The interaction of low male circumcision and high partner concurrency on HIV risk in Africa:
Evidence from Demographic & Health Surveys

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Introduction

- Sub-Saharan Africa is home to 10% of the world's population, yet carries more than 66% of the world's HIV infections.
- Infection rates vary across the continent with Southern Africa and pockets of East and West Africa being the most affected.
- High rates of multiple concurrent sexual partners (MCP) and low rates of male circumcision (MC) are believed to be the major drivers of high HIV infection rates.
- In spite of the recent attention paid to these two variables, the cumulative interaction of male circumcision and sexual concurrency is yet to be empirically estimated.
- Research has found that traditional behavioral factors alone fail to explain Africa's heightened HIV prevalence.
- This presents a puzzle: Africa is the continent with the highest and most rapidly increasing HIV infection rates in the world, and yet exhibits the lowest rates of conventional HIV risk behavior.

HIV Prevalence by Regional MC (Lagged)

HIV Prevalence by Regional MCP (Lagged)
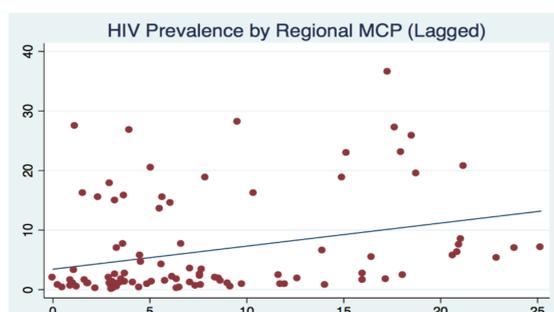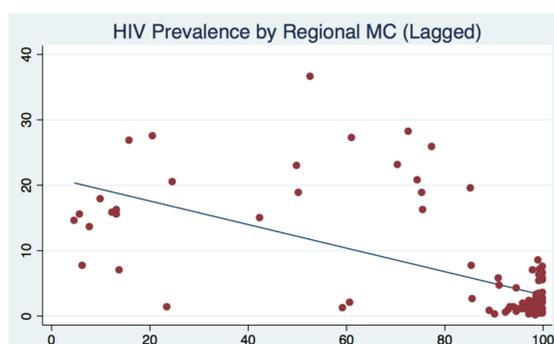
Methods

- Demographic & Health Surveys (DHS) with HIV biomarkers in 8 countries in Sub-Saharan Africa.
  - Countries selected to vary in rates of MC & MCP prevalence.
  - Availability of couples data recode.
  - Previous survey waves with risk factor (MC/MCP) indicators.
- Individual and regional level data used to model individual level HIV risk for men and women, adjusting for demographic & other risk factors.
- Individual-interaction term: Individuals were coded separately according to their joint prevalence of male circumcision and partner's concurrency.
- Regional-interaction term: Regions were coded according to their joint prevalence of male circumcision (below/above 80%) and past (from previous survey waves) sexual concurrency (below/above 5%).
- Varying-intercept model was run to assess couple and community-level risk for HIV infection.
- Gender-sensitive analysis in separate models for individual and regional effects.
- Sexual behavior controls: Age at first sex, number of wives, condom use at last intercourse.
- Demographic controls: Education, wealth, HIV testing & self-reported STIs.

Country	Prevalence (C.I.)	Tested Sample	# of regions	Year of Survey	Refusal Rate (%)	% Men Circumcised	% Extra-marital Partner
Liberia	1.5 (1.3-1.7)	11,733	6	2007	11.2	98.0	14.4
Mali	1.7 (1.5-1.9)	8,629	9	2006	12	97.6	11.1
Burkina Faso	1.8 (1.6- 2.2)	7,790	14	2003	5.4	88.5	14.1
Cameroon	5.5 (5.0-6.0)	10,682	12	2004	5.5	92.9	33.7
Kenya	6.8 (6.0-6.9)	6,360	8	2003	14	83.5	26.1
Malawi	11.7 (10.7-12.7)	5,357	11	2004	22.2	20.9	12.7
Zimbabwe	18.1 (16.9-19.3)	13,069	10	2005/6	15.2	10.3	15.3
Lesotho	23.2 (21.7-24.5)	5,364	10	2004	14.0	48.5	25.9

