Household and community-level determinants of HIV and sexual behavior risk in rural South Africa: Findings from the Agincourt Health and Socio-Demographic Surveillance System and the Ha Nakekela population-based study

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Short abstract
Variability in HIV prevalence in Sub-Saharan Africa across and within countries, even in small local areas, highlights the need to examine how community-level factors are associated with differential HIV risk. We aim to understand how individual and contextual-level factors impact on HIV and sexual risk behaviors. We use data from a 2010-2011 population-based study of men and women ages 15+ in rural South Africa. We use multi-level logistic regressions of HIV status and having multiple sexual partners in the past 2 years. We find that the poorest female-head households are more likely to have multiple sexual partners. For HIV status, being in a community with a higher than average proportion of employed adults is associated with lower odds of being HIV positive. The low level of within village correlation and high HIV prevalence across most villages suggests that it may be useful to target interventions to more proximal risk environments.

Introduction
Sub-Saharan Africa (SSA) continues to have the largest burden of HIV globally – with over two-thirds of people living with HIV located in the region (Joint United Nations Programme on HIV/AIDS (UNAIDS), 2014). Within SSA there is considerable variation in HIV risk both between and within countries, even in areas with high HIV prevalence (Cuadros et al., 2013, Cuadros et al., 2017). In South Africa variation in HIV prevalence has been shown at the provincial and metropolitan level, as well as between urban and rural areas (Shisana et al., 2014) and in relatively homogenous rural areas (Tanser et al., 2009). This variability highlights the need for a greater understanding of community-level factors associated with differential HIV risk to determine the appropriateness of community intervention and the potential to impact on HIV risk-related outcomes.

A recent systematic review examined the role of contextual factors on HIV and risky sexual behaviors in SSA (Ward-Peterson et al., 2018). Of the 19 studies examining HIV risk, there were mixed effects for community-level poverty and education, but more consistent risk associations with inequality measures. A number of studies showed associations between contextual factors and risky sexual behaviors, including: employment, education, socioeconomic status, and gender inequality. Many of the studies focused on women and young girls or children to young adults, and the most frequent source of data was Demographic and Health Surveys (DHS) – with resulting age limits of 49 for women and 54 or 59 for men. There is a need for data that includes information on a wide age range including older adults, especially given the changing dynamics of the aging HIV epidemic (Vollmer et al., 2016).

Figure 1 presents the conceptual framework for this study, based on the socio-ecological model and prior research (Magadi and Desta, 2011). Socio-ecological theory embeds individuals in multiple environments – including family, community, and society – highlighting the interaction of factors across contexts and their influence on individuals' health behaviors. The most proximate determinants of HIV risk are through sexual behaviours. In turn, less proximate behavioral and awareness factors such as alcohol use and HIV testing may influence sexual behaviors. Background factors, including individual socio-demographics, household factors such as assets, and community factors such as asset inequality in turn influence sexual behaviors either directly or indirectly through behaviors and awareness. Our framework also acknowledges that some background factors may have a direct influence on HIV risk given increased vulnerability.

In this study we incorporate contextual (household and village-level) determinants along with individual risk factors and examine their associations with HIV and multiple sexual partnerships. At the household-level, we hypothesize that: (1) gender inequity will increase HIV risk; (2) having older adults in the household will increase HIV risk; and (3) higher household socioeconomic status (SES) will reduce HIV risk. At the community-level, we expect that: (1) higher asset inequality among households will increase HIV risk; (2) higher levels of community employment will reduce HIV risk; (3) a higher proportion of households headed by older adults will increase HIV risk; (4) gender inequity will increase HIV risk; and (4) communities with a higher proportion of non-native South Africans will increase HIV risk given cultural differences with the Mozambican refugee population.

Method

Data

We use data from the Agincourt Health and Socio-Demographic Surveillance Site (HDSS) located in rural northeast South Africa. The setting is a former apartheid homeland, with limited infrastructure and employment opportunities. Since the early 1990s the site has conducted an annual census of the population updating vital events and sociodemographic information (Kahn et al., 2012).

We use two sources of data, with the first being population-level information aggregated to the household and village-level from the 2009 HDSS census. This forms the basis for our contextual factors. The second data source comes from a cross-sectional, population-based survey that was conducted at the site in 2010-2011 (Gómez-Olivé et al., 2013, Houle et al., 2018). The survey included an age-sex stratified random sample of men and women ages 15 and older who were resident in the HDSS in 2009. The survey collected information on chronic disease risk factors, sexual behaviors, as well as biomarker data collection for HIV. This forms the basis of our individual-level factors and outcomes.

