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## Sexual behavior and HIV risk across the life course in rural South Africa: trends and comparisons

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### ABSTRACT

There is limited information about sexual behavior among older Africans, which is problematic given high HIV rates among older adults. We use a population-based survey among people aged 15–80+ to examine the prevalence of sexual risk and protective behaviors in the context of a severe HIV epidemic. We focus on variation across the life course, gender and HIV serostatus to compare the similarities and differences of young, middle aged, and older adults. Younger adults continue to be at risk of HIV, with potential partners being more likely to have been diagnosed with an STI and more likely to have HIV, partner change is high, and condom use is low. Middle aged and older adults engage in sexual behavior that makes them vulnerable at older ages, including extramarital sex, low condom use, and cross-generational sex with people in age groups with the highest rates of HIV. We find insignificant differences between HIV positive and negative adults' reports of recent sexual activity. This study provides new information on sexual behavior and HIV risk across the life course in rural South Africa to inform HIV prevention and treatment programming.

### ARTICLE HISTORY

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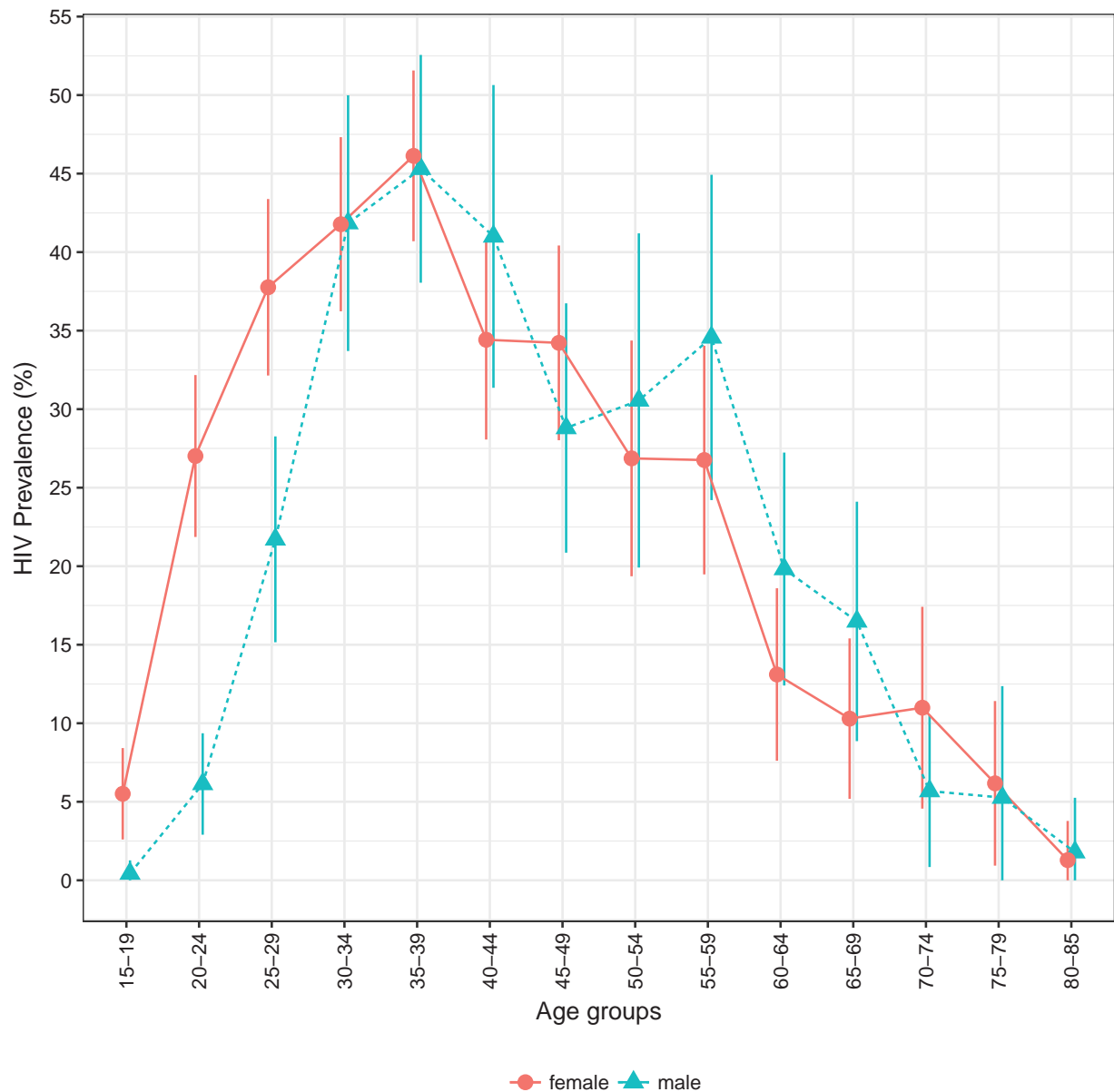
### KEYWORDS

