Journal of Development Economics 161 (2023) 103035

Contents lists available at ScienceDirect

Journal of Development Economics

journal homepage: www.elsevier.com/locate/devec

Regular Article

Social stigma as a barrier to HIV testing: Evidence from a randomized experiment in Mozambique

Hang Yu

China Center for Economic Research, National School of Development, Institute of South-South Cooperation and Development, Peking University, 5 Yiheyuan Road, Beijing, China

ARTICLE INFO

Keywords:
Social stigma
HIV testing
Misconception

ABSTRACT

This paper shows that concerns about social stigma cause individuals to avoid HIV tests. People have inaccurate beliefs about the stigma environment but are open-minded about taking on new information. A simple message that shares the local community's true (low) degree of stigmatizing attitudes can help individuals overcome the stigma barrier and result in more testing. The information intervention led to 36% more HIV testing among those who had overestimated stigma. The treatment effect is comparable to that of a monetary incentive worth more than half of the daily cost of living.

In 2013, the United Nations called for ninety percent of all people living with HIV to know their status by 2020 in its 90-90-90 goal (UNAIDS 2014).[1] This goal has not been met. By 2020, only 84 percent of the global infected population knew their status. Insufficient status awareness imposes extraordinary challenges to preventing transmission and expanding medical treatment.

Crucial to overcoming this challenge is to promote HIV testing (HIV Testing Services, 2020; Granich et al., 2009), especially in Sub-Saharan Africa, which remains the world's most HIV-affected region. Of the 37.7 million people living with HIV in 2020, 25.3 million are from Sub-Saharan Africa. As modern medicine develops, HIV infection has become preventable and manageable. However, like many other diseases in developing countries, health care utilization related to HIV is stuck at an unsatisfactory equilibrium. Governments in this region, partnered with global donors, have made tremendous efforts to *supply* related medical resources. Health services have become freely accessible in most of Sub-Saharan Africa (Kim et al., 2021; Falchetta et al., 2020), and there is widespread knowledge of HIV testing and where it is available (WHO 2015).[2] However, the testing rate has plateaued. Demand-side factors have started to draw the attention of policymakers and scholars. WHO called for demand creation (for HIV testing services) as a key strategy to fight HIV for the first time in its 2019 guideline (HIV Testing Services, 2020).

Social stigma is a widely blamed demand barrier to all HIV-related care. People living with HIV are often morally judged and socially avoided.[3] Such stigma spills over to their families and extends to those at high risk of infection. The threat of stigma could suppress HIV testing through two channels. First, seeking a test incurs direct stigmatization because it signals a high self-perceived risk of HIV-positive. Second, the stigma undermines the benefit of treatment, because seeking and adhering to treatment requires regular clinic visits that risk revealing one's status (Lowther et al., 2014). Both channels become stronger when privacy is not well protected. As is common in Sub-Saharan Africa, most people in Mozambique access HIV-related care from government-run sanitary units. A typical sanitary unit is small and local. It serves the everyday medical needs of nearby communities. Due to the lack of staff and space, a clinic visit often involves waiting in line in a shared hallway or open space outside the building (Seeley et al., 2019). Even though all tests are strictly anonymous by protocol, the lack of privacy when taking HIV tests or treatments is indeed a concern (Njau et al., 2014).

Anecdotal evidence suggests that people have avoided HIV testing for fear of being seen and stigmatized by their neighbors (Nhassengo

E-mail address: hyu@nsd.pku.edu.cn.

[1] The goals are "By 2020, 90% of all people living with HIV will know their HIV status; 90% of all people with diagnosed HIV infection will receive sustained antiretroviral therapy; 90% of all people receiving antiretroviral therapy will have viral suppression."

[2] As of 2015, 84% of women and 80% of men knew where to do an HIV test in Mozambique (MISAU, INE, and ICF 2015).

[3] I follow Goffman (1963) to define the stigma attached to HIV as the phenomenon that people living with HIV are socially avoided. Public health scholars have discussed the concept of the stigma attached to HIV more broadly (Stangl et al., 2013; Stangl et al. 2012; Parker and Peter, 2003) but social avoidance (or social exclusion) is the core manifestation. This study adopts a narrow working definition of stigma to allow for rigorous quantitative analysis.

https://doi.org/10.1016/j.jdeveco.2022.103035
Received 12 August 2022; Received in revised form 9 December 2022; Accepted 15 December 2022
Available online 21 December 2022

et al., 2018; Musheke et al., 2013). Although scholars have documented correlations between high degrees of stigma and low testing rates under various circumstances (Gesesew et al., 2017; Kelly et al. 2016; Sambisa et al. 2010), there is a dearth of well-identified evidence on the causal effect of stigma on HIV testing. Is the impact of stigma real and substantial enough for us to act on, or is stigma a convenient scapegoat covering failures in other aspects of the health care system? The main challenge to causal identification is that the stigma, as a community parameter, is difficult to experimentally alter without altering confounding factors.

This study overcomes the identification challenge by exploring varying beliefs about stigma. Although a community shares the same stigma environment, individuals perceive it differently. Our surveys in 76 Mozambican communities show that, unlike a decade-plus ago, measured stigmatizing attitudes are rare nowadays, but many people do not realize it. In an experiment, we randomly informed individuals of their communities' true (low) degree of stigma. I made two findings. First, this simple piece of information substantially increased HIV testing. Evidence suggests that such behavioral change came from updated beliefs about stigma. Second, to put a dollar value on the anti-stigma intervention, I introduced parallel study groups with various financial incentives for HIV testing. The treatment effect of correcting misperceived stigmas is comparable to that of a financial incentive worth more than half of the daily cost of living.

This study contributes to the health demand literature in low-income settings by establishing the social stigma's role. Economists have been concerned with the low preventive care utilization in developing countries (Dupas 2011). Compared to the impact of other demand-side barriers, such as lack of information, liquidity constraints, and nonrational preferences (reveiwed by Dupas and Miguel 2017; Dupas 2011), the impact of social factors on health behavior has been studied to a lesser extent.

Previously, the role of social stigma has only been implied indirectly in HIV-related care. In a pioneer work on this topic, Thornton (2008) documented that a small financial incentive could induce large demand for learning one's HIV status. She hypothesized that alleviating stigma was a channel how financial incentives promote testing (because monetary incentives provide individuals with an excuse for visiting health facilities to learn their status) but could not empirically distinguish stigma's role. Other studies continue to suggest the same hypothesis when they find providing financial incentives and offering home-based test kits helpful in promoting HIV tests (Moshoeu et al., 2019; Swann 2018). A recent effort that tried to link the social environment to HIV testing behavior is by Derksen et al. (2022). The study found that informing communities that antiretroviral therapy (ART) prevents HIV transmission can increase the demand for HIV tests. The authors believed that the informational intervention worked by relieving subjects from the reputational cost of seeking a test.

My paper answers the question first raised in Thornton (2008). The clear-cut design allows me to distinguish the causal effect of the stigma on testing and to quantify stigma's impact. High-quality individual-level data help me link behavior to beliefs and explore individual-level treatment heterogeneity. Karing (2021) also used individual-level analysis to learn the effect of social factors on health behavior. They identified the value of a positive social signal in promoting health behavior. My study, on the other hand, identifies the cost of a negative social signal and shows how relieving such cost can encourage health behavior.

