HHS Public Access

Author manuscript

AIDS Behav. Author manuscript; available in PMC 2018 September 01.

Published in final edited form as:

AIDS Behav. 2017 September ; 21(9): 2579–2588. doi:10.1007/s10461-016-1671-8.

Gender, HIV testing and stigma: The association of HIV testing behaviors and community-level and individual-level stigma in rural South Africa differ for men and women

Sarah Treves-Kagan[1,2], **Alison M. El Ayadi**[3], **Audrey Pettifor**[2,4,5], **Catherine MacPhail**[4,5,6], **Rhian Twine**[5], **Suzanne Maman**[2], **Dean Peacock**[7], **Kathleen Kahn**[5,8], and **Sheri A. Lippman**[1,5]

[1]University of California, San Francisco, Center for AIDS Prevention Studies, Department of Medicine, San Francisco, United States

[2]University of North Carolina at Chapel Hill, Gillings School of Global Public Health, Chapel Hill, United States

[3]University of California, San Francisco, Bixby Center for Global Reproductive Health, Department of Obstetrics, Gynecology and Reproductive Sciences, San Francisco, United States

[4]University of the Witwatersrand, Wits Reproductive Health and HIV Institute (WRHI), School of Clinical Medicine, Faculty of Health Sciences, Johannesburg, South Africa

[5]MRC/Wits Rural Public Health and Health Transitions Research Unit (Agincourt), School of Public Health, Faculty of Health Sciences; University of the Witwatersrand, Johannesburg, South Africa

[6]University of New England, School of Health, Armidale, Australia

[7]Sonke Gender Justice, Cape Town, South Africa

[8]Umeå Centre for Global Health Research, Division of Epidemiology and Global Health, Department of Public Health and Clinical Medicine, Umeå University, Umeå 90187, Sweden

Abstract

Stigma remains a significant barrier to HIV testing in South Africa. Despite being a social construct, most HIV-stigma research focuses on individuals; further the intersection of gender, testing and stigma is yet to be fully explored. We examined the relationship between anticipated stigma at *individual* and *community* levels and recent testing using a population-based sample (n=1,126) in Mpumalanga, South Africa. We used multi-level regression to estimate the potential effect of reducing community-level stigma on testing uptake using the g-computation algorithm.

Compliance with Ethical Standards

Conflict of Interest: The authors declare that they have no conflicts of interest.

Ethical approval: Research procedures were approved by the Institutional Review Boards at the University of North Carolina-Chapel Hill and the University of California, San Francisco, and the Human Research Ethics Committee at the University of the Witwatersrand in South Africa. All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Informed Consent: Informed consent was obtained from all individual participants included in the study.

Men tested less frequently (OR:0.22, 95%CI 0.14–0.33) and reported more anticipated stigma (OR:5.1, 95%CI 2.6–10.1) than women. For men only, testing was higher among those reporting no stigma vs. some (OR: 1.40, 95%CI 0.97–2.03; p=0.07). For women only, each percentage point reduction in community-level stigma, the likelihood of testing increased by 3% (p<0.01). Programming should consider stigma reduction in the context of social norms and gender to tailor activities appropriately.

Keywords

HIV; stigma; South Africa; rural; community; gender

Background

With the fourth highest adult HIV prevalence (19.1%) and the second highest number of HIV-related deaths in the world [1, 2], South Africa requires a broad response to the HIV epidemic. As a result, the government has implemented mass HIV testing campaigns and operates the world's largest antiretroviral (ART) program, with continued expansion of ART access [3,4]. Despite significant increases in HIV testing [5], data from the most recent national survey (which included HIV-testing) indicate that only 37.8% of HIV-positive men and 55.0% of HIV-positive women in South Africa were aware of their HIV status [6]. Because a substantial proportion of new infections are spread by persons unaware of their HIV status [7], there is an immense need for increased testing uptake and frequency. Knowledge of one's HIV status enables people living with HIV (PLHIV) to maximize the benefits of early HIV treatment and reduce the likelihood of further transmission [8]. Furthermore, knowing one's status has been associated with the adoption of lower risk behaviours among PLHIV [9, 10].

As has been noted since early in the HIV epidemic, stigma is a key barrier to effective prevention and treatment efforts [11]. Individual perceived stigma, or the fear of being stigmatized if positive, have long been associated with delays in testing or decisions not to test, and this had been shown to be the case both before [12–19] and after South Africa expanded access to HIV care and treatment [20–22]. To date, most of what is known about the relationship between stigma and HIV testing has focused on individual-level models, or those that examine an individual's perception of HIV-related stigma and its association with testing decisions [23]. However, stigma is an inherently social construct that can only manifest in a context where power structures exist; differences are identified, labelled and valued; and those deemed 'different' are actively 'othered' and devalued [11, 24]. The potential of being stigmatized because of a certain identity or behaviour is socially communicated—one's perception is informed by considering the attitudes of others who are part of the same community. As a result, it is important to understand how living in an environment or community where others anticipate stigma impacts testing behaviours [25]. In this study we operationalize community-level stigma by looking at the percent of people in a village reporting perceived stigma. This approach allows us to examine the impacts of living in village where a lot of people fear stigma (or not), independent of your own fears of stigma, and its impacts on individual testing. Examining how the social environment impacts individual testing behaviour can create pathways to structural interventions to increase HIV testing [25].

While exploring the statistical relationship between stigma and testing through a community lens is a nascent field, some investigators have noted important relationships. For example, in Nigeria, Babaloa found that men living in communities with more stigma were 43% less likely to be *ready* for HIV-testing than men who lived in communities with less stigma [26]. Smolak found that among women in Central Asia, stigma at every level - the individual, family and community – were significant predictors of HIV testing [27]. In Sierra Leon, community adherence to stigmatizing attitudes towards people living with HIV was negatively associated with individual-level recent HIV testing [23].