Sexual behavior; life course;  
South Africa; HIV/AIDS

## Introduction

Little is known about the sexual behavior of older Africans. Many surveys with sexual behavior information were designed primarily to elicit information on fertility and reproductive behavior, which end at age 49 and 55 (or 59) for women and men, respectively (Mutevedzi & Newell, 2011; UNAIDS, 2013). In the context of the HIV epidemic, a population-based survey in 2010–11 in rural South Africa, on which this current study is based, highlighted the importance of also including older adults in surveys of sexual behavior (Gómez-Olivé et al., 2013). While HIV rates were very high among youth and middle-aged adults, they remained high among older adults (Figure 1). The recent rollout of antiretroviral therapy (ART) in this setting (Houle et al., 2014; Mee et al., 2014) suggests that these data cannot represent only survival and aging of HIV positive youth into their middle and older ages, but rather new infections (Gómez-Olivé et al., 2013, 2014; Mojola, Williams, Angotti, & Gómez-Olivé, 2015).

South Africa bears the world's most significant HIV burden (over 7 million people living with HIV), has the largest ART program, and has a rapidly increasing proportion of older people in the population relative to other African countries (Hosegood & Timaeus, 2006; UNAIDS, 2013, 2016; World Health Organisation, 2014). The wide-scale rollout of ART and concomitant gains in life expectancy has increased the number of older adults living with HIV. As the HIV epidemic shifts to older ages, understanding older adults' sexual behavior is needed as a basis for establishing HIV prevention and treatment programs targeted at this otherwise overlooked population. In addition, comparing the sexual behaviors of older adults to those of younger adults would help inform prevention programming to specifically target adults at different stages of the life course. Our findings complement and extend previous studies focused on specific age groups (e.g., Freeman & Anglewicz, 2012; Pettifor et al., 2005 for adolescents; Rosenberg et al., 2017 for older adults) by including an expanded array of sexual behaviors and



**Figure 1.** HIV prevalence (and 95% confidence intervals) in rural South Africa, 2010–2011, by sex and age.

including young, middle aged and older adults, thereby enabling direct comparison across age groups. To our knowledge, this study is among the first to examine variation in sexual risk and protective behaviors across the life course (15–80+) in a rural African population.

Sources of sexual risk and protection are influenced by social context and vary by gender, serostatus and across the life course (Mojola et al., 2015). In South Africa, former apartheid homeland areas such as Agincourt have been heavily impacted by the HIV epidemic (Kahn et al., 2012). High HIV prevalence in these areas has been linked to apartheid-era labor policies that forcibly separated families, thereby enabling concurrent and commercial sex partnerships between male migrants and the few women living near all male hostels and mining

towns (Hunter, 2010; Lurie et al., 2003). Male labor migration has continued post-apartheid; 60% of men in Agincourt continue to migrate for work (Clark, Collinson, Kahn, Drullinger, & Tollman, 2007). Continued labor-related migration, alongside diminishing labor market opportunities has likely influenced HIV vulnerability in Agincourt: High rates of separation at younger ages may lead to heightened vulnerability to HIV, as do reunions, when separated couples resume regular shared residences and sexual activity at later ages (Mojola et al., 2015).

HIV prevention programming in South Africa has targeted young adults, which may explain, in part, their higher proclivity for condom use compared to middle age and older adults (Negin, Mills, & Bärnighausen, 2012; Pettifor et al., 2005). Older adults may instead

utilize different kinds of protective sexual behavior, such as divorce of HIV positive partners (Reniers, 2008; Schatz, 2005; Watkins, 2004) or refusing sex with partners whom they suspect of having extramarital affairs (Mojola et al., 2015). There is substantial HIV vulnerability within middle aged and older adults' long-term relationships (Floyd et al., 2008; Reniers, 2008; Zaba et al., 2008): many change partners due to divorce, death, or urban-rural migration (Shelley Clark & Brauner-Otto, 2015; Schatz & Knight, 2017). These population dynamics are likely to be more acute in Agincourt, where AIDS-related mortality (especially among adults in their 50s) (Kabudula et al., 2017), relationship instability (Schatz & Knight, 2017), and labor-related migration (Collinson, 2010) has been especially high.

