

# Successful prioritisation of HIV prevention using risk behaviour would greatly increase expected new infections preemptively reached.

## Spatio-temporal estimates of HIV risk group proportions for adolescent girls and young women across 13 priority countries in sub-Saharan Africa

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## Introduction

- Adolescent girls and young women (AGYW) 15-29 face disproportionately high risk of HIV infection, and are a priority population for prevention efforts
- The Global AIDS Strategy 2021-2026 recommends differentiating services for AGYW geographically based both on individual risk behaviour and epidemic indicators
- We used a spatio-temporal model to estimate the proportion of AGYW in four behavioural risk categories in 13 priority countries at a district level in the years 1999-2018

k	Risk group	Risk ratio
1	Not sexually active	0
2	One cohabiting partner	1
3	Non-regular or multiple partner(s)	1.72
4	Female sex workers (FSW)	13

## Methods

- We analyzed 46 national household surveys, including AIS, BAIS, DHS and PHIA
- We took a two-stage modelling approach:

- We fit a survey-weighted multinomial logistic regression to estimate the proportion of AGYW each risk group, with the non-regular or multiple partner(s) and FSW risk groups combined together, using age (IID), country (IID), spatial (ICAR) and temporal (IID) random effects
- To estimate the FSW proportion we used the 13 surveys with a transactional sex question to fit a survey-weighted logistic regression using age (IID), country (IID) and spatial (ICAR) random effects, as well as covariates for the proportion of men who are clients of FSW (Hodgins et al. 2022)

- We aligned our FSW estimates to national-level estimates obtained by disaggregating Stevens et al. (2022) by age group
- We disaggregated Naomi model (Eaton et al. 2021) general population incidence and prevalence estimates by risk group using incidence risk ratios and prevalence ratios
- We estimated the new infections that could be reached prioritising according to different strategies

