

Cost-Effectiveness of Pre-Exposure Prophylaxis Across Counties in Western Kenya

Anna Bershteyn¹, Daniel J Klein¹, Adam N Akullian¹, Zindoga Mukandavire², Graham F Medley², Wanjiru Mukoma³, Michael K Kiragu³, Kennedy Mutai⁴, Katharine Kripke⁵, for the OPTIONS Consortium

¹Institute for Disease Modeling, Bellevue, WA, USA, ²London School of Hygiene and Tropical Medicine, London, United Kingdom, ³LVCT Health, Nairobi, Kenya, ⁴National AIDS Control Council, Ministry of Health, Nairobi, Kenya, ⁵Avenir Health, Washington, DC, USA

Background

Pre-exposure prophylaxis (PrEP) is recommended when risk of acquiring HIV is high. Implementation planning for PrEP is now underway in Kenya. This analysis compares the estimated cost-effectiveness of PrEP in the six counties comprising the former Nyanza Province in Western Kenya, which exhibit a range of epidemic characteristics, including highly generalized, highly concentrated, and mixed epidemics.

Methods

The microsimulation model EMOD-HIV v2.5, fit to demographic, programmatic, and epidemic data for six counties in Western Kenya, was used to assess the cost-effectiveness and impact of PrEP. Female sex workers (FSW) were included based on a recent FSW enumeration study, and male clients of FSW were included to balance the reported number of clients per FSW. Projections with PrEP provision to FSW, “medium”-risk adolescent girls and young women (AGYW), who are not identified as FSW but still at elevated risk of HIV infection, and all medium-risk young adults were compared to projections without PrEP. The person-years of PrEP provided per HIV infection averted over a twenty-year time horizon was used as a proxy for PrEP cost-effectiveness in the absence of primary cost data.

Results

We first explored the cost-effectiveness of PrEP by county and target population. Figure 1 shows the cost-effectiveness of PrEP provided to different sub-populations in Western Kenya. Upper bounds for PrEP impact assume that present-day trends in antiretroviral therapy (ART) coverage will continue, while lower bounds for PrEP impact assumed achievement of UNAIDS 90-90-90 ART targets.

Consistent with other models [1], our estimates suggest that PrEP among FSW may be more cost-effective compared to providing PrEP to high-risk adolescents and young adults in the general population.