We use a population-based survey conducted in rural South Africa among people aged 15–80+ years to examine the prevalence of sexual risk and protective behaviors in the context of a severe HIV epidemic. We focus on gender and HIV serostatus differences, and variation across age groups.

## Methods

### Setting and data

Our study draws on data from the Agincourt Health and Socio-Demographic Surveillance Site (HDSS) in northeast South Africa, which covered a sub-district of 27 villages at the time of the study. It is a low-rainfall

setting with limited subsistence farming and employment options. As a former apartheid homeland, it remains burdened with the legacy of policies of differential development, which created poor communities with weak health services (see Kahn et al., 2012 for detailed description of the Agincourt HDSS). Since 1992, the Agincourt HDSS has conducted an annual update of the population that includes deaths, births, migrations, as well as sociodemographic information.

We use data from a cross-sectional, population-based survey conducted in 2010–2011 on an age-sex stratified random sample of men and women ages 15 and above resident in the Agincourt HDSS in 2009 (including an over-sample of adults ages 50+ from a prior study on older people; data extracted on 19 October 2011). Of the 7662 randomly sampled participants, 7287 were eligible, 4765 consented to the interview, and 4362 also consented to HIV testing. A trained field team visited sampled participants up to three times, with each in-home interview lasting about 45 min. In addition to collecting information on sexual behavior and chronic disease risk factors, the study included biomarker data collection for HIV (see Gómez-Olivé et al., 2013 for detailed description of the survey procedures). We focus on lifetime sexual behavior survey questions, and those that specified sexual behavior with partners in the past 24 months. Table 1 outlines the included measures. The study received ethical approval from the University of the Witwatersrand Human Research Ethics Committee and the Mpumalanga Provincial Research and Ethics Committee.

**Table 1.** Survey measures of sexual behaviors used in this study.

Measure	Time period	Question
Age at first sex	Retrospective lifetime	"How old were you the very first time you had sex?"
Circumcision	Retrospective lifetime	For male respondents, "Has your fore skin been removed (i.e., circumcision)?"
Recent sex	Past 24 months	"During the last 24 months how many sexual partners have you had?" Coding: Yes if the respondent reported any sexual partners.
Type of partner	Past 24 months	"How would you categorize this partner?" for the most recent partner. Coding: regular: someone the respondent reported as being special to them, such as a husband/ wife/ boyfriend/ girlfriend; or casual/ anonymous: someone the respondent either knew but wasn't their main partner, or someone the respondent didn't know the day before having sex.
Extramarital partnership	Past 24 months	If married respondents <sup>a</sup> indicated having sex with a casual/ anonymous partner or reported their relationship to the partner as boyfriend/girlfriend for any partner in the past 24 months using the questions "How would you categorize this partner?" and "What is your relationship with this partner?"
Suspicion of extramarital partnership	Past 24 months	Whether they thought their most recent partner in the past 24 months had an affair using the question "Has your partner ever had sex with someone else during your relationship with him/her?"
Condom use at last sex	Past 24 months	If they reported using a condom the last time they had sex with their most recent partner using the question "Did you use a condom the last time you had sex with this partner?"
STI diagnosis (other than HIV)	Retrospective lifetime	If the respondent reported ever being diagnosed with or treated for a sexually transmitted infection using the questions "Have you been diagnosed with, or have you been treated for a sexually transmitted disease such as trichomonas, gonorrhea or chlamydia, 'drop' (local name for these infections) or any abnormal vaginal or penile discharge that was treated with medicine (chlamydia, gonorrhea, or trichomonas)?", "Have you been diagnosed with, or have you been treated for a sexually transmitted disease such as genital herpes?", "Have you been diagnosed with, or have you been treated for a sexually transmitted disease such as syphilis?", "Have you been diagnosed with, or have you been treated for a sexually transmitted disease such as chancroid?", "Have you been diagnosed with, or have you been treated for a sexually transmitted disease such as pelvic inflammatory disease?"
Union status	2009	Agincourt HDSS census update

<sup>a</sup>See Current Union Status.

## Analysis

We compare prevalence of reported behaviors by age group, gender, and HIV status. We categorize age to capture differences across the life course and ensure sufficient numbers in each cell, using categories of: 15–24, 25–39, 40–59, and 60 years and above. We use probability weights to derive representative, population-level statistics, including means, medians, and proportions, and 95% confidence intervals. We test for significant prevalence differences by sex within age groups, and significant differences by HIV-status within sex-age groups using *t*-tests incorporating probability weights.