With continued emphasis on the importance of testing early and often [8, 28, 29], understanding the barriers to testing at multiple levels is paramount to inform prevention and treatment programming targeting high prevalence areas. As such, we explore the relationship between individual-level anticipated stigma, community prevalence of anticipated stigma and HIV testing uptake by gender in a population-based survey conducted in a rural, high prevalence area of South Africa.

Methods

Study setting

We conducted a cross-sectional, population-based survey among a random sample of 581 men and 600 women ages 18–35 in 22 villages in rural Mpumalanga Province, northeast South Africa, from February to June 2012. The survey was undertaken as part of a two-year cluster randomized controlled trial of a community mobilization intervention to change inequitable gender norms, particularly among men [30]. The research took place in the Agincourt Health and Socio-Demographic Surveillance System Site (HDSS), about 500 kilometers northeast of Johannesburg. The 22 villages included in this study make up the entirety of the Agincourt Health and Demographic Surveillance System, except one village which was excluded as it was significantly smaller than the others. The 22 villages vary in terms of size, ranging from 0.72 km^2 to 6.48 km^2, with populations between 800 and 9000 at the time of the study. The entire area is characterized by high levels of unemployment, a significant population of temporary labour migrants (who migrate *out* of the area for work) and high HIV prevalence, estimated at 45% for 35–39 year-old males and females [31, 32].

Sample and procedures

Individuals aged 18–35 were randomly selected from the Agincourt HDSS census, from among all men and women living in the 22 participating study villages [30]. Participation in the Agincourt HDSS census is almost universal (two households choose not participate in the census) [32]. The target enrollment for each of the 22 communities was 55 individuals with 27–28 males and females per community. Only one individual per household was sampled for recruitment to avoid clustering at the household level. Eligibility criteria for participation in the survey included: residence in the home (spends a majority of nights in a

7-day week within the home), age 18–35 years, and having lived in the study area for the past 12 months.

After eligibility was confirmed and informed consent obtained, surveys were conducted in participants' households. Interviews and informed consent procedures were conducted in Shangaan (local language) or English, depending on the participant's preference. We used computer assisted personal interviewing (CAPI), in which the interviewer read each question to the respondent, then entered the answer into an electronic form on a laptop computer. While this secondary analysis focused on variables regarding HIV testing, stigma and demographics, data was also collected on community mobilization domains, gender roles and equitable norms, sexual risk behavior, HIV treatment and disclosure, violence, substance use and exposure to program activities; as such, it took 1–2 hours to complete the survey. No financial compensation was provided for participation in the study per study site policy.

The Institutional Review Boards at the University of North Carolina-Chapel Hill and the University of California, San Francisco, and the Human Research Ethics Committee at the University of the Witwatersrand in South Africa approved this study.

Measures

Socio-demographic characteristics evaluated included gender, age group (18–24, 25–29, and 30–35), marital status (never married, married, separated or divorced, widowed), educational attainment (primary school or less, some high school, completed high school, tertiary), earned income over past 3 months (any vs. none), and past month household food insecurity (any days where any household member did not eat vs. none). We defined recent HIV testing as having tested in the past 12 months. Anticipated HIV stigma was operationalized using a 9-item scale previously validated in sub-Saharan Africa that includes questions that assess expectations of discrimination should one become HIV positive (e.g. "You would be treated badly at work or school") [17, 33]. Participants were classified as reporting anticipations of stigma if they answered "very likely" or "likely" to any of the nine questions. The decision to dichotomize responses as *any* versus *no* anticipated stigma was based on review of graphical depictions of the distribution of our continuous stigma variable whereby the majority of our sample reported no anticipated stigma. No clear-cut breaks were evident between medium versus high levels of stigma thus we did not want to make assumptions about the functional form of the stigma variable. Community-level stigma was calculated by estimating the weighted proportion of individuals within each village who reported any anticipated stigma, excluding the index individual.

Analysis

Univariate analyses were conducted to describe the socio-demographic characteristics of the population, stratified by gender. We then estimated a series of logistic regression models among individuals who did not report HIV-positive status. These models evaluate the relationships between 1) individual-level stigma and recent HIV testing; 2) community-level stigma and recent HIV testing; and 3) both individual-level stigma and community-level stigma within the same model predicting recent HIV testing. All models were run separately by gender and were adjusted for age group and educational attainment. Data for the response to one stigma variable was imputed for one participant who was missing only one of the nine stigma questions; 53 participants were excluded from analysis as they were missing data on all nine of the anticipated stigma questions. The 53 participants excluded for non-response to stigma variable did not differ from those who did respond in terms of village of residence, gender, age, marital status or educational attainment.

We also employed the g-computation algorithm, an imputation-based causal inference method, to estimate the potential effect of an intervention [34, 35]. This method was developed to control for time-dependent confounding within longitudinal analysis; however, it is also well suited to the estimation of population parameters under hypothetical interventions within cross-sectional studies [34]. We used this method to predict what HIV testing uptake can be expected based on changing levels of community stigma, accomplished by imputing each individual's probability of recent HIV testing under different community-stigma scenarios corresponding to the range of the observed data. This process estimates the missing counterfactuals through imputing each individual's probability of recent HIV testing if he/she had experienced a community stigma value that he/she did not experience based on individual characteristics and the risk associated with the particular community-level stigma value. Individual testing was predicted from 25% to 65% of the community reporting any stigma, at 5% intervals. We included covariates for age group, educational attainment and percent of village residents who were temporary migrants, defined as having spent less than 6 of the last 12 months in the area. [36].

Participants self-reported HIV status. We did not include participants in our analytic sample if they reported an HIV-positive status. This decision was based on the assumption that a positive HIV-status would influence both the participant's anticipated stigma and their testing behavior (i.e. there is no need to test if you know are HIV positive.) However, substantially fewer participants reported a positive HIV status than would expected based on district data. As such, we conducted a sensitivity analysis to explore how reported HIV status might impact the findings. As our analysis sample only included individuals self-reporting a HIV-negative status (some of whom likely have a positive status and therefore may have a different relationship to stigma or testing), we looked at the relationships between our variables of interest 1) only among those self-reporting a HIV-positive status and 2) among the full sample. We then compared these values to findings of those self-reporting a HIV-negative status, to get a sense of the directionality of the bias.

