

## **SEXUAL BEHAVIOR AND HIV RISK ACROSS THE LIFE COURSE IN RURAL SOUTH AFRICA: TRENDS AND COMPARISONS<sup>1</sup>**

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### **Abstract:**

There is a dearth of information about sexual behavior among older Africans. This gap is problematic given the exceptionally high HIV rates among older adults. In Agincourt, South Africa, 16.5% of adults aged 50 and over are HIV positive. In this paper, we use a unique, population-based survey among people aged 15-85 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 examine whether and how middle aged and older adults might differ from or are similar to younger adults. We find that middle aged and older adults do not transition into safety after they age out of reproductive ages. Rather, they continue to engage in high risk sexual behavior at older ages. Among those aged 40 and over, there are high reports of extramarital sex and relatively low reports of condom use. Further, there is some evidence that older men and women aged 60+ who were recently sexually active, engage in cross generational sex with people in the highest HIV risk age groups. We also find insignificant differences between HIV positive and negative adults reports of recent sexual activity in this setting, and higher reports of extramarital sex among HIV positive people compared to HIV negative people. The results of this study provide significant new information on sexual behavior and HIV risk across the life course in rural South Africa to inform HIV prevention and treatment programming.

**Key Words:** Sexual behavior; Life course; South Africa; HIV/AIDS

**Word Count:** 5461

## **SEXUAL BEHAVIOR AND HIV RISK ACROSS THE LIFE COURSE IN RURAL SOUTH AFRICA: TRENDS AND COMPARISONS**

### **Introduction**

There is a dearth of information about sexual behavior among older Africans. Many surveys with information on sexual behavior (such as the Demographic and Health Surveys - DHS) were designed primarily to elicit information on fertility and reproductive behavior, thus stopping at age 49 for women and age 55 or 59 for men. Once the HIV/AIDS epidemic began its march across the continent, these same surveys were capitalized upon to elicit information about HIV prevalence and sexual risk with the implicit assumption that information on older adults was not needed, presumably because they were not having sex, or at least, not high risk sex (Mutevedzi and Newell 2011; UNAIDS 2013). In 2010-2011, a population-based survey in rural South Africa, on which this current study is based, dramatically highlighted the problematic and dangerous limitations of these assumptions. While rates were very high among youth and middle-aged adults, they remained strikingly high among older adults (Figure 1).

*INSERT FIGURE 1 here: HIV PREVALENCE IN RURAL SOUTH AFRICA*

Overall, 16.5% of adults over 50 were HIV positive. For women, 16.1% over 50 were HIV positive, and prevalence remained above 10% until ages 70+. Among men, 17.7% over 50 were HIV positive, with prevalence remaining above 15% until ages 70+ (See also Gómez Olivé et al 2013). The recency of the rollout of antiretroviral therapy (ART) in this setting (beginning in 2007) suggests that these data cannot represent only survival and aging of HIV positive youth into their middle and older ages, but must reflect new infections among older adults (Gómez Olivé et al 2013; Mojola et al 2015).

South Africa is an especially important site to examine HIV over the life course, because it bears the world's most significant burden of HIV (with over 7 million people living with HIV), and has a rapidly aging population relative to other African countries (UNAIDS 2015; Hosegood and Timaeus 2006). 27% of South Africans are now aged 40 and over (Statistics South Africa, 2014); by 2045, this proportion is projected to rise to 38% (<http://populationpyramid.net/south-africa/2045/>). Increasingly, rollout of ART means that many adults who would otherwise have died are now aging into older ages with HIV. As such information on older adults' sexual behavior is important not just in and of itself, but also to serve as a basis for establishing HIV prevention and treatment programs targeted at this currently, largely ignored population. Additionally, examining the extent to which they are similar or different to those at younger ages would help policy makers know the extent to which they have to retool existing prevention programming for adults at different stages of the life course.

## **Background**

While sexuality continues to be expressed throughout the life course, and well past reproductive ages, there is evidence that sexual desire and frequency decline, and do so in gendered ways as people age (Rossi 1994; van der Geest, 2001; Lindau et al 2005; Carpenter 2010; Marshall 2011; Carpenter and Delamater 2012; Freeman and Anglewicz 2012; Freeman and Coast 2013). As such, sexual behavior and related HIV risk and protective behaviors are likely to shift over the life course from young people transitioning to adulthood (15-24) and beginning their sexual lives to those aged 25-39 who are likely settling into formal relationships, adults aged 40-59 transitioning out of reproductive ages and beginning menopause, and older adults (60+), many of whom have lost their life partners or are returning home to their life

partners after years of living elsewhere as migrant workers. In South Africa, young adults are highly exposed to HIV prevention programming (Pettifor et al 2005; Hunter 2010) and more likely to use condoms compared to older adults (Negin et al 2012). Older adults, by contrast, may have limited awareness of their HIV risk and thus not engage in HIV protective behavior, or they may be aware, but engage in *different kinds of* protective sexual behavior such as divorce of HIV positive partners (Reniers 2008; Schatz 2005) and/or careful partner selection (Watkins, 2004) as has been demonstrated in Malawi, or refuse sex with partners whom they suspect of having extramarital affairs as has been demonstrated in South Africa (Mojola et al 2015).