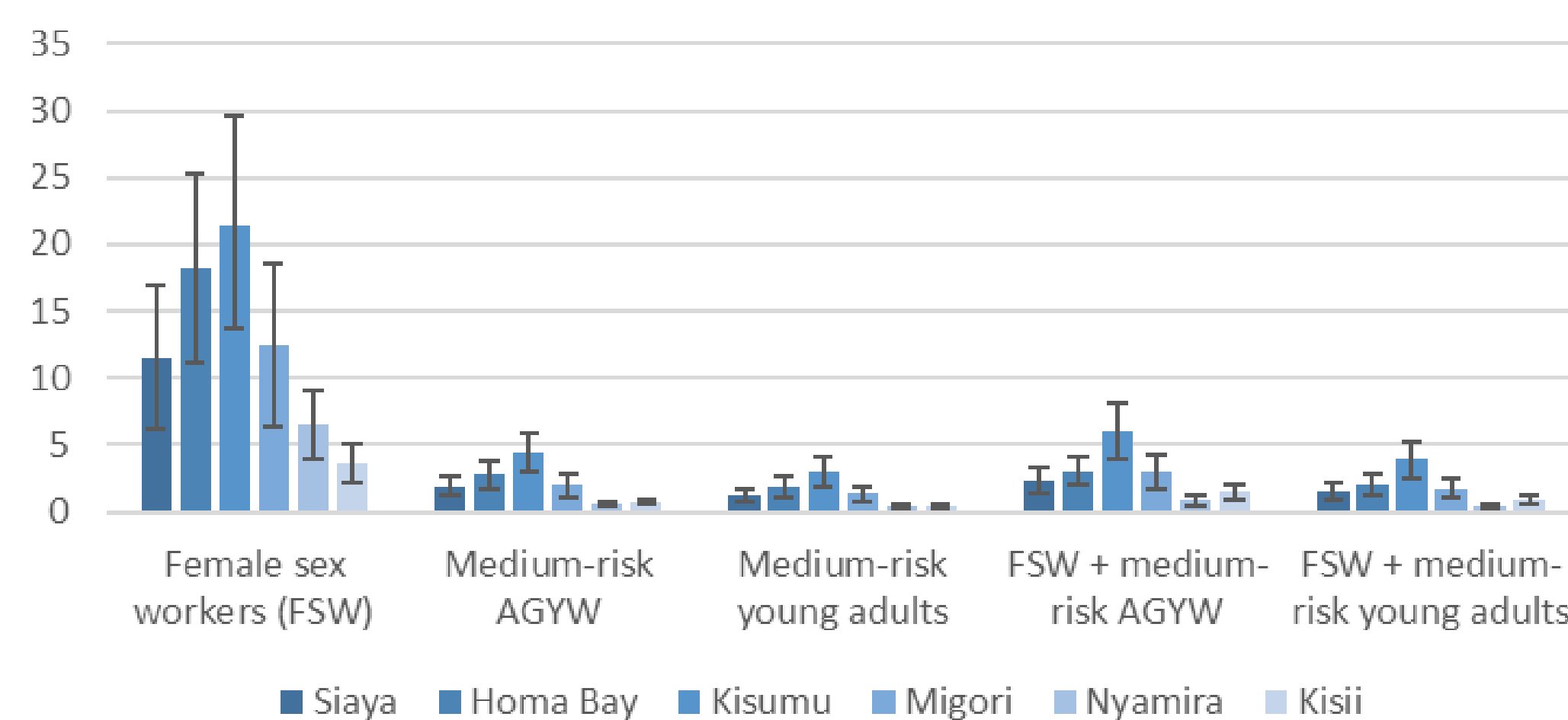


Figure 1. HIV infections averted per 1000 person-years of PrEP over the time interval of 2018-2038 in each of six counties of the former Nyanza Province in Western Kenya.

Results

Regardless of PrEP coverage, the populations for which PrEP was most cost-effective were FSW in generalized or mixed epidemic contexts. In contrast, the cost-effectiveness of PrEP in a concentrated epidemic setting such as Kisii County, which had the second-highest proportion of adult women participating in FSW but an overall low HIV prevalence, was similar to that of providing PrEP to medium-risk AGYW in generalized or mixed epidemics. PrEP for high-risk AGYW in mixed epidemics such as Kisumu was more cost-effective than PrEP for FSW in concentrated epidemics such as Kisii.

Though cost-effective, targeting PrEP exclusively to FSW had limited overall impact (Figure 2) because of the relatively small population sizes of FSW and the fact that regions with extremely high overall HIV prevalence are not necessarily those in which the highest numbers of FSW are found [2]. The trade-off between impact and cost-effectiveness is universal, but differs in magnitude by county. In Kisumu, substantial impact can be achieved by targeting FSW alone due to larger FSW populations, though broader targeting to both young men and women could double impact. In contrast, a focus on FSW in Homa Bay would be one of the most cost-effective strategies, but with limited impact compared to medium-risk young people, especially AGYW, in the general population.

