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## The Gendered Relationship Between HIV Stigma And HIV Testing Among Men And Women In Mozambique: A Cross-sectional Study to Inform A Stigma Reduction And Male-Targeted HIV Testing Intervention

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8 **THE GENDERED RELATIONSHIP BETWEEN HIV STIGMA AND HIV**  
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10 **TESTING AMONG MEN AND WOMEN IN MOZAMBIQUE: A CROSS-**  
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12 **SECTIONAL STUDY TO INFORM A STIGMA REDUCTION AND MALE-**  
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15 **TARGETED HIV TESTING INTERVENTION**  
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3 **1 ABSTRACT:**

4 **2 Objectives:** Increasing and sustaining engagement in HIV care for people living with HIV are  
5 critical to both individual therapeutic benefit and epidemic control. Men are less likely to test for  
6 HIV compared to women in sub-Saharan African countries, and ultimately have delayed entry to  
7 HIV care. Stigma is known to impede such engagement, placing an importance on understanding  
8 and addressing stigma to improve HIV testing and care outcomes. This study aimed to assess the  
9 gendered differences in the relationship between stigma and HIV testing.  
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17 **9 Design and Setting:** A cross-sectional, household probability survey was implemented between  
18 November and December 2016 in the Sofala province of Mozambique.  
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22 **12 Participants:** Data were restricted to men and women participants who reported no prior  
23 diagnosis of HIV infection (N=2,731).  
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27 **15 Measures:** Measures of socio-demographic characteristics, stigma, and past exposure to HIV  
28 interventions were included in gender-stratified logistic regression models to estimate the  
29 relationship between stigma and recent testing for HIV, as well as to identify other relevant  
30 correlates.  
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36 **20 Results:** Significantly fewer men (38.3%) than women (47.6%;  $p<0.001$ ) had recently tested for  
37 HIV. Men who reported previous engagement in community group discussions about HIV had  
38 an increased odds of testing in the past 12 months compared to those who had not participated  
39 (aOR=1.88; 95% CI 1.51-2.35). Concerns about stigma was not a commonly reported barrier to  
40 HIV testing; however, men who expressed anticipated individual HIV stigma had a 40% lower  
41 odds of recent HIV testing (aOR=0.60; 95% CI 0.42-0.86). This association was not observed  
42 among women.  
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50 **28 Conclusions:** Men have lower uptake of HIV testing in Mozambique when compared to women.  
51 Even amidst the beneficial effects of HIV messaging, individual stigma is negatively associated  
52 with recent HIV testing among men. Intervention efforts that target the unique challenges and  
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3 31 needs of men are essential in promoting men's engagement into the HIV care continuum in sub-  
4 Saharan Africa.  
5 32  
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7  
8 34 **Key words:** HIV test; Mozambique; HIV care continuum; gender  
9 35

10 36  
11 37 **ARTICLE SUMMARY:**

12 38 **Strengths and limitations of this study:**

- 13  
14 39
- 15 40 • This large, household probability survey explores the barriers to HIV testing, including  
16 41 stigma, that are distinct among men and women in a high HIV burden area district of  
17 42 Mozambique.
  - 18 43 • HIV stigma was assessed using comprehensive measures to capture five relevant stigma  
19 44 domains: shame/blame/isolation, inequity, discrimination, community, and anticipated  
20 45 individual stigma towards PLHIV.
  - 21 46 • Stigma domains and other potential correlates of recent HIV testing were stratified by  
22 47 gender to provide evidence for strategies to improve HIV testing and care among men.
  - 23 48 • As a cross-sectional analysis, temporality was not established.
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35 50 **INTRODUCTION:**

36 51 Global efforts are underway to achieve the Joint United Nations Programme on HIV/AIDS  
37 52 (UNAIDS) 2020 targets in which 90% of all people living with HIV (PLHIV) will know their  
38 53 HIV status, 90% of all people with diagnosed HIV infection will receive sustained antiretroviral  
39 54 therapy (ART), and 90% of all people receiving ART be virally suppressed (90-90-90 strategy).  
40 55 This strategy aims to change the epidemic trajectory through treatment as prevention.[1] Despite  
41 56 the emphasis on the role of HIV testing in the HIV care continuum, challenges remain in  
42 57 achieving global targets by 2020.[2]  
43 58

44 59 In sub-Saharan Africa, substantial investments have targeted and been successful in achieving  
45 60 high coverage of HIV testing among women in the context of antenatal care services and  
46 61 services to prevent mother-to-child transmission (PMTCT).[3, 4] However, fewer efforts have  
47 62 directly targeted HIV prevention, testing, and care for men and those that do include men often

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3 63 succeed in reaching women with greater frequency than men.[5] In sub-Saharan Africa, HIV  
4 64 testing rates tend to be lower among men than women, that is often coupled with late entry to  
5 65 HIV care, poor retention in care and ART adherence, and greater mortality rates while on  
6 66 antiretroviral therapy among men compared to women.[5,6] These gender gaps indicate a need to  
7 67 shift towards addressing the unique barriers to HIV testing uptake and engagement in HIV  
8 68 prevention and care continuums among men in sub-Saharan Africa.  
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16 70 Observational studies have provided evidence of the role of HIV stigma in HIV testing and care  
17 71 in sub-Saharan Africa.[7,8] People continue to associate HIV with death, despite treatment  
18 72 advances, and assign shame and blame to PLHIV.[9,10] Perceived HIV stigma can induce  
19 73 feelings of fear that prevent individuals from learning their HIV status, entering HIV-related  
20 74 facilities, and engaging in HIV-related services due to unwanted, negative attention of being  
21 75 identified as living with HIV.[9] As men are less likely to seek testing, a critical evaluation of the  
22 76 relationship between stigma and other factors on the uptake of HIV testing among men should be  
23 77 explored to inform HIV testing interventions.  
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31 79 As the fourth leading country in number of PLHIV, Mozambique has an estimated range of 1.6 –  
32 80 2.1 million PLHIV.[11] The country has an adult HIV prevalence of 13.2%, with 34% aware of  
33 81 their HIV status.[12] In Mozambique, men are less likely to receive an HIV test compared to  
34 82 women. In 2015, only 38% of men participating in the Demographic Health Survey (DHS)  
35 83 reported any history of HIV testing and only 19% had been tested within the last 12 months,  
36 84 compared to 31% among women.[12] Reports produced by the People Living with HIV Stigma  
37 85 Index suggest that HIV stigma is prevalent in Mozambique, though the role of stigma in HIV  
38 86 testing, particularly for men, has not formally been assessed.[13]  
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45 87  
46 88 The aim of this analysis was to identify and assess the role of HIV stigma and other correlates of  
47 89 recent uptake of HIV testing among men and women in a high burden province in Mozambique.  
48 90 This study was conducted as part of a baseline survey for a subsequent community-based stigma  
49 91 reduction and HIV care continuum intervention in Mozambique, which had a specific focus on  
50 92 improving HIV testing among men.  
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3 94 **METHODS:**  
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5 95 **Study site and population:** As part of a larger evaluation of a community-based intervention, a  
6 96 baseline, cross-sectional survey was conducted from November to December 2016. Eligibility  
7 97 requirements for participation in the study included providing consent to participate, being aged  
8 98 18 years or older, and living in participating districts of the Sofala province in Mozambique.  
9 99 Sofala province is one of the most HIV affected areas of Mozambique with an adult HIV  
10 100 prevalence of 16.3% as of 2015 DHS.[12]  
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16 101  
17 102 Two districts in Sofala Province, Nhamatanda and Dondo, each comprised of four facility sites  
18 103 and their surrounding catchment areas per district were selected for participation in the survey.  
19 104 Within Dondo district, the following sites were included: Canhandula, Dondo Sede, Mafambisse,  
20 105 and Macharote. Nhamatanda Sede, Nharuchonga, Tica, and Lamego were participating sites in  
21 106 Nhamatanda district. Sampling in each site was proportional to population size. Participants were  
22 107 recruited through random household selection.  
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29 109 The sample size was based on the parent study to assess the impact of a community-based  
30 110 intervention on community-level HIV stigma and HIV testing among men. We assumed 80%  
31 111 power to detect a conservative 5% difference in the change in stigma at  $\alpha < 0.05$  between  
32 112 intervention and control, with an assumption of 20% loss to follow-up between baseline and  
33 113 endline. This produced a target sample of 1,500 per intervention or control group (N=3,000  
34 114 total). Given the other outcomes of interest related to improvements in HIV testing among men,  
35 115 men were over-sampled to produce a sample comprised of two-thirds men and one-third women.  
36 116 Considering the estimated sample size of 1,500 per group, 66% of whom would be men, and  
37 117 20% loss to follow-up, it was estimated that that there would be over 80% power to detect at  
38 118 least 10% difference in self-reported HIV testing among surveyed men in the intervention and  
39 119 control sites. A total of 3,017 enrolled in the baseline survey; however, individuals who had self-  
40 120 reported living with HIV at the time of survey were excluded from this analysis, producing an  
41 121 effective sample size of N=2,731 for this analysis (n=1,887 men and n=844 women).  
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53 123 **Measures:** Data for the baseline survey was collected through a tablet-based questionnaire  
54 124 administered by local interviewers. Interviewers were fluent in local languages of Sena or Ndao  
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3 125 as well as Portuguese, had prior experience in health research, and had been trained on human  
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5 126 subjects protection and confidentiality. Survey administration took approximately 45 minutes.  
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7 127 The socio-behavioral survey collected information on demographic characteristics including  
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9 128 gender identity, exposure to HIV prevention and testing, knowledge of HIV, relationships with  
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11 129 PLHIV, and a comprehensive set of HIV stigma measures.  
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14 131 To ascertain recent HIV testing (last 12 months), participants were asked if they had ever been  
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16 132 tested for HIV within their lifetime. Those who responded positively and who had not reported a  
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18 133 positive diagnosis on their last HIV test, were then asked a categorical question of when their last  
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20 134 HIV test was completed. This categorical response was then reclassified to a binary response to  
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22 135 whether they had been tested within the last 12 months. Participants who reported no recent HIV  
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24 136 testing were additionally asked to report reasons why they had not tested and could select  
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26 137 multiple responses from a list of 13 potential barriers to testing.  
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30 139 HIV stigma was assessed using several measures to capture five relevant stigma domains. The  
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32 140 HIV stigma scale developed by Genberg and colleagues in the sub-Saharan setting was used to  
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34 141 measure individual feelings and perceptions about PLHIV and included three subscales  
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36 142 measuring shame/blame/isolation, inequity, and discrimination of PLHIV (alpha: 0.79).[14] The  
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38 143 domain of shame gauged the participants' tendency to blame and disgrace PLHIV,  
39  
40 144 discrimination captured the extent to which people unfairly treat PLHIV, and inequity  
41  
42 145 encompassed the preconceived opinions and prejudice towards PLHIV.[14] An example  
43  
44 146 statement from the discrimination subscale includes "*People living with HIV/AIDS face neglect*  
45  
46 147 *from their families.*" We developed new measures (7 items) to assess perceived HIV stigma  
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48 148 within the community (alpha: 0.77). An example statement in this measure included, "*In this*  
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50 149 *community, men who are known to be living with HIV have the same level of importance in*  
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52 150 *society as men who are not living with HIV.*" Both sets of measures used 4-point Likert scale  
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54 151 response options, in which 1 represented strong disagreement and 4 represented strong  
55  
56 152 agreement with the statement. To score the HIV stigma scale and community stigma measures,  
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58 153 points from the Likert scale were summed across all items in the same measure, with the  
59  
60 154 exception of those that were reverse coded, producing possible ranges in scores from 10 to 33 for  
155 shame/blame/isolation, 8 to 27 for discrimination, 5 to 19 for inequity, and 7 to 28 for perceived



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3 156 community stigma. A higher score meant greater levels of HIV stigma. Measures of anticipated  
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5 157 individual stigma towards PLHIV that are traditionally included in DHS surveys (5 items) were  
6  
7 158 also included in this survey. An example question under the domain of anticipated individual  
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9 159 HIV stigma asked, "*If you found out that one of your friends was living with HIV, would you still  
10  
11 160 be friends with him/her?*"[15] These measures were included as they are the only stigma  
12  
13 161 measures identified to explicitly measure the individual participant's potential stigma towards  
14  
15 162 PLHIV. The five items were evaluated with dichotomous responses of yes or no and were  
16  
17 163 ultimately combined into a single binary variable for "any anticipated individual stigma" based  
18  
19 164 on a response that endorses stigma for at least one of these five items.