Indeed as significant proportions of South Africans transition into older ages, they will be doing so in a changed sexual environment related to the HIV/AIDS epidemic. While marriage rates among younger adults in South Africa are low (Hosegood et al., 2009), marriage is likely to have played a significant role in structuring the sexual options for middle-aged and older adults. At the individual level, marriage is a key site of sexual acquisition and transmission of HIV for both men and women across the life course, and extramarital (concurrent) partnerships are a primary vehicle introducing HIV into a relationship (Clark 2004; De Walque 2007; Hunter 2002; Hunter 2005; Luke 2003; Leclerc-Madlala 2003). Adults over 50 are also likely to have had a greater variety of relationship statuses over time that may place/have placed them at risk, such as divorce, cohabitation, casual relationships, and widowhood. Widowhood may increase older people's risk of acquiring or transmitting HIV by placing them back on the marriage or sexual partnership market (Floyd et al.2008, Reniers, 2008, Zaba et al., 2008). Indeed high rates of adult male mortality in Agincourt since 2000 have resulted in a large number of widows in their middle and early older ages (Houle et al., 2014, Kahn et al., 2012, Tollman et al., 2008). An increase in partner change at older ages thus introduces varying dimensions of HIV risk for older

adults. In sum, sources of sexual risk for older adults are likely to differ compared to younger adults, and are likely to involve different sets of protective behaviors compared to younger adults.

In this paper, we use a unique population-based survey conducted in rural South Africa among people aged 15 - 85 years to examine the prevalence of sexual risk and protective behaviors in the context of a severe HIV epidemic. We focus on both gender differences, differences related to HIV serostatus, as well as variation across the life course. In doing so, our paper provides significant new information on sexual behavior in rural South Africa that is likely to inform more effective and inclusive HIV prevention and treatment programming.

### **Study Setting, Data and Methods**

**Setting:** Our study draws on data from the Agincourt Health and Socio-Demographic Surveillance Site (AHDSS) covering a sub-district of 27 villages in Mpumalanga Province in northeast South Africa. 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. As such, it is home to some of South Africa's poorest citizens (see Kahn et al., 2012 for detailed description of the AHDSS). The AHDSS conducts an annual census of this population (starting in 1992), including deaths, births, migrations, as well as sociodemographic information, including union formation/dissolution.

**Data:** We use data from a cross-sectional, population-based survey conducted in the site 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 oversample of adults ages 50+ from a

prior study on older people). (See Gómez-Olivé et al., 2013 for detailed description of the survey procedures). In addition to a survey questionnaire, the study included biomarker data collection for HIV and non-communicable diseases. For HIV status, dried blood spots were collected at the time of the interview, and tested using a screening (Vironostika Uniform 11, Biomerieux, France) assay with a positive result confirmed by the SD Bioline HIV ELISA test (Standard Diagnostics Inc., Korea) – if they did not agree, a third assay was done and determined the final HIV status result. The study received ethical approval from the University of the Witwatersrand Human Research Ethics Committee and the Mpumalanga Provincial Research and Ethics Committee.

Measures: We focus on survey questions that asked respondents about their lifetime sexual behavior and with partners in the past two years (n=2771 women and n=1776 men). We include reported: age at first sex; if men reported being circumcised; whether respondents reported that first sex was forced; recent sex in the past 2 years if the respondent reported any sexual partners in the past 24 months; most recent partner type in the past 24 months as either 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); any extramarital partnership for married respondents if they 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; whether they thought their most recent partner in the past 24 months had an affair; condom use at last sex if they reported using a condom the last time they had sex with their most recent partner in the past 24 months; and STD diagnosis (other than

HIV) if the respondent reported ever being diagnosed with or treated for a sexually transmitted disease. Union status information came from the 2009 AHDSS census update.

**Analysis:** We compare reported behaviors by age group, gender, and HIV status. We categorize age to capture changes along the life course, 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.

## **Results**

**Sexual debut:** Overall, the reported age at first sex in Agincourt has declined for young people for both men and women, from a high of age 20 among those aged 60 and over. Among women, the median age at first sex was age 18 for those aged 40-59, and age 17 for those aged 15-39. Among men, the median age at first sex was slightly earlier than women with a median age of 19 for ages 40-59, age 18 for ages 25-39, and age 16 for ages 15-24.

