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One in Four HIV-Positive South Africans Awaiting ART Initiation Report Condomless Sex with a Serodiscordant Partner

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To the Editors

As a result of concerted public health efforts, over two million HIV-positive South Africans are now receiving antiretroviral therapy (ART).¹ Despite this achievement, a proportion of South Africans who test HIV-positive and are successfully linked to care are not promptly initiated on ART, due to structural factors such as CD4 cell count-based treatment guidelines,² insufficient clinic staffing and resources,^{3,4} and requirements to complete protracted HIV literacy training prior to commencing treatment;^{5,6} as well as social factors such as treatment refusal,⁷ which may stem from underlying feelings of wellness^{8,9} or depression.¹⁰ Patients falling into this treatment gap are unable to capitalize on the primary and secondary prevention benefits associated with ART's rapid viral suppression,^{11–15} and continued sexual risk behavior among this subgroup thus poses considerable individual and public health consequences for the South African HIV epidemic.

Although a small number of recent investigations have examined patterns of sexual behavior among people living with HIV (PLWH) in South Africa who are linked to care but untreated,^{16–19} very little is known about the extent to which behaviors with the potential for HIV transmission are prevalent in this group, and the factors that underlie such high risk acts. The goals of the present study were to 1) assess the prevalence of serodiscordant

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condomless sex (i.e., involving HIV-negative and status unknown partners) among tested-but-not-treated South African PLWH; 2) quantify the transmission-related consequences of this behavior by identifying the number of serodiscordant partners exposed to HIV; and 3) identify possible drivers of risk.

At four public healthcare facilities in two South African districts burdened by very high HIV prevalence - uMgungundlovu and uMkhanyakude, KwaZulu-Natal²⁰ - HIV-positive patients who were tested, linked to care, and awaiting ART initiation were approached during routine clinical care visits (e.g., when obtaining isoniazid preventive therapy, CD4 test results, etc.) to take part in a prevention-with-positives intervention pilot. This pilot, which commenced in 2011 and focused only on tested-but-not-treated PLWH, was funded as a supplement²¹ to a larger randomized controlled trial that involved South African PLWH who had already been initiated on ART.²² Individuals were deemed as eligible for the intervention pilot if they were 1) 18 years of age or older; 2) HIV-positive; 3) linked to care at one of the four sites; and 4) not yet eligible for ART based on the national treatment guidelines at the time (i.e., CD4 cell count >250 (or >350 if pregnant)).²³

Participating PLWH completed an isiZulu or English touchscreen-based audio computer-assisted self-interview (ACASI) that assessed vaginal and anal sex during the past 4 weeks, and potential correlates of risk including demographics, comorbidities (e.g., alcohol use,²⁴ perceived physical and mental health,²⁵ and depression²⁶), information-motivation-behavioral skills (IMB) model constructs, and other behavioral factors (e.g., HIV-related stigma, perceived power to use/negotiate condoms) (see^{22,27,28} for details). For IMB constructs, “information” items assessed HIV prevention-related knowledge; “motivation” items identified condom-related attitudes and supportive norms for condom use; and “behavioral skills” items queried perceived skills and efficacy regarding the performance of HIV-preventive acts.²⁷ CD4 cell counts and relevant clinical factors were extracted from medical charts. Univariable logistic regression identified correlates of engaging in serodiscordant condomless sex during the past four weeks. Factors demonstrating univariable associations significant at $p < .10$, as well as participant gender, were included in a multivariable logistic regression model to identify independent predictors of serodiscordant condomless sex. Study procedures were approved by institutional review boards at the University of Connecticut (USA), University of KwaZulu-Natal (South Africa), and Centre for Addiction and Mental Health (Canada).

A total of 410 HIV+ patients (290f, 120m) completed the ACASI. Because our measure queried sexual behaviour over the past four weeks, we focused on the 276 patients (203f, 73m; 67.3%) who had been diagnosed with HIV for at least 28 days in order to specifically identify serodiscordant condomless sex that had occurred subsequent to HIV diagnosis. Data were excluded from eight participants (7f, 1m; 2.9%) due to non-responses to sexual behavior questions, and from two participants (1f, 1m; 0.7%) due to apparent touchscreen issues. Final analyses were based on a sample of 266 (195f, 71m).

Participants' mean age was 31.3 (SD=8.4), the vast majority (n=250, 94.0%) identified as “Black-Zulu,” most were unemployed (n=176, 66.2%) and lived in a rural area (n=170, 63.9%), and a third (n=89, 33.7%) lived with a sex partner. Mean number of days since HIV

diagnosis was 97.9 (SD=54.7) and mean CD4 cell count was 516.6 (SD=229.8). Only 9.6% of participants (n=25) had commenced clinic-based HIV literacy training required for ART initiation, and none had initiated treatment. Self-reported comorbidities included hazardous alcohol consumption (AUDIT²⁴ 8 men, 6 women) and depressive symptomatology (CESD 15²⁶); identified among 14.3% (n=36) and 22.3% (n=55) of the sample, respectively.

