Hidden from health: structural stigma, sexual orientation concealment, and HIV across 38 countries in the European MSM Internet Survey

John E. Pachankis, Mark L. Hatzenbuehler, Ford Hickson, Peter Weatherburn, Rigmor C. Berg, Ulrich Marcus, and Axel J. Schmidt

Abstract

Objective—Substantial country-level variation exists in prejudiced attitudes towards male homosexuality and in the extent to which countries promote the unequal treatment of MSM through discriminatory laws. The impact and underlying mechanisms of country-level stigma on odds of diagnosed HIV, sexual opportunities, and experience of HIV-prevention services, needs and behaviours have rarely been examined, however.

Design—Data come from the European MSM Internet Survey (EMIS), which was administered between June and August 2010 across 38 European countries (N=174 209).

Methods—Country-level stigma was assessed using a combination of national laws and policies affecting sexual minorities and a measure of attitudes held by the citizens of each country. We also assessed concealment, HIV status, number of past 12-month male sex partners, and eight HIV-preventive services, knowledge, and behavioural outcomes.

Results—MSM living in countries with higher levels of stigma had reduced odds of diagnosed HIV and fewer partners but higher odds of sexual risk behaviour, unmet prevention needs, not using testing services, and not discussing their sexuality in testing services. Sexual orientation concealment mediated associations between country-level stigma and these outcomes.
Conclusion—Country-level stigma may have historically limited HIV transmission opportunities among MSM, but by restricting MSM’s public visibility, it also reduces MSM’s ability to access HIV-preventive services, knowledge and precautionary behaviours. These findings suggest that MSM in European countries with high levels of stigma are vulnerable to HIV infection. Although they have less opportunity to identify and contact other MSM, this might change with emerging technologies.

Keywords
concealment; MSM; policy; sexual orientation; stigma

Globally, MSM are at a heightened risk for HIV infection compared with men who have sex only with women [1]. Stigma, which occurs when an individual possesses a socially devalued identity [2], has been theorized to exacerbate the spread of HIV [3]. Stigma restricts MSM’s public visibility and keeps them hidden from prevention efforts due to fear of discrimination or physical harm upon disclosure of their sexual identity and/or behaviour [4,5]. Therefore, a better understanding of stigma and the mechanisms through which it affects the health of MSM can help the field better predict future HIV epidemic trends among MSM and maximize the impact of biomedical and psychosocial interventions for this population [3].

Stigma operates at several levels to affect health, including internalized (e.g. sexual minorities’ negative thoughts, feelings, and behaviours about their own sexuality), interpersonal (e.g. discrimination) and structural (e.g. legislation that enshrines disadvantage in law) [6–8]. Recognizing the wide variation in stigma across countries and its potential role in HIV transmission among MSM, the WHO has called for reductions in structural forms of MSM stigma to reduce HIV transmission [9]. However, the impact of structural stigma on HIV outcomes has rarely been examined given the difficulty of sampling MSM in a single survey across multiple environments with varying degrees of stigma.

Because stigma in the form of discriminatory national legislation and prejudiced attitudes towards sexual minorities may constrain MSM’s open sexual expression, including opportunities to identify and contact other MSM, we hypothesized that these forms of country-level stigma would predict lower odds of HIV infection. However, because country-level stigma might also keep MSM underground and out of reach of HIV prevention programmes, we hypothesized that country-level stigma would also predict MSM’s inability to avoid HIV infection through inadequate HIV prevention knowledge; infrequent HIV and sexually transmitted infection (STI) testing; not discussing sexuality in HIV testing services; and higher odds of incorrect and inconsistent condom use and not discussing HIV with sexual partners.

We further advance the literature on structural drivers of HIV risk by exploring sexual orientation concealment as a pathway through which country-level stigma might yield HIV-relevant outcomes. In this study, sexual orientation concealment refers to a man having few or no other individuals who know about his sexual attraction to other men; it describes the state of being closeted, which is the opposite of being ‘out’. Sexual orientation concealment may restrict MSM’s public visibility and the accessibility and appropriateness of HIV-
prevention services [5,10,11]. Although stigmatizing climates have been argued to drive stigma concealment [12,13], no study to date has linked an objectively defined measure of country-level stigma to MSM’s odds of sexual orientation concealment or examined concealment as a pathway through which structural stigma generates HIV-relevant outcomes.