## Results

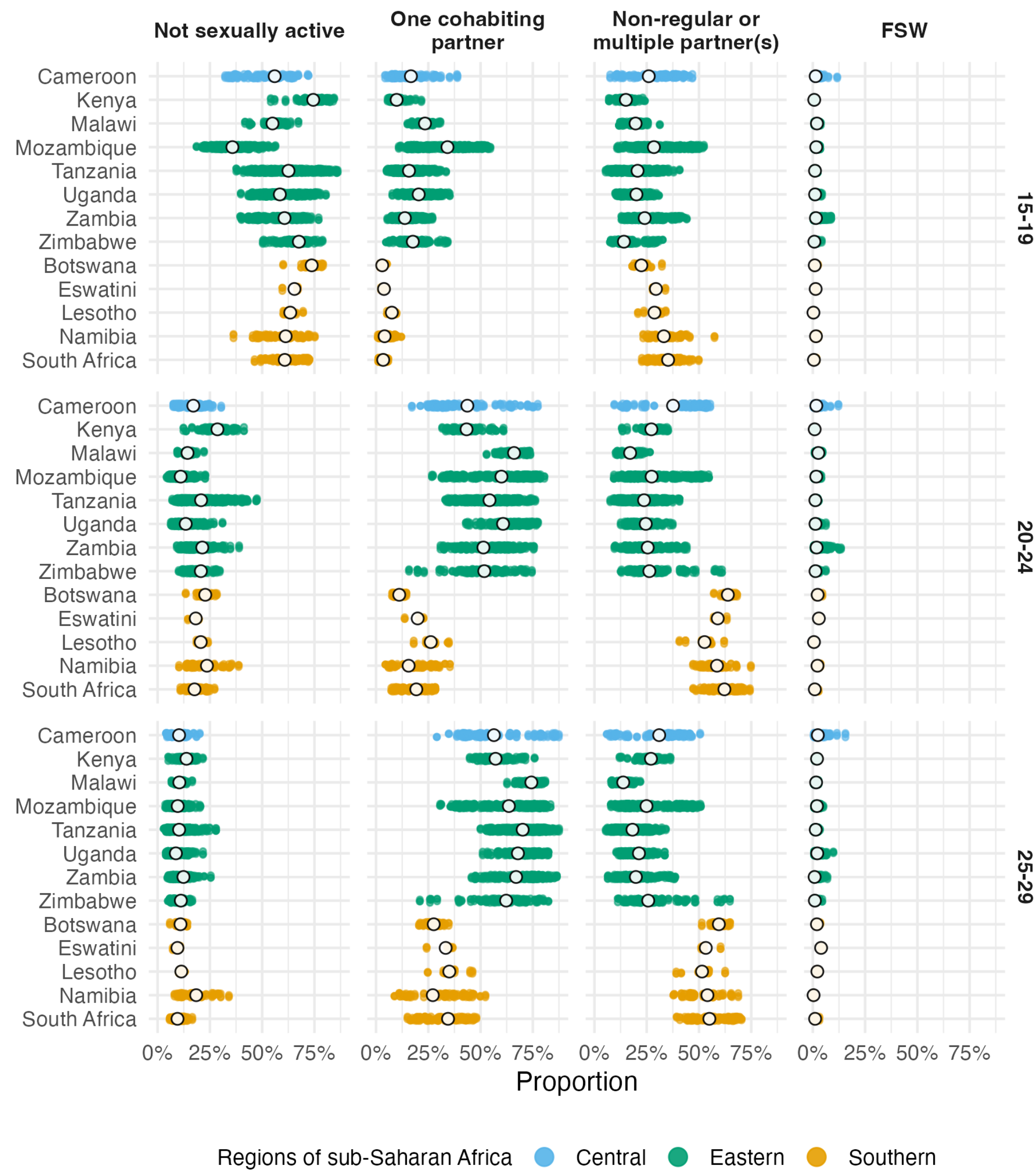


Figure 1: District level estimates (in colour) and national estimates (in white) in 2018.