Measures

Contextual variables. Our contextual variables are all derived from the 2009 HDSS census. At the household-level we include three indicators: (1) tertiles of socio-economic status (SES) (Kabudula et al., 2016); (2) the gender of the household-head; and (3) the number of adults in the household ages 60 and older. For our village-level indicators, we aggregated

individual and household data to the 21 villages included in this study. As a measure of village SES, we calculated wealth inequality as the ratio of the number of households in the richest SES tertile to the number of households in the poorest SES tertile. We include an indicator of employment as the proportion of people ages 15+ currently working. We also include the proportion of female-headed households and the proportion of households headed by someone aged 60 and older. Finally, we include the proportion of Mozambicans, former refugees of the Mozambican civil war, to account for ethnic diversity and different cultural practices. Given the limited number of villages, and in the absence of available norm data on what levels might be considered high, low, or normal, we create binary indicators for each factor based on the overall mean across the villages.

Sexual behaviors in the past two years. We include whether the respondent reported 2 or more sexual partners as a proxy of their sexual network. Condom use was measured as whether the respondent reported always using a condom with all of their sexual partners.

Proximate factors. We include two indicators that may directly or indirectly influence sexual behaviors: if the respondent reported having ever been tested for HIV, and alcohol use in the past month.

Socio-demographic factors. We include HIV status from the biomarker test. We also include an individual's age (mean centered), gender, education in years, nationality (South African vs. other/Mozambican), and employment and union status. Based on census data, we also include an indicator of migration history in the past 5 years.

Analysis

First, we include a model of one proximate sexual behaviour determinant of HIV risk: multiple sexual partnerships. Prior work suggests that this variable was highly discriminating between individuals engaging in risky vs. protective sexual behaviors. This modelling approach provides information on determinants of risky sexual behaviour. Second, in order to provide information of how background factors operate through proximate pathways, we estimate a model that includes both background and proximate factors on HIV status.

Our analytic approach follows the conceptual framework shown in Figure 1 – allowing us to model and identify the determinants leading to HIV vulnerability – including direct, indirect, and moderating effects of different factors on sexual behaviour and HIV status. We use multilevel logistic regressions to account for the hierarchical structure of individuals nested within households and villages. Given limited sample size within households, we only include a random intercept at the village level. We begin our analysis by fitting an unconditional mean model for both outcomes, using the intraclass correlation coefficient (ICC) to summarize the extent of clustering in each outcome at the village-level. Next, we include contextual and socio-demographic indicators. We next add proximate factors of alcohol consumption and HIV testing as a proxy for an individual's HIV awareness and risk behaviors that may be linked to HIV vulnerability. Finally, for the HIV model, we bring in sexual behaviors, including number of sexual partners and condom use.

Results

Figure 2 shows distributions of our two outcome variables along with community-level factors across the 21 villages included in this study. Overall and across the villages there is a high prevalence of HIV. Table 1 shows the variables outlined in Figure 1 for each of the two outcome variables.

Table 2 shows the results of the multi-level logistic regression on having multiple sexual partnerships in the past two years. Including a random intercept with no covariates shows an estimated intra-class correlation (ICC) of 0.04 – representing the total variance shared among individuals in the same village. Model 1 next includes individual, household, and contextual-level background factors. Men compared to women, and being employed are associated with higher odds of reporting multiple sexual partners, while older ages have lowered odds. At the household-level, there was a significant interaction between female-headed household and SES ($p<0.001$). Figure 3 shows the relationship between female-headed household and household socio-economic status – while generally being in a higher SES household increases the probability of having multiple partners, there is increased vulnerability for the poorest female-headed households compared to male-headed households. At the community-level none of the factors are associated with multiple sexual partners. Model 2 adds in proximate factors – a higher frequency of alcohol use is associated with higher odds of multiple partners compared to those who didn't drink in the past month. The associations with other factors remained the same between Models 1 and 2.