**Materials and methods**

We used data from the European MSM Internet Survey (EMIS), administered in 25 languages between June and August 2010 across 38 European countries. Over 235 local, national and international sexual minority websites recruited participants online through instant messages and banner advertising and offline through posters, recruitment cards and face-to-face communication. Eligibility criteria included male identification, European residence, at or above the age of homosexual consent in their country, and sexual attraction to and/or behaviour with men. Eligible participants had to indicate understanding the study’s purpose and provide consent. Typical completion time was 21 min. No material inducement was offered. EMIS items were generated through consultation with nongovernmental organizations (NGOs), pilot testing for comprehension and length with MSM in 21 countries, and cognitive interviewing to ensure accurate interpretation. The survey development and methods are described elsewhere [14,15].

**Sample**

The survey had 184,469 submissions. Three cases were lost to data corruption. Cases were removed for participants who did not specify a home country or indicated a country outside the study area (n =2427); were from a country that did not reach 100 qualifying cases (n =291); indicated being women, having no same-sex attraction or experience, or being outside the 13–89 age range or providing no age (n =544); or submitted more than one inconsistent response (n =6995), resulting in a final sample size of 174,209 MSM. Given our focus on concealment of sexual attraction to men, present analyses omitted participants who did not report being only or mostly attracted to men (n =16,998). The present analytic sample contained 157,211 MSM from 38 European countries.

**Measures**

**Predictor: country-level stigma**—Following previous analyses of EMIS data [7,8], we assessed country-level stigma using a combination of national legislation and general population attitudes towards sexual minorities. We derived legislation from the International Lesbian, Gay, Bisexual, Trans, and Intersex Association-Europe (ILGA-Europe) Rainbow Index 2010 [16], an aggregate of the presence of 10 supportive legislative policies (e.g. same-sex marriage, employment nondiscrimination legislation), which were given positive scores, and four discriminatory practices and legislative policies (e.g. violation of freedom of assembly), which were given negative scores. The data range from −2 (unsupportive) (i.e. Russia, Ukraine) to +10 (supportive) (i.e. Sweden) (M =3.18, SD =3.34). We derived country-level attitudes towards sexual minorities from the 2008 wave of the European Values Survey, a cross-national survey of social attitudes that randomly sampled approximately 1500 residents per European country. We included the proportion of respondents in each
country who thought homosexuality could be justified; agreed that homosexual couples should be able to adopt children; and did not indicate not wanting to have homosexuals as neighbours. We calculated the standardized mean of these three items. We then averaged this mean with the standardized policy index to create a country-level index of support towards sexual minorities in each country. The inverse standardized score of this index was used in all analyses to facilitate interpretation as standard deviation units of stigma.

**Mediator: sexual orientation concealment**—Concealment was assessed with the item, “Thinking about all the people who know you (including family, friends and work or study colleagues), what proportion know that you are attracted to men?” Response options included the following: ‘all or almost all’, ‘more than half’, ‘less than half’, ‘few’ and ‘none’. Participants reporting ‘few’ or ‘none’ were classified as high concealment; all other responses were considered low concealment. We also ran sensitivity analyses with high concealment limited to those who reported that ‘none’ knew of their attraction to men. Previous analyses of EMIS data have used the terms ‘outness’ and ‘closetry’ to describe this measure. Concealment (‘outness’ and ‘closetry’) represents a central variable to EMIS planning and data analysis. In fact, when planning the EMIS, we recognized that the proportion of men who do not conceal their sexual orientation would be a key way to group the included countries and could serve as a proxy for nonstigmatizing environment [15]. Previous EMIS reports have found associations between concealment and internalized homophobia, HIV testing and perceived control over sexual risk [8].