Results

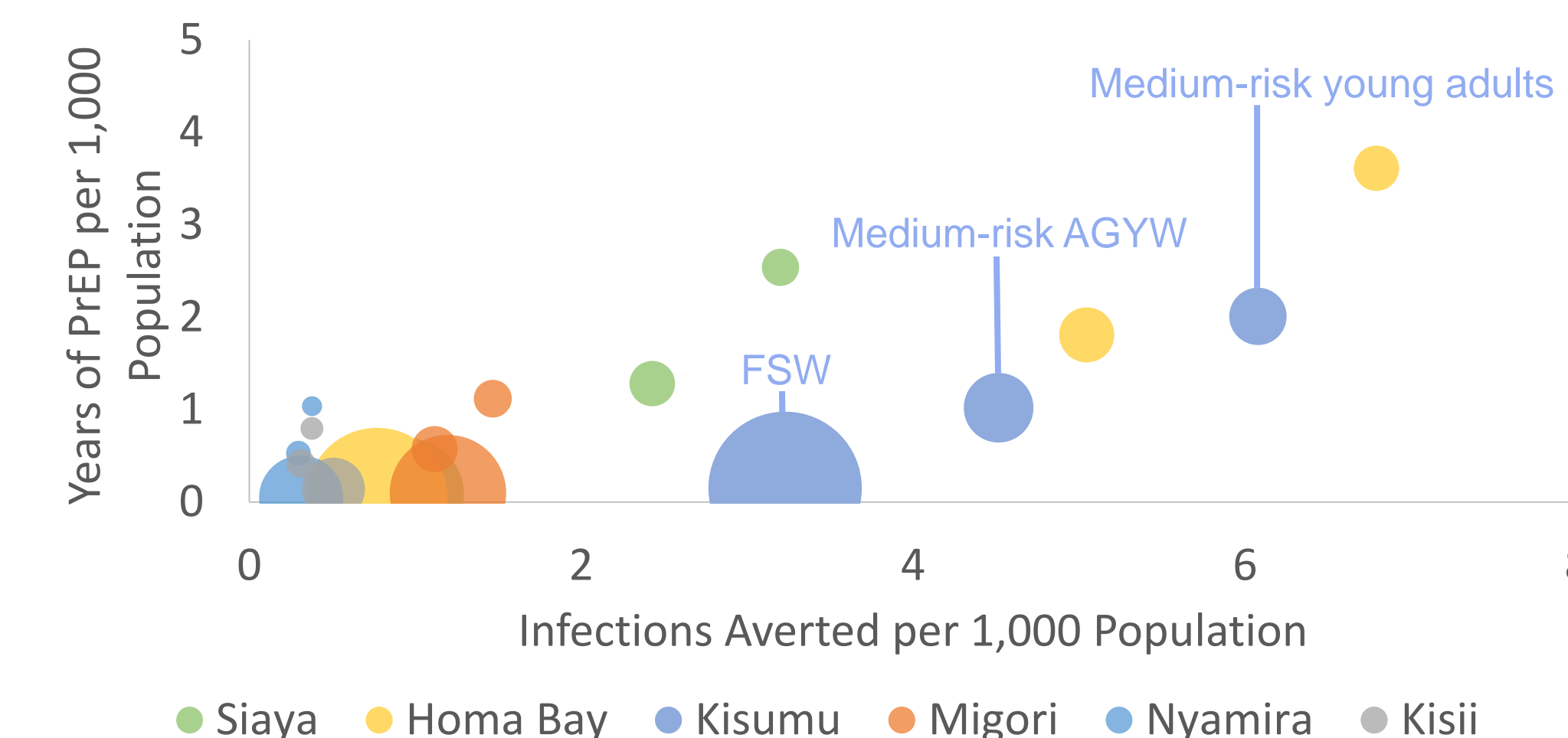


Figure 2. Infections averted and PY of PrEP distributed over 20 years, normalized to county population sizes (per 1,000 population.) Bubble sizes are proportional to the ratio of infections averted to person-years PrEP provided.

Conclusions

Transmission modeling suggests that the most cost-effective population for providing PrEP is FSW in mixed or generalized epidemics. FSW in concentrated epidemic contexts and medium-risk AGYW in mixed or generalized epidemic contexts are both important populations to consider for PrEP.

References

- [1] Cremin and Hallett, AIDS. 2015;29(6):733-738.
- [2] Odek et al., PLoS One. 2014; 9(3):e89180.