

**STRATEGIC ASSESSMENT TO DEFINE A  
COMPREHENSIVE RESPONSE TO  
HIV IN IRINGA, TANZANIA**

**RESEARCH BRIEF**

**ISOLATING HIV RISK FACTORS FROM THE TANZANIA  
HIV/AIDS AND MALARIA INDICATOR SURVEY**

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## INTRODUCTION

### Rationale

The Iringa region of Tanzania has among the highest rates of HIV in the country (Tanzania Commission for AIDS [TACAIDS], 2008). The reasons behind this elevated HIV prevalence are not fully understood, and the response to HIV in Iringa has thus far been insufficient to match the need. The Iringa strategic assessment was designed to inform the development of comprehensive HIV prevention interventions that respond to key factors linked to HIV-related risk in Iringa, Tanzania. The strategic assessment synthesized existing data; conducted additional analyses of representative population-based data from the Tanzania HIV/AIDS and Malaria Indicator Survey; and conducted a large number of qualitative interviews and focus groups with key informants, service delivery providers and clients, and people at heightened risk of HIV in Iringa. Together, these findings provide a better understanding of the reasons behind the high HIV prevalence in the region and help to identify and tailor an appropriate set of interventions to address it. In this brief, we present findings of risk factors for HIV in the Iringa region with an in-depth analysis of data from the 2007/2008 Tanzania HIV/AIDS and Malaria Indicator Survey (THMIS).

### Aim

Descriptive statistics from the 2007/8 THMIS and other sources provide a preliminary starting point for understanding HIV risk in Iringa; however, to date, there has not been a comprehensive analysis of these data beyond descriptive statistics that examine risk factors for HIV in Iringa and the rest of Tanzania. This study performs robust statistical analyses using the 2007/8 THMIS data, including multivariate logistic regression, to examine the drivers of HIV in Iringa, Tanzania. Together with the other strategic assessment studies, these data can be used to inform the development of more effective HIV prevention programs in this region.

### HIV in Tanzania and Iringa

In 2009, an estimated 1.4 million persons were living with HIV in Tanzania (UNAIDS, 2009). The nation's 2007/8 THMIS estimated an HIV prevalence of 5.6% among the general population. Women are disproportionately affected, with an HIV prevalence of 7% compared to the 5% prevalence reported among men (TACAIDS, 2008).

Iringa is one of 26 administrative regions in Tanzania. In the 2007/8 THMIS, Iringa's estimated HIV prevalence of 16% was the highest among all administrative regions in the country. The figure was nearly 2.5 times the national average and considerably higher than the two regions with next highest prevalence, Dar es Salaam (9%) and Mbeya (9%). Though the recent estimates represent an overall national decrease in HIV prevalence since the 2004/05 THMIS, prevalence in the Iringa region has remained unchanged (TACAIDS, 2008). Further, in the Iringa region, HIV prevalence is almost twice as high in urban areas (30%) relative to rural areas (16%) and is also higher among women (18%) relative to men (12%) (TACAIDS, 2008). Estimates from the 2007/8 THMIS showed that HIV prevalence in the region among youth ages 15-24 years was twice as high in young women compared to young men (8.2% vs. 4.8%) (TACAIDS, 2008). When examining modes of transmission in the Iringa region, 85% of HIV

transmission occurs through heterosexual contact and only 6% is attributed to mother-to-child transmission of HIV (PEPFAR, 2006). HIV incidence data are not available for Iringa, but data from the neighboring region of Mbeya indicate an approximate HIV incidence of 1.35 per 100 person-years (PY) during the years 2002-2006, with rates as high as 2.75 per 100 PY (Geis et al., 2011).