## Results

Table 2 presents age and gender demographics of the respondents, and prevalence of sexual behaviors overall and by gender.

### Sexual debut

The reported age at first sex has declined for both men and women; men and women 60 and over on average reported first sex at age 20. Among women, the median age at first sex was 18 for those aged 40–59 and 17 for those aged 25–39 and 15–24. Among men, the median

age at first sex was slightly earlier than women, with a median of 19 for ages 40–59, 18 for ages 25–39, and 16 for ages 15–24.

### Circumcision

Approximately one-quarter of men reported being circumcised (Table 2; Figure 2(a)). HIV-negative men had significantly higher prevalence of being circumcised compared to HIV-positive men within all but those 60 and over (15–24 ( $t = 2.57$ ;  $p = 0.01$ ), 25–39 ( $t = 3.21$ ;  $p = 0.001$ ), and 40–59 ( $t = 2.79$ ;  $p = 0.005$ )) (Figure 3(a)).

### Recent sex (in past 24 months)

There were small differences in reports of recent sex between men and women at ages 15–24 ( $t = 2.17$ ;  $p = 0.03$ ) and 25–39 ( $t = -0.75$ ;  $p = 0.45$ ). Widening gender differences emerged after age 40 (Figure 2(b)). At ages 40–59 women reported a significantly lower prevalence of sexual activity (73%) compared to men (88%) ( $t = -6.56$ ;  $p < 0.001$ ). At ages 60 and over 18% of women reported having had sex in the past 2 years compared to 73% of same aged men ( $t = -20.54$ ;  $p < 0.001$ ). There was little variation in the sex-age pattern of sexual activity in the past two years by HIV status (Figure 3(b)).

### Type of partner

#### Unions

Table 3 shows reports of current union status by age and sex. Among women, 40% reported never having been in a union. Union status varied across the life course, with 88% of those ages 15–24 reporting that they had never been in a union, 38% at ages 25–39, 10% at ages 40–59, and 5% at ages 60+. Being in a formal union currently was most common for women at ages 25–39 (32%) and 40–59 (46%), while being widowed was most common at ages 40–59 (21%) and ages 60+ (59%). Compared to women, a greater proportion of men had never been in a union (62%); 20% of men were in a formal union and 3% widowed. Ninety-six percent of men ages 15–24 were not in a union. For men, being in a formal union occurred at later life stages compared to women, with 50% of men ages 40–59 and 63% of men ages 60+ in a formal union. For men, being widowed was most common at ages 60+ (14%), a much lower proportion than for women ages 60+.

#### Casual partners

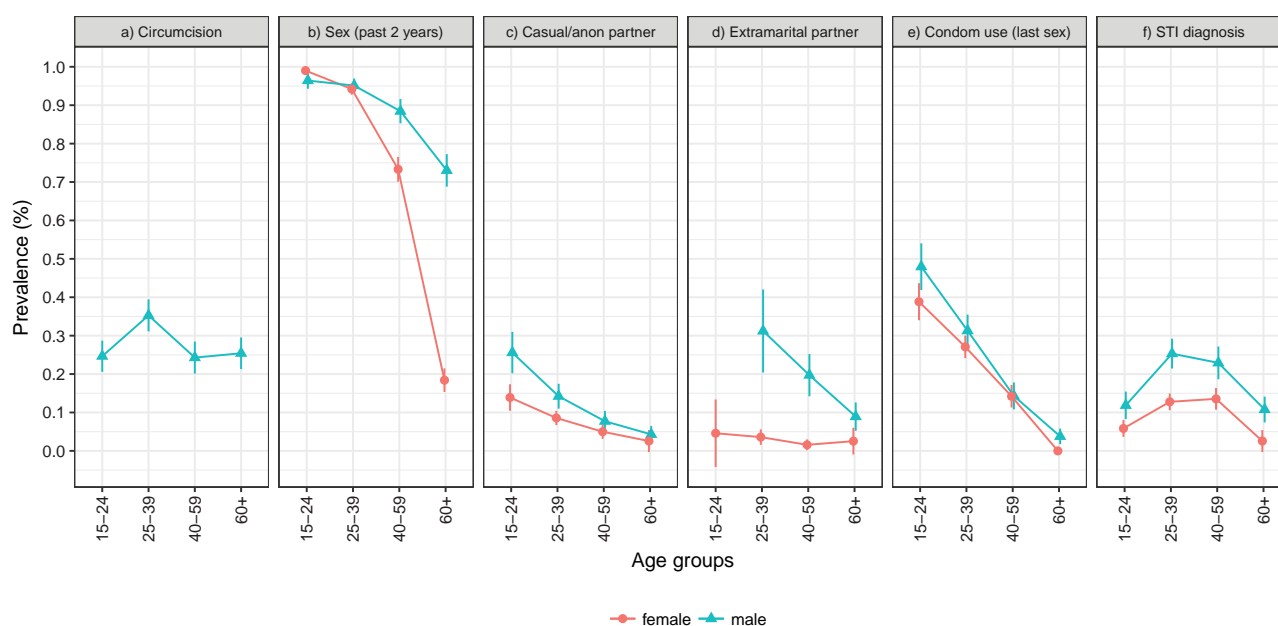
While most respondents reported regular partners (Table 2), overall, men had higher proportions of casual/anonymous partners compared to women. The