Table 3 shows the results of the multi-level logistic regression on HIV status. Including a random intercept with no covariates shows an estimated ICC of 0.03. Model 1 next includes individual, household, and community-level background factors. Younger women and older men have a higher probability of being HIV positive. Any migration history in the past 5 years is associated with 50% higher odds of being HIV positive. At the household-level, being in a household with at least one older adult ages 60+ is associated with higher odds of being HIV positive. At the community-level being in a community with a higher than average employment level is associated with 30% lower odds of being HIV positive. Examining proximate factors in Model 2 shows higher odds of being HIV positive for those reporting ever having an HIV test. Model 3 next shows that those with multiple sexual partners had almost 1.8 times the odds of being HIV positive compared to those with one sexual partner. Finally, Model 4 brings in condom use – given that condom use may be driven by awareness of one's HIV status, we also include an interaction between them ($p<0.001$). Figure 4 shows that those who have ever been tested for HIV and used a condom had the highest probability of being HIV positive, while those who had never been tested and used a condom had the lowest probability of being HIV positive. The associations with other factors and HIV status are slightly attenuated but remain across the models.

Discussion

Using a population-based study of ages 15 and above in a rural high HIV prevalence setting, we found consistent associations between female-headed households and a higher likelihood of having multiple sexual partners and for being HIV positive for the poorest female-headed households. Most factors at the community-level were not associated with HIV status or sexual behaviour risk. We hypothesized that being in a community with higher levels of employment would be protective for HIV risk. As a measure of social expansion,

this could provide environments to share and maintain norms that are protective against HIV risk.

For individuals in female headed-households, a higher likelihood of being HIV positive is at least partly explained by that some women in female-headed households are widows whose partners died due to AIDS and are more likely to be HIV positive themselves (Magadi and Desta, 2011, Schatz et al., 2011). A higher likelihood of having multiple sexual partners for the poorest female-headed households is in-line with their heightened vulnerability, including loss of support networks and employment opportunities (Schatz et al., 2011). Longitudinal data are needed to examine how social connections and other coping strategies change over time and relate to HIV and sexual behaviour risks.

We acknowledge strengths and weaknesses of this study. While we use a population-based study including a wide age range in a high HIV prevalence study, it is unclear how generalizable these results are to other rural settings. Our study was conducted at the beginning of widespread ART availability at the site, providing an important point of comparison to other contexts and time periods as ART rollout has accelerated. We included community-level factors that were aggregated from population census data, which reduces sampling error for contextual effects (Lüdtke et al., 2008). However, we are limited by what data is collected in the census and lack measures at the community level. Further, our aggregate measures are still subject to measurement error. In the absence of available community norms, we used cut-offs at the population mean – while this provides an intuitive interpretation – other cut-offs may be meaningful to our outcomes of interest. Relatedly, we have a limited number of village-units, limiting our ability to examine cross-level interactions. Our study is also cross-sectional, limiting our ability to make temporal assessments on the associations observed. We examined HIV pathways according to an established theoretical model via Figure 1, but it is also possible that directionality may be reversed – for instance, that being HIV infected may lead to job or wealth loss.

Using available population-level data to measure contextual factors, we found that few factors were associated with risky sexual behavior or HIV risk. Our results of low ICCs in the null models suggest that the village boundaries may not align with the boundaries that shape HIV and sexual behavior risk environments (Merlo, 2005). Results from the Africa Health Research Institute (AHRI) in KwaZulu-Natal found higher HIV prevalence near the National Road and urban township (Tanser et al., 2009). Thus, characteristics of where people live within these villages may therefore be a more important characterization of risk context. Further, another AHRI study found that higher ART coverage at the community level, defined using a standard Gaussian kernel of 3km radius, reduced individual HIV risk (Tanser et al., 2013) – also suggesting that the boundary definition may be an important factor. It could also be that different contextual measures may have more meaning in what is relatively homogenous area. A study at Agincourt among adults ages 18-49 showed that community social cohesion, measured by individual ratings aggregated to the village-level, was associated with lowered odds of heavy drinking among men and higher odds of HIV testing (Lippman et al., 2018). The low levels of within village correlation and the high HIV prevalence across most villages shown in this study suggests that it may be useful to identify and target interventions to more proximal risk environments in more homogenous rural communities.

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Figure 1. Conceptual framework for analysis of the determinants of multiple sexual partners and HIV status, Agincourt, South Africa.