The reasons behind the high HIV prevalence in Iringa are not fully understood; however, some evidence suggests that higher levels of risk factors and lower levels of protective factors exist in this region relative to other regions. For example, the prevalence of HIV knowledge as measured by the THMIS is lower in Iringa for women (18.7%) and men (32.4%) compared to the national prevalence of 39.6% and 44.3%, respectively (TACAIDS, 2008). Migration and mobility are also common in the region, and recent data triangulation efforts indicate that mobility may play an important role in the region's high prevalence. The majority (61.4%) of men and women in Iringa reported travelling in the past year; among those who had travelled, slightly over one-third (37%) spent more than a month away from home (TACAIDS, 2008). Migration and mobility may be a particularly concerning risk factor for HIV among female sex workers (FSW). While studies have not been conducted in the Iringa region specifically, the estimated HIV prevalence among FSW in towns and truck stops throughout Tanzania is as high as 60%, and between 32% and 50% among bar-based FSW (MHSW, 2004).

Other factors such as low prevalence of male circumcision, late initiation of HIV-infected individuals into clinical care and antiretroviral therapy (ART), and structural vulnerabilities for young women and girls also appear to contribute to ongoing HIV transmission. Only 30% of men in Iringa report being circumcised, compared to 67% of men nationally (TACAIDS, 2008). The percentages of adults ever tested for HIV in Iringa are 51.8% of women and 34.1% of men, compared to 40.9% of women and 29.2% of men nationally (TACAIDS, 2008). Although HIV care and treatment data are not available for Iringa specifically, in Tanzania, an estimated 22% of those eligible for ART are receiving it (UNAIDS, 2010).

## METHODS

This study used data from the 2007/2008 Tanzania HIV/AIDS and Malaria Indicator Survey (THMIS) to assess risk factors for HIV infection in the Iringa region relative to the rest of Tanzania.

The THMIS survey utilizes a conventional two-stage cluster sample representative of both urban and rural areas at the national level. In the first stage, 120 clusters of households were identified. An average of 25 households were then randomly sampled from each cluster, resulting in an overall sample of approximately 3,000 households. In all households, women and men of reproductive age (15-49 years) were eligible to participate. A total of 15,044 individuals were included in the 2007/8 survey in Tanzania, of which 445 were from Iringa. However, there has recently been a change in region boundaries, with Njombe becoming its own region. Therefore, these results must be interpreted in the context of the geographical boundaries which were represented during this data collection.

Survey sample weights were used to adjust for population density and oversampling of some sub-populations. We first performed descriptive analyses to assess differences in risk factors among those living with HIV and those not infected to confirm original descriptive results from the THMIS. We then used chi-squared tests to compare risk factors and demographic factors between HIV-infected and uninfected individuals. This analysis was stratified by geographic region to yield estimates for Iringa, all other regions outside of Iringa, and a pooled sample representing all of Tanzania.

Additionally, we conducted univariate and multivariate weighted logistic analyses to assess the determinants of HIV infection and odds ratios of HIV infection adjusted for various factors. All analyses assessed risk factors in the Iringa region compared with Tanzania overall, and then stratified by HIV status. The key outcome variable was HIV seroprevalence and the main predictor variables were age of sexual debut, marital status, age of the respondent, age difference between the respondent and his or her sexual partner, number of lifetime sexual partners, educational level of the respondent, and mobility. Mobility was defined as the frequency of movements from home as well as the duration of travel in the past year.

The multivariate model was developed through stepwise selection and purposeful selection of covariates based on a literature review and previous formative analysis. Variables that were found to be significant at the 0.1 alpha level in univariate analyses, based on the Wald test for logistic regression, were selected as candidates for the multivariate analysis. All analyses were conducted using STATA software package version 11.0 (College Station, Texas, USA).