Analyses were stratified by gender, weighted to account for the survey design and utilized robust standard errors to accommodate for potential clustering at the community level. All analyses were conducted in Stata 14 (StataCorp LP, College Station, TX). Sampling weights included the reciprocal of the probability of including a subject in the sample based on the number of eligible individuals of that gender in the community and household.

Results

Eighty-one percent of sample households were visited; target sample size was reached in some villages before the entire sample was exhausted. Of the households contacted, 69% included an eligible resident and 94% of those eligible enrolled in the study (n=1181; 600

women and 581 men). Demographics of our sample are presented in Table I. Men were younger than women with 75.2% of male participants aged 18–24 compared to only 51.1% of women. The majority of both men and women had not completed tertiary education, and only 32.1% of men and 40% of women reported having earned any income in the past three months. Only 2% of men and 6.9% of women self-reported positive HIV status. Participants excluded for non-response to the anticipated stigma scale were similar to those included in terms of gender, age group, marital status, and educational attainment. However, they differed significantly in socioeconomic status (SES), where those missing stigma variables had lower SES, as measured by any earned income in the past 3 months and any household food insecurity in the past month.

Men tested less frequently than women (OR 0.22, 95% CI 0.14–0.33; p<0.01; data not shown), with 43.7% of men and 78.7% of women reporting having tested in the last 12 months (Table I). The odds of reporting any individual anticipated stigma was five times higher among men compared to women at 61.8% vs. 23.9% respectively (OR 5.1, 95% CI 2.6–10.1, p<0.001; not shown). Table II documents the percent of men and women agreeing with the nine questions included in our composite internalized stigma variable. The mean proportion of individuals reporting anticipated stigma across communities was 41.5 (SD 10.3). By village, proportions of individuals reporting anticipated stigma ranged from 24.0% to 65.6%.

Our multivariate models found that men reporting no individual-level stigma (vs. any) were 40% more likely to have tested within the past year, though this did not reach statistical significance (OR 1.40, 95% CI 0.97–2.03, p=0.07). Individual anticipated stigma was not associated with recent testing behaviour among women (Table III). Analysis of community-level stigma demonstrated a significant association among women such that for each percentage point reduction in community-level stigma, the odds of recent HIV testing increased by 3% (p<0.01). The significant association persisted after accounting for individual-level stigma, age, education and community proportion of migrants. Community-level stigma was not associated with testing among men.

Estimated gains in HIV testing at different levels of community stigma using the g-computation algorithm are presented in Figure 1. Our results indicate that community-level interventions focused on decreasing community stigma could result in significant increases in testing for women, but not men. For example, if women living in villages where 50% of the village reported stigma as opposed to a village where only 25% of the community reported stigma, we should expect a 12.0 percentage point increase in the number of women reporting recent HIV testing.

Sensitivity analysis found that men self-reporting a HIV-positive status had significantly lower rates of anticipated stigma (12%) than men reporting a HIV-negative status (62%). Further, men self-reporting a HIV-positive status also reported higher rates of recent HIV testing (62%) than men reporting a HIV-negative status (43%). We suspect that the inclusion of men who knew their HIV-positive status but chose to report an HIV-negative status in our sample would bias our results towards the null hypothesis. While we make the assumption that self-reported HIV status is a variable heavily susceptible to social desirability, we do not make that same assumption about HIV testing. As such, we suspect that the subset would still report recent HIV testing accurately. If these assumptions are correct, we would see high stigma reported *and* recent testing behaviour, biasing our results towards the null hypothesis.

Among women, the difference in stigma for those reporting a positive or negative status was minimal; 75% of women reporting a positive status reported testing in the last year compared to 79% of women reporting a negative status (p=0.52). As rates of exposure and outcome were comparable between disclosing HIV-positive and all reporting negative women, there is some evidence that failure to report HIV-positive status among women, and thus erroneous inclusion in this analysis, would not influence the current findings. However, there is still some potential that women who are HIV-positive but do not disclose may differ and drive some findings in an unknown direction.

Discussion

Our research points to important differences in the relationship between stigma and HIV testing among men and women. We found that stigma influenced both men and women's likelihood of recent HIV testing but through different mechanisms. Individually-held anticipated stigma was associated with men's HIV testing uptake while women's testing patterns were associated with community levels of stigma. Individual reports of anticipated stigma were excluded from our community-level indicators, providing a conservative estimate of an association of village stigma with testing that was independent of individual perceptions [37]. The implication is that men's testing may be most impacted by personally held fears; whereas women's testing behaviours may be more influenced by community beliefs. Employing the g-computation algorithm allowed us to understand the potential gains in HIV testing for women that could be achieved on the population level due to an intervention modifying community levels of stigma.

Potential explanations of our findings regarding individual level stigma and testing include differential access to services for men and women and traditional gender norms. Access could be a significant moderator in the relationship between individual stigma and HIV-testing. As reflected by the stark differences in recent HIV testing across gender within our data, men are significantly less likely to access care at the clinic than women [38–41]. Research in South Africa has found that men test and enter care later, present with lower CD4 counts, and have worse HIV-related outcomes than women [38–41]. Comparatively, women have much greater social access to clinic-based testing. Women typically begin consistent engagement in health care at a younger age then men due to enrollment in reproductive health care for pregnancy and family planning, thus HIV testing and diagnosis for women may be more likely to occur within the context of a non-HIV-related visit. Further, much HIV programming has focused on engaging women in HIV testing and treatment services largely because of their role in preventing transmission to children [42]. Studies on gender differences in engagement to care found that men's absence from health facilities is related to both traditional ideas of illness as a sign of "weakness" and because clinics are viewed as a woman's realm [21, 43–45]. This focus on women may have inadvertently exacerbated men's differential structural and social access to HIV services [42]. Women's greater comfort level with clinic attendance may facilitate testing diagnosis earlier in their infection, independently of their individual-ideas of stigma [6]. It could be that without the structural points of access for men to test for HIV (i.e. socially acceptable pathways to clinic use), individual-level anticipated stigma has a stronger influence over testing behaviour.