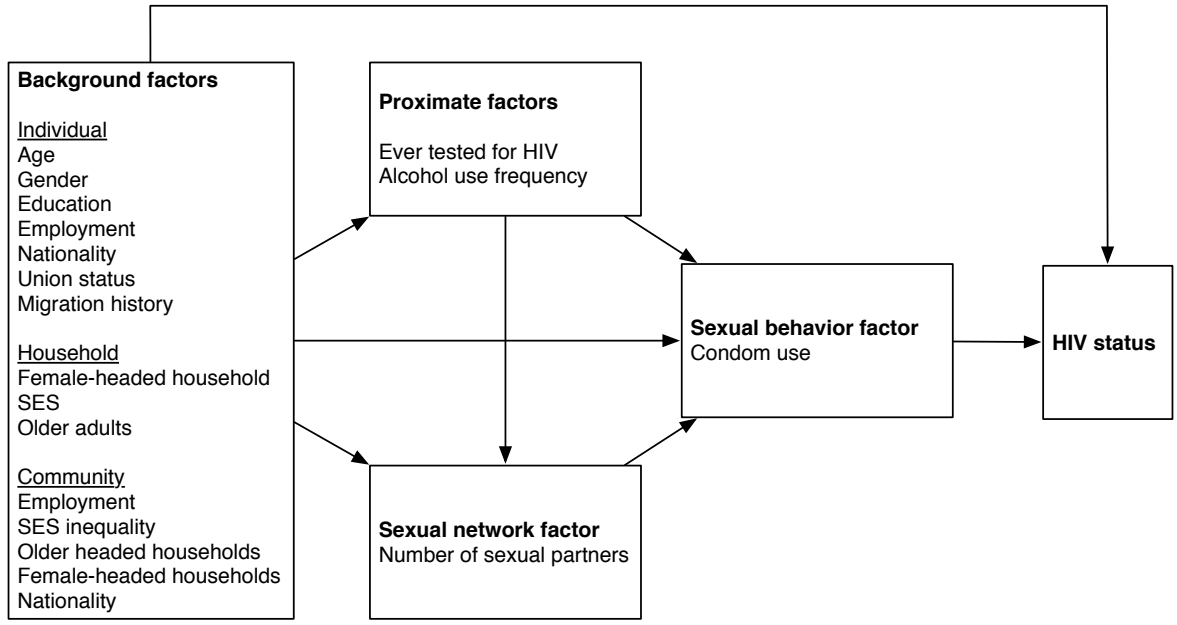

Figure 2. Distributions of HIV prevalence and prevalence of multiple sexual partners at the village-level, Agincourt, South Africa, 2010 – 2011.

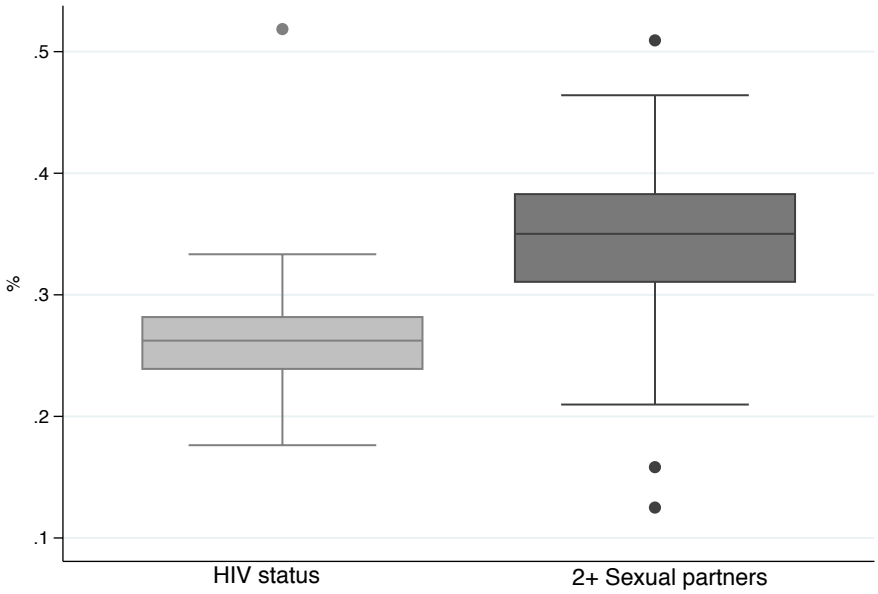

Figure 3. Predicted probability of having multiple sexual partners, by household-head gender and SES, Agincourt, South Africa, 2010 – 2011.