One hundred eighty-two participants (n=182/266 (68.4%); n=129/195f (66.2%), n=53/71m (74.6%)) reported engaging in 766 sexual acts with 201 partners during the past four weeks. Approximately two in five participants (n=101/266 (38.0%); n=65/195f (33.3%), n=36/71m (50.7%)) indicated that they had condomless sex during that timeframe, and this subsample reported 371 condomless acts with 107 partners. Serodiscordant condomless sex was indicated by one in four participants (n=66/266 (24.8%); n=46/195f (23.6%), n=20/71m (28.2%)) who reported a total of 207 condomless acts with 66 serodiscordant partners during the four week period.

As shown in Table 1, univariable logistic regression demonstrated that serodiscordant condomless sex was significantly associated with poorer HIV prevention-related knowledge, negative condom-related attitudes, poorer supportive norms for condom use, poorer perceived condom use skills, lower perceived power to negotiate condom use, and greater likelihood of hazardous alcohol consumption. Factors found to be independently associated with serodiscordant condomless sex as demonstrated by multivariable logistic regression included poorer supportive norms for condom use, lower perceived power to negotiate condom use, and greater likelihood of hazardous alcohol consumption.

Findings provide a compelling justification for an immediate test-and-treat approach to be implemented in South African clinical care settings. This approach is consistent with mathematical models demonstrating that the elimination of HIV in South Africa can be achieved through universal testing together with immediate ART initiation.¹⁴ Although several logistic, economic, and psychosocial challenges are inherent in this approach,^{8,29} given the number of serodiscordant partners identified in our study as being potentially exposed to HIV, and recognizing that our untreated PLWH participants were linked to clinical care, our results suggest that not offering immediate ART upon diagnosis entails a missed opportunity for reducing incident HIV in South Africa.

Findings also suggest the imperative to deliver behavioral prevention efforts at the time of HIV diagnosis if an immediate test-and-treat approach is unfeasible (i.e., in resource-constrained settings). For example, as hazardous alcohol consumption was associated with a greater than three-fold increase in the likelihood of serodiscordant condomless sex, the implementation of alcohol screening and brief interventions could help reduce both alcohol use and engagement in high-risk sex.^{30,31} Similarly, evidence-based behavioral interventions that establish normative support for condoms and provide skills that empower safer sex negotiation could further help curtail HIV transmission.²²

Study limitations include a cross-sectional design, a sample size that precluded separate multivariable modelling for female and male PLWH, and the employment of self-report

measures to assess sexual behavior and perceived partner serostatus. Additionally, given that this research was conducted in high HIV prevalence regions, it is possible that some of the sexual partners who were reported as being of unknown HIV status may in fact have been HIV-positive, thus potentially resulting in an elevated estimate of the number of individuals potentially exposed to HIV. Finally, as our patients were shown to have relatively high CD4 cell counts, our sample may not be fully reflective of PLWH awaiting treatment in other South African clinical care settings.

Nevertheless, the present investigation is the first to quantify HIV exposure associated with sexual behavior among tested-but-not-treated South African PLWH, and it provides much needed insight into the underpinnings of serodiscordant condomless sex occurring among this population. At this crucial time when an increasing number of South Africans are testing for HIV and entering care, instituting immediate test-and-treat when feasible, and providing behavioral prevention efforts to “fill” remaining treatment gaps, will be especially advantageous for reducing onward transmission of HIV.

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Table 1

Factors Associated with Serodiscordant Condomless Sex During the Past 4 Weeks: Univariable and Multivariable Logistic Regression.

Factor	Engaged in Serodiscordant Condomless Sex – Past 4 weeks		OR (95% CI)	p	AOR (95% CI)	p
	No (n=200) n (%)	Yes (n=66) n (%)				
Gender = Male	51 (25.5%)	20 (30.3%)	1.27 (0.69–1.27)	.445	0.52 (0.22–1.21)	.130
HIV prevention-related knowledge (M, SD) [*]	7.16 (2.11)	6.39 (2.46)	0.86 (0.76–0.97)	.017	0.88 (0.77–1.02)	.080
Condom-related attitudes (M, SD) [‡]	3.69 (0.90)	3.24 (0.91)	0.60 (0.44–0.81)	.001	0.86 (0.58–1.27)	.441
Supportive norms for condom use (M, SD) [‡]	3.32 (0.63)	2.96 (0.68)	0.45 (0.29–0.69)	<.001	0.58 (0.35–0.97)	.039
Condom-related behavioural skills (M, SD) [‡]	3.43 (1.06)	2.99 (0.93)	0.68 (0.52–0.89)	.004	0.87 (0.61–1.23)	.424
Perceived power to use/negotiate condoms (M, SD) [‡]	3.67 (0.73)	3.18 (0.66)	0.39 (0.26–0.59)	<.001	0.43 (0.25–0.75)	.003
Hazardous alcohol consumption (AUDIT 8 men, 6 women)	21 (11.1%)	15 (23.8%)	2.50 (1.20–5.22)	.015	3.65 (1.43–9.35)	.007

Note: Percentages are based on the number of participants who indicated a specific response divided by the number of participants who responded to the item in question.

^{*} Possible scale range=0–11;

[‡] Possible scale range=1–5