Regarding community-level stigma and testing, we explore social constructions of gender, the interaction between gender norms and engagement with HIV in the community, and differential migration patterns to explain differences between men and women. Research on the socialisation and psychology of women observes that women's decision-making is more heavily influenced by the potential impact a decision could have on relationships compared to men's decision making [46, 47]. The implication is that women may be more sensitive to other's feelings around HIV and these social norms influence women's decision-making around testing. While this social theory is based on US populations and may not be applicable in the South African context, findings from a meta-analysis of qualitative data with HIV-positive women in the United States by Sandelowski et al. confirm that women's decision-making prioritizes others' needs and opinions over self [48]. Specifically, Sandelowski's analysis found that women's goals when managing disclosure revolved around "preserving social relations and moral identities and preventing harm to others" [48]. Relationally-oriented decision-making may explain why community-level levels of stigma more heavily influence women's testing uptake as compared to individual level stigma.

Relatedly, caretakers of those living with HIV in South Africa are overwhelmingly women [49, 50]. This exposure to the realities of PLHIV may allow women to better understand the extent to which others fear HIV-related stigma and to the level of stigmatising attitudes in their communities. Indeed, when we explored differences in reported anticipations of stigma between HIV-positive and HIV-negative women, we saw almost identical percentages—whereas the proportion of HIV-positive and HIV-negative men anticipating stigma were dramatically different. This suggests that women's *expectations* of HIV-related stigma may be more similar to their *experiences* of stigma, while men's expectations of stigma may be more severe than the true experiences of a person living with HIV.

Finally, migration may serve to lessen the influence of community norms, and thus the relationship between stigma and HIV-testing, on men compared to women. There are extremely high rates of employment-related migration among males in this area—50–70% of men age 20–59 temporarily migrate out of the area for work [51]. Studies among migrant men have found lower rates of HIV-testing, more sexual risk behaviour and a higher prevalence of HIV [52, 53]. Migration introduces new vulnerabilities, can reduce access to health care services and, most relatedly, can lessen the influence of family and cultural norms. The concept of liminality suggests that when people are removed from their social environment they experience 'freedom' from social obligations, resulting in different behaviour patterns when at home or as a migrant [54]. This could explain why we do not see a relationship between community-level stigma and HIV testing among men in this area—men may feel less constrained by community social norms compared to women as a result of migration patterns. It is important to note that our sample excluded individuals who were currently migrant, however, as the majority of men in the area have been migrant previously and will likely be migrant again we believe this is still a salient issue for men.

Previous research has not found consistent relationships between stigma, HIV testing and gender. One study in Nigeria demonstrated that men's readiness to do an HIV test, but not women's, was influenced by the mean level of stigma in the individual's community [26]. These findings are in contrast to ours, as are those from research in Zimbabwe that found that "social rejection stigma" (measured by questions such as: If a female teacher has HIV but is not sick, she should be allowed to continue teaching in school) was associated with less testing for women, but not men [55]. Further, in Eastern Cape, South Africa, research found that women's testing was influenced by individual level stigma whereas men's testing was influenced by structural factors (i.e. availability of testing, quality of testing, etc.) [56]. Some differences may result from different scales and measures, however, they also might reflect contextual or cultural differences. Social phenomena such as stigma and gender norms are inherently influenced by local social contexts; as such, any related programming should be tailored to the local context to ensure it reflects the specific ways in which gender and stigma manifest themselves [57]. Further, as HIV treatment becomes increasingly available in South Africa and elsewhere, the relationship between HIV stigma and testing may change [58–61]. The timing of our data collection, in the context of rapidly changing HIV awareness, testing and treatment campaigns, may explain differences in our results compared to studies done previously and in other countries.

In our data, we found fewer people reported anticipated stigma as compared to other studies on HIV-related stigma and testing in Botswana and Kenya [17, 33]. Reported recent HIV-testing for men was slightly lower and women's was slightly higher compared to national rates of recent testing [6]. High testing uptake among women is likely related to the South African government's recent efforts to test all pregnant women and women accessing family planning services; unfortunately, pregnancy indicators were not collected in the survey but the sample does consist of women in a key child-bearing age category. We only examined the relationship between stigma and testing in the last 12 months. As our sample focused on young adults age 18–35 in an area with extremely high prevalence of HIV, annual testing is likely appropriate for many, if not most, participants. However, there may be some individuals at low risk who tested over a year ago. However, given the sample demographics, the high HIV prevalence of the area and the recent evolution of HIV services in South Africa, we felt that looking at the most proximal behavior (i.e. recent HIV testing) to current anticipations of stigma was most appropriate.

Our research has some limitations. Our data is cross-sectional; thus we cannot interpret these associations as causal. This data was collected in 2012; as previously mentioned, the relationship between stigma and testing may change over time as HIV treatment becomes increasingly available. Recently collected qualitative data from South Africa suggests that stigma remains a barrier to HIV testing but through different mechanisms for men and women [21]. Our sample of men and women aged 18–35 included more young men (age 18–24) than women, potentially because older men may be working or have migrated elsewhere for work. This may have influenced our results. We used an aggregated individual-level data to measure community-level stigma which has limitations. However, our analysis is strengthened by the use of sampling techniques for selection of a representative sample of community members and by the fact that the variable was aggregated based on the weighted responses from all community members, representing a community-normalized variable. Finally, we did not incorporate women's role in care taking for people living with HIV, transactional sex or pregnancy in our analysis as this data was not available. The relationship between HIV testing and stigma in sub-populations, such as migrants, sex workers, and care takers of people living with HIV, merits further research. This could provide additional interesting insights into the relationship between community-level stigma and HIV testing.