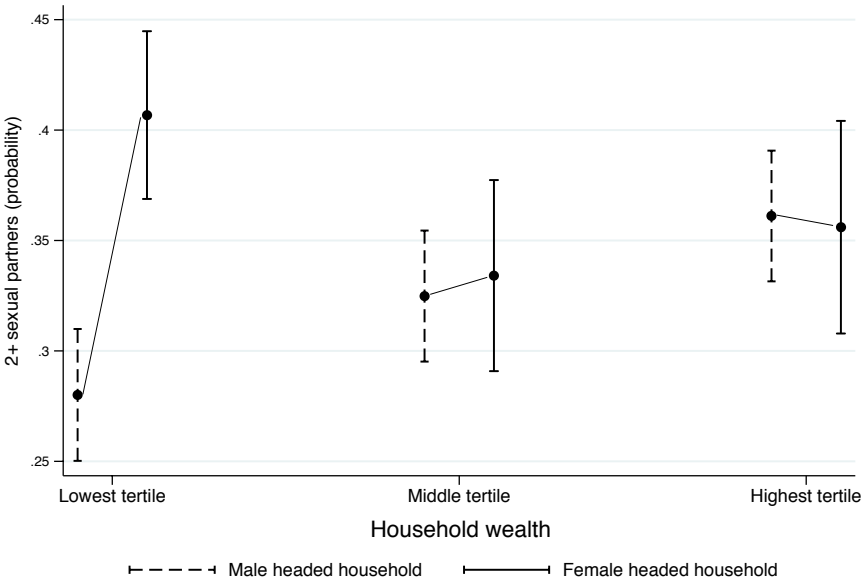

Figure 4. Predicted probability of being HIV positive using average marginal effects, by age, condom use, and ever tested for HIV, Agincourt, South Africa, 2010 – 2011.

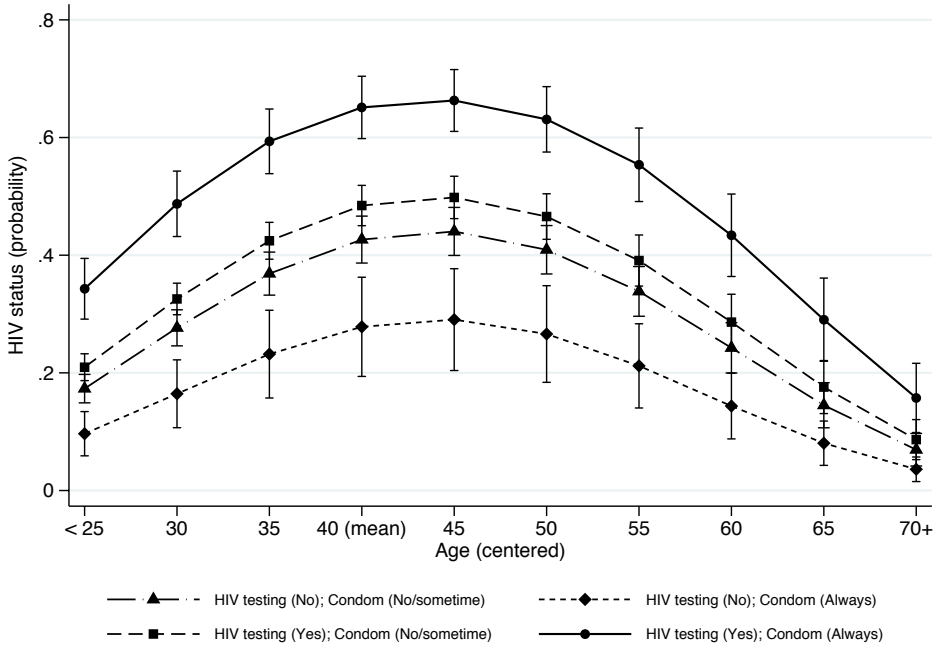

Table 1. Individual, household, and community-level factors by HIV status and number of sexual partners in the past 2 years.