20  
21 166 **Statistical Analyses:** This analysis aimed to identify the correlates of HIV testing among HIV-  
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23 167 uninfected individuals in Mozambique and to evaluate whether gender modified the relationship  
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25 168 between stigma, other variables of interest, and the outcome of recent HIV testing. Descriptive  
26  
27 169 analysis that was stratified by gender was conducted to assess characteristics of the study sample,  
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29 170 including prevalence of recent HIV testing and stigma scores. Chi-squared tests were  
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31 171 implemented to assess differences by gender for categorical variables; t-tests were implemented  
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33 172 to assess differences across continuous variables.

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35 174 A bivariate analysis was initially performed to identify potential correlates of recent HIV testing  
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37 175 among the total sample. Additional models were stratified by gender to determine variables that  
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39 176 would be appropriate to include in the final model for each gender. The independent variables  
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41 177 tested in the models included HIV prevention experience, HIV knowledge, and stigma among  
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43 178 participants, while demographics, such as age and education level, were considered as potential  
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45 179 confounders in the model. The five domains of stigma were tested separately in the models:  
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47 180 scores for shame/blame/isolation, discrimination, and inequity subscales, as well as perceived  
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49 181 community stigma, were tested as continuous variables, while anticipated individual stigma was  
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51 182 tested as a binary variable.

52  
53 184 Using variables identified in the bivariate models based on  $p < 0.10$ , a final multivariate logistic  
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55 185 regression model was built to present adjusted odds ratios, which allowed for the controlling of  
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57 186 potential confounders in the analysis. The logistic regression model was stratified by gender to

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3 187 present potential associations that differed between men and women for having recently tested  
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5 188 for HIV. Multivariable models were run for the combined sample, as well as separately for each  
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7 189 gender. Of the variables that presented a difference in relationship by gender, interaction terms  
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9 190 were added in the combined multivariate model to evaluate their statistical significance.  
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11 191 Variance inflation factor was calculated to test for collinearity in the final models. The Hosmer-  
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13 192 Lemeshow test was also conducted to test for goodness-of-fit. All analyses were conducted in  
14  
15 193 STATA 14 and adjusted for potential clustering of participants induced by the sampling  
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17 194 methodology using complex survey design procedures.[16]  
18

19 196 **Patient and Public Involvement:** No patients were involved in this study. As a cross-sectional  
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21 197 household survey, the public were involved in community information sharing sessions before  
22  
23 198 and after the study to support recruitment and sharing of study results, respectively. Members of  
24  
25 199 the public were selected for participation in the survey via probability based sampling. Results of  
26  
27 200 the study have been shared with development agencies supporting HIV programming in  
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29 201 Mozambique.

30  
31 203 **Human Subjects:** The study was approved by the Johns Hopkins Bloomberg School of Public  
32  
33 204 Health Institutional Review Board and the National Committee of Bioethics for Health (CNBS)  
34  
35 205 in Mozambique.

## 36 206

### 37 207 **RESULTS:**

38  
39 208 Table 1 provides a description of demographic characteristics by the gender of participants (no  
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41 209 participants identified as transgender or gender non-binary). Men and women participants were  
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43 210 similar in age, education, and income level. However, among the 2,731 self-reported HIV  
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45 211 uninfected individuals (1,887 men and 844 women), men tended to have slightly higher levels of  
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47 212 employment than women (Table 1).

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49  
50 214 Table 2 describes participants' exposure to HIV testing, prevention resources, and perceptions of  
51  
52 215 HIV stigma. More than half of the participants did not test for HIV in the year prior to the  
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54 216 baseline survey, which was significantly higher among men (61.7% vs. 52.4%,  $p < 0.001$ ).  
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56 217 Women were more likely than men to have had a recent HIV test, while men were more

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3 218 commonly exposed to HIV information than women via the radio, informational fliers, and  
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5 219 community discussion groups ( $p<0.001$ ). With respect to the domains of stigma, participants had  
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7 220 generally low levels of perceived stigma including shame/blame/isolation, discrimination, or  
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9 221 inequity towards PLHIV. Women were more likely than men to endorse at least one form of  
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11 222 anticipated individual stigma towards PLHIV (16.3% vs. 12.7%,  $p=0.013$ ) and reported higher  
12  
13 223 on average scores than men in having perceived shame/blame/isolation, feelings of inequity, and  
14  
15 224 perceived community stigma towards PLHIV (Table 2).

16 225  
17 226 When asked to report the reasons for not having tested for HIV in the last 12 months, over half of  
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19 227 participants who reported no recent test indicated it was because they felt healthy (55%), lacked  
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21 228 time for HIV testing (26%), and had low perceived risk (21%). Men were more likely to report  
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23 229 feeling healthy and not having time to get tested than women. Figure 1 displays the five most  
24  
25 230 common reasons for failure to test among men and women. Concerns related to stigma and  
26  
27 231 perceived gender norms associated with HIV testing were not commonly reported reasons for  
28  
29 232 lack of recent HIV testing. For example, 1.7% of participants reported that they had not recently  
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31 233 tested for HIV due to concerns about negative treatment by healthcare workers, as well as  
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33 234 concerns that neighbors or families suspect that they are living with HIV infection (0.4%), or  
34  
35 235 concerns that people would believe they were unfaithful or misbehaving (0.5%).

36 236  
37 237 *Insert Figure 1*  
38 238

39 239 In the multivariable logistic regression model that included the combined sample of men and  
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41 240 women (Table 3), the odds of recent HIV testing were almost 2 times higher among women than  
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43 241 men (aOR=1.95; 95% CI 1.55-2.46). Other correlates of recent HIV testing included being  
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45 242 married, attaining secondary education or technical school or university, past receipt of  
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47 243 informational fliers about HIV, and past participation in community group discussions about  
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49 244 HIV were also significantly associated with recent HIV testing. Participants who endorsed at  
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51 245 least one form of anticipated individual stigma towards PLHIV had a 34% reduced odds of  
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53 246 recent HIV testing, compared to those with none (aOR=0.66; 95% CI 0.50-0.89). The subscale  
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55 247 measuring feelings of inequity for PLHIV had a modest positive association with HIV stigma,

248 wherein for each point higher on the scale, there was a 1.06 increased odds in recent HIV testing  
249 (aOR=1.06; 95% CI 1.01-1.11).

250  
251 To explore effect modification by gender in the relationship between stigma and recent HIV  
252 testing and to identify unique correlates of recent HIV testing, gender disaggregated  
253 multivariable logistic regression models were implemented (Table 4). Among men, higher  
254 education and engagement in community discussion groups (aOR=1.88; 95% CI 1.51-2.35) were  
255 associated with increased odds of recent HIV testing. Men who endorsed at least one form of  
256 anticipated individual stigma towards PLHIV had a 40% lower odds of recent HIV testing  
257 (aOR=0.60; 95% CI 0.42-0.86), whereas there was a modest association between the inequity  
258 subscale and HIV testing among men (aOR=1.07; 95% CI 1.01-1.13).

259  
260 Women with secondary education and who were currently married were more likely to report  
261 recent HIV testing. Among women, having seen or read any informational fliers about HIV was  
262 associated with an increased odds of recent HIV testing (aOR=1.78; 95% CI 1.24-2.55). The  
263 shame subscale was negatively associated with recent HIV testing, where there was a 6%  
264 reduced odds of recent HIV testing for each point increase on the perceived shame subscale  
265 (aOR=0.94; 95% CI 0.89-0.99).

## 266 267 **DISCUSSION:**

268 Stigma has a well-documented role in inhibiting engagement across the HIV prevention and care  
269 continuums and greater understanding, particularly for men who are less engaged in the HIV  
270 care continuum, is critical to meeting global epidemic targets.[17] This study found that  
271 endorsement of anticipated individual stigma among men was associated with a 40% reduced  
272 odds of recent HIV testing – a finding that was unique to men. The measures of anticipated  
273 individual stigma captured how participants felt they would personally react to PLHIV; given the  
274 magnitude of the association among men, this suggests that men may avoid HIV testing to avoid  
275 similar treatment by others. Conversely, exposure to HIV informational messages through  
276 community discussions and fliers was positively associated with recent HIV testing for men, as  
277 well as for women. These findings suggest that interventions to improve HIV testing for men

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3 278 may be optimized by providing both stigma reduction efforts as well as communication about the  
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5 279 benefits and importance of HIV testing.  
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8 281 While anticipated individual HIV stigma was found to be associated with decreased odds of  
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10 282 recent HIV testing among men, concerns related HIV stigma was not often a reported reason for  
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12 283 not completing HIV testing within the last 12 months. Rather, participants predominantly  
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14 284 reported that they did not seek testing because they felt they were not at risk for HIV, felt  
15  
16 285 healthy, or did not have time. There are two (not mutually exclusive) potential explanations for  
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18 286 these disparities in findings. Within social epidemiology, stigma is widely viewed and measured  
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20 287 as a latent trait, as it was in this analysis that utilized comprehensive scales to measure various  
21  
22 288 forms of HIV stigma.[14, 15] Thus, specific concerns related to stigma as a reason for failing to  
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24 289 test for HIV may be very different in perceived significance from what may be captured by more  
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26 290 comprehensive scales that capture the multitude manifestations of HIV stigma. Second, it is  
27  
28 291 possible that stigma serves as an overarching issue that impacts individual efforts to overcome  
29  
30 292 barriers to HIV testing. In this sense, stigma that is present ubiquitously among individuals may  
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32 293 prevent them from resolving more immediate barriers related to time or perceived risk for HIV  
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34 294 acquisition. Addressing both immediate barriers to HIV testing as well as reducing stigma are  
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36 295 important areas of focus for HIV testing interventions for men, who do not have the same  
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38 296 normative access to HIV testing that women do through antenatal programs.  
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41 298 Unlike the relationships identified for men, we found that women endorsed greater feelings of  
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43 299 stigma towards PLHIV compared to men; however, stigma did not appear to be associated with  
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45 300 women's testing behaviors. The subscales measuring shame was found to be modestly associated  
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47 301 with reduced HIV testing among women, though did not have the same magnitude of association  
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49 302 with HIV testing as individual forms of stigma among men. However, the magnitude of  
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51 303 association is small and it is unclear if this finding is truly an association or simply the result of a  
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53 304 sufficiently large sample size that resulted in a statistically significant p-value.[18]  
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56 306 One likely explanation for the gender differential in recent HIV testing and the lack of  
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58 307 correlation with stigma among women is the availability of HIV testing in routine antenatal care.  
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60 308 Other research from Sofala Province estimated that at least 74% of women routinely receiving

