Serosorting for conjugal relationship formation in heterosexual couples, South Africa

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Background

- HIV transmission occurring within married or cohabiting couples is a major factor driving the general HIV epidemics in sub-Sharan Africa.

- Conjugal relationships refer to relationships to regular partners including marital relationships, in which both partners belong to the same household, may have had children together and are socially recognized as partners.

- Serosorting is broadly defined as a person choosing a sexual partner known to be of the same HIV serostatus, often to engage in unprotected sex.[1] Studies have shown that serosorting can reduce the risk of HIV transmission both in stable and non-stable relationship among MSM.[1]

- Occurrence and role of serosorting in **heterosexual couples** are largely unknown in sub-Saharan Africa. Seroconcordant relationships with seropositive partners (i.e. positive serosorting) may improve health outcomes via increased intimacy and social support.

- We examined 1) whether positive serosorting occurred in heterosexual couples in a rural high HIV endemic setting and 2) whether such association differed by age.

Methods

Study Setting

- We used data from the population-based longitudinal demographic and HIV surveillance at the African Health Research institute (AHRI) in rural KwaZulu-Natal, South Africa. Since 2000, the AHRI has operated an open cohort to enroll and follow highly dynamic and migrating population of 87,000 individuals residing in the 438 km[2] area (Figure 1). The adult HIV prevalence in the study area was estimated as 27.8% in 2012.

- A household survey was administered to a key household informant to record any changes in household memberships and attributes related to household at every 4 months. All individuals living in the surveillance area were followed up at every 6 months, offered HIV testing and interviewed for demographic information and sexual behaviors.

Study population

- Resident and non-resident adults of all households under surveillance between January 2003 and December 2016 were included in the analysis if they were >15 years old, already HIV-positive or had a first negative HIV test result followed by at least another HIV test, and were not in conjugal relationship.
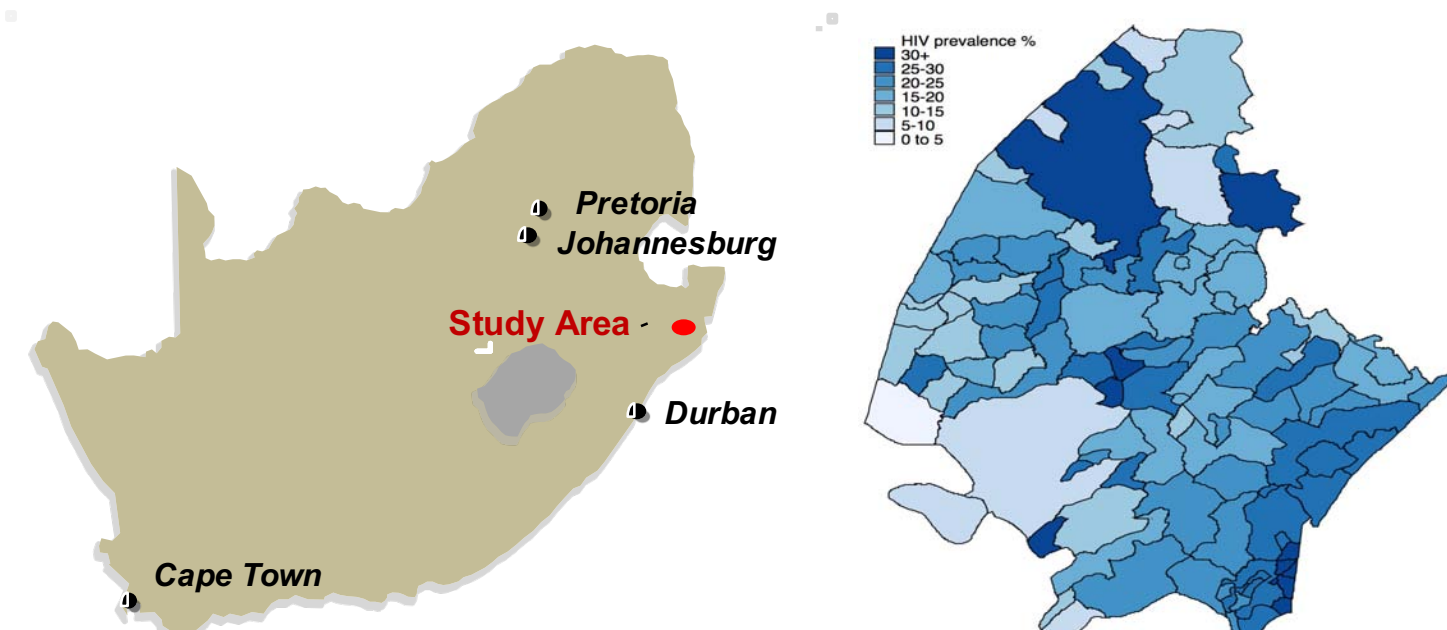