			HIV serostatus			Number of sexual partners		
	Overall (3391)		*Positive*	*Negative*		*1 partner*	*1+ partners*	
	N	%/mean	N (%/mean)	N (%/mean)	*P* value	N (%/mean)	N (%/mean)	*P* value
Ever migrate (past 5 years)								
No	3196	94.25%	868 (92.05%)	2328 (95.10)	< .01	2135 (95.31%)	1061 (92.18%)	< .001
Yes	195	5.75%	75 (7.95%)	120 (4.90%)		105 (4.69%)	90 (7.82%)	
Sex								
Female	1707	50.34%	556 (58.96%)	1151 (47.02%)	< .001	1419 (63.35%)	288 (25.02%)	< .001
Male	1684	49.66%	387 (41.04%)	1297 (52.98)		821 (36.65%)	863 (74.98%)	
Age	3391	37.730	943 (37.121)	2448 (37.964)	< .001	2240 (40.714)	1151 (31.922)	< .001
Education level								
None	550	16.22%	127 (13.47%)	423 (17.28%)	< .05	446 (19.91%)	104 (9.04%)	< .001
1-11 years	2185	64.44%	621 (65.85%)	1564 (63.89%)		1358 (60.62%)	827 (71.85%	
12+ years	656	19.35%	195 (20.68%)	461 (18.83%)		436 (19.46%)	220 (19.11%)	
Employment								
No	2496	73.61%	642 (68.08%)	1854 (75.74%)	< .001	1644 (73.39%)	852 (74.02%)	= .694
Yes	895	26.39%	301 (31.92%)	594 (24.26%)		596 (26.61%)	299 (25.98%)	
Nationality								
Others	1036	30.55%	280 (29.69%)	756 (30.88%)	= .500	683 (30.49%)	353 (30.67%)	= .915
South African	2355	69.45%	663 (70.31%)	1692 (69.12%)		1557 (69.51%)	798 (69.33%)	
Union status								
Not in a union	1855	54.70%	590 (62.57%)	1265 (51.67%)	< .001	992 (44.29%)	863 (74.98%)	< .001
In a formal/informal union	1536	45.30%	353 (37.43%)	1183 (48.33%)		1248 (55.71%)	288 (25.02%)	
Contextual effects								
Household head gender, household								
Male	2304	67.94%	548 (58.11%)	1756 (71.73%)	< .001	1605 (71.65%)	699 (60.73%)	< .001
Female	1087	32.06%	395 (41.89%)	692 (28.27%)		635 (28.35%)	452 (39.27%)	
Wealth, household								
Lowest tertile	1190	35.09%	355 (37.65%)	835 (34.11%)	< .01	769 (34.33%)	421 (36.58%)	= .267
Middle tertile	1076	31.73%	314 (33.30%)	762 (31.13%)		730 (32.59%)	346 (30.06%)	
Highest tertile	1125	33.18%	274 (29.06%)	851 (34.76%)		741 (33.08%)	384 (33.36%)	
N of 60+ years old resident, household								
None	2017	59.48%	591 (62.67%)	1426 (58.25%)	< .05	1324 (59.11%)	693 (60.21%)	= .536
≥ 1 person	1374	40.52%	352 (37.33%)	1022 (41.75%)		916 (40.89%)	458 (39.79%)	
% of employed, village								
≤ 20%	996	29.37%	323 (34.25%)	673 (27.49%)	< .001	656 (29.29%)	340 (29.54%)	= .878
> 20%	2395	70.63%	620 (65.75%)	1775 (72.51%)		1584 (70.71%)	811 (70.46%)	
Wealth inequality ratio, village								
More poorest household	2351	69.33%	647 (68.61%)	1704 (69.61%)	= .573	1520 (67.86%)	831 (72.20%)	< .01
More wealthiest household	1040	30.67%	296 (31.39%)	744 (30.39%)		720 (32.14%)	320 (27.80%)	
% of 60+ years old household head, village								
≤ 25%	1760	51.90%	521 (55.25%)	1239 (50.61%)	< .05	1132 (50.54%)	628 (54.56%)	< .05
> 25%	1631	48.10%	422 (44.75%)	1209 (49.39%)		1108 (49.46%)	523 (45.44%)	
% of Female headed household, village								
< 43%	1975	58.24%	558 (59.17%)	1417 (57.88%)	= .495	1339 (59.78%)	636 (55.26%)	< .05
More than 43%	1416	41.76%	385 (40.83)	1031 (42.12%)		901 (40.22%)	515 (44.74%)	
% of Mozambique resident, village								
≤ 33%	1918	56.56%	515 (54.61%)	1403 (57.31%)	= .155	1300 (58.04%)	618 (53.69%)	< .05
> 33%	1473	43.44%	428 (45.39%)	1045 (42.69%)		940 (41.96%)	533 (46.31%)	
Proximate factor								
Ever tested for HIV?								
No	1497	44.15%	293 (31.07%)	1204 (49.18%)	< .001	894 (39.91%)	603 (52.39%)	< .001
Yes	1894	55.85%	650 (68.93%)	1244 (50.82%)		1346 (60.09%)	548 (47.61%)	
Alcohol consumption (per month)								
None	2475	72.99%	708 (75.08%)	1767 (72.18%)	= .112	1829 (81.65%)	646 (56.13%)	< .001
1-3 day per month	414	12.21%	98 (10.39%)	316 (12.91%)		204 (9.11%)	210 (18.25%)	
Weekly	502	14.80%	137 (14.53%)	365 (14.91%)		207 (9.24%)	295 (25.63%)	
Sexual network								
Number of sexual partners								
1	2240	66.06%	594 (62.99%)	1646 (67.24%)	< .05			
More than 1	1151	33.94%	349 (37.01%)	802 (32.76%)				
Sexual behavioural factor								
Condom used with R partners								
None/sometime	2823	83.25%	746 (79.11%)	2077 (84.84%)	< .001			
Always	568	16.75%	19 (20.89%)	371 (15.16%)				