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3 309 antenatal care services in the Sofala province had tested for HIV in 2009 – an estimate that has  
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5 310 likely increased in recent years.[19] It may be that, unlike for men, antenatal care services allow  
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7 311 women to access HIV testing within the context of other reproductive care. With women visiting  
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9 312 health facilities for antenatal care, following and providing regular HIV prevention and care  
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11 313 services, amongst other services, is more common for women than for men.[20] In theory, male  
12  
13 314 partners may access HIV testing at antenatal care sites through their partner; however, in  
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15 315 practice, men's engagement in antenatal care services are low in Mozambique.[21] Given that  
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17 316 specialty services for men are not common within health facilities, increasing testing  
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19 317 opportunities in locations that men frequent, such as hosting workplace testing events, and  
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21 318 providing self-testing services at home or within the community are strategies to improve HIV  
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23 319 testing among men.[22]

24 321 Community discussion groups were found to be positively associated with recent HIV testing in  
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26 322 this study and have previously been successful in influencing a change in gender attitudes,  
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28 323 gender roles, and HIV stigma that also play a part in the uptake of HIV prevention and care  
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30 324 services.[23] Considering the higher proportion of men than women exposed to HIV prevention  
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32 325 messages, increasing and effectively distributing HIV prevention resources that deliver  
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34 326 information on HIV via fliers and community discussion groups among others are important for  
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36 327 future interventions targeting men. Contrary to these findings, an association was not observed  
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38 328 between hearing discussions about HIV on the radio and recent HIV testing. The content of the  
39  
40 329 radio programs that participants had heard was not documented and it may be the case that some  
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42 330 radio programs contained negative messages or misinformation. A closer evaluation of the  
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44 331 content of the radio programs would allow for better understanding of its relationship with recent  
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46 332 testing for HIV. As radio is one of the most dominant forms of communication within  
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48 333 Mozambique, with over 90% of households reportedly owning a radio, developing positive  
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50 334 messages for radio dissemination may play an important role in encouraging HIV testing and  
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52 335 reducing misinformation and stigma.[24]

53 336  
54 337 The findings should be viewed in light of study limitations. As a cross-sectional analysis,  
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56 338 temporality was not established and the direction of the associations cannot be established. Given  
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58 339 that stigma takes long periods of time to develop and change, we presume that stigma influences



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3 340 recent HIV testing behaviors; however, there is the possibility that HIV testing experiences could  
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5 341 have changed participants perspectives about stigma. With the exception of the perceived  
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7 342 community stigma measures, other stigma measures were established a decade ago and items  
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9 343 may need to be added or adjusted to account for changing social dynamics and programming as  
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11 344 the epidemics progresses. Finally, social desirability bias could have influenced our estimates of  
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13 345 stigma and HIV testing.

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### 15 347 **CONCLUSION:**

16  
17 348 Stigma is and should be widely recognized as a potent social determinant in health seeking  
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19 349 behaviors that compromises health among populations, particularly as it relates to HIV testing  
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21 350 and care.[25, 26] Of the various forms of stigma, anticipated individual stigma was found to be  
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23 351 strongly associated with reduced uptake of recent HIV testing among men. The availability of  
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25 352 HIV testing within antenatal care services provides opportunities for women to engage in HIV  
26  
27 353 testing, while challenges to engage men in HIV testing and, broadly, the HIV care continuum  
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29 354 persist. Findings from this study suggest that efforts to improve HIV testing among men should  
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31 355 focus on addressing both stigma reduction and immediate barriers to HIV testing, and may be  
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33 356 able to build on the positive effects of community-based HIV prevention and care activities. As  
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35 357 HIV testing and diagnosis are essential to linking individuals to treatment and care, acting on the  
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37 358 individual, social, and structural barriers that disparately impact men and women will be  
38  
39 359 necessary to achieving the ambitious goal of 90-90-90 to end the HIV epidemic in sub-Saharan  
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41 360 Africa.

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### 44 363 **Conflict of Interest Statement:**

45 364 The authors declare that they have no competing interests.

46 365

### 47 366 **Authorship:**

48  
49 367 LVL, ECM, PD, and ALW designed the study concept. JD and DP oversaw data collection.  
50  
51 368 ALW, JHH, and JC had full access to study data. JHH conducted statistical analysis and wrote  
52  
53 369 the initial draft of the manuscript with oversight and support by ALW. All authors review and  
54  
55 370 provided scientific input.

56 371

### 57 372 **Date Sharing Statement:**

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3 373 Technical appendix, statistical code, and dataset available upon request to the authors.  
4 374

5  
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**TABLES:****Table 1.** Demographic characteristics of participants in Sofala Province, Mozambique (N=2,731)

	<b>Total (N=2,731)</b>	<b>Men (n=1,887)</b>	<b>Women (n=844)</b>	<b>p-Value</b>
Age (SD), years	35.5 (15.5)	37.3 (16.2)	31.6 (12.8)	<0.001
Average monthly income (SD), MZN	10700 (380000)	14221 (460000)	2944 (4500)	0.480
District of residence				
Nhamatanda	1385 (50.7%)	951 (50.4%)	434 (51.4%)	0.621
Dondo	1346 (49.3%)	936 (49.6%)	410 (48.6%)	
Highest level of education completed				
None or primary	1396 (56.5%)	1004 (55.6%)	392 (59.0%)	0.087
Secondary	1004 (40.6%)	744 (41.2%)	260 (39.2%)	
Technical school or university	70 (2.8%)	58 (3.2%)	12 (1.8%)	
Current employment status				
Unemployed	1031 (37.8%)	532 (28.2%)	499 (59.1%)	<0.001
Employed	1699 (62.2%)	1354 (71.8%)	345 (40.9%)	
Marital status				
Never married	560 (20.5%)	456 (24.2%)	105 (12.3%)	<0.001
Married	1931 (70.7%)	1334 (70.6%)	598 (70.9%)	
Separated	240 (8.8%)	98 (5.2%)	143 (16.8%)	
Mean number of children (SD)	4 (5)	4 (6)	4 (2)	

**Table 2.** Exposure to HIV interventions and HIV stigma among men and women in Sofala Province, Mozambique

	Total (N=2,731)	Men (n=1,887)	Women (n=844)	p-Value
<b><i>HIV testing and exposure to HIV information</i></b>				
Tested in the last 12 months				
No	1602 (58.8%)	1161 (61.7%)	441 (52.4%)	<0.001
Yes	1121 (41.2%)	721 (38.3%)	400 (47.6%)	
Tested ever in lifetime				
No	807 (29.6%)	670 (35.6%)	137 (16.3%)	<0.001
Yes	1919 (70.4%)	1214 (64.4%)	705 (83.7%)	
Know of an HIV testing center				
No	156 (5.7%)	130 (6.9%)	26 (3.1%)	<0.001
Yes	2572 (94.3%)	1755 (93.1%)	817 (96.9%)	
Seen or read HIV informational fliers				
No	993 (36.4%)	546 (29.0%)	447 (53.1%)	<0.001
Yes	1733 (63.6%)	1338 (71.0%)	395 (46.9%)	
Heard any HIV discussion on the radio				
No	704 (25.8%)	378 (20.1%)	326 (38.7%)	<0.001
Yes	2022 (74.2%)	1506 (79.9%)	518 (61.3%)	
Participated in HIV community discussion groups				
No	2023 (74.2%)	1294 (68.7%)	729 (86.5%)	<0.001
Yes	704 (25.8%)	590 (31.3%)	114 (13.5%)	
Of all the people you know, how many have HIV infection? (SD)				
	4 (12)	4 (14)	3 (5)	0.005
<b><i>HIV stigma measures</i></b>				
HIV shame subscale (SD) <sup>1</sup>	16.8 (3.9)	16.7 (3.8)	17.0 (4.1)	0.044
Discrimination of PLHIV subscale (SD) <sup>1</sup>	16.1 (3.4)	16.1 (3.5)	16.3 (3.2)	0.080
Inequity for PLHIV subscale (SD) <sup>1</sup>	8.6 (2.4)	8.3 (2.2)	9.2 (2.5)	<0.001
Perceived community stigma of PLHIV (SD) <sup>1</sup>	19.8 (3.7)	19.6 (3.4)	20.2 (4.1)	<0.001

Any anticipated individual stigma towards PLHIV

No	2336 (86.2%)	1636 (87.3%)	700 (83.7%)	0.013
Yes	374 (13.8%)	238 (12.7%)	136 (16.3%)	

Note: <sup>1</sup>Scores of stigma subscales ranged from 10 to 33 for shame, 8 to 27 for discrimination, 5 to 19 for inequity, and 7 to 28 for community stigma.

**Table 3.** Correlates of recent HIV testing (last 12 months) among all participants (N=2,332)

Variable	Crude		Adjusted	
	OR (95% CI)	p-Value	Adj. OR (95% CI)	p-Value
<b><i>Demographic characteristics</i></b>				
Women (ref. men)	1.46 (1.24, 1.72)	<0.001	1.95 (1.55, 2.46)	<0.001
Age	0.98 (0.98, 0.99)	<0.001	0.98 (0.98, 0.99)	<0.001
Highest level of education completed (ref: none or primary)				
Secondary	1.75 (1.48, 2.07)	<0.001	1.48 (1.21, 1.79)	<0.001
Technical school or university	4.79 (2.80, 8.20)	<0.001	4.18 (2.37, 7.37)	<0.001
Currently employed (ref: unemployed)	1.11 (0.95, 1.30)	0.194	1.03 (0.85, 1.26)	0.746
Marital status (ref: never married)				
Married	1.10 (0.90, 1.33)	0.350	1.63 (1.28, 2.08)	<0.001
Separated	0.75 (0.55, 1.04)	0.082	1.31 (0.85, 2.02)	0.228
<b><i>HIV testing and exposure to HIV information</i></b>				
Seen or read HIV informational fliers	1.83 (1.56, 2.16)	<0.001	1.75 (1.42, 2.16)	<0.001
Heard any HIV discussion on the radio	1.14 (0.96, 1.36)	0.144	0.99 (0.80, 1.23)	0.945
Participated in HIV community discussion groups	1.78 (1.50, 2.12)	<0.001	1.73 (1.42, 2.12)	<0.001
<b><i>HIV stigma measures</i></b>				
HIV shame subscale	0.96 (0.94, 0.98)	<0.001	0.97 (0.95, 1.00)	0.071
Discrimination of PLHIV subscale	0.98 (0.96, 1.00)	0.081	0.99 (0.96, 1.02)	0.545
Inequity for PLHIV subscale	1.00 (0.97, 1.04)	0.783	1.06 (1.01, 1.11)	0.014
Perceived community stigma of PLHIV	1.04 (1.01, 1.06)	0.002	1.01 (0.99, 1.04)	0.263

Any anticipated individual stigma towards PLHIV (ref: no) 0.51 (0.40, 0.65) <0.001 0.66 (0.50, 0.89) 0.005

**Table 4.** Adjusted associations with testing for HIV in the last 12 months by gender

Variable	Men (n=1,714)		Women (n=618)	
	Adj. OR (95% CI)	p-Value	Adj. OR (95% CI)	p-Value
<b><i>Demographic characteristics</i></b>				
Age	0.99 (0.98, 0.99)	0.001	0.98 (0.96, 1.00)	0.030
Highest level of education completed (ref: none or primary)				
Secondary	1.41 (1.12, 1.79)	0.004	1.67 (1.15, 2.42)	0.007
Technical school or university	4.29 (2.31, 7.98)	<0.001	2.88 (0.71, 11.65)	0.139
Currently employed (ref: unemployed)	1.06 (0.83, 1.36)	0.639	1.05 (0.74, 1.48)	0.781
Marital status (ref: never married)				
Married	1.48 (1.12, 1.97)	0.006	2.02 (1.22, 3.34)	0.006
Separated	1.38 (0.77, 2.47)	0.274	1.52 (0.75, 3.09)	0.250
<b><i>HIV testing and exposure to HIV information</i></b>				
Seen or read HIV informational fliers	1.81 (1.40, 2.35)	<0.001	1.78 (1.24, 2.55)	0.002
Heard any HIV discussion on the radio	1.11 (0.85, 1.46)	0.449	0.84 (0.58, 1.21)	0.340
Participated in HIV community discussion groups	1.88 (1.51, 2.35)	<0.001	1.23 (0.76, 1.99)	0.408
<b><i>HIV stigma measures</i></b>				
HIV shame subscale	0.99 (0.96, 1.02)	0.481	0.94 (0.89, 0.99)	0.021
Discrimination of PLHIV subscale	0.98 (0.95, 1.01)	0.224	1.02 (0.96, 1.09)	0.435
Inequity for PLHIV subscale	1.07 (1.01, 1.13)	0.017	1.05 (0.97, 1.14)	0.247
Perceived community stigma of PLHIV	1.01 (0.98, 1.04)	0.564	1.03 (0.98, 1.07)	0.234
Any anticipated individual stigma towards PLHIV (ref: no)	0.60 (0.42, 0.86)	0.006	0.84 (0.50, 1.40)	0.497

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**Figure 1:** Five most common reasons for failing to test for HIV in the last 12 months among men and women in Sofala Province, Mozambique.