It is of note that only 2% of men and 6.9% of women self-reported HIV-positive status, which is significantly lower than the documented HIV prevalence, which ranges from 6.1% (age 20–24) to 41.8% (age 30–34) among men and from 27% (age 20–24) to 41.8% (age 30–34) among women [31]. It is possible that our sampling introduced bias through exclusion of migrants as our eligibility criteria only included people who spent the majority of nights in a 7-day week within the home. However migrant populations were also likely to be excluded from the prevalence surveys. More likely this underreporting of HIV-positive status could result from 1) a significant proportion of people living with HIV in the area not knowing their status [62] or 2) biases in self-reported status driven by social desirability or discomfort in disclosing. Research conducted in the study site (which included HIV testing) found that in 2010 only 20–30% of people living with HIV in the area knew their status. More recent estimates of national data from 2012 suggest that 55% of HIV-positive women and 37% of HIV-positive men know their status [6]. Based on national rates of known status, the age distribution of data and the age distribution of the HIV epidemic in the area, we estimate that around half of the underreporting for men and 40% of the underreporting for women is due to not knowing their status. We theorized that the remaining bias would likely manifest itself as higher rates of stigma among recent testers (i.e. people who have tested positive but are reporting a negative status due to fears of stigma), attenuating effect estimates.

These findings have implications for gender-based programming, including crafting stigma reduction programming through a gendered-lens and specifically considering the social context of stigma. To increase men's HIV testing, programs are needed that both reduce men's personal fears around stigma, challenge traditional ideas of masculinity that act as a barrier to engaging in health care, and create alternative environments where men can access testing services, such as home-based or self-testing or testing in majority-male spaces. Community, social or familial based intervention approaches—such as community mobilization to reduce stigma —may be more successful for women. Our intervention modelling suggests that modifying community levels of stigma could lead to important potential gains in HIV testing for women. Efforts to increase HIV testing are imperative to end the HIV epidemic. Carefully accounting for and responding to HIV-related stigma continues to be paramount in removing social barriers to engagement in HIV prevention, testing and treatment. Stigma operates within internal and social planes; as such, intervention development must also target points of environmental influence on behaviour.

Acknowledgments

We would like to thank the research participants for their time and willingness to share information about their lives. We are deeply appreciative of the study staff, the community liaison office (LINC) staff, and data collection team whose hard work made this research possible, especially Amanda Selin, Rushina Cholera and Sheree Schwartz. We also thank Eric Vittinghoff for his assistance with programming the statistical analysis.

Funding: This work was supported by the United States National Institute of Mental Health under Grant 1R01MH087118-01 (Pettifor) and Grant 1R21MH090887-01 (Lippman). The Agincourt HDSS is supported by the Wellcome Trust, UK under Grants 058893/Z/99/A; 069683/Z/02/Z; 085477/Z/08/Z; 085477/B/08/Z; the South African Medical Research Council; and the University of Witwatersrand.

References

1. World Health Organization. Prevalence of HIV among adults aged 15 to 49, estimates by country. 2013.
2. World Health Organization. Number of deaths due to HIV/AIDS, estimates by country. 2013.
3. South Africa National Department of Health. National consolidated guidelines for the prevention of mother-to-child transmission of HIV (PMTCT) and the management of HIV in children, adolescents and adults. Pretoria: National Department of Health; 2015.
4. World Health Organization. Global update on HIV treatment 2013: Results, impact and opportunities. Geneva: WHO Press; 2013.
5. Karim SSA, Churchyard GJ, Karim QA, Lawn SD. HIV infection and tuberculosis in South Africa: An urgent need to escalate the public health response. Lancet. 2010; 374(9693):921–933.
6. Shisana, ORT., Simbayi, LC., Zuma, K., Jooste, S., Zungu, N., Labadarios, D., Onoya, D., et al. South African national HIV prevalence, incidence and behaviour survey, 2012. Cape Town: HSRC Press; 2014.
7. Marks G, Crepaz N, Janssen RS. Estimating sexual transmission of HIV from persons aware and unaware that they are infected with the virus in the USA. AIDS. 2006; 20(10):1447–1450. [PubMed: 16791020]
8. Cohen MS, Chen YQ, McCauley M, et al. Prevention of HIV-1 infection with early antiretroviral therapy. N Engl J Med. 2011; 365(6):493–505. [PubMed: 21767103]
9. Marks G, Crepaz N, Senterfitt JW, Janssen RS. Meta-Analysis of high-risk sexual behavior in persons aware and unaware they are infected with HIV in the United States: Implications for HIV prevention programs. JAIDS. 2005; 39(4):446–453. [PubMed: 16010168]
10. Bunnell R, Opio A, Musinguzi J, et al. HIV transmission risk behavior among HIV-infected adults in Uganda: results of a nationally representative survey. AIDS. 2008; 22(5):617–624. [PubMed: 18317003]
11. Parker R, Aggleton P. HIV and AIDS-related stigma and discrimination: a conceptual framework and implications for action. Soc Sci Med. 2003; 57(1):13–24. [PubMed: 12753813]
12. Kalichman SC, Simbayi LC. HIV testing attitudes, AIDS stigma, and voluntary HIV counselling and testing in a black township in Cape Town, South Africa. Sex Transm Infect. 2003; 79(6):442–447. [PubMed: 14663117]
13. Chesney MA, Smith AW. Critical Delays in HIV Testing and Care: The Potential Role of Stigma. Am Behav Sci. 1999; 42(7):1162–1174.
14. Skinner D, Mfecane S. Stigma, discrimination and the implications for people living with HIV/AIDS in South Africa. SAHARA J. 2004; 1(3):157–164. [PubMed: 17601003]
15. Zuch M, Lurie M. 'A virus and nothing else': the effect of ART on HIV-related stigma in rural South Africa. AIDS Behav. 2012; 16(3):564–570. [PubMed: 22080386]
16. Kalichman S, Simbayi L, Jooste S, Toefy Y, Cain D, Cherry C. Development of a brief scale to measure AIDS-related stigmas in South Africa. AIDS Behav. 2005; 9:135– 143. [PubMed: 15933833]
17. Weiser SD, Heisler M, Leiter K, et al. Routine HIV testing in Botswana: a population-based study on attitudes, practices, and human rights concerns. PLoS Med. 2006; 3(7):e261. [PubMed: 16834458]
18. Tobin-West CI, Lawson AM. Stigma and underutilization of facility-based sexually transmitted infection services undermine human immunodeficiency virus testing in rural communities of Rivers State, Nigeria. Int J Health Allied Sci. 2013; 2:2013.