**Circumcision:** While male circumcision is a rite of passage in many South African communities as men transition to adulthood (Mayatula and Mavudla 1997; Vincent 2008), in this predominantly Shangaan setting, only 26% of men reported being circumcised (Figure 2(a)). However, among those aged 25-39, 35% reported being circumcised, perhaps reflecting recent HIV intervention programming (Scott et al 2005, Auvert et al 2009). HIV-negative men had significantly higher prevalence of being circumcised compared to HIV-positive men within all but the oldest age groups (15-24 ( $p=0.01$ ), 25-39 ( $p=0.001$ ), and 40-59 ( $p=0.005$ )) (Figure 3(a)).

*INSERT FIGURE 2 here: SEXUAL BEHAVIORS BY SEX AND AGE*



**Forced first sex:** A growing body of literature suggests that sexual violence is a public health challenge in South Africa (Jewkes et al 2002; Dunkle et al 2004; Peterson et al 2005). In this setting, a striking proportion of young women (21%) and men (24%) transitioning to adulthood (ages 15-24) reported forced sex on sexual debut (Figure 2(b)). It is worth noting that these proportions are much lower at older ages suggesting either that this is a recent phenomenon, or that the same experience is newly recognized as problematic among young adults. It is unlikely that this contributed to high HIV rates among young people as there was little variation for either women or men by HIV status in the age pattern of reporting being forced to have sex at sexual debut (Figure 3(b)).

*INSERT FIGURE 3 here: SEXUAL BEHAVIORS BY SEX, AGE and HIV STATUS*

**Recent Sex (in last 2 years):** In examining reports of recent sex, there was little difference between men and women at younger ages. However, large and widening gender differences emerged after age 40 (Figure 2(c)). At ages 40-59 women reported a lower prevalence of sexual activity (73%) compared to men (88%) ( $p < 0.001$ ). The highest disparity was among those aged 60 and over. In that age group, 18% of women reported having had sex in the past 2 years compared to 73% of same aged men ( $p < 0.001$ ). Significantly, there was little variation in the sex-age pattern of sexual activity in the past two years by HIV status (Figure 3(c)).

### **Type of partner:**

**Unions:** Table 1 shows that 40% of all women had never been in a union, with a quarter in a formal union and 18% widowed. Union status varied across the life course, with 88% of women ages 15-24 not in a union, declining to 38% at ages 25-39 and 10% at ages 40-59. Being in a formal union 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. 96% of men ages 15-24 were not in a union, declining to 54% at ages 25-39 and 18% at ages 40-59. 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+. These differential widowhood patterns reflect the higher mortality amongst men overall and particularly due to HIV/AIDS in the population (Houle et al., 2014).

*INSERT TABLE 1 here: UNION STATUS BY SEX AND AGE*

**Casual Partners:** Most survey respondents reported regular partners, and very few reported casual/anonymous partners. Overall, men had higher proportions of casual/anonymous partners compared to women. The prevalence of reporting the most recent partner was casual or anonymous as opposed to regular was highest amongst those ages 15-24 for both men and women (Figure 2(d)). Men reported a higher prevalence of casual/anonymous recent partners than women at ages 15-39, with one quarter of men ages 15-24 reporting a casual/anonymous partner compared to 14% of equivalent aged women ( $p<0.001$ ). HIV positive women were more likely to have a recent casual/anonymous partner at ages 25-59 compared to HIV negative women (Figure 3(d)) ( $p<0.001$  for both ages 25-39 and 40-59). HIV negative men reported a higher prevalence of casual/anonymous partners at ages 15-24 compared to HIV positive men ( $p=0.027$ ).

**Partner age differences:** There were striking gender differences in the age of partners.

Figure 4 shows the summed proportion of differences in most recent partner age (irregardless of partner type) across respondent age for men and women. For women, about 80% of their partners were older across any age group. The proportion of partners older by 6+ years increased through to ages 40-59 compared to ages 15-24. Further parsing by HIV status showed a greater proportion of partners younger than 11+ years for HIV positive women ages 60+ (23%), 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 increased across older men. Further parsing by HIV status showed a greater proportion of HIV positive men have partners younger by 11+ years compared to proportions for HIV negative men (at ages 60+, 52% for HIV positive men vs. 38% for HIV negative men). This suggests that HIV positive older adults are partnered with people in the highest HIV prevalence age groups.

*INSERT FIGURE 4 here: PARTNER AGE DIFFERENCE*

**Extramarital partnership:** Gaps in reports of extramarital partnerships between men and women were lower at older ages, with similar reports among those aged over 60 (Figure 2(e); see Figure 3(e) for prevalence by HIV status). Respondents were also asked if they suspected their most recent partner had had an affair. About the same proportion of 15-24 year old young men (22%) and women (25%) suspected their partner had had an affair. Gender gaps widened at older ages, however, with 18% of men and 39% of women aged 25-39, 9% of men and 40% of women aged 40-59, and 6% of men and 36% of women aged over 60 having such suspicions.