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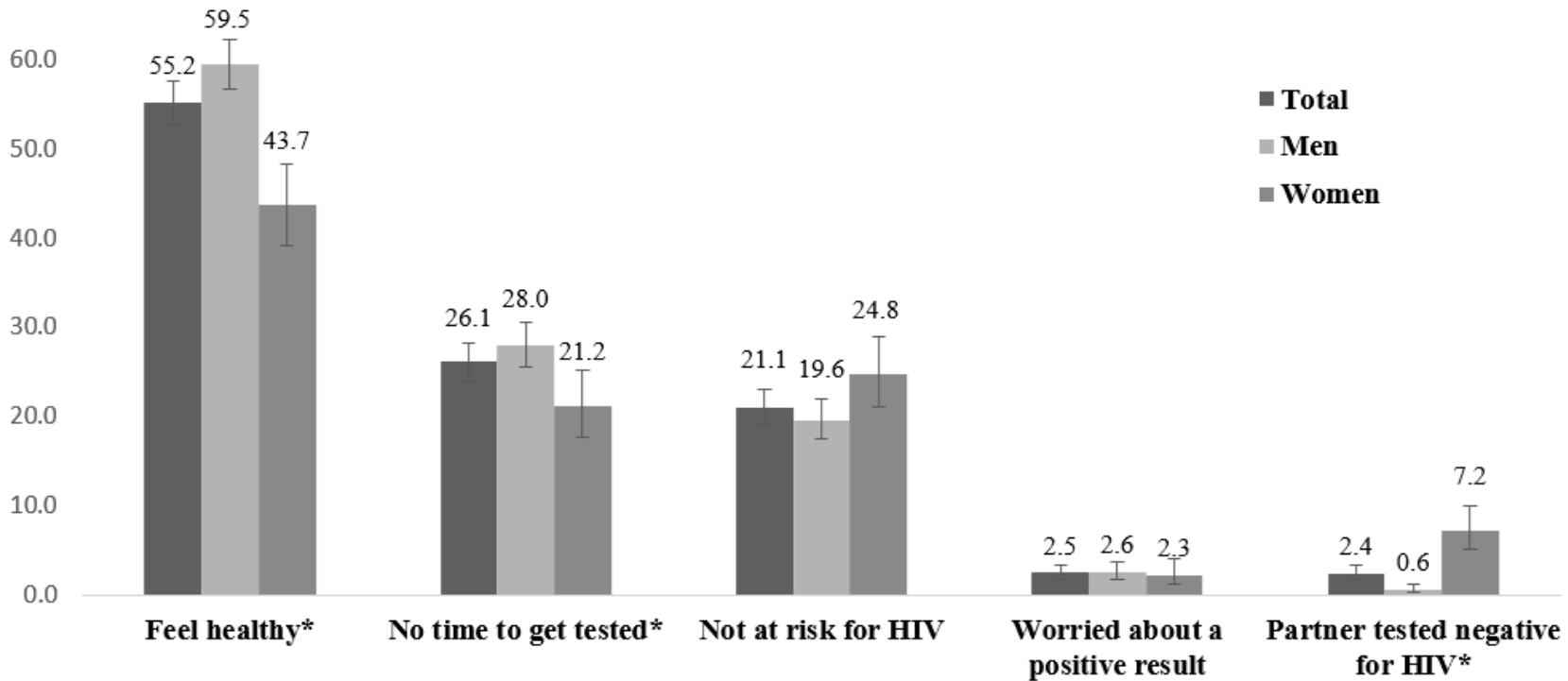
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Note: \* indicates for statistical significance of  $p < 0.05$ . Error bars represent 95% CI.

STROBE Statement—Checklist of items that should be included in reports of *cross-sectional studies*

	Item No	Recommendation	Page No
<b>Title and abstract</b>	1	(a) Indicate the study's design with a commonly used term in the title or the abstract	1-2
		(b) Provide in the abstract an informative and balanced summary of what was done and what was found	2
<b>Introduction</b>			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	3
Objectives	3	State specific objectives, including any prespecified hypotheses	4
<b>Methods</b>			
Study design	4	Present key elements of study design early in the paper	5
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	5
Participants	6	(a) Give the eligibility criteria, and the sources and methods of selection of participants	5
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	6-7
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	6-7
Bias	9	Describe any efforts to address potential sources of bias	7
Study size	10	Explain how the study size was arrived at	5
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	7-8
Statistical methods	12	(a) Describe all statistical methods, including those used to control for confounding	7-8
		(b) Describe any methods used to examine subgroups and interactions	7-8
		(c) Explain how missing data were addressed	7-8
		(d) If applicable, describe analytical methods taking account of sampling strategy	7-8
		(e) Describe any sensitivity analyses	7-8
<b>Results</b>			
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	8
		(b) Give reasons for non-participation at each stage	8
		(c) Consider use of a flow diagram	na
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	8 + Tables
		(b) Indicate number of participants with missing data for each variable of interest	8+ Tables
Outcome data	15*	Report numbers of outcome events or summary measures	8+ Tables

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Main results	16	(a) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	9 + Tables
		(b) Report category boundaries when continuous variables were categorized	7
		(c) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	N/A
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	NA
<b>Discussion</b>			
Key results	18	Summarise key results with reference to study objectives	10
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	12
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	10-12
Generalisability	21	Discuss the generalisability (external validity) of the study results	10-12
<b>Other information</b>			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	13

\*Give information separately for exposed and unexposed groups.

**Note:** An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at <http://www.plosmedicine.org/>, Annals of Internal Medicine at <http://www.annals.org/>, and Epidemiology at <http://www.epidem.com/>). Information on the STROBE Initiative is available at [www.strobe-statement.org](http://www.strobe-statement.org).

# BMJ Open

## The Gendered Relationship Between HIV Stigma And HIV Testing Among Men And Women In Mozambique: A Cross-sectional Study to Inform A Stigma Reduction And Male-Targeted HIV Testing Intervention

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Keywords:	HIV & AIDS < INFECTIOUS DISEASES, HIV testing, Stigma, Mozambique, gender

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8 **THE GENDERED RELATIONSHIP BETWEEN HIV STIGMA AND HIV**  
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10 **TESTING AMONG MEN AND WOMEN IN MOZAMBIQUE: A CROSS-**  
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12 **SECTIONAL STUDY TO INFORM A STIGMA REDUCTION AND MALE-**  
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15 **TARGETED HIV TESTING INTERVENTION**  
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3 **1 ABSTRACT:**

4 **2 Objectives:** Increasing and sustaining engagement in HIV care for people living with HIV are  
5 critical to both individual therapeutic benefit and epidemic control. Men are less likely to test for  
6 HIV compared to women in sub-Saharan African countries, and ultimately have delayed entry to  
7 HIV care. Stigma is known to impede such engagement, placing an importance on understanding  
8 and addressing stigma to improve HIV testing and care outcomes. This study aimed to assess the  
9 gendered differences in the relationship between stigma and HIV testing.  
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12 **9 Design and Setting:** A cross-sectional, household probability survey was implemented between  
13 November and December 2016 in the Sofala province of Mozambique.  
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16 **10 Participants:** Data were restricted to men and women participants who reported no prior  
17 diagnosis of HIV infection (N=2,731).  
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20 **11 Measures:** Measures of socio-demographic characteristics, stigma, and past exposure to HIV  
21 interventions were included in gender-stratified logistic regression models to estimate the  
22 relationship between stigma and recent testing for HIV, as well as to identify other relevant  
23 correlates.  
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26 **12 Results:** Significantly fewer men (38.3%) than women (47.6%;  $p<0.001$ ) had recently tested for  
27 HIV. Men who reported previous engagement in community group discussions about HIV had  
28 an increased odds of testing in the past 12 months compared to those who had not participated  
29 (aOR=1.92; 95% CI 1.51-2.44). Concerns about stigma was not a commonly reported barrier to  
30 HIV testing; however, men who expressed anticipated individual HIV stigma had a 35% lower  
31 odds of recent HIV testing (aOR=0.65; 95% CI 0.44-0.96). This association was not observed  
32 among women.  
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35 **13 Conclusions:** Men have lower uptake of HIV testing in Mozambique when compared to women.  
36 Even amidst the beneficial effects of HIV messaging, individual stigma is negatively associated  
37 with recent HIV testing among men. Intervention efforts that target the unique challenges and  
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3 31 needs of men are essential in promoting men's engagement into the HIV care continuum in sub-  
4 Saharan Africa.  
5 32  
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8 34 **Key words:** HIV test; Mozambique; HIV care continuum; gender  
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10 36

## 11 37 **ARTICLE SUMMARY:**

### 13 38 **Strengths and limitations of this study:**

- 15 39 • This large, household probability survey explores the barriers to HIV testing, including  
16 40 stigma, which are distinct among men and women in a high HIV burden area district of  
17 41 Mozambique.
- 20 42 • HIV stigma was assessed using comprehensive measures to capture five relevant stigma  
21 43 domains: shame/blame/isolation, inequity, discrimination, perceived community stigma,  
22 44 and anticipated individual stigma towards PLHIV.
- 24 45 • Stigma domains and other potential correlates of recent HIV testing were stratified by  
25 46 gender to provide evidence for strategies to improve HIV testing and care among men.
- 28 47 • As a cross-sectional analysis, temporality was not established.  
29 48  
30 49

## 31 50 **INTRODUCTION:**

32 51 Global efforts are underway to achieve the Joint United Nations Programme on HIV/AIDS  
33 52 (UNAIDS) 2020 targets in which 90% of all people living with HIV (PLHIV) will know their  
34 53 HIV status, 90% of all people with diagnosed HIV infection will receive sustained antiretroviral  
35 54 therapy (ART), and 90% of all people receiving ART be virally suppressed (90-90-90 strategy).  
36 55 This strategy aims to change the epidemic trajectories in many countries through treatment as  
37 56 prevention.[1] Despite the emphasis on the role of HIV testing in the HIV care continuum,  
38 57 challenges remain in achieving global targets by 2020.[2]  
39 58