This paper also relates to a growing literature on misperceptions about social norms. Scholars have found widespread misperceptions affecting behavior, and sometimes treatments to re-calibrate perceptions can lead to behavioral changes (recently reviewed by Bursztyn and Yang 2022). Most of this literature has focused on social or political issues where the role of public opinion is prominent (Bursztyn et al. 2020; Gerber et al., 2020; Kendall et al. 2015). My study is one of the first to document and intervene in social misperceptions in the health domain. The other studies are Turetsky and Sanderson (2018), on norms regarding mental health among US college students, and Allen et al. (2021), on community support for social distancing during the COVID-19 pandemic in Mozambique. Both studies relied on survey-measured outcomes and neither found significant behavioral changes due to correcting misperceptions. In contrast, my paper has studied a health condition of a much higher stake and with broader public awareness, and measured objective behavioral outcomes.

I find a strong behavioral effect of correcting misperceived social stigma attached to HIV. The persuasion rate (DellaVigna and Kaplan 2007) of the informational intervention on HIV testing reaches 9.4%. My behavioral outcome takes place over a longer time frame (within two weeks after the intervention) than most of the other studies correcting misperceptions reviewed by (Bursztyn and Yang 2022), which look at behavior immediately after the intervention.[4] Behavior over a longer time frame is less prone to the experimenter demand effect (Zizzo 2009) or short-term noises and reflects more accurate real-life decisions. Further analysis of outcome dynamics in my study confirmed the importance of collecting non-immediate outcome. I can also explore mechanisms for behavioral changes by eliciting individual beliefs before and after the intervention. The strategy is similar to that of Cantoni et al. (2019), but their behavioral outcome was self-reported, while mine was objectively measured. My study implies large potential welfare gains in identifying and correcting social misperceptions or, more broadly, applying norm-based interventions (Benabou and Tirole 2011) in the realm of public health.

1. Experiment design

The study took place in 76 communities across three provinces in Mozambique, Manica, Sofala, and Zambezia. In 2017 and 2018, a baseline survey was conducted to measure the local stigma environment in each community. The experiment rolled out in 2019, when we randomly revealed the true local stigma measures collected from the baseline and offered individuals varying monetary incentives for taking HIV tests.

1.1. Settings

HIV prevalence in Mozambique reached 12.6% among adults in 2018, making it one of the most affected countries by the epidemic. In 2018, the country saw 150,000 new HIV infections and 54,000 AIDS-related deaths. Only 72% of all people living with HIV in Mozambique know their status (UNAIDS 2019).

HIV-related services in Mozambique are mainly provided free of charge through sanitary units (local clinics).[5] In 2018, Mozambique conducted more than 9 million HIV tests. Most of the tests, or 83%, were conducted through the provider-initiated counseling and testing (ATIP) approach, where tests were routinely offered to all patients seeking health services in clinics. The ATIP approach can only cover the population who use the health services of clinics.[6] Only 17% of HIV tests were

[4] An outstanding exception is Bursztyn et al. (2020), where the authors reported the impact of correcting misperceptions on long-term (three to five months) female labor supply outcomes.

[5] There were 1652 sanitary units in Mozambique as of the end of 2018. A sanitary unit on average served 16,855 people. Eighty-nine percent of them also offered antiretroviral therapy (ART) to treat HIV (MISAU 2020).

[6] For example, 50% of the ATIP tests in 2018 were made through maternal services, as pregnant women and new mothers made up most routine users of sanitary units in Mozambique. Depending on available resources at a sanitary unit, ATIP is either offered to all patients or only to those who present symptoms suggestive of HIV infection. In the latter case, ATIP only catches HIV in the later stage of infection, when the virus may already have been transmitted to others, and the patient has missed the best window to initiate medical treatment.

initiated by people who voluntarily sought to learn their status (formally known as the user-initiated counseling and testing approach, or ATIU). The positive rate from ATIU tests was 8.0%, much higher than that from the ATIP tests (4.5%), suggesting insufficient coverage of the population who do not regularly use clinic services.[7] In a high HIV-prevalence region, encouraging the general population to learn its status before symptoms appear is essential for preventing transmission and improving treatment efficacy. The Mozambique Ministry of Health recommends that the general population take tests every six months (MISAU 2015). In this study, we referred eligible participants to take HIV tests through the ATIU approach and tracked their testing behavior.

1.2. Baseline survey stigma environment measures

A baseline survey was conducted on a representative sample of households in each of the 76 study communities in 2017–2018.[8] Among other information, I collected responses for the following three questions and constructed community-specific measures of the stigma environment.

Q1. Would you buy fresh vegetables from a shopkeeper if you knew that this person had HIV? (Yes/No)
Q2. If a member of your family became sick with AIDS, would you be willing to care for them in your own household? (Yes/No)
Q3. In your opinion, if a teacher has HIV but is not sick, should they be allowed to continue teaching at school? (Yes/No)

The three questions were adopted from the worldwide panel AIDS Indicator Survey (AIS) of the DHS Program.[9] They assess an individual's tendency to avoid people living with HIV (stigmatize HIV); an affirmative answer indicates a supportive attitude, while a negative answer indicates stigmatization. In an average community, the fractions of affirmative answers to the three questions are 80.1%, 93.2%, and 89.2%, respectively. The variation across communities is moderate, and, except for Q1 in three communities, the supportive fractions are always higher than 60% (see Appendix C). These findings echo the results from a representative Mozambican sample by AIS: the share of affirmative answers from AIS consistently increased between 2003 and 2015 (MISAU, INE, and ICF 2015).[10] The community-level shares of affirmative responses at the baseline are used in the intervention discussed later to mitigate participants' concerns about stigma.

[7] Statistics regarding HIV tests are from MISAU (2019). Guidelines for ATIP and ATIU can be found at MISAU (2015).

[8] The baseline survey was embedded in a household survey intended to evaluate a public health program, Força à Comunidade e Crianças (FCC, "Strengthening Communities and Children"). Yang et al. (2023) provides an extensive description and evaluation of the FCC program. This experiment and the FCC program followed independent randomization of treatment. Online Appendix B replicates all tables in this paper while controlling for FCC exposures. All results are robust to inclusion of FCC controls.

[9] See https://dhsprogram.com/methodology/survey/survey-display-467.cfm.

[10] In the AIS-Mozambique sample, between 2003 and 2015, the fractions of affirmative answers increased monotonically over time: Q1 from 36% to 76%, Q2 from 82% to 90%, and Q3 from 61% to 81%. There was a fourth question, "If a member of your family got infected with HIV, would you want it to remain a secret?", in AIS also intended to measure stigmatizing altitudes (a negative response was considered "supportive, not stigmatizing"). However, only 24% respondents to AIS' 2015 Mozambique survey gave "supportive" answers. I excluded this question from the experiment at the design stage for its unlikely to generate stigma-relieving information to be used in the intervention. My baseline survey confirmed the AIS result: only 24.0% of my baseline sample gave "supportive" answer. Why this question behaved differently is not the focus of this study. Its answers may reflect a mixture of "social stigma" and "privacy awareness" in the population.