## RESULTS

Overall, there were 15,044 individuals in our study sample, of which 445 were from the Iringa region. Table 1 summarizes demographic and risk characteristics of participants overall and stratified by HIV status, comparing Iringa region with Tanzania overall. When assessing distribution stratified by geographical region, the significant differences between individuals in the Iringa region compared with the rest of Tanzania were in age difference with sexual partner, male circumcision status, and wealth quintile. Compared to Tanzania overall, a higher proportion of individuals in Iringa had sexual partners who either had no age difference (9.2% and 5.7%, respectively) or an age difference between one and nine years (69.4% and 66.4%, respectively); a lower proportion were circumcised (27.5% and 66.4%, respectively); and a higher proportion were in the middle (24.7% and 19.3%, respectively) and richer (34.5% and 20.0%, respectively) wealth quintiles.

There were significant differences in HIV prevalence and risk factors among individuals in the Iringa region compared with the rest of Tanzania. HIV prevalence in Iringa was three times higher than the combined prevalence of other regions in the country (15.7% vs. 5.23%,  $p < 0.001$ , respectively). In addition, only 27.5% of men in Iringa reported being circumcised, a significantly lower figure than the 66.4% in Tanzania's other regions ( $p < 0.001$ ). Significant differences also existed in circumcision in HIV-infected men by HIV status overall and other regions of Tanzania: a lower proportion of HIV positive males in Tanzania overall were circumcised (3.6% versus 6.7%, respectively,  $p < 0.001$ ), as well as in regions other than Iringa (3.6% versus 5.6%, respectively,  $p < 0.05$ ).

The addition of tests of statistical significance to the THMIS demographics revealed that gender discrepancy in HIV status was significant. Women were more likely to be HIV-infected as compared to males in Tanzania overall (6.6% for females, 4.6% for males,  $p < 0.001$ ) and in Iringa (18.6% for females, 12.1% for males,  $p < 0.001$ ). Chi-squared analyses revealed the following factors were significantly associated with HIV prevalence: age (highest among those 30-39 years,  $p < 0.001$ ) and marital status (highest among those divorced/widowed/separated,  $p < 0.001$ ) for all of Tanzania; and employment status in the last 12 months (highest among employed,  $p < 0.05$ ) for all of Tanzania, Iringa, and other regions.

**Table 1. Demographic and risk characteristics by HIV serostatus for Tanzania as a whole, the Iringa region, and other regions of Tanzania**

	Overall Tanzania (N=15,044) %	Iringa Region (N=445) %	Overall Tanzania (N=15,044)		Iringa (N=445)		Other regions (N=14,599)	
			HIV- %	HIV+ %	HIV- %	HIV+ %	HIV- %	HIV+ %
<b>Gender</b>								
<b>Male</b>	45.6	44.5	95.44	4.56**	87.9	12.13* *	95.8	4.2**
<b>Female</b>	54.4	55.5	93.39	6.61	81.4	18.6	93.9	6.1
<b>Age</b>								