40 59 In sub-Saharan Africa, substantial investments have targeted and been successful in achieving  
41 60 high coverage of HIV testing among women in the context of antenatal care services and  
42 61 services to prevent mother-to-child transmission (PMTCT).[3, 4] However, fewer efforts have  
43 62 directly targeted HIV prevention, testing, and care for men and those that do include men often

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3 63 succeed in reaching women with greater frequency than men.[5] In sub-Saharan Africa, HIV  
4 64 testing rates tend to be lower among men than women, which is often coupled with late entry to  
5 65 HIV care, poor retention in care and ART adherence, and greater mortality rates among men on  
6 66 treatment compared to women.[5, 6] These gender gaps indicate a need to shift attention towards  
7 67 addressing the unique barriers of HIV testing uptake among men and their engagement in HIV  
8 68 prevention and care continuums in sub-Saharan Africa.  
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15 70 Observational studies have provided evidence on the role of HIV stigma in HIV testing and  
16 71 care.[7,8] Qualitative and quantitative research have demonstrated that HIV is often associated  
17 72 with death, despite treatment advances, and that shame and blame are frequently assigned to  
18 73 PLHIV.[9, 10] Perceived HIV stigma can induce feelings of fear that prevent individuals from  
19 74 learning their HIV status, entering HIV-related facilities, and engaging in HIV-related services  
20 75 due to unwanted, negative attention of being identified as living with HIV, and has been  
21 76 associated with a two-fold increased odds of late presentation for HIV care in low-resource  
22 77 settings.[9, 11] A global meta-analysis estimated that HIV stigma was associated with 32%  
23 78 reduced odds of ART adherence, as well as worse outcomes related to depression, social support,  
24 79 and access to and usage of health and social services.[12] Complementary meta-analysis of  
25 80 qualitative data revealed that HIV-related stigma compromised general psychological processes,  
26 81 such as adaptive coping and social support, which are critical determinants of participants'  
27 82 ability to overcome the structural and economic barriers associated with poverty in order to  
28 83 successfully engage in care and adhere to ART.[13] Noted as a major barrier to HIV testing in  
29 84 sub-Saharan Africa, fear of HIV-related stigma is potentially exacerbated by low perceived HIV  
30 85 risk and financial concerns for the cost of HIV testing and care.[14] As men are less likely to  
31 86 seek testing, a critical evaluation of the relationship between stigma and other factors on the  
32 87 uptake of HIV testing among men should be explored to inform HIV prevention and care  
33 88 continuum interventions.  
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50 90 As the fourth leading country in number of PLHIV, Mozambique has an estimated range of 1.6 –  
51 91 2.1 million PLHIV.[15] The country has an adult HIV prevalence of 13.2%, with 34% aware of  
52 92 their HIV status.[16] Data from the national AIDS Indicator Survey found that men had almost  
53 93 twice the odds of being unaware of their HIV status, compared to women, and regional data  
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3 94 demonstrate increased risk of advanced HIV disease and severe immunosuppression at diagnosis,  
4 95 clinical loss-to-follow-up, and death among men who are living with HIV.[17-19] Low  
5 96 awareness of one's status is likely attributable to low HIV testing rates; in 2015, only 38% of  
6 97 men participating in the Demographic Health Survey (DHS) reported any history of HIV testing  
7 98 and only 19% had been tested within the last 12 months, compared to 31% among women.[16]  
8 99 HIV testing services have expanded substantially across the country over the last decade and,  
9 100 with improved access, GIS data mapped to serial cross-sectional surveys among women have  
10 101 found that distance to HIV testing services is no longer a barrier to HIV testing at the regional  
11 102 level.[20] As such structural barriers are minimized, additional research to understand lingering  
12 103 barriers to HIV testing – the first entry point to HIV prevention and care continua – are needed.  
13 104 Reports produced by the People Living with HIV Stigma Index suggest that HIV stigma is  
14 105 prevalent in Mozambique, and qualitative data from Mozambique highlight the potential impact  
15 106 of moral stigma – the perception that HIV is associated with immoral behaviors – on HIV  
16 107 testing.[21, 22] Gender-based differences in the association between stigma and HIV testing  
17 108 have not formally been assessed, but are necessary to understand differential uptake of HIV  
18 109 testing and awareness of HIV status.  
19 110

20 111 The aim of this analysis was to identify and assess the role of HIV stigma and other correlates for  
21 112 recent uptake of HIV testing among men and women in a high burden province in Mozambique.  
22 113 This study was conducted as part of a baseline survey for a subsequent community-based stigma  
23 114 reduction and HIV care continuum intervention in Mozambique, which had a specific focus on  
24 115 improving HIV testing among men.  
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## 26 117 **METHODS:**

27 118 **Study site and population:** As part of a larger evaluation of a community-based intervention, a  
28 119 baseline, cross-sectional survey was conducted from November to December 2016. Eligibility  
29 120 requirements for participation in the study included providing signed consent to participate,  
30 121 being aged 18 years or older, and living in participating districts of the Sofala province in  
31 122 Mozambique. Sofala province was selected for the community-based interventions as it is one of  
32 123 the most HIV affected areas of Mozambique with an adult HIV prevalence of 16.3% as of the  
33 124 2015 DHS.[16]

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5 126 Two districts in Sofala Province, Nhamatanda and Dondo, each comprised of four facility sites  
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7 127 and their surrounding catchment areas per district were selected for participation in the survey.  
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9 128 Within Dondo district, the following sites were included: Canhandula, Dondo Sede, Mafambisse,  
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11 129 and Macharote. Nhamatanda Sede, Nharuchonga, Tica, and Lamego were participating sites in  
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13 130 Nhamatanda district. Sites were selected based on matching catchment area population size, with  
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15 131 final selection based on security and availability of clinical data that was required for the parent  
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17 132 study. Sampling in each site was proportional to population size and determined through  
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19 133 household probability selection. In this process, a designated data collector would begin with a  
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21 134 random start in their assigned location, then approach the door of every third house counted on  
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23 135 each side of the street. Data collectors were required to interview only a family member of the  
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25 136 same gender; if no head of household of the data collector's gender was available, the data  
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27 137 collection staff would coordinate availability to ensure a staff member of the same gender could  
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29 138 administer the interview. Each interviewer continued until they surveyed their quota of  
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31 139 participants in each location. Prior to research implementation, the local research team briefed  
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33 140 community leaders about the participant selection process and obtained approval and buy-in for  
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35 141 the survey implementation within their communities.  
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39 143 The sample size was based on the parent study to assess the impact of a community-based  
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41 144 intervention on community-level HIV stigma and HIV testing among men. We assumed 80%  
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43 145 power to detect a conservative 5% difference in the change in stigma at  $\alpha < 0.05$  between  
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45 146 intervention and control, with an assumption of 20% loss to follow-up between baseline and  
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47 147 endline. This produced a target sample of 1,500 per intervention or control group (N=3,000  
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49 148 total). Given the other outcomes of interest related to improvements in HIV testing among men,  
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51 149 men were over-sampled to produce a sample comprised of two-thirds men and one-third women.  
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53 150 Considering the estimated sample size of 1,500 per group, 66% of whom would be men, and  
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55 151 20% loss to follow-up, it was estimated that that there would be over 80% power to detect at  
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57 152 least 10% difference in self-reported HIV testing among surveyed men in the intervention and  
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59 153 control sites. A total of 3,017 enrolled in the baseline survey; however, individuals who had self-  
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154 reported living with HIV at the time of survey were excluded from this analysis, producing an  
155 effective sample size of N=2,731 for this analysis (n=1,887 men and n=844 women).

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5 157 **Measures:** Data for the baseline survey was collected through a tablet-based questionnaire  
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7 158 administered by local interviewers. Interviewers were fluent in local languages of Sena or Ndao  
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9 159 as well as Portuguese, had prior experience in health research, and had been trained on human  
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11 160 subjects protection and confidentiality. Survey administration took approximately 45 minutes.  
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13 161 The socio-behavioral survey collected information on demographic characteristics including  
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15 162 gender identity, exposure to HIV prevention and testing, knowledge of HIV, relationships with  
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17 163 PLHIV, and a comprehensive set of HIV stigma measures.

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19 165 To ascertain recent HIV testing (last 12 months), participants were asked if they had ever been  
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21 166 tested for HIV within their lifetime. Those who responded positively and who had not reported a  
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23 167 positive diagnosis on their last HIV test, were then asked a categorical question of when their last  
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25 168 HIV test was completed. This categorical response was then reclassified to a binary response to  
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27 169 whether they had been tested within the last 12 months. Participants who reported no recent HIV  
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29 170 testing were additionally asked to report reasons why they had not tested and could select  
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31 171 multiple responses from a list of 13 potential barriers to testing.

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33 173 HIV stigma was assessed using several measures to capture five relevant stigma domains. The  
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35 174 HIV stigma scale developed by Genberg and colleagues in the sub-Saharan setting was used to  
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37 175 measure feelings and perceptions about PLHIV and included three subscales measuring  
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39 176 shame/blame/isolation, discrimination, and inequity of PLHIV (alpha: 0.79).[23] The domain of  
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41 177 shame gauged the participants' tendency to blame and disgrace PLHIV, discrimination captured  
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43 178 the extent to which participants believe PLHIV are unfairly treated, and inequity encompassed  
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45 180 the discrimination subscale includes "*People living with HIV/AIDS face neglect from their families.*"  
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47 181 While this scale was originally conceptualized as a way to identify individual discrimination, the  
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49 182 framing of the discrimination statements leaves it open to participant interpretation of whether  
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51 183 this is the participant's own anticipated behaviors or the anticipated behaviors of others.

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53 185 We developed new measures (7 items) to assess perceived HIV stigma within the community  
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55 186 (alpha: 0.77). An example statement in this measure included, "*In this community, men who are*

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3 187 *known to be living with HIV have the same level of importance in society as men who are not*  
4 *living with HIV.*” These sets of measures used 4-point Likert scale response options, in which 1  
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6 represented strong disagreement and 4 represented strong agreement with the statement. To score  
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8 the community stigma measures and the HIV stigma scale, comprised of the three subscales,  
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10 191 points from the Likert scale were summed across all items in the same measure, with the  
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12 192 exception of those that were reverse coded, producing possible ranges in scores from 7 to 28 for  
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14 193 perceived community stigma, 10 to 33 for shame/blame/isolation, 8 to 27 for discrimination, and  
15 194  
16 194 5 to 19 for inequity. A higher score meant greater levels of HIV stigma.  
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19 196 Measures of anticipated individual stigma towards PLHIV that are traditionally included in DHS  
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21 197 AIDS Indicators Survey (5 items) were also included in the survey to explicitly measure the  
22 198  
23 198 individual participant’s anticipated stigmatizing behaviors towards PLHIV. An example question  
24 199  
25 199 under the domain of anticipated individual HIV stigma asked, “*If you found out that one of your*  
26 200  
27 200 *friends was living with HIV, would you still be friends with him/her?*”[24] A total of five items  
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29 201 were evaluated with dichotomous responses of yes or no and were ultimately combined into a  
30 202  
31 202 single binary variable “any anticipated individual stigma,” which is based on whether a  
32 203  
33 203 participant endorses at least one of the five pertinent items. Appendix 1 displays the full set of  
34 204  
35 204 stigma measures included in the survey.

36 206 **Statistical Analyses:** This analysis aimed to identify the correlates of HIV testing among HIV-  
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38 207 uninfected individuals in Mozambique and to evaluate whether gender modified the relationship  
39 208  
40 208 between stigma, other variables of interest, and the outcome of recent HIV testing. Descriptive  
41 209  
42 209 analysis that was stratified by gender was conducted to assess characteristics of the study sample,  
43 210  
44 210 including prevalence of recent HIV testing and stigma scores. Chi-squared tests were  
45 211  
46 211 implemented to assess differences by gender for categorical variables; t-tests were implemented  
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48 212 to assess differences across continuous variables.