**Condom use at last sex:** Figure 2(f) shows that the prevalence of condom use at last sex declined with age for both women and men, with the gender disparities in use also declining with

age. For women, condom use was 39% amongst ages 15-24, declining to 0% amongst those ages 60+ ( $p<0.001$ ). Figure 3(f) shows that HIV positive women reported higher condom use at ages 25-59 compared to HIV negative women ( $p<0.001$  for ages 25-39 and 40-59). For men, condom use declined from 48% at ages 15-24 to 4% at ages 60+ ( $p<0.001$ ). Older HIV positive men (ages 40+) reported higher prevalence of condom use than HIV negative men ( $p=0.011$  ages 40-59;  $p=0.023$  ages 60+). In examining condom use by partner type, for women, condom use was similar for those ages 15-24 by partner type ( $p=0.278$ ), with higher prevalence of condom use for ages 25-59 for casual or anonymous partners compared to regular partners ( $p<0.001$  for ages 25-39 and 40-59). Young men and women (15-24) reported similar patterns of condom use regardless of partner type, but with higher prevalence for men with casual or anonymous partners than women ( $p=0.033$ ). Men ages 25-39 reported higher prevalence of condom use with casual or anonymous partners compared to regular partners ( $p<0.001$ ), with higher levels persisting into older ages.

**STD diagnosis:** Women reported higher prevalence of ever being diagnosed with an STD compared to men across all age-groups (Figure 2(g)). The age pattern was similar for both sexes, with increased prevalence amongst ages 25-59. Age, but not gender patterns of STD diagnosis mirror those of HIV prevalence in this setting. HIV positive women ages 25+ reported higher prevalence of an STD diagnosis compared to HIV negative women ( $p<0.001$ ; and increasing prevalence into older ages) (Figure 3(g)). For HIV positive and HIV negative men, STD prevalence was similar (and declining into older ages) except for the youngest ages, with a higher prevalence reported for HIV positive men ages 15-24 ( $p=0.036$ ).

## **Discussion and Conclusion**

These findings illustrate sexual behavior and risk factors placing sexually active individuals *across the life course* in Agincourt at high risk of HIV acquisition and transmission. As supported by other literature, young adults in rural South Africa continue to navigate a high HIV risk environment, and exhibit sexual behavior that places them at risk of both HIV acquisition and transmission. Sexual debut occurs earlier than older generations, creating a longer period for exposure to HIV, potential partners are more likely to have been diagnosed with an STD and to have HIV, partner change is high, low cross generational sex ensures that their partner pool has the highest rates of HIV, and condom use is low given the HIV prevalence rates. Of particular concern is the high rate of STD diagnoses as STIs are known to exacerbate HIV acquisition and add fuel to HIV epidemics (Fleming and Wasserheit 1999; Røttingen, Cameron, and Garnett 2001).

Our findings also show that middle aged and older adults do not transition into safety after they age out of reproductive ages. Rather, they continue to be at risk for HIV acquisition at older ages. Among middle aged adults (40-59), there are high rates of recent sex, high reports of extramarital sex, and relatively low use of condoms especially among non-regular or main partners. A high diversity of partnership statuses, coupled with low condom use, as people age, also suggests that reentering the partnership market in this high HIV prevalence setting could be a high risk endeavor. 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. Further, there is some evidence that older men and women who were recently sexually active, engage in cross generational sex with people in the highest HIV risk age groups. In this way, a potential route to HIV among older adults,

could be acquiring HIV this way, and passing it on to their regular partners, among whom condom use is lowest.

There are insignificant differences between HIV positive and negative adults in recent sexual activity in this setting. Further, HIV positive people report higher rates of extramarital sex compared to HIV negative people. Given low ART uptake at the time of the survey (28% based on self-report), and low rates of condom use, this suggests a potentially high community viral load in the sexual partnership pool. There is some evidence that HIV prevention programming may be positively impacting 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.

Our study has some important limitations. While respondents were willing to report on sexual activity and risk behaviors, behaviors are based on respondent self-report and may be subject to recall, reporting, and social desirability bias, along with selection effects that also vary by respondent sex and age. For instance, differences in reported age at first sex may represent differences in perceived ‘respectable age’ at which to start having sex. Additionally, reporting errors may result from recall bias or reluctance to report, as well as age heaping in reporting around particular ages. Similarly, selection effects may be operating if survival was selective against behaviors such as early sexual debut or those who experienced forced first sex. The study was also cross-sectional in design, limiting our analyses to associations between measures. Further analyses using longitudinal data can help clarify the direction of associations.

Overall, our study provides significant new information on sexual behavior across the life course in a high HIV prevalence setting. This is especially important given the rising proportions

of HIV positive people aging with and at risk of HIV acquisition at older ages. We provide strong evidence not only of the need for continued HIV prevention and treatment programming targeted at young adults, but also, and critically, the need to extend this focus to middle aged and older adults who are at high risk of HIV acquisition and transmission.