1.3. Recruitment survey and stigma concern assessment

Participants were recruited through home visits in 2019. Adult participants answered a recruitment survey, which collected individual characteristics and determined their eligibility for the experiment.

Individuals who were not self-reported HIV positive and had not been tested in the previous three months were offered coupons that could be redeemed upon an HIV test (the tests themselves are free). Of all 2548 recruitment survey respondents, 1587 were eligible for coupons (hereafter, the coupon-eligible sample). 358 respondents self-reported HIV positive, and 603 self-reported that they had tested negative within the last three months.

The recruitment survey collected respondents' beliefs about the stigma environment of their community through the following questions.

EQ1. If I ask the question, "Would you buy fresh vegetables from a shopkeeper if you knew that this person had HIV?" to 10 people in your community, how many of them would you expect to say "Yes"?
EQ2. If I ask the question, "If a member of your family became sick with AIDS, would you be willing to care for them in your own household?" to 10 people in your community, how many of them would you expect to say "Yes"?
EQ3. If I ask the question, "In your opinion, if a teacher has HIV but is not sick, should they be allowed to continue teaching at school?" to 10 people in your community, how many of them would you expect to say "Yes"?

If an individual's belief was lower than the corresponding truth in her community, then she overestimated stigma. For example, if 90 percent of the community said "yes" in the baseline survey when asked if they would buy fresh vegetables from an HIV-positive shopkeeper, but a participant believed that only 70 percent would have said "yes", she overestimated the stigma. Her bias in belief about this question was −20 (i.e., 70 minus 90) percentage points.

The average biases in beliefs about the three measures are −9.09, −15.27, and −7.35 percentage points, respectively, among the coupon-eligible sample. Fig. 1 depicts the distribution of biases. We define a person as "concerned" about social stigma if she overestimates at least one of the stigma measures in her community, i.e., she falls into the shadowed part in at least one of the three histograms in Fig. 1.[11] 62.7% of the coupon-eligible sample (996 out of 1587) were "concerned". They constituted the primary experiment sample and were randomly assigned to receive the concern-relieving intervention.

On average, the primary experiment sample (coupon-eligible, concerned) is 36 years old and has completed six years of education. Sixty-eight percent of them are female. An average participant has had 1.05 sex partners in the last 12 months. They are from households living on roughly $1.90 to $3.20 per person per day. Seven-and-a-half percent live with HIV-positive household members. The 996 primary experiment samples came from 896 households, averaging 1.1 participants per household. Compared to those who did not overestimate the local stigma environment, the concerned individuals had taken significantly fewer HIV tests in the past (58% vs. 64% self-reported ever tested for HIV, p-value: 0.020). They also had less knowledge about HIV and its treatment (provided 11.7 vs. 12.6 correct answers in a 15-question HIV knowledge test, p-value < 0.001). The two groups were similar in other baseline characteristics. Appendix Table A2 reports further details.

1.4. Assignment and intervention

The randomization was conducted at the household level and

[11] In practice, we define the "overestimation of stigma" as having a belief bias of less than −5 percentage points.

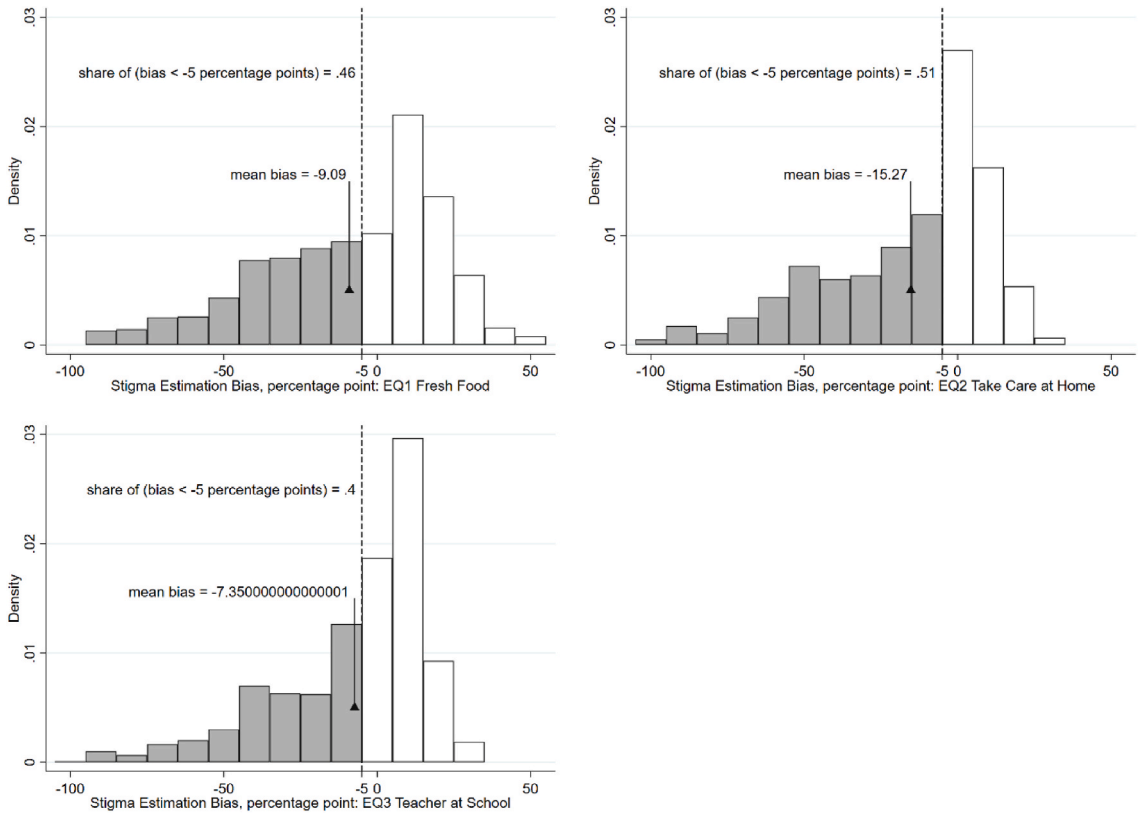

Fig. 1. Distribution of participants' bias in the belief about stigma. **Notes**: A bias is defined as an individual's belief about a stigma environment measure (an individual's answer to question EQ1, EQ2, or EQ3, transformed to percent, e.g., 6 out of 10 is transformed to 60 percent) minus the true stigma measure obtained from the baseline survey in her community (summary of question Q1, Q2, or Q3). A negative bias indicates overestimating stigma. We define the "overestimation of stigma" as having a belief bias of less than -5 percentage points (shadowed bars in the diagrams). The histograms are based on all participants who are eligible for coupons (sample size = 1,587).

stratified by communities. The primary experiment sample was randomly assigned to three study groups: a control group, where participants received a coupon redeemable for 50 meticais ($2.25 by PPP[12]) when taking an HIV test; a concern-relieving intervention group, where participants received the same 50-metical coupons and were informed of the true (low) stigma environment measures from their communities; and a high-incentive group, where participants received coupons redeemable for 100 meticais upon taking a test but received no information.[13] The unconcerned sample also received coupons and was tracked for comparison purposes. A complete description of the sample structure can be found in Appendix Fig. A1.