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50 214 A bivariate analysis was initially performed to identify potential correlates of recent HIV testing  
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52 215 among the total sample. Additional models were stratified by gender to determine variables that  
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54 216 would be appropriate to include in the final model for each gender. The independent variables  
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56 217 tested in the models included HIV prevention experience, HIV knowledge, and stigma among

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3 218 participants, while demographics, such as age and education level, were considered as potential  
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5 219 confounders in the model. The five domains of stigma were tested separately in the models:  
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7 220 scores for shame/blame/isolation, discrimination, and inequity subscales, as well as perceived  
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9 221 community stigma, were tested as continuous variables, while anticipated individual stigma was  
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11 222 tested as a binary variable.  
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14 224 Using variables identified in the bivariate models based on  $p < 0.10$ , a final multivariate logistic  
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16 225 regression model was built to present adjusted odds ratios, which allowed for the controlling of  
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18 226 potential confounders in the analysis. The logistic regression model was stratified by gender to  
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20 227 present potential associations that differed between men and women for having recently tested  
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22 228 for HIV. Multivariable models were run for the combined sample, as well as separately for each  
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24 229 gender. Of the variables that presented a difference in relationship by gender, interaction terms  
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26 230 were added in the combined multivariate model to evaluate their statistical significance.  
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28 231 Variance inflation factor was calculated to test for collinearity in the final models. The Hosmer-  
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30 232 Lemeshow test was also conducted to test for goodness-of-fit. All analyses were conducted in  
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32 233 STATA 14 and adjusted for potential clustering of participants induced by the sampling  
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34 234 methodology using complex survey design procedures.[25]

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38 236 **Patient and Public Involvement:** No patients were involved in this study. As a cross-sectional  
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40 237 household survey, the public were involved in community information sharing sessions before  
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42 238 and after the study to support recruitment and sharing of study results, respectively. Members of  
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44 239 the public were selected for participation in the survey via probability-based sampling. Results of  
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46 240 the study have been shared with development agencies supporting HIV programming in  
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48 241 Mozambique.  
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53 243 **Human Subjects:** The study was approved by the Johns Hopkins Bloomberg School of Public  
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55 244 Health Institutional Review Board and the National Committee of Bioethics for Health (CNBS)  
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57 245 in Mozambique.  
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62 247 **RESULTS:**

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3 248 Table 1 provides a description of demographic characteristics by the gender of participants (no  
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5 249 participants identified as transgender or gender non-binary). Men and women participants were  
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7 250 similar in age, education, and income level. However, among the 2,731 self-reported HIV  
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9 251 uninfected individuals (1,887 men and 844 women), men tended to have slightly higher levels of  
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11 252 employment than women (Table 1).

12 253  
13 254 Table 2 describes participants' exposure to HIV testing, prevention resources, and perceptions of  
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15 255 HIV stigma. More than half of the participants did not test for HIV in the year prior to the  
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17 256 baseline survey, which was significantly higher among men (61.7% vs. 52.4%,  $p<0.001$ ).  
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19 257 Women were more likely than men to have had a recent HIV test, while men were more  
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21 258 commonly exposed to HIV information than women via the radio, informational fliers, and  
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23 259 community discussion groups ( $p<0.001$ ). With respect to the domains of stigma, participants had  
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25 260 generally low levels of perceived stigma including shame/blame/isolation, discrimination, or  
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27 261 inequity towards PLHIV. Women were more likely than men to endorse at least one form of  
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29 262 anticipated individual stigma towards PLHIV (16.3% vs. 12.7%,  $p=0.013$ ) and reported higher  
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31 263 on average scores than men in having perceived shame/blame/isolation, feelings of inequity, and  
32  
33 264 perceived community stigma towards PLHIV (Table 2).

34 265  
35 266 When asked to report the reasons for not having tested for HIV in the last 12 months, over half of  
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37 267 participants who reported no recent test indicated it was because they felt healthy (55%), lacked  
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39 268 time for HIV testing (26%), and had low perceived risk (21%). Men were more likely to report  
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41 269 feeling healthy and not having time to get tested than women. In a separate analysis, men who  
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43 270 were currently employed were more likely to report lack of time as a barrier to HIV testing (ref:  
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45 271 unemployed; OR=1.46; 95% CI 1.09-1.95,  $p=0.010$ ; data not displayed). Figure 1 displays the  
46  
47 272 five most common reasons for failure to test among men and women. Concerns related to stigma  
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49 273 and perceived gender norms associated with HIV testing were not commonly reported reasons  
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51 274 for lack of recent HIV testing. For example, 1.7% of participants reported that they had not  
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53 275 recently tested for HIV due to concerns about negative treatment by healthcare workers, as well  
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55 276 as concerns that neighbors or families suspect that they are living with HIV infection (0.4%), or  
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57 277 concerns that people would believe they were unfaithful or misbehaving (0.5%).  
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3 279 *Insert Figure 1*  
4

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6  
7 281 In the multivariable logistic regression model that included the combined sample of men and  
8  
9 282 women (Table 3), the odds of recent HIV testing were almost 2 times higher among women than  
10  
11 283 men (aOR=1.79; 95% CI 1.39-2.30). Other correlates of recent HIV testing included being  
12  
13 284 married, attaining secondary education or technical school or university, past receipt of  
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15 285 informational fliers about HIV, knowing two or more people who were living with HIV, and past  
16  
17 286 participation in community group discussions about HIV were also significantly associated with  
18  
19 287 recent HIV testing. Modest associations were observed among participants all male and female  
20  
21 288 participants in terms of anticipated individual stigma and inequity for PLHIV: participants who  
22  
23 289 endorsed at least one form of anticipated individual stigma towards PLHIV had a 26% reduced  
24  
25 290 odds of recent HIV testing, compared to those with none (aOR=0.74; 95% CI 0.54-1.01). The  
26  
27 291 subscale measuring feelings of inequity for PLHIV had a modest positive association with HIV  
28  
29 292 stigma, wherein for each point higher on the scale, there was a 1.07 increased odds in recent HIV  
30  
31 293 testing (aOR=1.07; 95% CI 1.02-1.13).

32 294

33 295 To explore effect modification by gender in the relationship between stigma and recent HIV  
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35 296 testing and to identify unique correlates of recent HIV testing, gender disaggregated  
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37 297 multivariable logistic regression models were implemented (Table 4). Among men, higher  
38  
39 298 education, knowing two or more people who were living with HIV (aOR=1.38; 95% CI 1.08-  
40  
41 299 1.76), and engagement in community discussion groups (aOR=1.92; 95% CI 1.51-2.44) were  
42  
43 300 associated with increased odds of recent HIV testing. Men who endorsed at least one form of  
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45 301 anticipated individual stigma towards PLHIV had a 35% lower odds of recent HIV testing  
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47 302 (aOR=0.65; 95% CI 0.44-0.96), whereas there was a modest positive association between the  
48  
49 303 inequity subscale and HIV testing among men (aOR=1.10; 95% CI 1.03-1.17).

50 304

51 305 Women with secondary education and who were currently married were more likely to report  
52  
53 306 recent HIV testing. Having seen or read any informational fliers about HIV was also associated  
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55 307 with an increased odds of recent HIV testing among women (aOR=1.83; 95% CI 1.25-2.66).

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57 309 **DISCUSSION:**  
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3 310 Stigma has a well-documented role in inhibiting engagement across the HIV prevention and care  
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5 311 continuums and greater understanding, particularly for men who are less engaged in the HIV  
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7 312 care continuum, is critical to meeting global epidemic targets.[26] This study found that  
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9 313 endorsement of anticipated individual stigma among men was associated with a 35% reduced  
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11 314 odds of recent HIV testing – a finding that was unique to men. The measures of anticipated  
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13 315 individual stigma captured how participants felt they would personally react to PLHIV; given the  
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15 316 magnitude of the association among men, this suggests that men may avoid HIV testing to avoid  
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17 317 similar treatment by others. Conversely, exposure to HIV informational messages through  
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19 318 community discussions and fliers was positively associated with recent HIV testing for men, as  
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21 319 well as for women. These findings suggest that interventions to improve HIV testing for men  
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23 320 may be optimized by providing both stigma reduction efforts as well as communication about the  
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25 321 benefits and importance of HIV testing.

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27 323 While anticipated individual HIV stigma was found to be associated with decreased odds of  
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29 324 recent HIV testing among men, concerns related HIV stigma was not often a reported reason for  
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31 325 not completing HIV testing within the last 12 months. Rather, participants predominantly  
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33 326 reported that they did not seek testing because they felt they were not at risk for HIV, felt  
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35 327 healthy, or did not have time. There are two (not mutually exclusive) potential explanations for  
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37 328 these disparities in findings. Within social epidemiology, stigma is widely viewed and measured  
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39 329 as a latent trait, as it was in this analysis that utilized comprehensive scales to measure various  
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41 330 forms of HIV stigma.[23, 24] Thus, specific concerns related to stigma as a reason for failing to  
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43 331 test for HIV may be very different in perceived significance from what may be captured by more  
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45 332 comprehensive scales that capture the multitude manifestations of HIV stigma. Second, it is  
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47 333 possible that stigma serves as an overarching issue that impacts individual efforts to overcome  
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49 334 barriers to HIV testing, as suggested by other authors.[13] In this sense, stigma that is present  
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51 335 ubiquitously among individuals may prevent them from resolving more immediate barriers  
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53 336 related to time or perceived risk for HIV acquisition. Addressing both immediate barriers to HIV  
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55 337 testing as well as reducing stigma are important areas of focus for HIV testing interventions for  
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57 338 men, who do not have the same normative access to HIV testing that women do through  
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59 339 antenatal programs.

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3 341 Unlike the relationships identified for men, we found that women endorsed greater feelings of  
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5 342 stigma towards PLHIV compared to men; however, stigma did not appear to be associated with  
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7 343 women's testing behaviors. One likely explanation for the gender differential in recent HIV  
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9 344 testing and the lack of correlation with stigma among women is the availability of HIV testing in  
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11 345 routine antenatal care. Other research from Sofala Province estimated that at least 74% of  
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13 346 women routinely receiving antenatal care services in the Sofala province had tested for HIV in  
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15 347 2009 – an estimate that has likely increased in recent years.[27] It may be that, unlike for men,  
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17 348 antenatal care services allow women to access HIV testing within the context of other  
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19 349 reproductive care. With women visiting health facilities for antenatal care, following and  
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21 350 providing regular HIV prevention and care services, amongst other services, is more common for  
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23 351 women than for men.[28] In theory, male partners may access HIV testing at antenatal care sites  
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25 352 through their partner; however, in practice, men's engagement in antenatal care services are low  
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27 353 in Mozambique.[29] Given that specialty services for men are not common within health  
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29 354 facilities, increasing testing opportunities in locations that men frequent, such as hosting  
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31 355 workplace testing events, and providing self-testing services at home or within the community  
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33 356 are strategies to improve HIV testing among men.[30] These testing interventions may reduce  
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35 357 barriers associated with anticipated HIV stigma, as well as observed barriers related to time  
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37 358 constraints and perceptions of being healthy.