## REFERENCES

- Clark, Shelley 2004. "Early marriage and HIV risks in sub-saharan africa". *Studies in Family Planning*, 35(3): 149-160
- De Walque, Damien 2007. "Sero-discordant couples in five African countries: Implications for prevention strategies". *Population and Development Review*, 33(3): 501-523.
- Dunkle, Kristin L., Rachel K. Jewkes, Heather C. Brown, Glenda E. Gray, James A. McIntyre, and Siobán D. Harlow. "Gender-based violence, relationship power, and risk of HIV infection in women attending antenatal clinics in South Africa." *The lancet* 363, no. 9419 (2004): 1415-1421.
- Fleming, D. T., and J. N. Wasserheit. 1999. "From Epidemiological Synergy to Public Health Policy and Practice: The Contribution of Other Sexually Transmitted Diseases to Sexual Transmission of HIV Infection." *Sexually Transmitted Infections* 75:3-17.
- Floyd, Sian, Amelia C Crampin, Judith R Glynn, Michael Mwenebabu, Stancelaus Mnkhondia, Bagrey Ngwira, Basia Zaba & Paul Em Fine 2008. "The long term social and economic impact of HIV on the spouses of infected individuals in northern Malawi". *Tropical Medicine & International Health*, 13(4): 520-531
- Freeman, Emily & Philip Anglewicz 2012. "HIV prevalence and sexual behaviour at older ages in rural malawi". *International Journal of STD & AIDS*, 23(7): 490-496.
- Freeman, E. K., & Coast, E. (2014). Sex in older age in rural Malawi. *Ageing and Society*, 34(07), 1118-1141.
- Gómez-Olivé FX, Angotti N, Houle B, Klipstein-Grobusch K, Kabudula C, Menken J, et al (2013) *Prevalence of HIV among those 15 and older in rural South Africa*. *AIDS care* 25(9):1122-1128.
- Hunter, Mark 2002. "The materiality of everyday sex: Thinking beyond 'prostitution'". *African Studies*, 61(1): 99-120.
- Hunter, Mark 2005. "Cultural politics and masculinities: Multiple-partners in historical perspective in Kwazulu-Natal". *Culture, Health & Sexuality*, 7(4): 389-403.
- Hosegood V, Timaeus IM. (2006) *HIV/AIDS and older people in South Africa*. *Aging in Sub-Saharan Africa: recommendations for furthering research* pp 250-75.
- Hosegood, Victoria, Nuala Mcgrath & Tom Moultrie 2009. "Dispensing with marriage: Marital and partnership trends in rural Kwazulu-Natal, South Africa 2000-2006". *Demographic Research*, 20.
- Houle, Brian, Samuel J Clark, F. Xavier Gómez-Olivé, Kathleen Kahn, and Stephen M Tollman. (2014) "The unfolding counter-transition in rural South Africa: mortality and cause of death, 1994-2009." *PLoS ONE*, 9(6):e100420.
- 
- Houle, Mojola et al (2016) Sexual behavior across the life course in rural South Africa.



- Jewkes, Rachel, and Naeema Abrahams. "The epidemiology of rape and sexual coercion in South Africa: an overview." *Social Science & Medicine* 55.7 (2002): 1231-1244.
- Kahn K, Collinson MA, Gómez-Olivé FX, Mokoena O, Twine R, Mee P, et al. (2012) *Profile: Agincourt health and socio-demographic surveillance system*. *International Journal of Epidemiology* 41(4):988-1001.
- Leclerc-Madlala, Suzanne 2003. "Transactional sex and the pursuit of modernity". *Social Dynamics*, 29(2): 213-233.
- Lindau, S. T., Schumm, L. P., Laumann, E. O., Levinson, W., O'Muircheartaigh, C. A., & Waite, L. J. (2007). A study of sexuality and health among older adults in the United States. *New England Journal of Medicine*, 357(8), 762-774.
- Luke, Nancy 2003. "Age and economic asymmetries in the sexual relationships of adolescent girls in sub-Saharan Africa". *Studies in Family Planning*, 34(2): 67-86.
- Mayatula, V., and Thandisizwe R. Mavundla. "A review on male circumcision procedures among South African blacks." *Curationis* 20.3 (1997): 16-20.
- Mojola, Sanyu A., Jill Williams, Nicole Angotti, and F. Xavier Gómez-Olivé. "HIV after 40 in rural South Africa: A life course approach to HIV vulnerability among middle aged and older adults." *Social Science & Medicine* 143 (2015): 204-212.
- Mutevedzi PC, Newell M-L. (2011) *A missing piece in the puzzle: HIV in mature adults in sub-Saharan Africa*. *Future Virology* 6(6):755-767.
- Negin, Joel, Till Bärnighausen, Jens D Lundgren & Edward J Mills 2012. "Aging with HIV in Africa: The challenges of living longer". *Aids*, 26S1-S5.
- Petersen, Inge, Arvin Bhana, and Mary McKay. "Sexual violence and youth in South Africa: The need for community-based prevention interventions." *Child abuse & neglect* 29.11 (2005): 1233-1248.
- Reniers, Georges 2008. "Marital strategies for regulating exposure to HIV". *Demography*, 45(2).
- Røttingen, John-Arne, D. William Cameron, and Geoffrey P. Garnett. 2001. "A Systematic Review of the Epidemiological Interactions between Classic Sexually Transmitted Diseases and HIV: How Much Really Is Known?" *Sexually Transmitted Diseases* 28 (10): 579-97.
- Schatz, Enid. 2005. "'Take your mat and go!': Rural Malawian women's strategies in the HIV/AIDS era." *Culture, Health & Sexuality* 7 (5): 479-492