At the end of each recruitment survey, after a participant reported her testing history and beliefs about the stigma environment, eligible participants were randomly assigned to groups and the appropriate script was read. In the concern-relieving intervention group, the survey enumerator revealed the true measure(s) of the stigma environment that the participant had overestimated and explained its implications. For example, a piece of the enumerator's scripts for the interventions goes as follows.

> I'd like to share some information we collected from your community. Recall that a few minutes ago, I asked you to guess, out of 10 people, how many of them would have answered "yes" to the following question:
>
> "Would you buy fresh vegetables from a shopkeeper if you knew this person had HIV?"
>
> Your guess was [6 out of 10] people would answer "yes".
>
> In fact, we did ask a large number of people this question last year in your community. The fact is [more than 9 out of 10 people (or 91.5%)] answered "yes". People in your community are more supportive of people infected with HIV than you thought they would be.

The intervention revealed the true stigma measure from the baseline only if the participant overestimated the degree of stigma for a particular question. The intervention kept silent about the measure(s) that a participant did not overestimate. On average, we revealed 1.96 true measures to each intervention group participant.

The randomization resulted in 382 people in the control group, 372 in the concern-relieving intervention group, and 242 in the high-incentive group. Baseline characteristics are balanced across study groups (see Appendix Table A3 for details). For comparison purposes, 591 people eligible for coupons but did not overestimate stigma were randomly assigned coupons; of these, 407 received 50-metical coupons, and 184 received 100-metical coupons.[14]

1.5. *Measuring HIV tests*

We tracked HIV tests through the redemption of coupons. The coupons were distributed to eligible participants immediately after the recruitment survey and the intervention, when applicable. A coupon

[12] Purchasing power parity (PPP) data source: World Bank, https://data.worldbank.org/(accessed June 27, 2022).

[13] The randomization procedure followed the pre-analysis plan (Yu 2019). This paper describes the procedure here in a different but equivalent way.

[14] Due to a delay in IRB approval, the high-incentive group was introduced in only 62 out of the 76 study communities.

could be redeemed in the local sanitary unit for its value in electronic cash when a person presented proof of an HIV test on the same day (without disclosing the test result).

HIV testing services are free and anonymous at local sanitary units. Our study involved all 30 sanitary units serving the 76 study communities. The primary experiment sample, on average, lived 2.25 km (1.4 miles) from a sanitary unit. HIV tests were performed with Rapid antibody test kits which typically return results within 15 min. The standard testing protocol involves one-on-one information provision (pre-test) and counseling (during and post-test) and takes around 30 min, including waiting time. The health care provider who performs the test signs a paper proof of testing.

The coupons were valid for 14 days. A unique barcode, which is only readable to researchers analyzing data remotely, can link a redeemed coupon to its recipient. This protocol keeps the test takers anonymous to doctors and research staff in the field.

2. Analyses

2.1. Main result

The regression has the following format.

$$Y_i = \beta_0 + \beta_1 T_i^{reliev} + \beta_2 T_i^{highinc} + \gamma X_i + \varepsilon_i, \quad (1)$$

where Y_i is an indicator for individual i taking an HIV test (redeeming a coupon)[15]; T_i^{relive} and $T_i^{highinc}$ are indicators for being assigned to the concern-relieving intervention group or the high-incentive group; and X_i is a vector of pre-specified individual characteristics collected before group assignment is revealed.[16]

Table 1 presents the results. Treatment effect estimates are stable across specifications. The discussion on point estimates here focuses on column (3), where the complete set of controls is included. In the control group, 20.7 percent of participants took tests. The concern-relieving intervention increased the testing rate by 7.42 percentage points, while doubling the financial incentives increased the testing rate by 12.3 percentage points.

To put the numbers into perspective, the three-month testing rate (self-reported) from the recruitment survey was 29.4%. The low incentive (of the control group) induced a test rate two-thirds as high in the experiment sample in two weeks, while the high incentive induced an even higher test rate in two weeks. The concern-reliving intervention aims to reduce, but not necessarily eliminate, stigma concerns. Individuals may still face other barriers to testing that were not intervened in this study, such as time cost, psychological cost, and behavioral factors.

Testing spanned the entire 14 days allowed. The average lag between receiving and redeeming a coupon is 4.0 days. If we regress cumulative test uptake rates by day 0 through day 14 on group indicators, the treatment effect starts to stabilize only after eleven days for the concern-relieving intervention and after five days for the high-incentive intervention.[17] The dynamic pattern highlights the importance of collecting non-immediate post-intervention outcomes in this setting.

Table 1
Main results.

Outcome	(1)	(2)	(3)
	Test Uptake		
Concern-Relieving Intervention	0.0620**	0.0582*	0.0742**
	(0.0313)	(0.0312)	(0.0324)
High Incentive	0.120***	0.112***	0.123***
	(0.0377)	(0.0379)	(0.0387)
Control group mean	0.207	0.207	0.207
Observations	996	996	996
R-squared	0.011	0.141	0.236
Constant	yes	yes	yes
Community FE	no	yes	yes
Other Controls	no	no	yes

Notes: Standard errors in parentheses. Standard errors are clustered at the household level. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. The full set of control variables, which are specified in the pre-analysis plan, are: female indicator; primary guardian indicator; mobile phone ownership indicator; sexually-active indicator; multiple-sex-partner indicator; ever tested for HIV indicator; within-one-year HIV test indicator; age; years of schooling; HIV-knowledge index (the number of correct answers to 15 HIV-related knowledge questions); self-perceived risk of HIV infection (from low to high coded 1 to 5); the straight-line distance, and the square of the distance, between home and the closest sanitary unit (in *km*); household ever gone without food indicator; living with HIV-positive household member indicator; household-asset index (the first principal component of 14 asset-ownership indicators); enumerator fixed-effects; community fixed-effects. If some variable X has missing values, the missing values are replaced with zero, and an indicator to flag missing status is created and controlled for.

Participants from the control and high-incentive groups were under the same experimental condition but faced different monetary incentives. If we consider the monetary incentive as a negative price, the varying incentive value allows us to locally trace a demand curve for an HIV test. Lowering the price by 50 meticais (from −50 to −100 meticais) is associated with a 12.3-percentage-point increase in HIV test uptake (quantity demanded). Meanwhile, the concern-relieving intervention shifts the demand curve outward by 7.4 percentage points. The shift is equivalent to a 30-metical[18] (1.30 dollars by PPP) increase in individuals' willingness to pay. The size of the increase in willingness to pay is over half of the daily cost of living.

The financial incentive itself may relieve some of the stigma concerns by allowing test takers to conceal their real motivations for taking a test (Swann 2018; Thornton 2008). If so, the experiment design still identifies the existence of a demand barrier due to stigma concerns, while 30 meticais is the lower bound of the stigma barrier's role in suppressing individuals' willingness to pay for HIV tests.