**Table 2.** Sociodemographic characteristics and sexual behaviors, by sex, in rural South Africa, 2010–2011.

Variable	Female <i>N</i> = 2872		Male <i>N</i> = 1893		Total <i>n</i> = 4765	
	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%
Age, yrs						
15–24	540	36	470	63	1010	45
25–39	978	25	556	14	1534	21
40–59	752	23	422	11	1174	19
60+	602	17	445	12	1047	15
Age at first sex, yrs, median	2771	18	1717	17	4488	18
Circumcision						
No	–	–	1359	74	–	–
Yes	–	–	530	26	–	–
Recent sex (past 24 mos)						
No	744	23	203	9	947	19
Yes	2027	77	1514	91	3541	81
Most recent partner status <sup>a</sup>						
Regular	1862	90	1331	82	3192	88
Casual/anon	165	10	184	18	349	12
Non-marital partner, any past 24 mos <sup>a</sup>						
No	1204	50	723	29	1927	43
Yes	823	50	791	71	1614	57
Condom use, most recent partner <sup>a</sup>						
No	1545	73	1150	66	2695	70
Yes	482	27	364	34	846	30
STI diagnosis, lifetime						
No	1799	90	1212	84	3011	88
Yes	228	10	302	16	530	12

Percentages include sampling weights and may not sum to 100% due to rounding. Totals do not equal final sample due to missing values.

<sup>a</sup>Among respondents who reported at least 1 sexual partner in the past 24 months ( $n = 3541$ ).



**Figure 2.** Prevalence of sexual behaviors (and 95% confidence intervals), by respondent sex and age. For extramarital partnerships, prevalence estimates include any casual, anonymous, or girlfriend/boyfriend partners reported in the past 2 years among married respondents (some estimates omitted due to small sample sizes).

prevalence of reporting the most recent partner in the past 24 months as casual or anonymous, as opposed to regular, was highest amongst those ages 15–24 for both men and women (Figure 2(c)). Men reported a higher prevalence of casual/anonymous recent partners than women at ages 15–24 and 25–39, with one quarter of men ages 15–24 reporting a casual/anonymous partner compared to 14% of equivalent aged women ( $t = 3.59$ ;  $p < 0.001$ ). HIV positive women were more likely to have had a recent casual/anonymous partner at ages 25–39 and 40–59 compared to HIV negative women (Figure 3(c)) ( $p < 0.001$  for both ages 25–39 ( $t = -3.93$ ) and 40–59 ( $t = -3.56$ )). HIV negative men reported a higher prevalence of casual/anonymous partners at ages 15–24 compared to HIV positive men ( $t = 2.22$ ;  $p = 0.026$ ).

**Table 3.** Union status in rural South Africa, 2010, by sex and age.

	15–24 (%)	25–39 (%)	40–59 (%)	60+ (%)	Total (%)
<b>Women</b>	( <i>n</i> = 443)	( <i>n</i> = 973)	( <i>n</i> = 752)	( <i>n</i> = 601)	( <i>n</i> = 2769)
Never in union	88	38	10	5	40
Informal union	7	18	8	4	10
Formal union	4	32	46	20	25
Separated/ divorced	1	7	14	12	8
Widowed	0	5	21	59	18
<b>Men</b>	( <i>n</i> = 307)	( <i>n</i> = 544)	( <i>n</i> = 419)	( <i>n</i> = 445)	( <i>n</i> = 1715)
Never in union	96	54	18	6	62
Informal union	3	20	13	9	9
Formal union	0	12	50	63	20
Separated/ divorced	1	13	16	9	7
Widowed	0	1	3	14	3

Based on data from the 2009 Agincourt HDSS. Percentages include sampling weights and may not sum to 100% due to rounding. Totals do not equal final sample due to missing values.

