Role of key populations and past interventions on HIV transmission in Cameroon

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BACKGROUND

- Cameroon has one of the largest, albeit declining, HIV epidemic in West and Central Africa. By 2018, HIV prevalence in Yaoundé was 2%.
- Despite a long history of key population (KP) programs, there exist large prevention gaps among KP leading to disproportionate HIV burden, with HIV prevalence:
  - 45% among men who have sex with men (MSM)
  - 24% among female sex workers (FSW)
  - 3% among clients of FSW

OBJECTIVES

To estimate:

1. **The impact of past interventions** (condom use and antiretroviral treatment [ART]) on new HIV infections in Yaoundé
2. **The contribution of different groups and partnership types** to new transmissions in the total population over successive decades

METHODS

1) Compartmental mathematical model of HIV transmission among 15-49 years old populations in different risk groups in Yaoundé (Figure 1)

Figure 1: modelled population structure. Arrows represent sexual contacts within partnerships

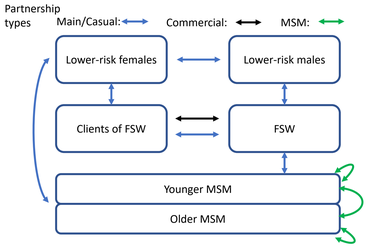
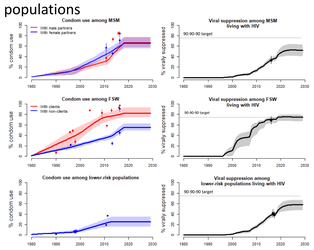


Figure 2: Observed (dots) and model fitted (lines and shades) of condom use and viral suppression levels among MSM, FSW and lower-risk populations



2) Model parametrized and fitted in a Bayesian framework to available city- and country-specific demographic (e.g. size of KP), sexual behavior (e.g. number of sex partners, anal sex), HIV prevalence and intervention coverage (condom, ART) data for the general population (e.g. Demographic Health Surveys) and KP (e.g. bio-behavioural surveys, 4-cities study) (Figures 2, 3)

3) Calibrated model used to estimate:

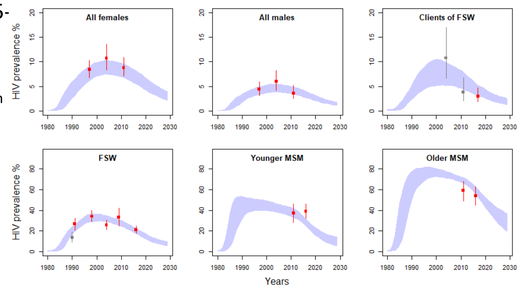
Past impact of interventions - the fraction of new HIV infections averted (AF) over 10 years with interventions (condom use, ART) vs. counterfactual without intervention

Contribution of risk population and partnership types to HIV transmission - population attributable fractions (PAF): fraction of cumulative new HIV infections over 10 years that could be prevented by fully interrupting transmission within a given partnership type

Despite success of past interventions, the unmet needs of key populations still contribute to a large proportion of new HIV infections in Yaoundé, Cameroon

TRENDS IN HIV PREVALENCE AMONG RISK POPULATIONS

Figure 3: Empirical (red dots) and model fitted (blue shades) HIV prevalence in different groups over time



A declining HIV epidemic in Yaoundé

- The model reproduced trends in the observed HIV prevalence data (Figure 3), but there are scarce historical data on MSM & clients of FSW
- Clients of FSW experience higher HIV risks compared to lower-risk men (3-fold higher HIV prevalence, due to more casual sex and commercial sex)
- HIV prevalence & prevention gaps disproportionately higher among FSW, clients, and MSM (Figures 2&3)

HIV INFECTIONS AVERTED BY INTERVENTIONS

Figure 4: Estimated proportions of new HIV infections averted in the total population by the use of condoms alone, ART alone, and due to condoms and ART together, over successive decades, 1980-2018.