Scott, Beth E., Helen A. Weiss, and J. I. Viljoen. "The acceptability of male circumcision as an HIV intervention among a rural Zulu population, Kwazulu-Natal, South Africa." *AIDS care* 17.3 (2005): 304-313.

Van Der Geest, Sjaak 2001. "'No strength': Sex and old age in a rural town in Ghana". *Social Science & Medicine*, 53(10): 1383-1396.

Vincent, Louise. "'Boys will be boys': traditional Xhosa male circumcision, HIV and sexual socialisation in contemporary South Africa." *Culture, Health & Sexuality* 10.5 (2008): 431-446.

Statistics South Africa. (2014) Mid-year population estimates, South Africa.

UNAIDS (2013): *HIV and aging: A special supplement to the UNAIDS report on the global AIDS epidemic 2013*.

Tollman, Stephen M, Kathleen Kahn, Benn Sartorius, Mark A Collinson, Samuel J Clark & Michel L Garenne 2008. "Implications of mortality transition for primary health care in rural South Africa: A population-based surveillance study". *The Lancet*, 372(9642): 893-901

Watkins, Susan Cotts 2004. "Navigating the AIDS epidemic in rural Malawi". *Population and Development Review*, 30(4): 673-705.

Zaba, Basia, Jim Todd, Sam Biraro, L Shafer, Tom Lutalo, Anthony Ndyanabo & Alpha Network. Diverse age patterns of HIV incidence rates in Africa. Proceedings of the XVII International AIDS Conference, Mexico City, 2008.

## TABLES

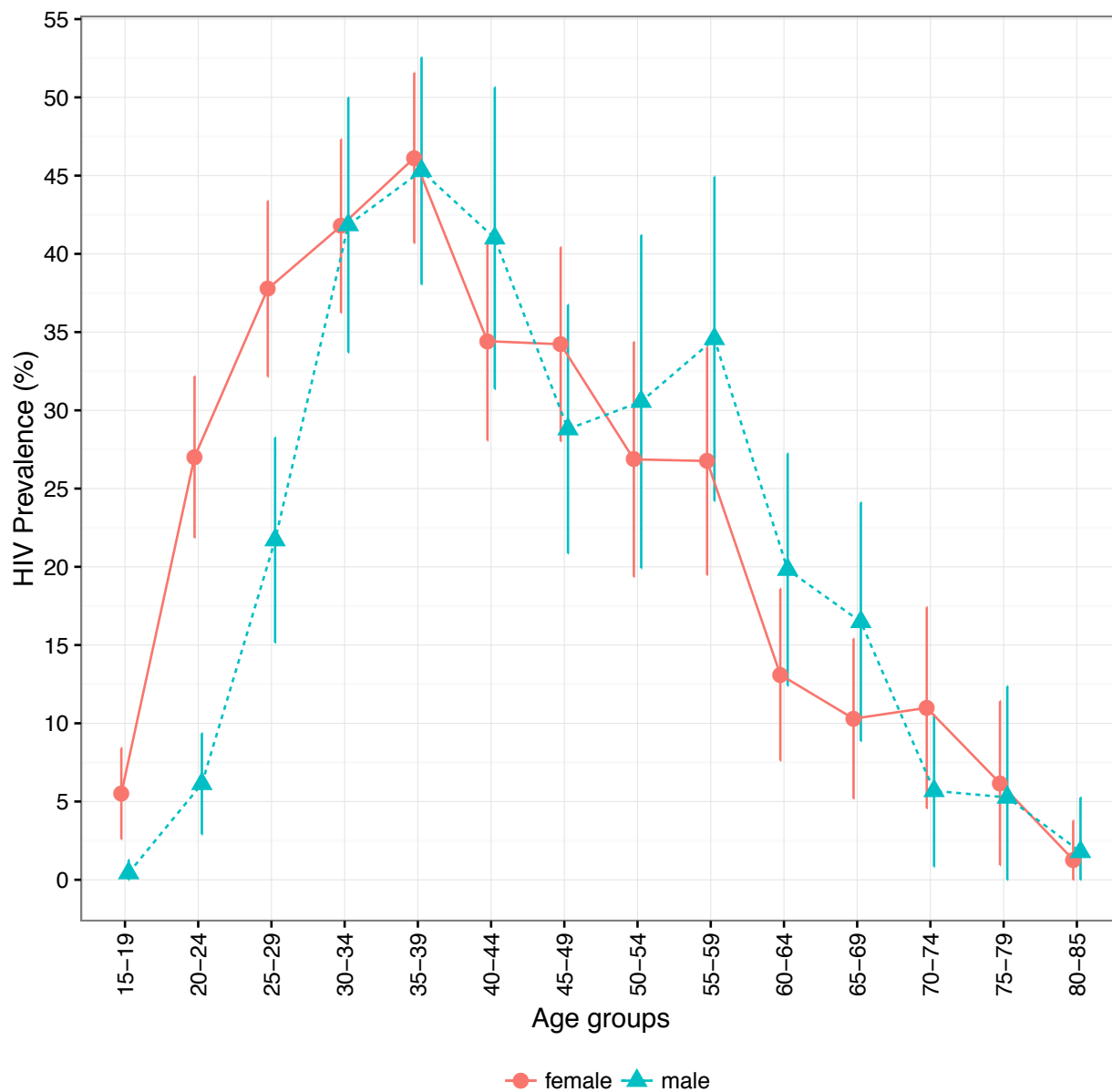
**Table 1:** Union status in rural South Africa, 2010, by sex and age.

