** The “best estimate” in the paper is that shifting 50% of concurrent relationships to serial ones, while maintaining the total number of relationships over all, would lead to an 11.9% decline in incidence—and a 16.2% decline among women. McCreesh et al. describe this as “relatively moderate,” and G&B in the accompanying editorial as “fairly minimal.” For comparison, note that raising ART coverage from 0 to 92% in this simulation by itself only reduces prevalence by about 28% by 2020 (Figure S2). While this study was not designed to estimate the impact of ART, the results are similar to a recent study in Lancet by Schwartzlander and others [10] which estimated that 50% ART coverage, plus 10% more male circumcision, plus 15% increased condom among the HIV infected, would result in a drop of about 30% in incidence by 2020 (with no further declines). This does not lead them to advocate abandoning Treatment as Prevention, instead they propose that we aim instead for an even more ambitious goal of 80% ART coverage. All of these estimates assume that ART coverage translates into the level of viral suppression that is needed to reduce infectivity.

Putting this in context, in the US, after 17 years of ART availability, only 19–29% of people living with HIV are virally suppressed [11, 12] and HIV prevalence has remained fairly stable for the last decade. By comparison, in Zimbabwe, we have observed a 50% decline in concurrency, along with a large decline in HIV prevalence, all before ART became available [3].

4. **Finally, the gender implications of this study are critical** – Concurrency reduction in this study had a much larger impact on lowering women’s incidence in every scenario, because men’s higher rates of concurrency are one of the key behavioral mechanisms that puts women at risk. The most optimistic estimates showed reductions of 16–23% in women’s incidence, and women’s relative benefits were between 2 to 4 times greater than men’s. The higher the level of men’s concurrency, the more women benefit from the intervention. Women’s HIV prevalence in the generalized heterosexual epidemics in Southern and Eastern Africa is typically 30% higher than men’s, and men’s concurrency is a compelling hypothesis for this disparity. To date we do not have a single prevention intervention that targets women’s prevalence specifically. It is disappointing to have this uniquely protective intervention for women so summarily dismissed in the accompanying editorial by G&B.

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