19. Young SD, Hlavka Z, Modiba P, et al. HIV-related stigma, social norms, and HIV testing in Soweto and Vulindlela, South Africa: National Institutes of Mental Health Project Accept (HPTN 043). J Acquir Immune Defic Syndr. 2010; 55(5):620–624. [PubMed: 20980913]
20. Khan R, Yassi A, Engelbrecht MC, Nophale L, van Rensburg AJ, Spiegel J. Barriers to HIV counseling and testing uptake by health workers in three public hospitals in Free State Province, South Africa. AIDS Care. 2015; 27(2):198–205. [PubMed: 25174842]
21. Treves-Kagan S, Steward WT, Ntswane L, Haller R, Gilvydis JM, Gulati H, Barnhart S, Lippman SA. Why increasing availability of ART is not enough: a rapid, community-based study on how HIV-related stigma impacts engagement to care in rural South Africa. BMC Public Health. 2016; 16(1):1. [PubMed: 26728978]
22. Velloza J, Watt MH, Choi KW, et al. HIV/AIDS-related stigma in South African alcohol-serving venues and its potential impact on HIV disclosure, testing and treatment-seeking behaviours. Glob Public Health. 2015; 10(9):1092–1106. [PubMed: 25630531]
23. Kelly JD, Weiser SD, Tsai AC. Proximate context of HIV stigma and its association with HIV testing in Sierra Leone: A population-based study. AIDS Behav. 2016; 20(1):65–70. [PubMed: 25771909]
24. Link BG, Phelan JC. Conceptualizing stigma. Annu Rev Sociol. 2001; 27(1):363–385.
25. Underwood C, Hendrickson Z, Van Lith LM, Lengwe Kunda JE, Mallalieu EC. Role of community-level factors across the treatment cascade: A critical review. JAIDS. 2014; 66:S311–S318. [PubMed: 25007202]
26. Babalola S. Readiness for HIV testing among young people in northern Nigeria: The roles of social norm and perceived stigma. AIDS Behav. 2007; 11(5):759–769. [PubMed: 17191141]
27. Smolak A, El-Bassel N. Multilevel stigma as a barrier to HIV testing in Central Asia: a context quantified. AIDS Behav. 2013; 17(8):2742–2755. [PubMed: 23904147]
28. Granich RM, Gilks CF, Dye C, De Cock KM, Williams BG. Universal voluntary HIV testing with immediate antiretroviral therapy as a strategy for elimination of HIV transmission: A mathematical model. Lancet. 2009; 373(9657):48–57. [PubMed: 19038438]
29. World Health Organization. Consolidated guidelines on HIV testing services. Geneva: WHO Press; 2015.
30. Pettifor A, Lippman SA, Selin AM, Peacock D, Gottert A, Maman S, Rebombo D, Suchindran CM, Twine R, Lancaster K, Daniel T. A cluster randomized-controlled trial of a community mobilization intervention to change gender norms and reduce HIV risk in rural South Africa: study design and intervention. BMC Public Health. 2015; 15(1):752. [PubMed: 26245910]
31. Gomez-Olive FX, Angotti N, Houle B, et al. Prevalence of HIV among those 15 and older in rural South Africa. AIDS Care. 2013; 25(9):1122–1128. [PubMed: 23311396]
32. Kahn K, Collinson MA, Gómez-Olivé FX, et al. Profile: Agincourt health and socio-demographic surveillance system. Int J Epidemiol. 2012; 41:988–1001. [PubMed: 22933647]
33. Turan JM, Bukusi EA, Onono M, Holzemer WL, Miller S, Cohen CR. HIV/AIDS stigma and refusal of HIV testing among pregnant women in rural Kenya: Results from the MAMAS Study. AIDS Behav. 2011; 15(6):1111–1120. [PubMed: 20827573]
34. Ahern J, Hubbard A, Galea S. Estimating the effects of potential public health interventions on population disease burden: A step-by-step illustration of causal inference methods. Am J Epidemiol. 2009; 169(9):1140–1147. [PubMed: 19270051]
35. Hernán MA, Robins JM. Estimating causal effects from epidemiological data. J Epidemiol Community Health. 2006; 60(7):578–586. [PubMed: 16790829]
36. Pearl, J. Causality: Models, reasoning and inference. Cambridge, United Kingdom: Cambridge University Press; 2000.
37. Ahern J, Galea S. Collective efficacy and major depression in urban neighborhoods. Am J Epidemiol. 2011; 173:1453–1462. [PubMed: 21527512]
38. Cornell M, McIntyre J, Myer L. Men and antiretroviral therapy in Africa: Our blind spot. Trop Med Int Health. 2011; 16(7):828–829. [PubMed: 21418449]
39. Cornell M, Technau K, Fairall L, et al. Monitoring the South African National Antiretroviral Treatment Programme, 2003–2007: the IeDEA Southern Africa collaboration. S Afr Med J. 2009; 99(9):653–660. [PubMed: 20073292]

40. Muula AS, Ngulube TJ, Siziya S, et al. Gender distribution of adult patients on highly active antiretroviral therapy (HAART) in Southern Africa: A systematic review. BMC Public Health. 2007; 7:63. [PubMed: 17459154]

41. Wouters E, Heunis C, Ponnet K, et al. Who is accessing public-sector anti-retroviral treatment in the Free State, South Africa? An exploratory study of the first three years of programme implementation. BMC Public Health. 2010; 10:387. [PubMed: 20594326]

42. Dovel K, Yeatman S, Watkins S, Poulin M. Men's heightened risk of AIDS-related death: the legacy of gendered HIV testing and treatment strategies. AIDS. 2015; 29(10):1123–1125. [PubMed: 26035315]

43. Barker, G., Ricardo, C. Young men and the construction of masculinity in Sub-Saharan Africa: Implications for HIV/AIDS, conflict and violence. The Workd Bank; 2005.