2.2. Belief updating mechanism

The experiment hypothesizes that the concern-relieving intervention changes behavior (HIV testing) by changing participants' beliefs about the stigma environment. To test this hypothesis, I introduced a "concern re-assessment" procedure to collect the posterior beliefs of the intervention group. The re-assessment took place 15–30 min after the intervention was performed. During the interval between the treatment and the re-assessment, a participant was occupied by answering survey questions unrelated to health or HIV. In the concern re-assessment session, the enumerator re-asked the questions in which the participant

[15] More specifically, Y_i takes the value 1 if and only if a coupon designated for individual i is redeemed by an adult of the same gender as individual i within 14 days after the coupon is distributed. Appendix A.3 shows that the main results are robust to alternative definitions of HIV test uptake measured by coupon redemption.

[16] For a more intuitive interpretation, the format of equation (1) deviates from the primary regression equation specified in the pre-analysis plan (Yu 2019). Conceptually, these deviations do not affect the identification of the concern-relieving treatment effect (β_1 in equation (1)). I reach quantitatively similar results when running the primary regression specified in the pre-analysis plan. See Appendix B for details.

[17] See Appendix A.5 for the full distribution of redemption lags and regressions of 15 cumulative test-uptake indicators.

[18] 50 meticais $\times \frac{7.4}{12.3} \times 100\% \approx 30$ meticais.

overestimated the stigma the first time.[19]

The intervention shows a strong first-stage effect on beliefs. Treated participants came to believe that more people gave affirmative answers to questions Q1 through Q3.[20] In the meantime, the belief updating exhibits a fair degree of heterogeneity. While 66% of treated participants updated their beliefs in the intended direction (coming to believe that there was less stigma than they initially thought), 24% maintained their overly-pessimistic beliefs and 10% updated their beliefs in the opposite direction. Those who did not update their beliefs in the intended direction may have held a strong prior, lacked trust in our information, or could not process and remember the new information. The reasons for varying belief updates directions are beyond this study's scope. Nonetheless, the variation gives us a way to explore treatment mechanisms.

We construct variables to indicate the direction of belief updates and add them to the main regression equation (1). The control group are always coded as "no updates". The regression results are reported in Table 2.

Column (1) of Table 2 shows that the re-assessed sub-sample is representative of the full sample. The point estimate of the concern-relieving intervention effect from the sub-sample, 8.7 percentage points, is comparable to that obtained from the full sample, though it loses statistical significance due to the reduced sample size. Columns (2) through (4) explore the belief updating mechanism. The regression in column (2) includes a binary belief update measure, which takes the value 1 if a participant updated her belief in the right direction and the value 0 otherwise. It shows that the entire treatment effect is absorbed by the belief updating indicator, suggesting that the concern-relieving intervention worked only if it had first induced the correct belief update. Column (3) introduced a slightly different belief update measure that takes the value 1 if the belief update is in the right direction, value −1 if the update is in the wrong direction, and value 0 if the belief is unchanged. The conclusion remains, with strengthened statistical power. Column (4) introduces two binary variables indicating the two directions of belief updates. The point estimates further suggest that behavior changes in accordance with belief updates.

Table 2
Treatment heterogeneity by belief updates.

Outcome	(1)	(2)	(3)	(4)
	Test Uptake			
Concern-Relieving Intervention	0.0865	−0.0194	0.0179	0.0195
	(0.0537)	(0.0718)	(0.0560)	(0.0863)
Belief Update Direction (0/1)		0.151*		
		(0.0826)		
Belief Update Direction (−1/0/1)			0.115**	
			(0.0541)	
Belief Update - Right Direction				0.113
				(0.0935)
Belief Update - Wrong Direction				−0.118
				(0.123)
Control Group Mean	0.241	0.241	0.241	0.241
Observations	341	341	341	341
R-squared	0.374	0.382	0.384	0.384
Constant	yes	yes	yes	yes
Full Controls	yes	yes	yes	yes

Notes: Standard errors in parentheses. Standard errors are clustered at the household level. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. The analysis sample for this table are individuals from Sofala and Zambezia provinces, where we implemented the concern-reassessment procedure. The control variables are the same as those in Table 1.

2.3. Treatment heterogeneity

Table 3 reports treatment heterogeneity in four pre-specified dimensions. I split the sample into pairs of subgroups by gender, education, wealth, and self-perceived risk of infection, respectively. Baseline stigma concerns of each subgroup measured by pre-treatment answers to EQ1-EQ3 are reported along with regression results.

The effect of the concern-relieving intervention exhibits substantial heterogeneity by education level. It is close to zero in the low-education group, in contrast to 17.0 percentage points in the high-education group. Coefficients obtained from the high-education subsample are the only ones that remain significant after adjusting for Multiple Hypotheses Testing. The baseline degrees of stigma concern are largely invariant across education levels. The treatment heterogeneity suggests strong complementarity between information and education (Dupas and Miguel 2017; Godlonton et al. 2016; Duflo et al. 2015).[21] The pattern is consistent with the belief-update mechanism analyzed above. It reminds us that, when applying informational experiments to a low-literacy population, participants' ability to understand the information can substantially affect the intervention's impacts.

The subjective risk of infection is another dimension worth noting. Individuals who strongly believed themselves HIV-negatives had fewer stigma concerns at the baseline (p-value < 0.001), yet they still responded stronger to both interventions according to point estimates. A possible reason is that the internal psychological environment (less fear of bad test results) complements external interventions (reducing social stigma concerns or strengthening financial incentives). No other dimension exhibits an imbalance in baseline belief about stigma.

2.4. Compared with the unconcerned

We now gauge the concern-relieving intervention from a different angle. To what degree has the intervention helped "concerned" individuals catch up with the "unconcerned" individuals in taking HIV tests?

To get a comparable sample, consider everyone who did not know their HIV status in the three months before we surveyed them. In what follows, I combine their self-reports of tests taken three months before the recruitment survey and their coupon redemptions during the 14 days after the recruitment survey.

Fig. 2 summarizes the patterns. In this exercise, I assume an individual's "concern" status is time-invariant. Out of 100 unconcerned people, 31.4 chose to take a test without incentives in the three months preceding the recruitment survey, according to their self-reports. Those who did not take a test received coupons (recall that the unconcerned people also received coupons, though they are not in the main analysis sample). The 50-metical coupons had a 23.6-percent redemption rate among the unconcerned, which translates to 16.2 additional tests. To sum up, 47.5 out of 100 unconcerned people were willing to test for HIV during the three-month-and-fourteen-day interval with a 50-metical

[19] The re-assessment procedure was initiated in the middle of the experiment to explore mechanisms and was implemented only in Zambezia and Sofala provinces. The analyses in this subsection are beyond the scope of the pre-analysis plan. While I hope to shed light on the mechanism of the intervention effect, such results are presented with caution.

[20] The average beliefs about the three stigma measures increased significantly by 7 percentage points after the concern-relieving intervention. Appendix A.6 provides more details.

[21] The low-education group had substantially higher test uptake (measured by coupon-redemption) under the control condition. This is probably because they were more responsive to the small financial incentive offered in the control group. According to the recruitment survey, test uptake was higher in the high-education subgroup when it was measured by retrospective self-report.

Table 3
Treatment heterogeneity across subgroups (outcome: Test uptake).