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41 360 Community discussion groups were found to be positively associated with recent HIV testing in  
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43 361 this study and have previously been successful in influencing a change in gender attitudes,  
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45 362 gender roles, and HIV stigma that also play a part in the uptake of HIV prevention and care  
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47 363 services.[31] Considering the higher proportion of men than women exposed to HIV prevention  
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49 364 messages, increasing and effectively distributing HIV prevention resources that deliver  
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51 365 information on HIV via fliers and community discussion groups among others are important for  
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53 366 future interventions targeting men. Contrary to these findings, an association was not observed  
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55 367 between hearing discussions about HIV on the radio and recent HIV testing. The content of the  
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57 368 radio programs that participants had heard was not documented and it may be the case that some  
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59 369 radio programs contained negative messages or misinformation. A closer evaluation of the  
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370 content of the radio programs would allow for better understanding of its relationship with recent  
371 testing for HIV. As radio is one of the most dominant forms of communication within

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3 372 Mozambique, with over 90% of households reportedly owning a radio, developing positive  
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5 373 messages for radio dissemination may play an important role in encouraging HIV testing and  
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7 374 reducing misinformation and stigma.[32]

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10 376 Finally, knowing multiple individuals who are living with HIV was positively associated with  
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12 377 recent HIV testing among men. In this case, witnessing the benefits of testing and prompt ART  
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14 378 initiation may buffer against stigma and motivate men to initiate or increase the frequency of  
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16 379 HIV testing. These findings are consistent with other prospective research conducted in South  
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18 380 Africa, which demonstrated that knowing others who were living with HIV decreased individual  
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20 381 stigma of HIV over time and, ultimately increased uptake of community voluntary counseling  
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22 382 and testing.[33]

23 383  
24 384 The findings should be viewed in light of study limitations. With the exception of the perceived  
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26 385 community stigma measures, other stigma measures were established a decade ago and items  
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28 386 may need to be added or adjusted to account for changing social dynamics and programming as  
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30 387 the epidemics progresses. The community stigma measure was developed for the purpose of this  
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32 388 assessment and has not been validated, though psychometric testing is underway. As a cross-  
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34 389 sectional analysis, temporality was not established and the direction of the associations cannot be  
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36 390 established. Given that stigma takes long periods of time to develop and change, we presume that  
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38 391 stigma influences recent HIV testing behaviors; however, there is the possibility that HIV testing  
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40 392 experiences could have changed participants' perspectives about stigma. Further, there is the  
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42 393 possibility that greater HIV stigma may increase HIV testing as a means to prevent the disease,  
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44 394 as may be the case for women who endorsed greater stigma. Such a relationship has not been  
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46 395 borne out in the scientific literature. The observation that current marriage is one of the strongest  
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48 396 correlates of recent HIV testing among women, likely because it is also correlated with number  
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50 397 of child births, rather suggests that the effects of stigma may be overcome by routine HIV testing  
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52 398 in the context of prenatal care for women. Finally, social desirability bias could have influenced  
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54 399 our estimates of stigma and HIV testing.

51 400

53 401 **CONCLUSION:**

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3 402 Stigma is and should be widely recognized as a potent social determinant in health seeking  
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5 403 behaviors that compromises health among populations, particularly as it relates to HIV testing  
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7 404 and care.[34, 35] Of the various forms of stigma, anticipated individual stigma was found to be  
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9 405 strongly associated with reduced uptake of recent HIV testing among men. The availability of  
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11 406 HIV testing within antenatal care services provides opportunities for women to engage in HIV  
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13 407 testing, while challenges to engage men in HIV testing and, broadly, the HIV care continuum  
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15 408 persist. Findings from this study suggest that efforts to improve HIV testing among men should  
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17 409 focus on addressing both stigma reduction and immediate barriers to HIV testing, and may be  
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19 410 able to build on the positive effects of community-based HIV prevention and care activities. As  
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21 411 HIV testing and diagnosis are essential to linking individuals to treatment and care, acting on the  
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23 412 individual, social, and structural barriers that disparately impact men and women will be  
24  
25 413 necessary to achieving the ambitious goal of 90-90-90 to end the HIV epidemic in sub-Saharan  
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27 414 Africa.

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#### 30 417 **Conflict of Interest Statement:**

31 418 The authors declare that they have no competing interests.

32 419

#### 33 420 **Authorship:**

34 421 LVL, ECM, PD, and ALW designed the study concept. JC and DP oversaw data collection.  
35 422 ALW, JHH, and JC had full access to study data. JHH conducted statistical analysis and wrote  
36 423 the initial draft of the manuscript with oversight and support by ALW. All authors review and  
37 424 provided scientific input.

38 425

#### 39 426 **Date Sharing Statement:**

40 427 Technical appendix, statistical code, and dataset available upon request to the authors.

41 428

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**TABLES:****Table 1.** Demographic characteristics of participants in Sofala Province, Mozambique (N=2,731)

	<b>Total (N=2,731)</b>	<b>Men (n=1,887)</b>	<b>Women (n=844)</b>	<b>p-Value</b>
Age (SD), years	35.5 (15.5)	37.3 (16.2)	31.6 (12.8)	<0.001
Average monthly income (SD), MZN	10700 (380000)	14221 (460000)	2944 (4500)	0.480
District of residence				
Nhamatanda	1385 (50.7%)	951 (50.4%)	434 (51.4%)	0.621
Dondo	1346 (49.3%)	936 (49.6%)	410 (48.6%)	
Highest level of education completed				
None or primary	1396 (56.5%)	1004 (55.6%)	392 (59.0%)	0.087
Secondary	1004 (40.6%)	744 (41.2%)	260 (39.2%)	
Technical school or university	70 (2.8%)	58 (3.2%)	12 (1.8%)	
Current employment status				
Unemployed	1031 (37.8%)	532 (28.2%)	499 (59.1%)	<0.001
Employed	1699 (62.2%)	1354 (71.8%)	345 (40.9%)	
Marital status				
Never married	560 (20.5%)	456 (24.2%)	105 (12.3%)	<0.001
Married	1931 (70.7%)	1334 (70.6%)	598 (70.9%)	
Separated	240 (8.8%)	98 (5.2%)	143 (16.8%)	
Mean number of children (SD)	4 (5)	4 (6)	4 (2)	

**Table 2.** Exposure to HIV interventions and HIV stigma among men and women in Sofala Province, Mozambique

	Total (N=2,731)	Men (n=1,887)	Women (n=844)	p-Value
<b><i>HIV testing and exposure to HIV information</i></b>				
Tested in the last 12 months				
No	1602 (58.8%)	1161 (61.7%)	441 (52.4%)	<0.001
Yes	1121 (41.2%)	721 (38.3%)	400 (47.6%)	
Ever tested (lifetime)				
No	807 (29.6%)	670 (35.6%)	137 (16.3%)	<0.001
Yes	1919 (70.4%)	1214 (64.4%)	705 (83.7%)	
Know of an HIV testing center				
No	156 (5.7%)	130 (6.9%)	26 (3.1%)	<0.001
Yes	2572 (94.3%)	1755 (93.1%)	817 (96.9%)	
Seen or read HIV informational fliers				
No	993 (36.4%)	546 (29.0%)	447 (53.1%)	<0.001
Yes	1733 (63.6%)	1338 (71.0%)	395 (46.9%)	
Heard any HIV discussion on the radio				
No	704 (25.8%)	378 (20.1%)	326 (38.7%)	<0.001
Yes	2022 (74.2%)	1506 (79.9%)	518 (61.3%)	
Participated in HIV community discussion groups				
No	2023 (74.2%)	1294 (68.7%)	729 (86.5%)	<0.001
Yes	704 (25.8%)	590 (31.3%)	114 (13.5%)	
Median number of people known to be living HIV infection (IQR)				
	1 (0-5)	1 (0-4)	1 (0-4)	0.005
<b><i>HIV stigma measures</i></b>				
HIV shame subscale (SD) <sup>1</sup>	16.8 (3.9)	16.7 (3.8)	17.0 (4.1)	0.044
Discrimination of PLHIV subscale (SD) <sup>1</sup>	16.1 (3.4)	16.1 (3.5)	16.3 (3.2)	0.080
Inequity for PLHIV subscale (SD) <sup>1</sup>	8.6 (2.4)	8.3 (2.2)	9.2 (2.5)	<0.001
Perceived community stigma of PLHIV (SD) <sup>1</sup>	19.8 (3.7)	19.6 (3.4)	20.2 (4.1)	<0.001

## Any anticipated individual stigma towards PLHIV

No	2336 (86.2%)	1636 (87.3%)	700 (83.7%)	0.013
Yes	374 (13.8%)	238 (12.7%)	136 (16.3%)	

Note: <sup>1</sup>Scores of stigma subscales ranged from 10 to 33 for shame, 8 to 27 for discrimination, 5 to 19 for inequity, and 7 to 28 for community stigma.

**Table 3.** Correlates of recent HIV testing (last 12 months) among all participants (N=2,332)

Variable	Crude		Adjusted	
	OR (95% CI)	p-Value	Adj. OR (95% CI)	p-Value
<b>Demographic characteristics</b>				
Women (ref. men)	1.46 (1.24, 1.72)	<0.001	1.79 (1.39, 2.30)	<0.001
Age	0.98 (0.98, 0.99)	<0.001	0.98 (0.98, 0.99)	<0.001
Highest level of education completed (ref: none or primary)				
Secondary	1.75 (1.48, 2.07)	<0.001	1.48 (1.20, 1.82)	<0.001
Technical school or university	4.79 (2.80, 8.20)	<0.001	3.66 (1.96, 6.86)	<0.001
Currently employed (ref: unemployed)	1.11 (0.95, 1.30)	0.194	1.06 (0.85, 1.31)	0.610
Marital status (ref: never married)				
Married	1.10 (0.90, 1.33)	0.350	1.71 (1.31, 2.21)	<0.001
Separated	0.75 (0.55, 1.04)	0.082	1.19 (0.75, 1.89)	0.466
Number of people participant knows who are living with HIV (ref: none)				
One	1.15 (0.86, 1.53)	0.357	1.22 (0.88, 1.70)	0.228
Two or more	1.65 (1.39, 1.97)	<0.001	1.37 (1.11, 1.68)	0.003
<b>HIV testing and exposure to HIV information</b>				
Seen or read HIV informational fliers	1.83 (1.56, 2.16)	<0.001	1.71 (1.32, 2.17)	<0.001
Heard any HIV discussion on the radio	1.14 (0.96, 1.36)	0.144	0.93 (0.73, 1.17)	0.531
Participated in HIV community discussion groups	1.78 (1.50, 2.12)	<0.001	1.75 (1.41, 2.18)	<0.001

**HIV stigma measures**



HIV shame subscale	0.96 (0.94, 0.98)	<0.001	0.98 (0.95, 1.01)	0.158
Discrimination of PLHIV subscale	0.98 (0.96, 1.00)	0.081	0.99 (0.96, 1.02)	0.534
Inequity for PLHIV subscale	1.00 (0.97, 1.04)	0.783	1.07 (1.02, 1.13)	0.005
Perceived community stigma of PLHIV	1.04 (1.01, 1.06)	0.002	1.02 (0.99, 1.05)	0.162
Any anticipated individual stigma towards PLHIV (ref: no)	0.51 (0.40, 0.65)	<0.001	0.74 (0.54, 1.01)	0.056