Results

- The mean HIV prevalence in high risk regions is 21.56% as compared to 1.35% in lowest risk regions.
- Men in a high risk relationship were 4.3 times more likely to have HIV than those in low risk relationships, adjusting for behavioral and demographic variables (p<0.05).
- Women in a high risk relationship were only marginally more likely to be HIV positive than those in low risk relationships, adjusting for behavioral and demographic variables (p<0.1).
- Men living in highest risk regions were 9.0 times more likely to be HIV-positive than those living in lowest regions, after adjusting for behavioral and demographic variables (p<0.01).
- Women living in highest risk regions were 3.7 times more likely to be HIV positive than those living in lowest risk regions, after adjusting for behavioral and demographic variables (p<0.05).

Mean HIV prevalence (%) by regional interaction term
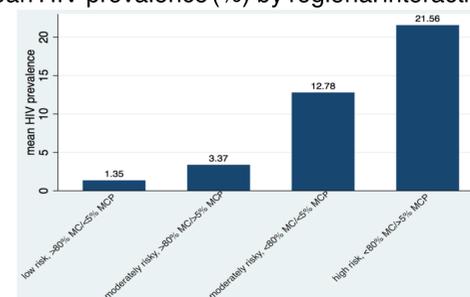
		Female	Male
Fully Adjusted Individual-Level Model	Low risk (MC & no MCP) (ref)	ref	ref
	Medium Risk (Uncircumcised or MCP)	1.342***	1.379***
		(1.085 - 1.659)	(1.118 - 1.702)
	High Risk (Uncircumcised + MCP)	1.600*	4.468**
		(0.919 - 2.788)	(1.276 - 15.64)
Regional-Level Interaction	Low risk (MC >80% & MCP <5%) (ref)	ref	ref
	Medium Risk (MC >80% & MCP >5%)	1.433	1.382
		(0.894 - 2.297)	(0.837 - 2.282)
	Medium Risk (MC <80% & MCP <5%)	3.802**	8.187***
		(1.364 - 10.60)	(3.150 - 21.28)
	High Risk (MC <80% & MCP >5%)	3.716**	8.968***
		(1.302 - 10.61)	(3.431 - 23.44)
Individual-Level Interaction	Low risk (MC & no MCP) (ref)	ref	ref
	Medium Risk (Uncircumcised or MCP)	1.292**	1.332***
		(1.045 - 1.598)	(1.081 - 1.642)
	High Risk (Uncircumcised +MCP)	1.657*	4.336**
		(0.960 - 2.861)	(1.247 - 15.07)

Discussion & Conclusion

- Interaction effects at both the individual and regional levels were significantly associated with higher risk, though less so for women.
- Male circumcision and multiple concurrent partnerships should not be addressed as separate interventions.
- While much funding and attention has been focused on scaling up male circumcision, in the absence of concerted efforts to reduce sexual concurrency, circumcision on its own may have a less-than-anticipated impact.
  - Once off interventions for circumcision should be provided alongside ongoing interventions for behavior change to reduce sexual concurrency.
- Findings support the need for population-wide interventions backed by government political commitments.
- Adopting an integrated approach to addressing male circumcision and sexual concurrency will be critical in achieving the Sustainable Development Goal Target 3.3: Ending the AIDS Epidemic by 2030.

Limitations

- The findings from this study are limited to generalized epidemic settings in which heterosexual intercourse is the primary mode of transmission.
- Due to limitations of DHS surveys, the couple's data recode was used to build the measure of sexual concurrency, which disregards data on individuals not in a co-habitating or same-sex relationship.
- The use of cross-sectional data limits our ability to assess causation, although we improve on the issue of temporality by using lagged regional measures.