44. Jewkes R, Morrell R. Gender and sexuality: emerging perspectives from the heterosexual epidemic in South Africa and implications for HIV risk and prevention. J Int AIDS Soc. 2010; 13(1):6. [PubMed: 20181124]

45. Skovdal M, Campbell C, Madanhire C, Mupambireyi Z, Nyamukapa C, Gregson S. Masculinity as a barrier to men's use of HIV services in Zimbabwe. Global Health. 2011; 7(1):13. [PubMed: 21575149]

46. Cross SE, Madson L. Models of the self: self-construals and gender. Psychol Bull. 1997; 122(1):5–37. [PubMed: 9204777]

47. Gilligan, C. In a different voice: Psychological theory and women's development. Cambridge, MA: Harvard University Press; 1982.

48. Sandelowski M, Lambe C, Barroso J. Stigma in HIV-positive women. J Nurs Scholarsh. 2004; 36(2):122–128. [PubMed: 15227758]

49. Campbell C, Nair Y, Maimane S, Sibiya Z. Supporting people with AIDS and their carers in rural South Africa: Possibilities and challenges. Health Place. 2008; 14(3):507–518. [PubMed: 18023238]

50. Schatz E, Ogunmefun C. Caring and contributing: The role of older women in Rural South African multi-generational households in the HIV/AIDS Era. World Development. 2007; 35(8):1390–1403.

51. Collinson MA, White MJ, Bocquier P, et al. Migration and the epidemiological transition: insights from the Agincourt sub-district of northeast South Africa. Glob Health Action. 2014; 7:23514.

52. Lippman SA, Pulerwitz J, Chinaglia M, Hubbard A, Reingold A, Díaz J. Mobility and its liminal context: Exploring sexual partnering among truck drivers crossing the Southern Brazilian border. Soc Sci Med. 2007; 65(12):2464–2473. [PubMed: 17761375]

53. Weine SM, Kashuba AB. Labor migration and HIV risk: A systematic review of the literature. AIDS Behav. 2012; 16(6):1605–1621. [PubMed: 22481273]

54. Hennink M, Cooper P, Diamond I. Seasonal work and sexual behaviour. J Sex Res. 2000; 37(2):175–183.

55. Sambisa W, Curtis S, Mishra V. AIDS stigma as an obstacle to uptake of HIV testing: evidence from a Zimbabwean national population-based survey. AIDS Care. 2010; 22(2):170–186. [PubMed: 20390496]

56. Hutchinson PL, Mahlalela X. Utilization of voluntary counseling and testing services in the Eastern Cape, South Africa. AIDS Care. 2006; 18(5):446–455. [PubMed: 16777636]

57. Auerbach JD, Parkhurst JO, Caceres CF. Addressing social drivers of HIV/AIDS for the long-term response: conceptual and methodological considerations. Glob Public Health. 2011; 6(Sup 3):S293–S309. [PubMed: 21745027]

58. Castro A, Farmer P. Understanding and addressing AIDS-related stigma: from anthropological theory to clinical practice in Haiti. Am J Public Health. 2005; 95(1):53–9. [PubMed: 15623859]

59. Wolfe WR, Weiser SD, Leiter K, Steward WT, Percy-de Korte F, Phaladze N, et al. The impact of universal access to antiretroviral therapy on HIV stigma in Botswana. Am J Public Health. 2008; 98(10):1865–71. [PubMed: 18703447]

60. Chan, BT., Tsai, AC., Siedner, MJ. Has anti-retroviral treatment scale-up in sub-Saharan Africa reduced HIV-related stigma in the general population? A cross-country analysis. Seattle. Conference on Retroviruses and Opportunistic Infections; 2015.

61. Chan BT, Weiser SD, Boum Y, Siedner MJ, Mocello AR, Haberer JE, et al. Persistent HIV-related stigma in rural Uganda during a period of increasing HIV incidence despite treatment expansion. AIDS. 2014; 29(1):83–90.

62. Kabudula, CW., Gómez-Olivé, FX. VCT service use at the primary health care units in Agincourt sub-district, rural South Africa (2006–2009). South Africa: MRC/Wits Rural Public Health and Health Transitions Research Unit, Agincourt Health and Demographic Surveillance System; 2010.