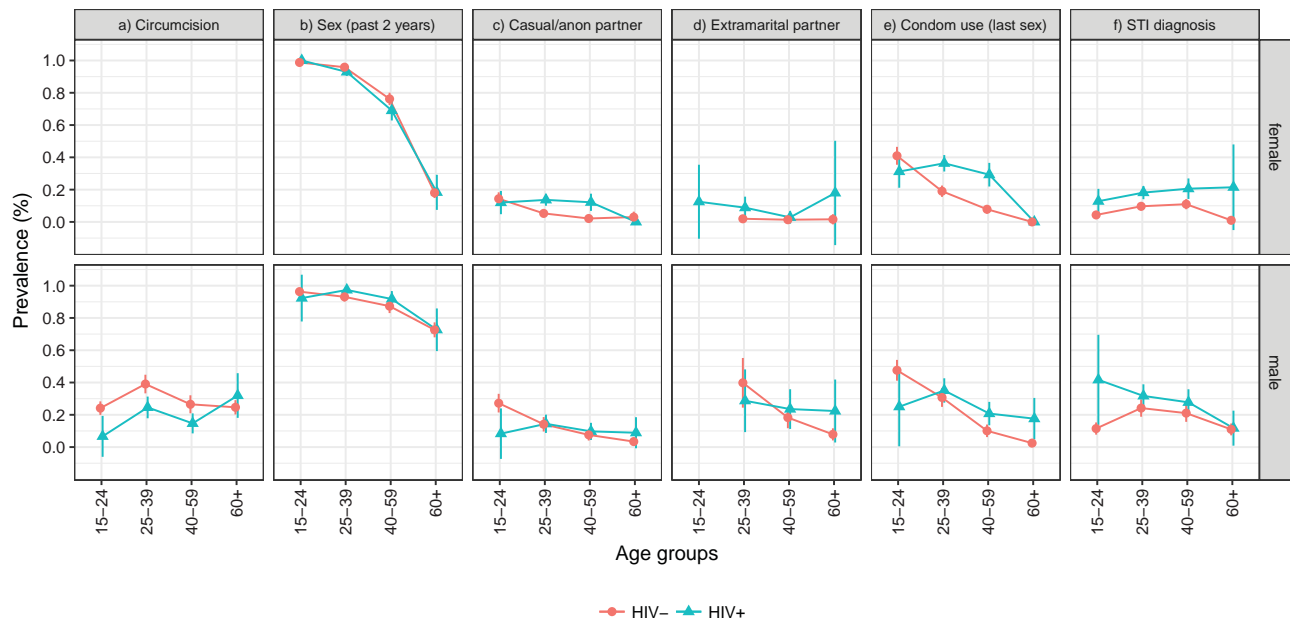
### Partner age differences

Figure 4 shows the summed proportion of differences in the most recent partner age (regardless of partner type) across respondent age for men and women. For women, about 80% of their partners were older across any age group. Further parsing by HIV status showed a greater proportion of partners younger than 11+ years for HIV positive women aged 60+ (10%), compared to age equivalent HIV negative women (1%). Men showed a markedly different pattern, with approximately 80% of their partners being younger across any age group. The proportion of partners younger by 11+ years was higher among older men. Further parsing by HIV status showed, similar to women, a greater proportion of HIV positive men have partners younger by 11+ years compared to proportions for HIV negative men (at ages 60+, 46% for HIV positive men vs. 34% for HIV negative men).

### Extramarital partnership

There were few gender differences in reports of recent (past 24 mths) extramarital sexual partnerships at older ages (Figure 2(d); see Figure 3(d) for prevalence by HIV status). Respondents were also asked if they suspected their most recent partner had had an affair. About 36% of 15–24-year-old women responded affirmatively compared to 28% of men ( $t = 1.91$ ;  $p = 0.056$ ). Gender gaps were wider at older ages, with 23% of men and 52% of women aged 25–39 ( $t = 9.91$ ;