**Table 4.** Adjusted associations with testing for HIV in the last 12 months by gender

Variable	Men (n=1,714)		Women (n=618)	
	Adj. OR (95% CI)	p-Value	Adj. OR (95% CI)	p-Value
<b><i>Demographic characteristics</i></b>				
Age	0.98 (0.98, 0.99)	0.001	0.98 (0.96, 1.00)	0.038
Highest level of education completed (ref: none or primary)				
Secondary	1.40 (1.08, 1.81)	0.010	1.66 (1.13, 2.44)	0.010
Technical school or university	3.81 (1.89, 7.65)	<0.001	2.63 (0.60, 11.43)	0.198
Currently employed (ref: unemployed)	1.06 (0.83, 1.36)	0.689	1.09 (0.75, 1.56)	0.638
Marital status (ref: never married)				
Married	1.60 (1.17, 2.19)	0.003	2.01 (1.21, 3.34)	0.007
Separated	1.10 (0.57, 2.11)	0.773	1.55 (0.74, 3.27)	0.245
Number of people participant knows who are living with HIV (ref: none)				
One	1.20 (0.80, 1.78)	0.374	1.30 (0.70, 2.40)	0.398
Two or more	1.38 (1.08, 1.76)	0.010	1.36 (0.91, 2.04)	0.133
<b><i>HIV testing and exposure to HIV information</i></b>				
Seen or read HIV informational fliers	1.75 (1.31, 2.34)	<0.001	1.83 (1.25, 2.66)	0.002
Heard any HIV discussion on the radio	1.05 (0.77, 1.42)	0.763	0.80 (0.55, 1.18)	0.267
Participated in HIV community discussion groups	1.92 (1.51, 2.44)	<0.001	1.15 (0.70, 1.92)	0.567
<b><i>HIV stigma measures</i></b>				
HIV shame subscale	0.99 (0.95, 1.02)	0.501	0.95 (0.90, 1.01)	0.112



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Discrimination of PLHIV subscale	0.98 (0.94, 1.01)	0.168	1.03 (0.96, 1.09)	0.430
Inequity for PLHIV subscale	1.10 (1.03, 1.17)	0.003	1.04 (0.95, 1.09)	0.101
Perceived community stigma of PLHIV	1.01 (0.97, 1.05)	0.640	1.03 (0.99, 1.08)	0.884
Any anticipated individual stigma towards PLHIV (ref: no)	0.65 (0.44, 0.96)	0.032	1.04 (0.60, 1.80)	0.884

For peer review only

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3 **Figure 1:** Five most common reasons for failing to test for HIV in the last 12 months among  
4 men and women in Sofala Province, Mozambique.  
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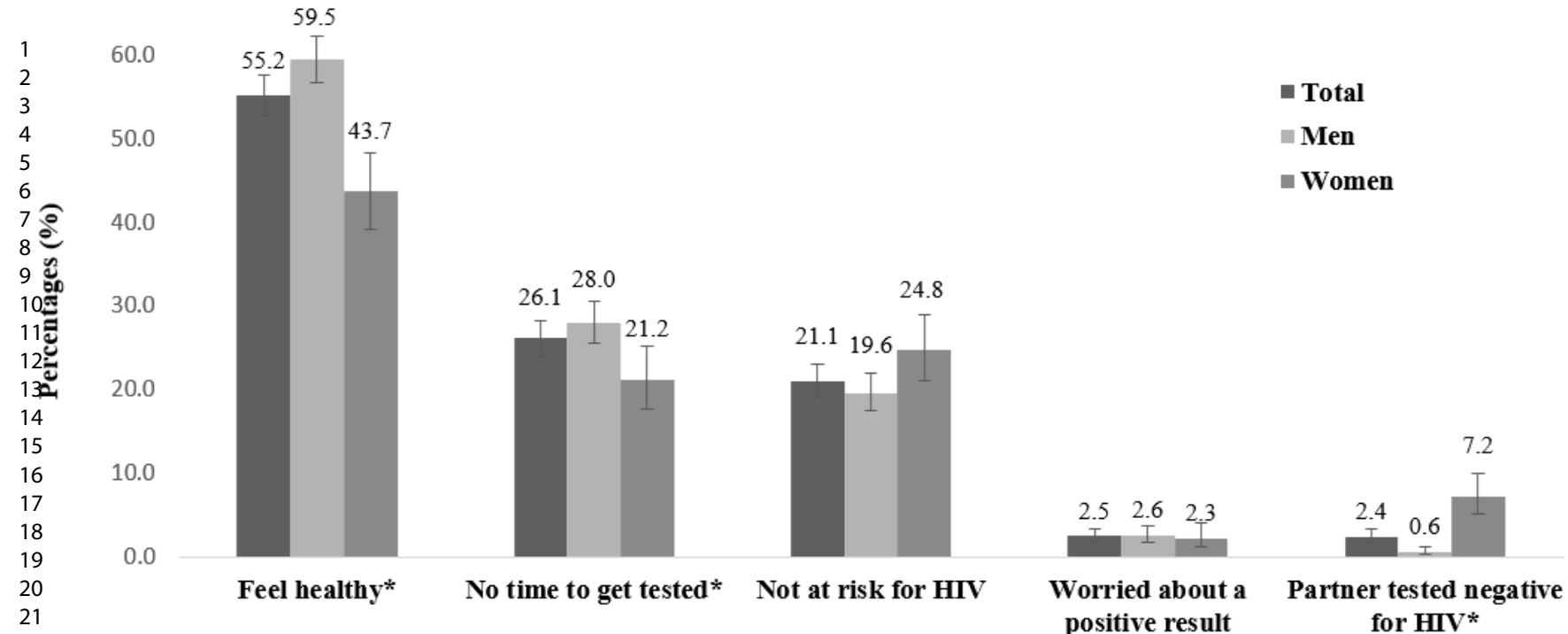
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Note: \* indicates for statistical significance of  $p < 0.05$ . Error bars represent 95% CI.

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5 **THE GENDERED RELATIONSHIP BETWEEN HIV STIGMA AND HIV TESTING AMONG MEN AND WOMEN**  
6 **IN MOZAMBIQUE: A CROSS-SECTIONAL STUDY TO INFORM A STIGMA REDUCTION AND MALE-**  
7 **TARGETED HIV TESTING INTERVENTION**  
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11 **Judy H. Ha<sup>1</sup>, Lynn Van Lith<sup>2</sup>, Elizabeth C. Mallalieu<sup>2</sup>, Jose Chidassica<sup>3</sup>, Dirce Pinho<sup>3</sup>, Patrick Devos<sup>3</sup>,**  
12 **Andrea L. Wirtz<sup>4\*</sup>**  
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16 **Appendix: Stigma survey measures**  
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<b>Genberg Stigma Scale: Shame/blame/isolation subscale (measured as 4 point Likert scale of level of agreement)<sup>1</sup></b>
People living with HIV/AIDS should be ashamed
People with AIDS should be isolated from other people.
People who have HIV/AIDS are cursed
A person with HIV/AIDS should be allowed to work with other people <sup>+</sup>
People living with HIV/AIDS deserved to be punished
Families of people living with HIV/AIDS should be ashamed
It is reasonable for an employer to fire people who have HIV/AIDS
People living with HIV/AIDS are disgusting
People who have HIV/AIDS deserve compassion <sup>+</sup>
People with HIV should be allowed to participate fully in the social events in this community <sup>+</sup>
<b>Genberg Stigma Scale: Discrimination subscale (measured as 4 point Likert scale of level of agreement)<sup>1</sup></b>
People living with HIV/AIDS face neglect from their families
People living with HIV/AIDS face physical abuse
People want to be friends with someone who has HIV/AIDS <sup>+</sup>
People living with HIV/AIDS face ejection from their homes by their families
Most people would not buy vegetables from a shopkeeper or food seller that they knew had AIDS
People who are suspected of having HIV/AIDS lose respect in the community
People who have HIV/AIDS face verbal abuse
People living with HIV/AIDS face rejection from their peers
<b>Genberg Stigma Scale: Equality subscale (measured as 4 point Likert scale of level of agreement)<sup>1</sup></b>
People who have HIV/AIDS should be treated the same as everyone else <sup>+</sup>
People with HIV/AIDS do not deserve any support
People with HIV/AIDS should not have the same freedoms as other people
People living with HIV/AIDS should be treated similarly by healthcare professionals as people with other illnesses <sup>+</sup>
<b>DHS AIDS Indicator Stigma Measures: Anticipated individual stigma (measured as a binary yes/no item)<sup>2</sup></b>
Would you buy fresh vegetables from a shopkeeper or vendor if you knew that this person had HIV/AIDS?
If a member of your family got infected with HIV/AIDS, would you want it to remain a secret or not?



**[Continued from above] DHS AIDS Indicator Stigma Measures: Anticipated individual stigma (measured as a binary yes/no item)<sup>2</sup>**

If a member of your family became sick with HIV/AIDS, would you be willing to care for him/her in your own household?

If a teacher at the school where you send your students had HIV/AIDS, would you continue to send your children there?

If you found out that one of your friends was living with HIV, would you still be friends with him/her?

**New Community Stigma Measures (measured as 4 point Likert scale of level of agreement)**

In this community, men who are known to be living with HIV are treated with respect. <sup>+</sup>

In this community, men who are known to be living with HIV have the same level of importance in society as men who are not living with HIV. <sup>+</sup>

In this community, women who are known to be living with HIV are treated with respect. <sup>+</sup>

In this community, women who are known to be living with HIV are considered equally valuable members of the family as those who are not living with HIV. <sup>+</sup>

In this community, people who are not living with HIV give support to those who are living with HIV infection. <sup>+</sup>

In this community, community members - including people living with and without HIV infection – work together to address the HIV epidemic. <sup>+</sup>

In this community, there are laws and policy to protect people who are living with HIV from discrimination. <sup>+</sup>

Note: <sup>+</sup> Indicates items that are reverse coded for scoring

**References:**

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STROBE Statement—Checklist of items that should be included in reports of *cross-sectional studies*

	Item No	Recommendation	Page No
<b>Title and abstract</b>	1	(a) Indicate the study's design with a commonly used term in the title or the abstract	1-2
		(b) Provide in the abstract an informative and balanced summary of what was done and what was found	2
<b>Introduction</b>			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	3
Objectives	3	State specific objectives, including any prespecified hypotheses	4
<b>Methods</b>			
Study design	4	Present key elements of study design early in the paper	5
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	5
Participants	6	(a) Give the eligibility criteria, and the sources and methods of selection of participants	5
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	6-7
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	6-7
Bias	9	Describe any efforts to address potential sources of bias	7
Study size	10	Explain how the study size was arrived at	5
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	7-8
Statistical methods	12	(a) Describe all statistical methods, including those used to control for confounding	7-8
		(b) Describe any methods used to examine subgroups and interactions	7-8
		(c) Explain how missing data were addressed	7-8
		(d) If applicable, describe analytical methods taking account of sampling strategy	7-8
		(e) Describe any sensitivity analyses	7-8
<b>Results</b>			
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	8
		(b) Give reasons for non-participation at each stage	8
		(c) Consider use of a flow diagram	na
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	8 + Tables
		(b) Indicate number of participants with missing data for each variable of interest	8+ Tables
Outcome data	15*	Report numbers of outcome events or summary measures	8+ Tables

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Main results	16	(a) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	9 + Tables
		(b) Report category boundaries when continuous variables were categorized	7
		(c) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	N/A
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	NA
<b>Discussion</b>			
Key results	18	Summarise key results with reference to study objectives	10
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	12
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	10-12
Generalisability	21	Discuss the generalisability (external validity) of the study results	10-12
<b>Other information</b>			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	13

\*Give information separately for exposed and unexposed groups.

**Note:** An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at <http://www.plosmedicine.org/>, Annals of Internal Medicine at <http://www.annals.org/>, and Epidemiology at <http://www.epidem.com/>). Information on the STROBE Initiative is available at [www.strobe-statement.org](http://www.strobe-statement.org).