Figure 1. Location of the study area in South Africa (left) and HIV prevalence in the study area in 2011 (right)

Methods (cont'd)

- **The primary exposure** was each participant's HIV status. Participant's HIV status was ascertained as time-varying. For both participants and their partners who seroconverted during the study, the midpoint date between the last negative HIV test and first positive HIV test was used as a proxy for the date of HIV infection.

- **The primary outcome** was time to formation of conjugal relationship (CR) with a HIV-positive partner, where formation with a partner with negative or unknown HIV status was treated as competing risks. Conjugal relationships were ascertained only from female household member during household surveys. Partner's HIV status was ascertained as above. Partner's HIV status was considered as unknown if the partner's HIV test result was unavailable or unknown.

- Participants were censored on 1) the date of CR formation for those who had formed CR or 2) the last date of HIV-negative test if HIV-negative or the last visit date if HIV-positive for those who had not formed CR. Household asset, education, area of residence, condom use with a partner, and number of partners in the past 12 months were examined as time-varying covariates.

- Local area HIV prevalence and ART coverage of each individual were estimated using gaussian kernel weights of search radius 3km in each calendar year.[2]

- Competing-risks survival regression with age as the time scale was used. All analyses were conducted in STATA 13.0 and R.

Results

- Between January 2003 and December 2016, 35,114 individuals met the inclusion criteria and contributed 169,851 person year (PY) follow-up time. Of these, 21,669 (61.7%) women were matched with men (any HIV serostatus), and 13,2445 (38.3%) men with women with known serostatus.

- There were 24,512 (69.8%) HIV-negative and 10,602 (30.2%) HIV-positive individuals including 3,372 who seroconverted during the study.

Table 1. Baseline characteristics of study participants in the AHRI surveillance area, South Africa (2003-2015) (N=35,114)

Socioeconomic status (Household Asset)	
Poorest	3095 (13.1)
Poor	5319 (22.4)
Medium	5372 (22.6)
Rich	5044 (21.3)
Richest	4895 (20.6)
Education	
No formal education	3746 (11.0)
Primary (Grade 1-7)	8177 (23.9)
Secondary (Grade 8-12)	13376 (39.2)
Tertiary (>12)	8857 (25.9)
Area of residence	
Rural	21874 (64.0)
Peri-urban	10652 (31.1)
Urban	1661 (4.9)
Number of partners in past 12 months	
2+	1341 (5.7)
1	19655 (83.8)
0	2472 (10.5)
Condom use	
Always	4119 (17.6)
Sometimes	9803 (41.8)
Never	9514 (40.6)

Results (cont'd)

- We observed overall 646 (3.8/1000 PY) new CR formation (Table 2).

Table 2. Formation of conjugal relationships by participants' HIV Status

Partner's HIV Status*	Overall (N=35,114)			HIV-negative (N=24,512)			HIV-positive (N=10,602)		
	Formation No.	PY	Incidence Rate/100 PY	Formation No.	PY	Incidence Rate/100 PY	Formation No.	PY	Incidence Rate/100 PY
Negative	193		0.117	152		0.126	41		0.084
Positive	68	169851	0.040	28	120784	**0.023**	40	49067	**0.082**
Unknown	385		0.227	217		0.180	168		0.342

- HIV-positive individuals had **2.08 (95% CI: 1.24-3.50)** times higher risk of CR formation with HIV-positive partners than HIV-negative individuals did (p=0.008) and the association remained significant after adjusting for other covariates **(Adjusted Hazard Ratio (AHR)=2.52, 95% CI: 1.43-4.45)** (Table 3). The average median age at the time of CR formation was 27 (IQR:21-36), and the time to CR formation since HIV diagnosis among HIV-positive individuals was 2.6 (±2.6) years.