	15-24 (%)	25-39 (%)	40-59 (%)	60+ (%)	Total (%)
<b>Women</b>	(n=443)	(n=973)	(n=752)	(n=601)	(n=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>	(n=307)	(n=544)	(n=419)	(n=445)	(n=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

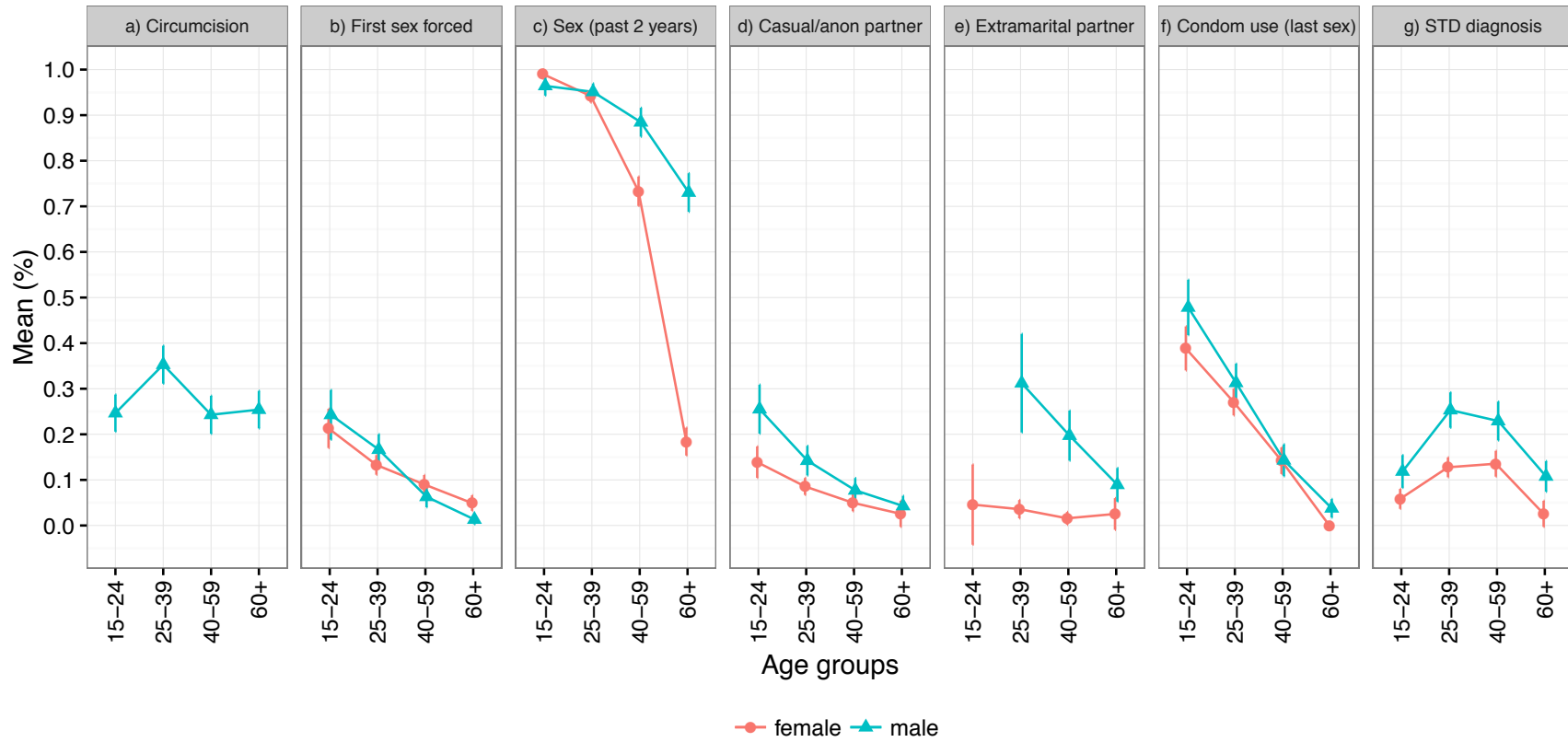
Based on data from the 2009 Agincourt HDSS. Percentages may not sum to 100% due to rounding. Totals do not equal final sample due to missing values.