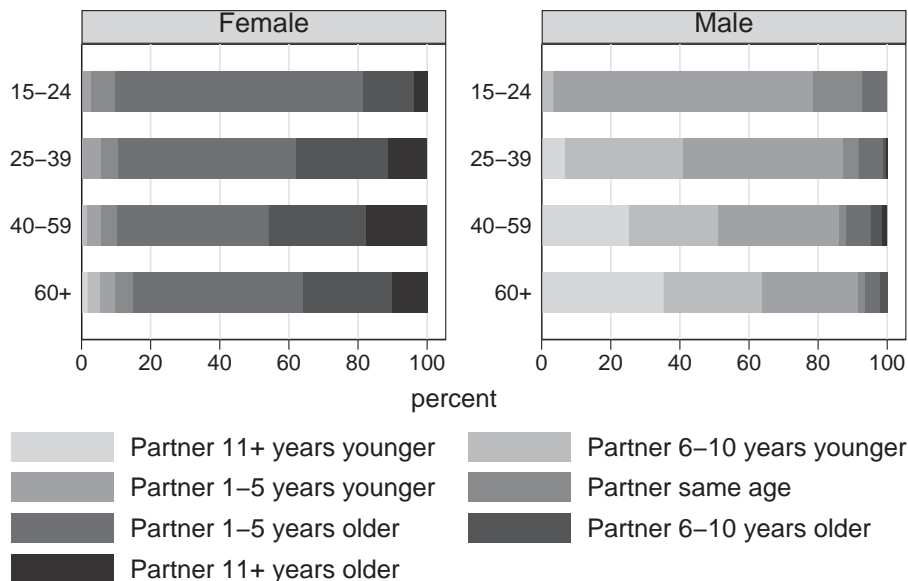
**Figure 3.** Prevalence of sexual behaviors (and 95% confidence intervals), by respondent sex, age and HIV status. For extramarital partnerships, prevalence estimates include any casual, anonymous, or girlfriend/boyfriend partners reported in the past 2 years among married respondents (some estimates omitted due to small sample sizes).

$p < 0.001$ ), 12% of men and 51% of women aged 40–59 ( $t = 12.68$ ;  $p < 0.001$ ), and 6% of men and 41% of women aged over 60 ( $t = 6.72$ ;  $p < 0.001$ ) having such suspicions.

### Condom use at last sex

Figure 2(e) shows that the prevalence of condom use at last sex declined with age for both women and men, with gender disparities in use also lower at older ages. For women, condom use was 39% for those aged

15–24. Those aged 60+ reported no use (compared to ages 15–24;  $t = 15.78$ ;  $p < 0.001$ ). Figure 3(e) shows that HIV positive women reported higher condom use at ages 25–39 and 40–59 compared to HIV negative women ( $p < 0.001$  for ages 25–39 ( $t = -5.49$ ) and 40–59 ( $t = -5.40$ )). For men, condom use was lower at older ages, with a high of 48% at ages 15–24 to 4% at ages 60+ ( $t = 13.52$ ;  $p < 0.001$ ). Older HIV positive men (ages 40+) reported a higher prevalence of condom use than HIV negative men (ages 40–59:  $t = -2.55$ ;  $p = 0.011$ ; ages 60+:  $t = -2.28$ ;  $p = 0.022$ ).



**Figure 4.** Stacked bar chart of partner (most recent in past 2 years) age differences by respondent sex and age.

In examining condom use by partner type (regular, casual/anonymous), for young women (15–24), condom use did not differ by partner type ( $t = 1.08$ ;  $p = 0.278$ ). However, among older women (25–39, 40–59), there was a higher prevalence of condom use for casual/anonymous partners compared to regular partners ( $p < 0.001$ ). Young men (15–24) with casual or anonymous partners were more likely than same aged women to report condom use ( $t = -2.13$ ;  $p = 0.033$ ). Men ages 25–39 reported higher prevalence of condom use with casual or anonymous partners compared to regular partners ( $t = -4.40$ ;  $p < 0.001$ ).

Further examining condom use by whether they knew their partner's HIV status, young women's (15–24) condom use did not differ by knowing their partner's HIV status ( $t = -1.63$ ;  $p = 0.103$ ). Among older women, there was a higher prevalence of condom use for those who knew their partner's HIV status compared to those who did not (25–39  $p < 0.001$ ; 40–59  $p = 0.023$ ). Among men (25–39), there was also a higher prevalence of condom use for those who knew their partner's HIV status compared to those who did not ( $t = -3.19$ ;  $p = 0.001$ ). There were no significant differences by known partner HIV status for men ages 15–24 or 40–59.

### STI diagnosis

Men reported a higher prevalence of ever being diagnosed with an STI compared to women across all age-groups (Figure 2(f)). The age pattern was similar for both sexes, with the highest prevalence among those aged 25–59. HIV positive women ages 25–39 and 40–59 had higher reports of STI diagnosis than HIV negative women (ages 25–39:  $t = -3.45$ ;  $p = 0.001$ ; ages 40–59:  $t = -2.66$ ;  $p = 0.008$ ) (Figure 3(f)). Among men aged 25+, STI prevalence did not differ by HIV serostatus (ages 25–39:  $t = -1.64$ ;  $p = 0.10$ ; ages 40–59:  $t = -1.35$ ;  $p = 0.18$ ; ages 60+:  $t = -0.13$ ;  $p = 0.89$ ). However, among the youngest men (15–24), HIV positives had higher reports of STI diagnoses ( $t = -2.10$ ;  $p = 0.036$ ).