Subgroup	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Male	Female	Low edu	High edu	Poor	Wealthy	Low subrisk	High subrisk
Concern-Relieving Intervention (β_1)	0.0910	0.0525	−0.0145	0.170***	0.0270	0.118**	0.101**	0.0255
	(0.0704)	(0.0401)	(0.0548)	(0.0462)	(0.0532)	(0.0506)	(0.0506)	(0.0586)
High-Incentive (β_2)	0.159*	0.113**	0.0875	0.195***	0.115*	0.128**	0.139**	0.0538
	(0.0821)	(0.0513)	(0.0589)	(0.0588)	(0.0606)	(0.0623)	(0.0605)	(0.0677)
Control Group Mean	0.175	0.221	0.279	0.155	0.223	0.193	0.233	0.189
Mean Stigma Belief	68.40	66.84	67.06	67.53	67.77	66.97	69.96	64.46
LSX-adjusted p-value: β_1	0.665	0.670	0.795	0.000	0.923	0.218	0.325	0.882
LSX-adjusted p-value: β_2	0.375	0.327	0.677	0.010	0.474	0.315	0.257	0.869
Test of equality p-value: β_1	.549		.002		.142		.25	
Test of equality p-value: β_2	.545		.123		.855		.267	
Observations	324	672	446	545	469	527	522	443
R-squared	0.482	0.299	0.428	0.324	0.412	0.315	0.331	0.342
Constant	yes	yes	yes	yes	yes	yes	yes	yes
Full Controls	yes	yes	yes	yes	yes	yes	yes	yes

Notes: Standard errors in parentheses. Standard errors are clustered at the household level. The stars reflect unadjusted p-values. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. This table also reports p-values that are adjusted for multiple hypotheses testing (16 tests in total, 2 coefficients by 8 subgroups) according to List et al. (2019), LSX-adjusted p-values. The intervention effects in each pair of subgroups are tested against equality. p-values of equality tests are reported. "Low educ" group includes participants with below-median years of schooling (five years or less); "high educ" group otherwise. "Poor"/"Wealthy" status are determined by the first principal components of ownership of 14 assets. The cut-off value is 0.250. "Low subrisk" participants are those who believed most strongly (1 in a scale of 1–5) that they are HIV negative; "high subrisk" group otherwise. "Mean stigma belief" is constructed from participants' pre-treatment responses to EQ1-EQ3 transformed to percentage points. It measures the baseline belief about stigma environment of each subsample (higher values mean believing less stigma in the community). All regressions include the same control variables as those in Table 1. Columns (1) and (2) drop the female indicator, columns (3) and (4) drop years of schooling, columns (5) and (6) drop the asset indicator, and columns (7) and (8) drop the self-perceived risk index.

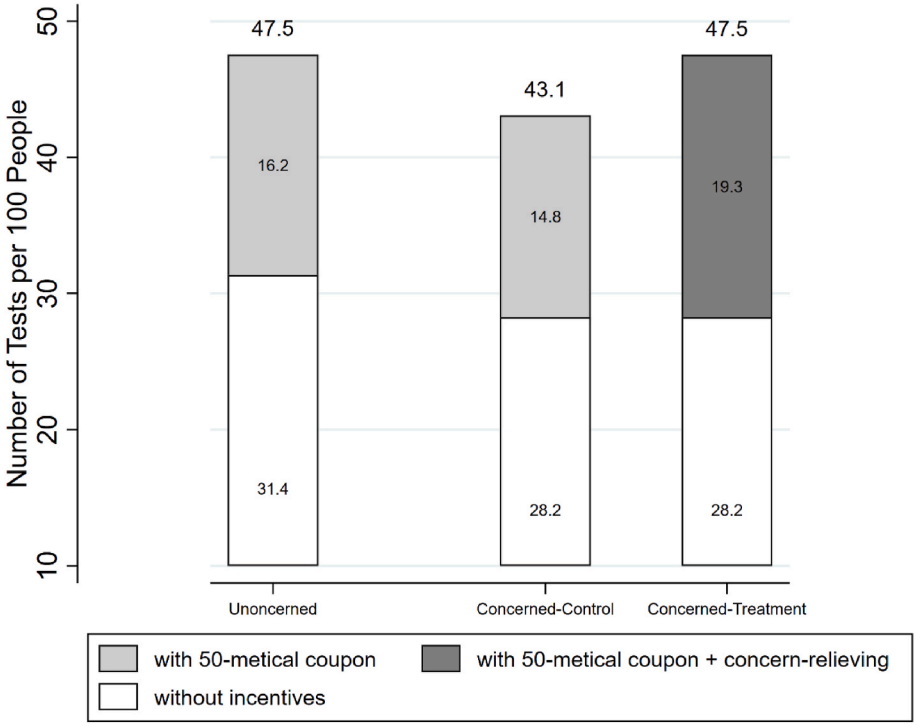

Fig. 2. Demand for testing among the concerned and unconcerned. **Notes**: The analysis sample (N=1,823) of this figure is the union of the following two groups recruitment survey respondents: 1. those who were eligible for a coupon and ended up receiving a 50-metical coupon (N=1,161); 2. those self-reported taken an HIV test within three months before the recruitment survey (N=662, of which 603 reported their results negative, 59 reported positive). 1,146 of the sample are categorized as "concerned" measured by their answers to questions EQ1-EQ3; 677 are "unconcerned".

incentive.[22]

By comparison, only 28.2 out of 100 concerned individuals took tests within three months preceding the survey. The 50-metical coupons induced 14.8 additional tests, as they had a 20.7-percent redemption rate among the concerned. In sum, 43.1 out of 100 concerned people were willing to take tests with the same incentive during the same time frame. The concern-relieving intervention can fill the gap between the concerned and unconcerned, inducing 47.5 out of 100 concerned people to take a test.

3. Conclusions and discussions

This paper analyzed a randomized controlled trial to prove the concept of the stigma barrier. It establishes that stigma concerns cause

[22] By summing up, I assume that those who took a test before any incentive was offered would also have taken a test with a 50-metical coupon.

people to avoid taking HIV tests. Participants informed of the true (low) degree of stigma in their community increased testing by 36%. In the demand curve framework, the concern-relieving intervention increased individuals' willingness to pay for an HIV test by 30 meticais, or more than half of the daily cost of living. I also show evidence of the belief-updating mechanism and the complementarity between information and education. In an analysis combining self-reported testing history with coupon redemption, the simple concern-relieving intervention can help individuals with excessive concerns take HIV tests at a similar rate as the unconcerned.

The last two decades have seen governments and global donors launch campaigns combating HIV in Sub-Saharan Africa. Many of these disseminate knowledge about the disease and promote supportive attitudes toward the infected population. As we find in this study, these campaigns are successful in the sense that the self-reported stigma measures have been falling and people have become open-minded about taking in and acting on new information about stigma. Nevertheless, we also show that stigmas still concern the public and suppress testing.

The United Nations now aims for new targets of HIV testing, treatment, and viral suppression rates to be 95%-95%-95% (UNAIDS 2020). Testing continues to play a central role in achieving the new targets as it is the entry point for all HIV care. Demand creation is an essential strategy, and addressing stigma concerns is key. This paper proves the impact of stigma concerns on real health behavior. Such impact will not be confined to testing but can challenge the entire cascade of HIV treatment (testing, ART initiation and adherence) and prevention (for example, the use of PrEP, Velloza et al., 2020).