Table 2. Multilevel logistic regression of multiple sexual partnerships (n=3391).

Number of sexual partners (*1 partner: base*)	Model 1	95% CI	Model 2	95% CI
Ever migrate (past 5 years)				
No (base)				
Yes	1.115	[.795 - 1.564]	1.141	[.809 - 1.609]
Sex				
Female (base)				
Male	13.512	[10.269 - 17.779]	10.401	[7.791 - 13.885]
Age	.916	[.901 - .932]	.916	[.900 - .931]
Education level				
None (base)				
1-11 years	.984	[.714 - 1.358]	1.011	[.730 - 1.401[
12+ years	.917	[.632 - 1.330]	.943	[.647 - 1.375]
Employment				
No (base)				
Yes	1.268	[1.030 - 1.562]	1.257	[1.019 - 1.552]
Nationality				
Others (base)				
South African	.905	[.722 - 1.135]	.905	[.720 - 1.138]
Union status				
Not in a union (base)				
In a formal/informal union	.441	[.354 - .550]	.468	[.375 - .585]
Male * age	1.065	[1.047 - 1.084]	1.065	[1.047 - 1.084]
Contextual effects				
Household head gender, household				
Male (base)				
Female	2.204	[1.631 - 2.980]	2.276	[1.681 - 3.083]
Wealth, household				
Lowest tertile (base)				
Middle tertile	1.297	[.992 - 1.696]	1.309	[.999 - 1.716]
Highest tertile	1.654	[1.262 - 1.135]	1.688	[1.285 - 2.217]
Household wealth * Household head gender				
Lowest tertile * female headed (base)				
Middle tertile * female headed	.497	[.323 - .763]	.481	[.312 - .740]
Highest tertile * female headed	.457	[.297 - .714]	.415	[.266 - .647]
N of 60+ years old resident, household				
None (base)				
$\geq$ 1 person	.991	[.825 - 1.190]	.978	[.813 - 1.177]
% of employed, village				
$\leq$ 20% (base)				
> 20%	1.066	[.717 - 1.584]	1.079	[.712 - 1.633]
Wealth inequality ratio, village				
More poorest household (base)				
More wealthiest household	1.066	[.626 - 1.815]	1.110	[.636 - 1.936]
% of 60+ years old household head, village				
$\leq$ 25% (base)				
> 25%	.859	[.558 - 1.322]	.842	[.537 - 1.320]
% of Female headed household, village				
< 43% (base)				
More than 43%	1.433	[.974 - 2.109]	1.441	[.964 - 2.156]
% of Mozambique resident, village				
$\leq$ 33% (base)				
> 33%	1.257	[.778 - 2.030]	1.267	[.768 - 2.091]
Proximate factor				
Ever tested for HIV?				
No (base)				
Yes			.915	[.763 - 1.098]
Alcohol consumption (per month)				
None (base)				
1-3 day per month			1.389	[1.079 - 1.788]
Weekly			1.898	[1.486 - 2.424]
Random effect, village (variance(SE))	.119 (.054)	[.049 - .289]	.134 (.059)	[.057 - .317]
Intraclass correlation (ICC)	.035	[.015 - .081]	.039	[.017 - .088]
BIC	3494.566		3489.922	

Table 3. Multilevel logistic regression of HIV status (n=3391).