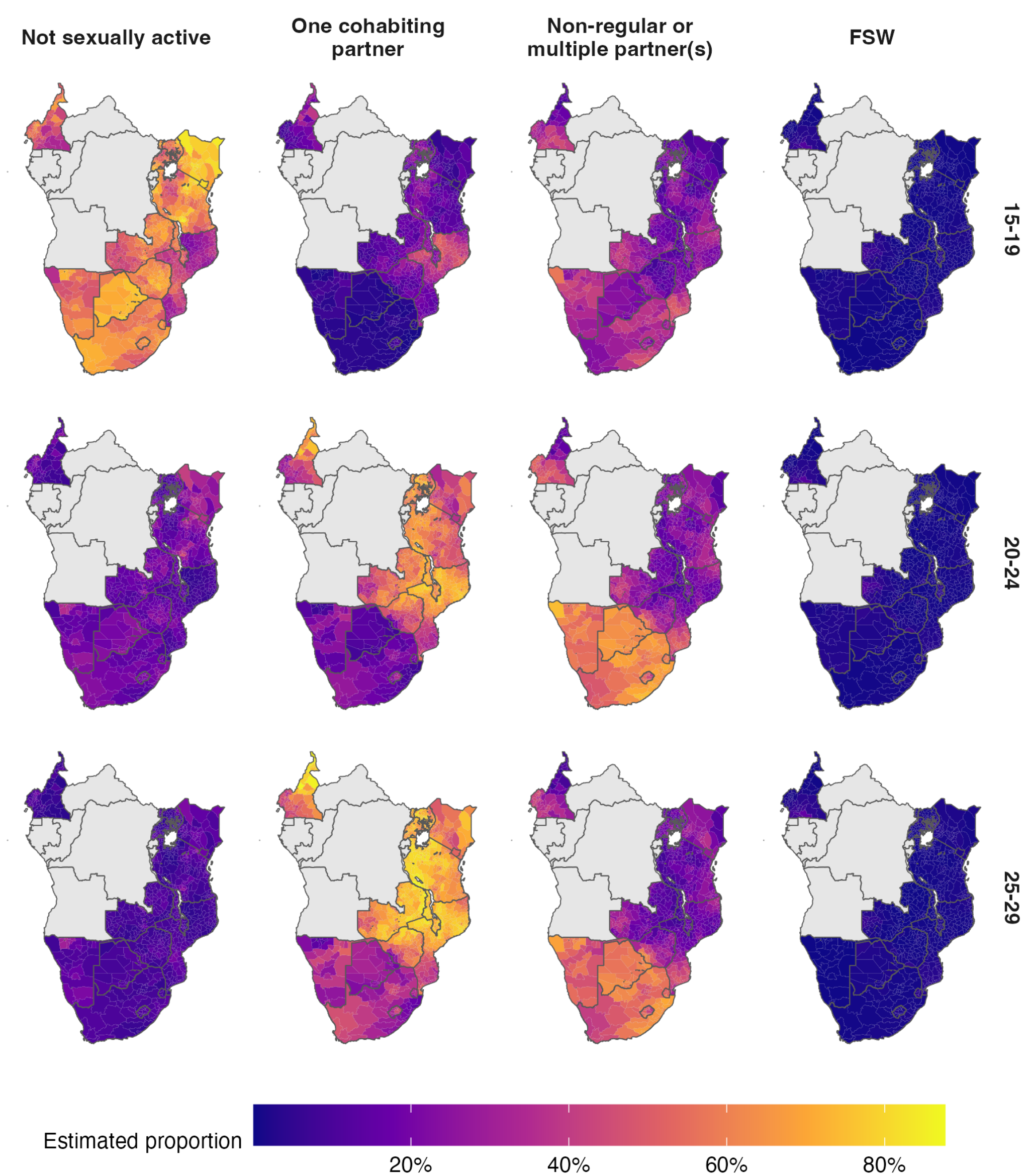


Figure 2: Spatial distribution of our 2018 estimates.

- Risk group proportions varied substantially across age groups (65.9% of total variation explained), countries (20.9%), and between districts within each country (11.3%), but changed little over time (0.9%)
- Among women aged 20-29, cohabiting (63.1%) was more common in eastern Africa than non-regular or multiple partner(s) (21.4%), while in southern countries non-regular or multiple partner(s) (58.5%) were more common than cohabiting (23.4%)
- Large numbers of 15-19 in Mozambique have early sexual debut (64.2%) and close to a third (34.2%) are already cohabiting