The intervention in this study, which disseminates information on low degrees of stigma, can be readily scaled up at a low cost. If the point estimates in this paper extrapolate to the long term, a nationwide information campaign addressing misperceived stigma will increase the HIV testing rate by a similar seven percentage points. If the additional tests translate to a 5-percentage-point increase in status awareness among the concerned population, then, in a country with the similar number of infections and level of misperception to Mozambique, at least 66,000 more people living with HIV will become aware of their status. Even with the current unsatisfactory treatment uptake and adherence rate, 45,000 more HIV-positive individuals can be saved from AIDS and stopped from transmitting the disease. Building on the existing achievements of anti-stigma campaigns, such a policy will push us toward achieving the last mile to a "zero stigmatization" world. More broadly, this study makes a case for public transparency and open discussion of HIV and AIDS and their social implications.

Notes: A bias is defined as an individual's belief about a stigma environment measure (an individual's answer to question EQ1, EQ2, or EQ3, transformed to percent, e.g., 6 out of 10 is transformed to 60 percent) minus the true stigma measure obtained from the baseline survey in her community (summary of question Q1, Q2, or Q3). A negative bias indicates overestimating stigma. We define the "overestimation of stigma" as having a belief bias of less than −5 percentage points (shadowed bars in the diagrams). The histograms are based on all participants who are eligible for coupons (sample size = 1587).

Notes: The analysis sample (N = 1823) of this figure is the union of the following two groups recruitment survey respondents: 1. Those who were eligible for a coupon and ended up receiving a 50-metical coupon (N = 1161); 2. Those self-reported taken an HIV test within three months before the recruitment survey (N = 662, of which 603 reported their results negative, 59 reported positive). 1146 of the sample are categorized as "concerned" measured by their answers to questions EQ1-EQ3; 677 are "unconcerned".

Declaration of competing interest

The author declares that there is no interest that relate to the research described in this paper.

Data availability

Data will be made available on request.

Acknowledgement

I am deeply indebted to Dean Yang, Tanya Rosenblat, Hoyt Bleakley, and Lauren Falcao Bergquist for their guidance in developing this study. I thank the team of the project on Health, Education, and Economic Interventions for Orphans and Vulnerable Children in Mozambique for sharing research facilities. This project would not be possible without the excellent work of the research assistant team in Mozambique led by Faustino Lessitala. Danito Angorete, Sihang Cai, and Jiaqi Zhao provided essential assistance. I appreciate feedback from participants at the University of Michigan Economic Development Seminar, World Congress of Econometric Society, and Midwest International Economic Development Conference. I am grateful for the funding from Rackham Graduate School at the University of Michigan and the Jordan and Kim Dickstein African Initiative Fund. The study is approved by the University of Michigan Health Sciences and Behavioral Sciences Institutional Review Board (HUM00113011) and National Committee on Bioethics for Health (CNBS), Ministry of Health of Mozambique (IRB00002657), and registered with the AEA RCT Registry (AEARCTR-0004120).

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.jdeveco.2022.103035.

References

Allen, James. I.V., Mahumane, Arlete, James Riddell, I.V., Rosenblat, Tanya, Yang, Dean, Yu, Hang, 2021. Correcting Perceived Social Distancing Norms to Combat COVID-19. National Bureau of Economic Research. Working Paper 28651.
Benabou, Roland, Jean, Tirole, 2011. Laws and Norms. National Bureau of Economic Research. *Working Paper* 17579.
Bursztyn, Leonardo, Yang, David Y., 2022. Misperceptions about others. Ann. Rev. Econ. 14, 425–452.
Bursztyn, Leonardo, González, Alessandra L., Yanagizawa-Drott, David, 2020. Misperceived social norms: women working outside the home in Saudi Arabia. Am. Econ. Rev. 110 (10), 2997–3029.
Cantoni, Davide, Yang, David Y., Yuchtman, Noam, Jane Zhang, Y., 2019. Protests as strategic games: experimental evidence from Hong Kong's antiauthoritarian movement. Q. J. Econ. 134 (2), 1021–1077.
DellaVigna, Stefano, Kaplan, Ethan, 2007. The fox news effect: media bias and voting. Q. J. Econ. 122 (3), 1187–1234.
Derksen, Laura, Adamson, Muula, Joep van Oosterhout, 2022. Love in the time of HIV: how beliefs about externalities impact health behavior. J. Dev. Econ. 159, 102993.
Duflo, Esther, Dupas, Pascaline, Kremer, Michael, 2015. Education, HIV, and early fertility: experimental evidence from Kenya. Am. Econ. Rev. 105 (9), 2757–2797.
Dupas, Pascaline, 2011. Health behavior in developing countries. Ann. Rev. Econ. 3 (1), 425–449.
Dupas, Pascaline, Miguel, Edward, 2017. Impacts and determinants of health levels in low-income countries. In: Handbook of Economic Field Experiments. Abhijit Vinayak Banerjee and Esther Duflo, North-Holland, pp. 3–93.
Falchetta, Giacomo, Hammad, Ahmed T., Shayegh, Soheil, 2020. Planning universal accessibility to public health care in sub-Saharan Africa. Proc. Natl. Acad. Sci. USA 117 (50), 31760–31769.
Gerber, Alan, Hoffman, Mitchell, Morgan, John, Raymond, Collin, 2020. One in a million: field experiments on perceived closeness of the election and voter turnout. Am. Econ. J. Appl. Econ. 12 (3), 287–325.
Gesesew, Hailay Abrha, , Amanuel Tesfay Gebremedhin, Tariku Dejene Demissie, Mirkuzie Woldie Kerie, Sudhakar, Morankar, Mwanri, Lillian, 2017. Significant association between perceived HIV related stigma and late presentation for HIV/AIDS care in low and middle-income countries: a systematic review and meta-analysis. PLoS One 12 (3), e0173928.
Godlonton, Susan, Munthali, Alister, Thornton, Rebecca, 2016. Responding to risk: circumcision, information, and HIV prevention. Rev. Econ. Stat. 98 (2), 333–349.
Goffman, Erving, 1963. Stigma: Notes on the Management of Spoiled Identity. Prentice-Hall, Englewood Cliffs, NJ.
Granich, Reuben M., Gilks, Charles F., Dye, Christopher, De Cock, Kevin M., Williams, Brian G., 2009. Universal voluntary HIV testing with immediate antiretroviral therapy as a strategy for elimination of HIV transmission: a mathematical model. Lancet 373 (9657), 48–57.