## Iringa Strategic Assessment Brief: HIV risk factors from the DHS

<20	23.7	20.8	99.00	0.99**	97.5	2.6**	99.1	0.94**
20-29	33.6	30.0	94.54	5.46	85.3	14.7	94.9	5.1
30-39	26.1	27.5	90.53	9.47	74.1	25.9	91.3	8.7
40+	16.6	21.7	93.18	6.82	83.1	16.9	93.8	6.2
<b>Education</b>								
None	16.8	15.4	94.15	5.85	82.9	17.1	94.6	5.4
Primary	19.2	17.2	94.09	5.91	83.4	16.7	94.6	5.4
Secondary and higher	52.2	57.1	95.97	4.03	93.0	7.0	96.1	3.9
	11.9	10.4						
<b>Employed in the past 12 months</b>								
No	22.6	19.1	97.52	2.48**	93.2	6.8*	97.7	2.3**
Yes	77.5	80.9	93.55	6.45	82.2	17.8	94.1	5.9
<b>Marital status</b>								
Never married	32.5	33.7	97.91	2.09**	94.1	5.9**	98.1	1.9**
Married	5.7	57.2	93.92	6.08	82.6	17.4	94.4	5.6
Divorced/Widowed/Separated	8.8	9.1	83.83	16.17	58.9	41.1	85.0	15.0
<b>Lifetime number of sexual partners</b>								
1	30.9	30.5	97.36	2.64**	90.4	9.6	97.7	2.3**
2 to 5	55.6	60.0	92.61	7.39	80.6	19.4	93.4	6.6
>5	13.5	9.5	88.92	11.08	69.6	30.4	90.3	9.7
<b>Age at first sexual intercourse &lt;15 years</b>								
No	68.1	80.4	93.59	6.41	81.3	18.7	93.5	6.5
Yes	31.9	19.6	92.80	7.20	81.6	18.4	92.8	7.2
<b>Age difference with sexual partner<sup>1</sup></b>								
0	5.7	9.2*	94.16	5.84	85.3	14.7	94.5	5.5
1 to 9 years	66.4	69.4	97.25	2.75	81.0	19.0	94.4	5.6
10 years and higher	27.9	21.4	92.93	7.07	78.7	21.3	94.2	5.8
<b>Used condoms during every sex act in the past 12 months</b>								
No	18.8	16.0	89.23	10.77	76.1	23.9	90.1	9.9
Yes	81.2	84.0	91.77	8.23	74.7	25.3	93.0	7.0
<b>Paid for sex in the past 12 months (men only)</b>								
No	88.6	87.0	94.32	5.68	81.2	18.8	94.3	5.7
Yes	11.4	13.0	93.91	6.09	86.8	13.2	93.2	6.8
<b>Male circumcision</b>								
No	33.6	72.5 **	93.64	6.36**	86.3	13.7	94.4	5.6*
Yes	66.4	27.5	96.33	3.67	92.0	8.0	96.4	3.6
<b>Wealth quintile</b>								
Poorest	17.8	8.3 **	95.39	4.61**	82.35	17.65	95.66	4.34**

<b>Poorer</b>	19.2	19.1	94.92	5.08	86.10	13.90	95.31	4.69
<b>Middle</b>	19.3	24.7	95.35	4.65	85.50	14.50	95.91	4.09
<b>Richer</b>	20.0	34.5	94.67	5.33	84.82	15.18	95.44	4.56
<b>Richest</b>	23.8	13.4	91.93	8.07	79.29	20.71	92.24	7.76

Data are shown as percentages,  $\chi^2$  comparison of HIV+ and HIV-individuals  
 \* $p < 0.05$ , \*\* $p < 0.001$   
<sup>1</sup> Calculated as an absolute value of differences between respondent and partner's ages

HIV-infected individuals residing outside of the Iringa region were significantly more likely to be in the wealthiest quintiles than the four poorer quintiles, though this trend was not the case among the population in Iringa. Interestingly (although non-significantly), in Iringa, the highest proportion of HIV-infected persons were in the poorest and richest quintiles.

Univariate analysis exploring the associations between different variables and HIV status are displayed in Table 2. Individuals in Iringa had a 3.4 times greater odds of HIV infection compared to individuals in other parts of the country (95% CI: 2.23-5.1). Compared with the rest of the country, women were shown to have an increased risk of HIV in Iringa, trending on statistical significance (OR= 1.65, 95% CI: 0.9-3.1). Within the region, those between the ages of 30-40 years had a 1.72 times higher odds of being HIV-infected relative to those above 40 years (95% CI: 1.04-2.8). Relative to those never married, married individuals had a three-fold higher odds of being HIV-infected (OR=3.40, 95% CI: 1.4-7.6), and this effect was even stronger for individuals who were divorced, widowed or separated (OR=11.10, 95% CI: 4.5-27.2). Further, in Iringa, there were no statistically significant differences in the odds of having HIV across educational levels, lower age groups (less than 30), having five or fewer lifetime sexual partners, mobility and frequency of trips, using condoms during every sex act, or having had paid someone for sex.