### Discussion

This study illustrates similarities and variation in HIV vulnerability across age groups in Agincourt, South Africa. Starting with the behaviors of young adults, and as others have found (Pettifor et al., 2005), our findings show continued high risk of HIV among young adults. Sexual debut now occurs earlier, creating a longer period for exposure to HIV. Potential sexual partners for young people are more likely to have been diagnosed with an STI, are more likely to have HIV, partner change is high, and condom use is low. Of particular concern is

the high rate of STI diagnoses as STIs are known to exacerbate HIV infection (Fleming & Wasserheit, 1999; Røttingen, Cameron, & Garnett, 2001).

Our findings also show that middle aged (40–59) adults continue to be at risk for HIV, with similar findings to another Agincourt-based study restricted to older ages (Rosenberg et al., 2017). The combination of high rates of recent sex, reports of extramarital sex, greater diversity of partnership statuses and relatively low use of condoms, also suggests that reentering the partnership market after being widowed in this high HIV prevalence setting is likely to be a high-risk endeavor (see also Floyd et al., 2008; Reniers, 2008; Zaba et al., 2008).

Results among older adults (60+) suggest potential avenues for HIV risk; there are striking gender differences in recent sex, coupled with higher self-reports and suspicion of extramarital sex among men and low condom use. There is some evidence that sexually active older men and women engage in cross-generational sex with people in age groups with the highest HIV prevalence. Older adults could be acquiring HIV this way, and then passing it on to their regular within-generation partners, among whom condom use is lowest.

We found no significant differences between HIV positive and negative adults' reports of recent sexual activity. There is some evidence that HIV prevention programming may be having a positive impact in this setting. HIV negative youth (15–24) report higher condom use at last sex compared to HIV positive youth suggesting efforts to avoid HIV acquisition. At older ages, HIV positive adults are more likely to report condom use at last sex compared to HIV negative adults, suggesting efforts on their part to prevent onward transmission of HIV (Rosenberg et al., 2017). Only 55% of the sample had ever had an HIV test (Schatz, Houle, Mojola, Angotti, & Williams, 2016) and thus many were unlikely to be aware of their HIV status. As a result, low ART uptake at the time of the survey (28% based on self-report) and a low rate of condom use, suggest a potentially high community viral load in Agincourt at the time of the survey (Castel et al., 2012).

This study has a number of policy and programming implications. Among young people, our findings suggest the heightened urgency in rolling out and/or expanding HIV prevention, testing and treatment interventions. Among those in their middle ages, there is a need for more nuanced HIV prevention interventions that engage the more complex relationship environments middle aged adults are navigating. These might include programming focused on encouraging HIV testing at the onset of new relationships. Among older adults, interventions might focus on encouraging condom use in cross generational relationships with younger partners.



Our study has several limitations. First, the data were collected in 2010–11 at the beginning of the introduction of ART in the area; thus, sexual behavior patterns may have changed over time. Nonetheless, this study is important in examining variation in sexual risk and protective behavior across different age groups in a rural African setting. Second, while respondents were willing to report on sexual behaviors, their self-reports may be subject to recall, reporting, and social desirability bias, along with selection effects that also vary by respondent gender and age (Houle et al., 2016; Nnko, Boerma, Urassa, Mwaluko, & Zaba, 2004). For instance, reported age at first sex may reflect differences in the perceived “respectable age” at which to start having sex (Houle et al., 2016). Condom use reports may be due to social desirability. Reporting errors may result from recall bias or reluctance to report, as well as age heaping in reporting around particular ages. Finally, as the study was cross-sectional in design, our analysis is limited to associations between measures; further analyses using longitudinal data can help clarify the direction of associations. Despite these limitations, our findings provide an important comparison for other contexts and future studies.

Overall, this study highlights the critical importance of targeting adults at all ages, not just young adults, to reduce the burden of HIV in South Africa. Our findings highlight the need for nuanced and targeted campaigns tailored to different stages of the life course to increase the effectiveness of HIV prevention and treatment programming as well as campaigns to increase awareness that HIV risk is not just restricted to younger ages but is also affecting middle aged and older adults. This is especially important given the rising proportions of people aging with HIV, and those at risk of acquiring HIV at older ages.

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## Disclosure statement

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