HIV (*negative: base*)	Model 1	95% CI	Model 2	95% CI	Model 3	95% CI	Model 4	95% CI
Ever migrate (past 5 years)								
No (base)								
Yes	1.512	[1.084 - 2.107]	1.476	[1.057 - 2.060]	1.455	[1.041 - 2.035]	1.401	[1.000 - 1.962]
Sex								
Female (base)								
Male	.885	[.733 - 1.069]	.893	[.717 - 1.112]	.737	[.585 - .929]	.735	[.583 - .928]
Age	.996	[.984 - 1.008]	1.000	[.988 - 1.012]	1.006	[.993 - .996]	1.004	[.992 - 1.017]
Education level								
None (base)								
1-11 years	1.208	[.907 - 1.609]	1.181	[.885 - 1.576]	1.199	[.898 - 1.601]	1.153	[.862 - 1.541]
12+ years	.918	[.649 - 1.299]	.883	[.622 - 1.252]	.904	[.637 - 1.283]	.867	[.609 - 1.233]
Employment								
No (base)								
Yes	.944	[.776 - 1.149]	.966	[.793 - 1.177]	.946	[.775 - 1.154]	.978	[.800 - 1.195]
Nationality								
Others (base)								
South African	1.076	[.862 - 1.342]	1.086	[.869 - 1.358]	1.089	[.870 - 1.363]	1.095	[.874 -1.372]
Union status								
Not in a union (base)								
In a formal/informal union	.401	[.326 - .494]	.402	[.326 - .497]	.424	[.343 - .525]	.442	[.356 - .548]
Male * age	1.067	[1.051 - 1.083]	1.061	[1.044 - 1.077]	1.060	[1.044 - 1.077]	1.061	[1.045 - 1.078]
Age * age	.996	[.995 - .996]	.996	[.995 - .996]	.996	[.995 - .996]	.996	[.992 - .996]
Contextual effects								
Household head gender, household								
Male (base)								
Female	1.412	[1.158 - 1.718]	1.442	[1.183 - 1.757]	1.406	[1.152 - 1.716]	1.386	[1.134 - 1.695]
Wealth, household								
Lowest tertile (base)								
Middle tertile	1.064	[.868 - 1.305]	1.062	[.866 - 1.304]	1.073	[.873 - 1.318]	1.060	[.861 - 1.304]
Highest tertile	.877	[.706 - 1.091]	.887	[.713 - 1.103]	.873	[.700 - 1.088]	.851	[.681 - 1.063]
N of 60+ years old resident, household								
None (base)								
≥ 1 person	1.280	[1.068 - 1.534]	1.300	[1.083 - 1.559]	1.313	[1.093 - 1.577]	1.310	[1.089 - 1.577]
% of employed, village								
≤ 20% (base)								
> 20%	.693	[.517 - .928]	.693	[.516 - .931]	.687	[.510 - .925]	.670	[.493 - .908]
Wealth inequality ratio, village								
More poorest household (base)								
More wealthiest household	1.279	[.865 - 1.892]	1.274	[.857 - 1.894]	1.276	[.856 - 1.903]	1.251	[.832 - 1.881]
% of 60+ years old household head, village								
≤ 25% (base)								
> 25%	.808	[.582 - 1.123]	.816	[.585 - 1.137]	.816	[.584 - 1.141]	.816	[.580 - 1.148]
% of Female headed household, village								
< 43% (base)								
More than 43%	.970	[.728 - 1.291]	.965	[.722 - 1.289]	.936	[.699 - 1.254]	.932	[.692 - 1.255]
% of Mozambique resident, village								
≤ 33% (base)								
> 33%	1.104	[.770 - 1.582]	1.095	[.761 - 1.577]	1.070	[.742 - 1.544]	1.077	[.741 - 1.565]
Proximate factor								
Ever tested for HIV?								
No (base)								
Yes			1.608	[1.336 - 1.935]	1.640	[1.361 - 1.976]	1.309	[1.072 - 1.597]
Alcohol consumption (per month)								
None (base)								
1-3 day per month			1.150	[.860 - 1.537]	1.098	[.820 - 1.472]	1.150	[.856 - 1.545]
Weekly			1.249	[.946 - 1.649]	1.155	[.872 - 1.529]	1.178	[.888 - 1.562]
Sexual network								
Number of sexual partners								
1 (base)								
More than 1					1.792	[1.457 - 2.204]	1.845	[1.496 - 2.277]
Sexual behavioral factor								
Condom used with R partners								
None/sometime (base)								
Always							.474	[.295 - .763]
Condom used * Ever tested for HIV								
Always * Yes							4.549	[2.644 - 7.830]
Random effect, village (variance(SE))	.048 (.030)	[.014 - .166]	.050 (.031)	[.015 - .168]	.051 (.031)	[.015 - .169]	.054 (.033)	[.016 - .179]
Intraclass correlation (ICC)	.014	[.004 - .048]	.015	[.005 - .049]	.015	[.005 - .049]	.016	[.005 - .052]
BIC	3600.707		3597.630		3574.881		3548.819	