**Table 2. Univariate analyses: Odds of HIV infection by demographic and risk characteristics for Tanzania as a whole, the Iringa region, and other regions of Tanzania**

	<b>Overall Tanzania (N=15,044)</b>	<b>Iringa (N=445)</b>	<b>Other regions (N=14,599)</b>
	OR (95% CI)	OR (95% CI)	OR (95% CI)
<b>Gender</b>			
<b>Male</b>	1.00	1.00	1.00
<b>Female</b>	1.48 (1.24-1.78)	1.65 (0.9-3.1)	1.50 (1.2-1.8)
<b>Age</b>			
<b>40+</b>	1.00	1.00	1.00
<b>&lt;20</b>	0.14 (0.09-0.2)	0.13 (0.04-1.75)	0.14 (0.1-0.23)
<b>20-29</b>	0.79 (0.6-1.04)	0.84 (0.41-1.75)	0.81 (0.60-1.1)
<b>30-39</b>	1.42 (1.1-1.8)	1.72 (1.04-2.8)	1.43 (1.1-1.9)
<b>Education</b>			
<b>None</b>	1.00	1.00	1.00
<b>Primary</b>	1.01 (0.77-1.32)	0.97 (0.53-1.77)	1.00 (0.75-1.34)

<b>Secondary and higher</b>	0.68 (0.45-1.02)	0.36 (0.1-1.5)	0.70 (0.46-1.1)
<b>Employed in the past 12 months</b>			
<b>No</b>	1.00	1.00	1.00
<b>Yes</b>	2.71 (1.94-3.8)	2.96 (0.9-9.6)	2.70 (1.9-3.9)
<b>Marital status</b>			
<b>Never married</b>	1.00	1.00	1.00
<b>Married</b>	3.03 (2.29-4.0)	3.40 (1.4-7.9)	3.02 (2.2-4.1)
<b>Divorced/Widowed/Separated</b>	9.02 (6.72-12.1)	11.10 (4.5-27.2)	9.00 (6.6-12.4)
<b>Lifetime number of sexual partners</b>			
<b>1</b>	1.00	1.00	1.00
<b>2 to 5</b>	2.87 (2.14-3.85)	2.30 (0.7-7.6)	2.96 (2.2-3.9)
<b>&gt;5</b>	4.24 (3.02-5.96)	4.10 (1.2-14.5)	4.50 (3.1-6.5)
<b>Age at first sexual intercourse &lt;15 years</b>			
<b>No</b>	1.00	1.00	1.00
<b>Yes</b>	1.06 (0.87-1.29)	0.98 (0.44-2.2)	1.12 (0.9-1.4)
<b>Age gap of sexual partner</b>			
<b>0</b>	1.00	1.00	1.00
<b>1 to 9 years</b>	1.10 (0.85-1.37)	1.40 (0.63-3.0)	1.03 (0.8-1.3)
<b>10 years and higher</b>	1.06 (0.73-1.54)	1.60 (0.44-5.6)	1.10 (0.7-1.6)
<b>Used condoms during every sex act in the past 12 months</b>			
<b>No</b>	1.00	1.00	1.00
<b>Yes</b>	0.75 (0.42-1.4)	1.1 (0.32-3.7)	0.69 (0.35-1.34)
<b>Paid for sex in the past 12 months (men only)</b>			
<b>No</b>	1.00	1.00	1.00
<b>Yes</b>	1.13 (0.92-1.4)	0.65 (0.26-1.6)	1.2 (0.96-1.5)
<b>Male circumcision</b>			
<b>No</b>	1.00	1.00	1.0
<b>Yes</b>	0.56 (0.40-0.78)	0.55 (0.15-1.94)	0.62 (0.43-0.89)
<b>Region</b>			
<b>Other</b>	1.00		
<b>Iringa</b>	3.40 (2.23-5.1)		