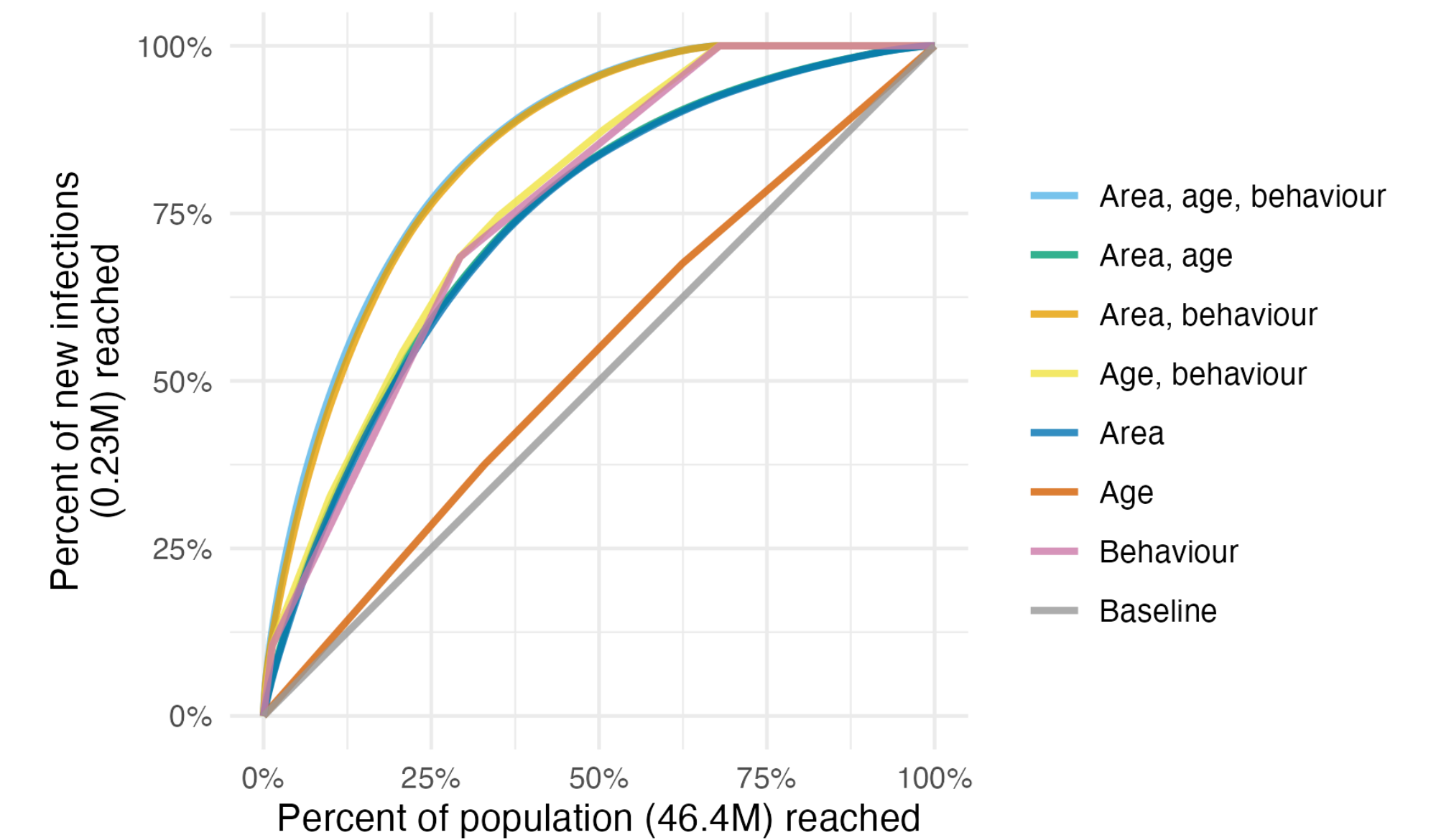


Figure 3: Comparison of prioritisation strategies

- Using location, age and behavioral risk prioritisation, 50% of expected new infections can be found by reaching 10.6% of the population, compared with 19.3% of the population when behaviour is excluded
- The majority of this benefit comes from reaching FSW, who are 1.4% of the at risk population but 10.9% of all expected new infections

## Discussion

- Providing prevention services on the basis of behavior would allow many more expected new infections to be reached, especially among FSW
- Programs should ensure that behavioural prioritisation occurs without stigmatising or blaming AGYW
- We focused on the most proximal determinants of risk, based on location and behaviour, rather than more distal determinants
- Using a two-stage approach allowed us to include all surveys, even those without a specific transactional sex question
- We overcome the small sample sizes created by multiple stratifications by using spatio-temporal smoothing

## Limitations

- No adjustment for under-reporting biases, which likely vary by age group
- Choosing appropriate risk group definitions that succinctly capture variation in risk consistently across contexts is challenging
- We are least confident in our FSW estimates, which face particular measurement difficulties
- We did not assess the practicalities or costs of the risk prioritisation strategies we considered

## Future work

- Inclusion of more surveys e.g. VACS
- Extension to general population (adults 15-49)

Interested to read more? Manuscript and R code available are available from [github.com/athowes/multi-agyw](https://github.com/athowes/multi-agyw).

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## References

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