HIV Testing Services, 2020. Consolidated Guidelines on HIV Testing Services. World Health Organization, Geneva, 2019.
Karing, Anne, 2021. Social signaling and childhood immunization: a field experiment in Sierra Leone. https://drive.google.com/file/d/1DoqJhkj0BB7Lyzj-uFX7m6PYk5rPxqy6/view. (Accessed 7 May 2022). Accessed.
Kelly, J. Daniel, Weiser, Sheri D., Tsai, Alexander C., 2016. Proximate context of HIV stigma and its association with HIV testing in Sierra Leone: a population-based study. AIDS Behav. 20 (1), 65–70.
Kendall, Chad, Nannicini, Tommaso, Trebbi, Francesco, 2015. How do voters respond to information? Evidence from a randomized campaign. Am. Econ. Rev. 105 (1), 322–353.
Kim, Hana, Musuka, Godfrey N., Mukandavire, Zindoga, Adam, Branscum, Cuadros, Diego F., 2021. When distance matters: mapping HIV health care underserved communities in sub-Saharan Africa. PLOS Global Publ. Health 1 (11), e0000013.
List, John A., Shaikh, Azeem M., Xu, Yang, 2019. Multiple hypothesis testing in experimental economics. Exp. Econ. 22 (4), 773–793.
Lowther, Keira, Selman, Lucy, Harding, Richard, Higginson, Irene J., 2014. Experience of persistent psychological symptoms and perceived stigma among people with HIV on antiretroviral therapy (ART): a systematic review. Int. J. Nurs. Stud. 51 (8), 1171–1189.
MISAU, 2015. *Direcção Nacional de Assistência Médica (DNAM) para Implementação do Aconselhamento e Testagem em Saúde.* Ministério da Saúde (Maputo).
Misau, I.N.E., ICF, 2015. *Inquérito de Indicadores de Imunização, Malária e HIV/SIDA em Moçambique 2015.* Ministério da Saúde (MISAU). Instituto Nacional de Estatística (INE), and Com a Assistência Técnica de ICF (Maputo and Rockville).
MISAU, 2019. Relatório Anual das Actividades Relacionadas ao HIV/SIDA 2018. Minist. Saúde (Maputo).
MISAU, 2020. *Anuário Estatístico de Saúde 2019.* Ministério da Saúde – Direcção de Planificação e Cooperação (DPC)-Departamento de Informação para a Saúde (DIS) (Maputo).
Moshoeu Moshoeu, Prisca, Kuupiel, Desmond, Gwala, Nonjabulo, Tivani, P., Mashamba-Thompson, 2019. The use of home-based HIV testing and counseling in low-and-middle income countries: a scoping review. BMC Publ. Health 19 (1), 132.
Musheke, Maurice, Ntalasha, Harriet, Gari, Sara, McKenzie, Oran, Bond, Virginia, Martin-Hilber, Adriane, Merten, Sonja, 2013. A systematic review of qualitative findings on factors enabling and deterring uptake of HIV testing in sub-Saharan Africa. BMC Publ. Health 13 (1), 220.
Nhassengo, Pedroso, Cataldo, Fabian, Magaço, Amilcar, Hoffman, Risa M., Nerua, Lucas, Saide, Mohomede, Rosa, Cuco, Hoek, Roxanne, Mbofana, Francisco, Couto, Aleny, Gudo, Eduardo, Chicumbe, Sergio, Dovel, Kathryn, 2018. Barriers and facilitators to the uptake of test and treat in Mozambique: a qualitative study on patient and provider perceptions. PLoS One 13 (12), e0205919.
Njau, Bernard, Jan, Ostermann, Brown, Derek, Mühlbacher, Axel, Reddy, Elizabeth, Nathan, Thielman, 2014. HIV testing preferences in Tanzania: a qualitative exploration of the importance of confidentiality, accessibility, and quality of service. BMC Publ. Health 14 (1), 838.
Parker, Richard, Peter, Aggleton, 2003. HIV and AIDS-related stigma and discrimination: a conceptual framework and implications for action. Soc. Sci. Med. 57 (1), 13–24.
Sambisa, William, Curtis, Sian, Mishra, Vinod, 2010. AIDS stigma as an obstacle to uptake of HIV testing: evidence from a Zimbabwean national population-based survey. AIDS Care 22 (2), 170–186.
Seeley, Janet, Bond, Virginia, Yang, Blia, Floyd, Sian, MacLeod, David, Viljoen, Lario, Phiri, Mwelwa, Simuyaba, Melvin, Hoddinott, Graeme, Shanaube, Kwame, Bwalya, Chiti, de Villiers, Laing, Jennings, Karen, Mwanza, Margaret, Schaap, Ab, Dunbar, Rory, Sabapathy, Kalpana, Ayles, Helen, Bock, Peter, Hayes, Richard, Fidler, Sarah, Hptn study team the, 2019. Understanding the time needed to link to care and start ART in seven HPTN 071 (PopART) study communities in Zambia and South Africa. AIDS Behav. 23 (4), 929–946.
Stangl, Anne, Brady, Laura, Fritz, Katherine, 2012. Measuring HIV Stigma and Discrimination. STRIVE Technical Brief.
Stangl, Anne, Lloyd, Jennifer, Brady, Laura, Holland, Claire, Baral, Stefan, 2013. A systematic review of interventions to reduce HIV-related stigma and discrimination from 2002 to 2013: how far have we come? J. Int. AIDS Soc. 16 (3S2), 18734.
Swann, Mandy, 2018. Economic strengthening for HIV testing and linkage to care: a review of the evidence. AIDS Care 30 (Suppl. 3), 85–98.
Thornton, Rebecca, 2008. The demand for, and impact of, learning HIV status. Am. Econ. Rev. 98 (5), 1829–1863.
Turetsky, Kate M., Sanderson, Catherine A., 2018. Comparing educational interventions: correcting misperceived norms improves college students' mental health attitudes. J. Appl. Soc. Psychol. 48 (1), 46–55.
UNAIDS, 2014. 90-90-90 an Ambitious Treatment Target to Help End the AIDS Epidemic. Joint United Nations Programme on HIV/AIDS, Geneva).
UNAIDS, 2019. UNAIDS Data 2019. Joint United Nations Programme on HIV/AIDS, Geneva).
UNAIDS, 2020. Prevailing against Pandemics by Putting People at the Centre. Joint United Nations Programme on HIV/AIDS, Geneva).
Velloza, Jennifer, Khoza, Nomhle, Scorgie, Fiona, Chitukuta, Miria, Mutero, Prisca, Mutiti, Kudzai, Mangxilana, Nomvuyo, Nobula, Lumka, Michelle, A.Bulterys, Atujuna, Millicent, Hosek, Sybil, Heffron, Renee, Bekker, Linda-Gail, Mgodi, Nyaradzo, Chirenje, Mike, Celum, Connie, Delany-Moretlwe, Sinead, Hptn study group for the, 2020. The influence of HIV-related stigma on PrEP disclosure and adherence among Adolescent girls and young women in HPTN 082: a qualitative study. J. Int. AIDS Soc. 23 (3), e25463.
WHO, 2015. Consolidated Guidelines on HIV Testing Services 2015. World Health Organization, Geneva).
Yang, Dean, James Allen, I.V., Mahumane, Arlete, James Riddell, I.V., Yu, Hang, 2023. Knowledge, stigma, and HIV testing: an analysis of a widespread HIV/AIDS program. J. Dev. Econ. 160, 102958.
Yu, Hang, 2019. Anti-stigma interventions to encourage HIV testing in vulnerable households in Mozambique. AEA RCT Regist. https://doi.org/10.1257/rct.4120. April 22.
Zizzo, Daniel John, 2009. Experimenter demand effects in economic experiments. Exp. Econ. 13 (1), 75–98.