The multivariate analysis in Table 3 summarizes the adjusted odds of HIV infection among individuals in Tanzania as a whole, in the Iringa region, and in other regions in Tanzania. After adjusting for a variety of demographic and risk factors, individuals in the Iringa region had more than three times the adjusted odds of HIV infection compared to those in the rest of Tanzania (aOR=3.54, 95% CI: 2.1-5.9). In the Iringa region, individuals less than 20 years of age had an odds of being HIV-infected almost six times that of individuals over 40 years of age (aOR=5.8, 95% CI: 1.5-22.7). This is different than in other regions of Tanzania where being between 20 and 39 years of age was represented the greatest risk. Additional risk

factors for HIV infection among individuals in the Iringa region included having a greater than 10-year age gap with a sexual partner (aOR=4.60, 95% CI: 1.2-17.6) and more than five lifetime sexual partners (aOR=8.20, 95% CI: 1.1-62.0).

**Table 3. Multivariate analysis: Adjusted odds of HIV infection for Tanzania as a whole, the Iringa region, and other regions of Tanzania**

	<b>Overall Tanzania N=15,044</b>	<b>Iringa N=445</b>	<b>Other regions N=14,599</b>
	aOR (95% CI)	aOR (95% CI)	aOR (95% CI)
<b>Age</b>			
40+	1.00	1.00	1.00
<20	1.1 (0.5-2.5)	5.8 (1.5-22.7)	0.9 (0.3-2.4)
20-29	1.5 (1.0-2.3)	1.1 (0.32-3.6)	1.6 (1.01-2.5)
30-39	1.96 (1.36-2.81)	1.77 (0.84-3.7)	2.0 (1.3-3.0)
<b>Age gap with sexual partner</b>			
0	1.00	1.00	1.00
1 to 9 years	2.10 (1.6-2.7)	2.50 (0.81-7.5)	2.1 (1.6-2.7)
10 years plus	1.88 (1.16-3.1)	4.60 (1.2-17.6)	1.7 (1.03-2.9)
<b>Number of current sexual partners</b>			
1	1.00	1.00	1.00
2 to 5	2.42 (1.5-3.9)	2.70 (0.3-25.0)	2.40 (1.5-3.8)
>5	5.5 (3.2-9.5)	8.20 (1.1-62.0)	5.30 (3.0-9.3)
<b>Age at first sexual intercourse</b>			
>15 years	1.00	1.00	1.00
<=15 years	0.99 (0.7-1.3)	0.90 (0.04-0.8)	1.00 (0.7-1.4)
<b>Region</b>			
Other	1.00		
Iringa	3.54 (2.1-5.9)		

## DISCUSSION

Our analyses confirmed the statistical significance of the three-fold higher odds of HIV infection in Iringa as compared with those living in other parts of Tanzania. Multivariate analysis revealed that in Iringa, HIV infection was associated with increasing number of sexual partners, being 20 years of age or younger, having a large age gap between sexual partners (10+ years), and being female. When compared to Tanzania overall, factors that emerged as drivers of HIV risk were older compared to younger age (between 20 and 39 years), large age gap with sexual partners (one to nine and 10+ years) and number of sexual partners (two plus). These risk factors were similar to other regions of Tanzania as well. The age group at highest risk of HIV was a key difference between Iringa (where individuals below 20 years were at highest risk) and other regions (where individuals 20-39 years were at highest risk).

The feminization of the epidemic should be a chief consideration for prevention interventions. Women had 65% greater odds of being HIV positive compared with men in Iringa. This gender effect is amplified compared to the other regions of Tanzania, where women had only a 50% increase in odds of HIV as compared to men. Our analysis suggests that overall, women are less likely to report condom use and multiple sex partners than men, though further research is needed to understand these drivers within the larger contexts of social environment and gender norms. Understanding local gender norms and sexual partner dynamics, as well as their relationship to HIV risk factors including condom use, multiple sex partners, and marital status, warrants further qualitative and quantitative investigation.