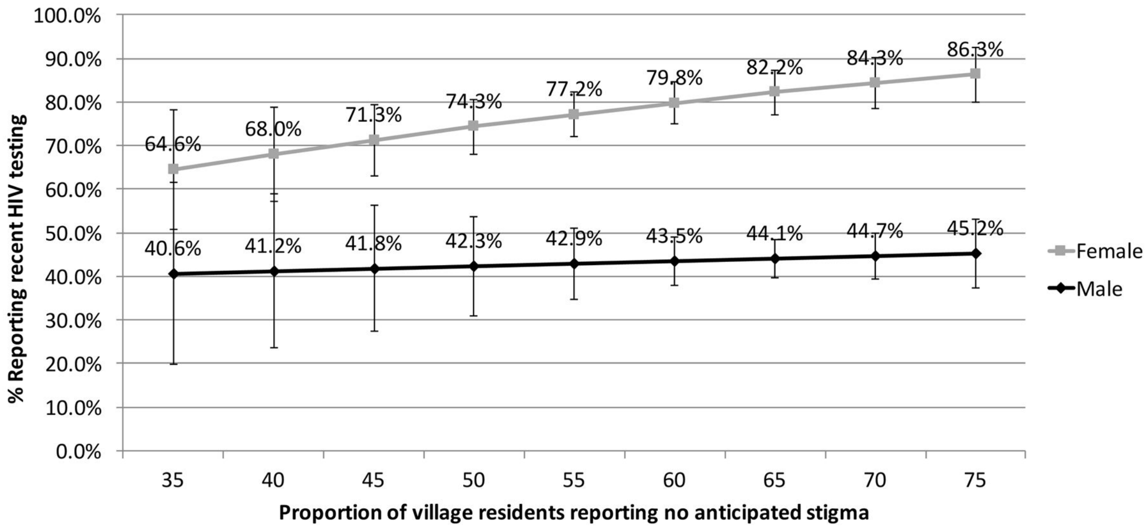

Figure 1.

Proportion of females and males testing for HIV under various community anticipated stigma scenarios using g-computation algorithm, Agincourt sub-district, Mpumalanga province, South Africa

Table I

Participant demographics by gender, Agincourt sub-district, Mpumalanga province, South Africa[a]

	Males		Females		Pearson's	p-value
	wgt %	95% ci	wgt %	95% ci	X^2	
Age Group					26.93	<0.001
Age 18–24	75.2	(70.3–79.6)	51.1	(45.8–56.4)		
Age 25–29	15.6	(12.7–18.9)	24.0	(19.6–29.0)		
Age 30–35	9.2	(5.7–14.5)	24.9	(20.0–30.7)		
Marital Status					23.28	<0.001
Never married	84.9	(79.6–89.1)	66.3	(60.0–72.0)		
Married	9.6	(6.6–13.7)	30.4	(24.9–36.5)		
Separated/Divorced	5.2	(3.2–8.3)	2.2	(1.1–4.2)		
Widowed	0.3	(0.0–1.0)	1.1	(0.5–2.4)		
Educational Attainment					3.33	0.04
Completed primary or less	11.8	(6.9–19.3)	9.3	(6.7–12.8)		
Some high school	59.4	(53.8–64.7)	51.6	(44.4–58.7)		
Completed high school	26.7	(21.6–32.6)	37.0	(28.8–46.1)		
University/technikon	2.1	(1.2–3.7)	2.1	(0.1–4.4)		
Any Income Past 3 Mo	32.1	(26.5–38.4)	40.0	(35.4–44.7)	6.58	0.02
Any Household Food Insecurity	2.5	(1.3–4.9)	3.2	(1.8–5.5)	0.45	0.51
HIV Test Last 12 Mo[b]	43.7	(37.8–49.9)	78.7	(72.9–83.4)	86.29	<0.001
HIV Positive	2.0	(0.1–6.2)	6.9	(4.9–9.7)	3.93	0.06

[a] weights account for sampling;

[b] excludes participants reporting positive HIV-status

Table II

Percent reporting very or somewhat likely responses to internalized stigma indicators by gender, Agincourt sub-district, Mpumalanga province, South Africa[a]

	Males		Females	
	wgt %	**95% ci**	**wgt %**	**95% ci**
"Different people feel differently about people who have HIV/AIDS. Now I am going to ask you to tell me what might happen to you if you were to test positive for HIV and told others your status. For each statement, please tell us if the following situations are very likely, somewhat likely, or unlikely."				
Agree with any internalized stigma indicators	**61.8**	**(54.5–68.6)**	**23.9**	**(16.1–34.1)**
You would experience a break-up of your marriage or relationship.	33.5	(26.7–41.2)	16.2	(10.7–28.9)
You would experience physical abuse by your spouse/partner(s).	28.4	(21.8–36.2)	15.3	(10.3–22.0)
You would lose your job/ livelihood.	22.6	(17.4–28.8)	8.9	(5.5–13.9)
You would be treated badly at work or school.	28.6	(23.4–34.8)	11.4	(7.4–17.0)
You would lose your friends.	32.3	(27.3–37.8)	14.3	(9.6–20.6)
You would be disowned from or neglected by your family.	12.4	(8.3–17.9)	10.6	(6.9–15.8)
You would be treated badly by health professionals.	22.5	(16.3–30.1)	11.3	(6.7–18.4)
Your community(village) would treat you like a social outcast.	36.7	(27.5–46.9)	15.8	(10.1–23.7)
Your family would not care for you if you became sick.	11.6	(7.5–17.6)	10.3	(6.1–16.8)

[a]weights account for sampling; excludes participants reporting positive HIV-status

Table III

Logistic regression analysis predicting past year HIV testing among HIV-negative individuals by gender, Agincourt sub-district, Mpumalanga province, South Africa

	Anticipated Stigma		Univariate			Multivariate[a]		
	%	**95% CI**	**OR**	**95% CI**	**P**	**OR**	**95% CI**	**P**
Males								
Individual stigma								
No Stigma	38.2	31.5–45.5	1.41	0.97–2.06	0.08	1.40	0.97–2.03	0.07
Any Stigma	61.8	54.5–68.6	REF	–	–	REF	-	-
Village Level Stigma	59.3[b]	54.4–64.2	1.00	0.98–1.04	0.69	1.00	0.97–1.03	0.94
Females								
Individual stigma								
No Stigma	76.1	65.9–84.0	0.80	0.45–1.41	0.44	0.68	0.37–1.27	0.23
Any Stigma	23.9	16.1–34.1	REF	-	-	REF	-	-
Village Level Stigma	58.9[b]	54.0–63.7	1.03	1.01–1.05	0.01	1.03	1.01–1.05	<0.01

[a] controlled for age group, educational attainment, and community proportion of migrants;

[b] mean