## FIGURES

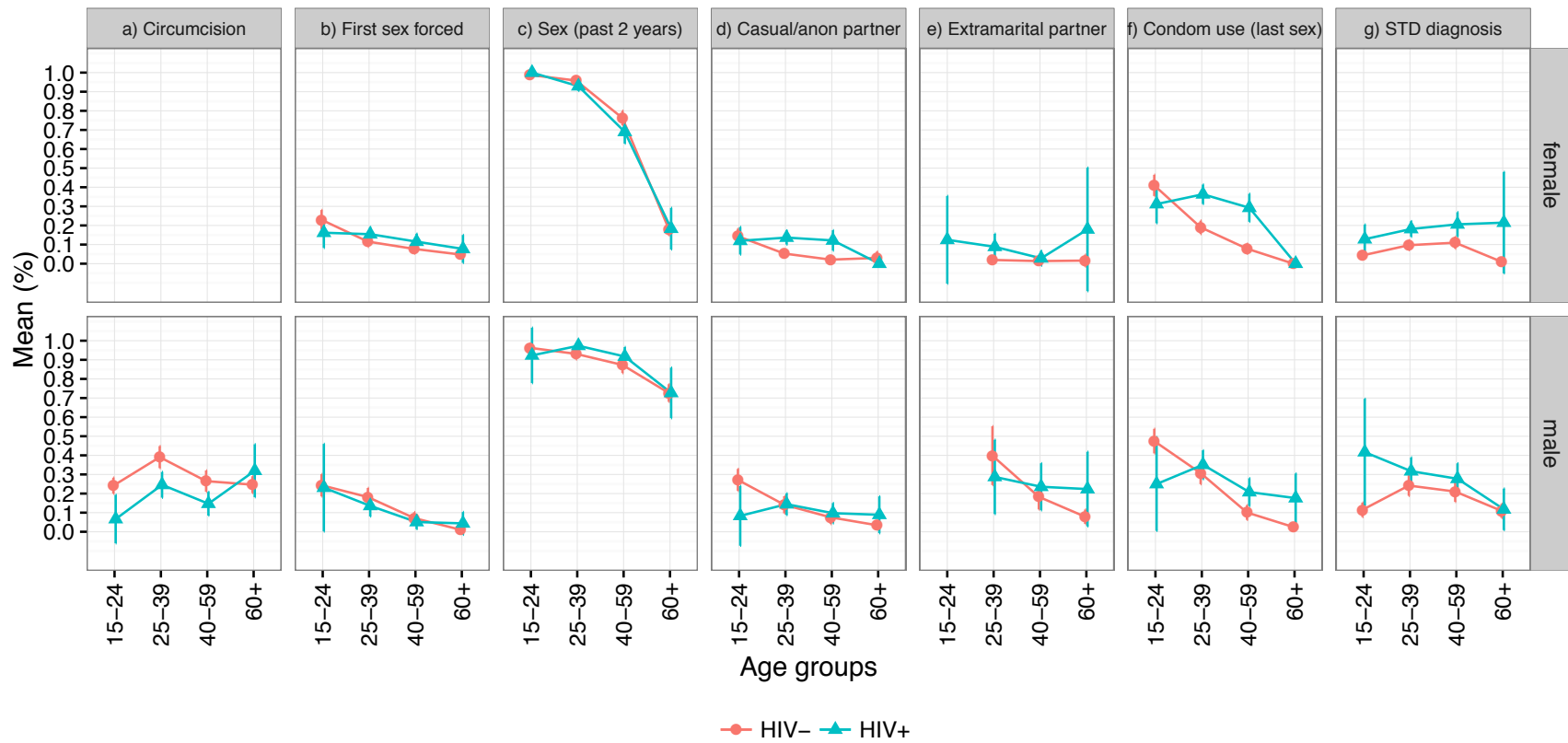
**Figure 1:** HIV prevalence (and 95% confidence intervals) in rural South Africa, 2010, by sex and age.



**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).



**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).



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