Young age has been shown by other studies to be associated with higher HIV risk (Simbayi et al., 2005). Being less than 20 years old was a significant risk factor for HIV infection in Iringa, but not in other areas of Tanzania. Estimates show higher HIV prevalence in Tanzania for young women aged 15-24 years as compared to young men of the same age group (WHO, 2003). Possible contributing factors specific to younger populations such as HIV knowledge, transactional sex, low circumcision rates, and the rates and influence of drug and alcohol use are important topics for future research.

The initial 2007/8 THMIS analysis also suggests that among youth, young women in Tanzania have a higher prevalence of HIV compared to young men. Physical immaturity of the genital tract, higher likelihood of an older sexual partner being HIV infected, lower likelihood of using condoms effectively and consistently as well as potentially violent sex experienced at a young age are all hypothesized to increase risk of HIV infection among young girls (Simbayi et al., 2005). Additionally, having older male sexual partners has been shown to increase HIV risk among young women as older men are more likely to be HIV infected (UNAIDS, 2009). In both the Iringa region as well as other regions in Tanzania, our analyses found a significantly higher risk of HIV infection among individuals who reported a 10 or more year age gap with a sexual partner. This is likely to predominately represent older men partnering with younger women. There are many possible explanations for the increased HIV risk associated with this trend: inherent power differentials result in potential difficulties in the ability of younger women to negotiate condom use with older men, and older men may be more likely to be HIV-positive due to a greater number lifetime or concurrent sexual partners. These relationship dynamics that result in the increased risk of HIV with partners of a large age gap is in important consideration for further research and intervention development.

Our analysis reveals some key characteristics of the HIV epidemic in the Iringa region that differentiates it from that of other regions in Tanzania. These key findings should be attended to in HIV prevention interventions designed specifically for the Iringa region. As previously noted, younger individuals were at greater risk for infection in Iringa than older individuals, but this was not true in other regions. Further, it is worth noting that the adjusted odds ratio of HIV infection comparing those who reported a sexual partner with at least a 10-year age difference to those who reported an age difference of less than 10 years was higher in Iringa (4.60, CI: 1.2-17.6) compared with other regions of Tanzania (1.88, CI: 1.16-3.1). This finding was borderline statistically significant, and may be limited by sample size. Finally, though the association between male circumcision and reduced HIV prevalence did not meet criteria for statistical significance in Iringa, a large body of scientific literature supports this protective effect (Auvert et al., 2005). Thus, the significantly lower level of male circumcision in Iringa relative to the rest of the country stands as another possible factor contributing to the region's higher HIV prevalence, and another potentially important area for prevention interventions.

### **Limitations**

These data are cross-sectional and thus we cannot establish causality in the associations between demographic and risk factors and HIV prevalence. Further, although specifically examining the Iringa region was the focus of this study, the sample size from Iringa was relatively small and limited our power for analyses, especially for stratified analyses. Additionally, we were limited to questions that were asked on the 2007/8 THMIS survey, and it is possible that additional risk factors, such as intimate partner violence and sexually transmitted infections, that were not asked in the THMIS were significant drivers of HIV risk in the region.

### **Conclusions**

The 2007/8 THMIS originally reported the Iringa region as having the highest HIV prevalence in Tanzania. It also suggested that some risk factors were more prevalent in Iringa. This analysis revealed the statistical significance of these discrepancies and used multivariate analysis to isolate risk factors for HIV in Iringa. These risk factors included being below 20 years of age, having reported multiple sex partners, and having reported a 10 or more year age gap with a sexual partner. Some of these factors were specific to, or amplified in the Iringa region. Additional formative research in the Iringa region has shown that transactional sex and sex with older men may be key drivers of HIV among young women in the region. These notions, along with the higher prevalence of HIV in women and young people in the region, indicate that HIV prevention programs in Iringa should focus on reducing unprotected sex with multiple and cross-generational sex partners. Interventions for voluntary medical male circumcision, already underway, may also prove to effectively reduce HIV transmission in Iringa. Further research is needed to identify the underlying structural and cultural factors of risk factors revealed in this study, and how to best address them in targeted interventions.

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