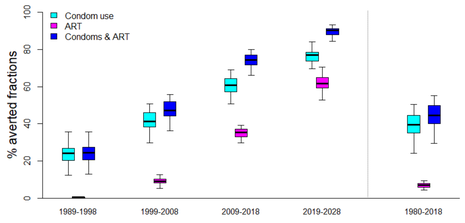


Table 1. Fraction of HIV infections in the total population averted over 2009-2018 due to increases in condom use alone or to ART alone and intervention coverage in 2018 in each group.

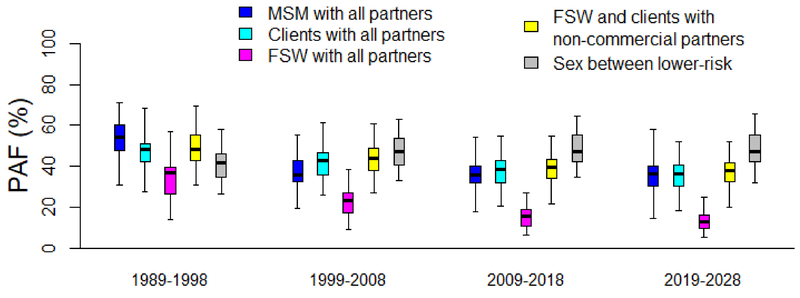
Population	Condom use		ART	
	Coverage % in 2018	Averted fractions % over 2009-2018	Coverage % in 2018	Averted fractions % over 2009-2018
All	As below	60.9% (50.9-69.1)	As below	35.4% (29.8-39.2)
MSM	66.6% (57.5-76.3)	37.2% (19.2-54.6)	46.2% (41.1-52.8)	6.4% (3.2-9.1)
FSW	72.6% (65.0-84.1)	29.4% (11.1-50.5)	88.0% (81.3-91.3)	8.0% (2.9-13.2)
Clients	41.7% (29.4-53.0)	31.5% (17.9-41.9)	44.0% (38.3-49.3)	10.5% (5.1-16.4)
Lower-risk groups	29.4% (20.2-37.1)	19.6% (9.9-31.9)	51.1% (46.6-55.6)	20.5% (13.1-25.4)

Condom use significantly impacted the HIV epidemic in Yaoundé

- Overall, condoms and ART might have averted ~44% of all new HIV infections since 1980 (Figure 4)
  - Mostly due to condoms (AF=39%)
  - ART coverage was recent (~50% coverage in 2018)
- Impact of interventions higher in later decades (AF=74% over 2009-2018)
- Success of past HIV prevention programmes focusing on FSW (Figure 2 and Table 1)
- Condom use among MSM with their male and female partners averted ~37% of all new infections over 2009-2018 (Table 1)
- Transmission impact from ART mostly due to viral suppression in lower-risk populations (Table 1)

CONTRIBUTION OF UNMET PREVENTION NEEDS OF KEY POPULATIONS TO OVERALL TRANSMISSION

Figure 5: Estimated fraction of new HIV infections transmitted by different partnership types over successive decades.



Unmet needs of KP still contribute to onward HIV transmission (Figure 5)

- PAF of sex between FSW and their partners fell over time to ~ 15% of new infections over 2009-2018
  - This reflects high intervention coverage among FSW
- High and steady contribution of sex between clients with all partners (39% of new infections over 2009-2018) and MSM with all partners (39% over 2009-2018) due to large prevention gaps (Figures 2 and Table 1)
- Slight increase in contribution of sex between lower-risk populations over time (47% of new infections over 2009-2018)
- Next decade: contribution of each risk group is expected to be similar to estimates for 2009-2018

CONCLUSIONS

- Increases in condom use among FSW, and recent ART scale-up in Yaoundé substantially reduced HIV transmission
- Unmet prevention and treatment needs among KPs still substantially contribute to new HIV infections in Yaoundé
- Unmet needs of MSM & clients contribute the most, because of large treatment preventions gaps, with low level of viral suppression, and low condom use by clients during sex with main and casual partners.

→ Need to prioritize HIV prevention and treatment interventions to MSM & clients of FSW which have been neglected, while maintaining achievements of programmes among FSW.

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