- When the model was fitted by age <30 vs. age 30+, the association became only significant among those aged 30+ (Table 3, Model 4).

Table 3. Association between participants' HIV status and positive serosorting

Characteristic	Univariate Model 1: Overall	Multivariate† Model 2: Overall	Model 3: Age < 30	Model 4: Age 30+
	HR (95% CI)	AHR (95% CI)	AHR (95% CI)	AHR (95% CI)
HIV status				
Positive	2.08 (1.24-3.50)**	2.52 (1.43-4.45)**	1.57 (0.61 - 4.00)	3.95 (1.61-9.67)**
Negative	Ref	Ref		
HIV prevalence of the opposite sex		0.97 (0.95-1.00)	0.95 (0.88-1.03)	0.98 (0.94-1.02)
Local area ART coverage (per 10% increase)		0.92 (0.73-1.16)	0.72 (0.52-1.00)*	1.05 (0.74-1.49)
Local area HIV prevalence (per 10% increase)		1.18 (0.67-2.08)	1.11 (0.48-2.61)	1.61 (0.66-3.95)
Sex: Male (vs. Female)		2.51 (1.39-4.53)**	3.00 (0.44-20.58)	2.32 (1.17-4.60)**
Socioeconomic status (Household Asset)				
Poorest	4.25 (1.43-12.61)**	3.00 (0.65-13.86)**		4.13 (0.77-22.28)
Poor	2.15 (0.68-6.75)	1.52 (0.30-7.61)		1.76 (0.27-11.37)
Medium	1.57 (0.51-4.82)	0.56 (0.09 - 3.57)		2.67 (0.51-13.89)
Rich	0.63 (0.17-2.35)	0.53 (0.09 - 3.13)		0.70 (0.09-5.35)
Richest				
Education				
No formal education	1.86 (0.68-5.12)	N/A		3.09 (1.00-9.59)
Primary (1-7)	1.36 (0.60-3.06)	0.74 (0.09-5.82)		2.30 (0.82-6.41)
Secondary (8-12)	1.19 (0.63-2.25)	1.20 (0.48-3.05)		1.15 (0.42-3.16)
Tertiary (>12)	Ref			
Area of residence				
Peri-urban	1.66 (0.85-3.24)	3.36 (1.14-9.97)*		1.04 (0.39-2.78)
Urban	1.98 (0.54-7.26)	4.44 (0.83-22.75)		1.10 (0.11-10.69)
Rural	Ref			
Condom use with a partner				
Never	1.67 (0.68-4.07)	0.73 (0.17-3.14)		5.89 (0.85-40.97)
Sometimes	1.53 (0.63-3.73)	1.21 (0.42-3.50)		3.93 (0.53-29.16)
Always	Ref			
Number of partners in the past 12 months				
+2	1.45 (0.59-3.53)	N/A		1.64 (0.51-5.27)
1	Ref	Ref		Ref
0	0.44 (0.15-1.32)			0.49 (0.16-1.48)

*p-value < 0.05 **p-value < 0.01 †Adjusted for all other variables shown in the model

Discussion

- We found that HIV-positive individuals were more likely to form stable conjugal relationships with HIV-positive partners in heterosexual couples, especially among older adults (aged 30+). Such associations remained significant after adjusting for HIV prevalence of opposite sex and HIV prevalence and ART coverage in the local area.

- In this community, conjugal relationships are more commonly formed and accepted as social norm. Partners often negatively react to someone's disclosure of HIV status. Having positive seroconcordant partners can reduce the stress of having or feeling disserted after disclosing HIV status to partners. HIV-positive older adults may seek and experience more social support and intimacy from partners living with HIV.[3]

- Young adults might be more vulnerable to HIV-associated stigma and reluctant to disclose their HIV serostatus when initiating new relationships.

- This is one of the first studies to show positive serosorting behavior in heterosexual couples based on the population-based surveillance data in high HIV endemic area.

- Our study supports that we need to promote importance of safe sex and provide education and support to disclose HIV status with sexual partners especially among young adults in stable conjugal relationships.

- Further studies are needed whether positive serosorting is linked to increased knowledge for HIV, access to ART care and better long-term health outcomes.

Reference

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