**Outcome variables: HIV diagnosis**—Participants were classified as either ‘HIV diagnosed’ or ‘last test negative or untested’ on the basis of their response to the question: ‘Have you ever received an HIV test result?’ Answer options included ‘Yes, my last test was negative (I did not have HIV infection at the time of the test),’ ‘Yes, I’ve tested positive (I have HIV infection),’ and ‘No, I’ve never received an HIV test result’. A significant proportion (n =50 777; 29.4%) reported never having been tested.

**Number of nonsteady male sex partners**—Participants were asked, ‘How many different nonsteady male partners have you had sex with in the last 12 months?’ We dichotomized this outcome at the median number of nonsteady sex partners (i.e. 5).

**HIV-preventive services, knowledge and behaviours**—We assessed eight HIV-preventive services, knowledge and behavioural outcomes largely based on recommendations of the United Nations General Assembly Special Session (UNGASS) on HIV/AIDS [17] and the European Centers for Disease Control (ECDC) [18]. (1) EMIS-modified UNGASS-indicator #9: Participants were classified as being inadequately reached by HIV prevention services if, in the last 12 months, they were not confident they could access HIV testing (if not diagnosed HIV-positive) or reported not having visited a provider for HIV monitoring (if diagnosed HIV-positive), reported unprotected anal intercourse due to lack of condom access, or reported not seeing or hearing MSM-specific information about HIV or STIs. (2) EMIS-modified UNGASS indicator #14: To assess HIV knowledge, participants were presented with five true statements about HIV and for each were asked whether they already knew this. Although this approach likely underestimates ignorance, it
avoids providing falsehoods while serving an educational purpose. Lack of HIV-risk knowledge was classified as not knowing all of the five items. The EMIS Network suggested the above modifications of the original UNGASS indicators as more appropriate for the European situation. The ECDC has accepted the suggested alternatives for the regional Dublin Declaration Monitoring.

(3) UNGASS indicator #8: Having received an HIV test in the previous 12 months was measured by asking tested-negative participants when they had last received a negative HIV test result, and tested-positive participants if they were first diagnosed within the last 12 months. (4) Participants were asked whether they had received a blood or urine test for STIs or anal and penile inspection or swab in the absence of symptoms to determine whether they had been asymptptomatically screened for STIs in the past 12 months (yes/no). (5) Participants who reported any condom use in the past 12 months were asked whether they had engaged in any of seven condom failure related behaviours in the previous 12 months (yes/no). (6) Participants who reported having had anal sex with a nonsteady male partner within the previous 12 months were asked about frequency of condom use (‘not at all’ or ‘seldom’ versus ‘sometimes,’ ‘mostly’ or ‘always’). (7) Participants were asked, ‘The last time you tested for HIV, did you talk about the sex you have with men?’ to assess comfort and perceptions of safety in discussing same-sex sexual behaviours as part of testing (yes/no). (8) Participants who reported a nonsteady male sex partner in the preceding 12 months were asked about disclosure of HIV status before or during sex with their most recent nonsteady sexual encounter (‘I said nothing about my HIV status’ versus those who shared a positive, negative or unknown status).

Covariates—Individual-level covariates included age, relationship status, employment status, education and settlement size. HIV testing history was covaried in analyses that included diagnosed positive and not diagnosed positive participants. We also included each country’s 2009 Gini coefficient, an index of income inequality, as a country-level covariate given the association of this index with country-level stigma ($r=0.34, P<0.05$), consistent with previous research showing associations between income inequality and stigmatizing attitudes towards homosexuality [19].

Statistical analyses—Given the nested structure of the data, we used SPSS 19.0 GENLINMIXED to test the full mediation models [20]. Fixed effects were calculated for explanatory variables. Nesting of respondents within countries was accounted for using a random intercept model. For each outcome, mediation was tested with the distribution-of-the-product method using R-Mediation [21], which builds confidence intervals (CIs) for the mediated effect.

Sample size for each full model depended on the amount of missing data relevant to that model and the relevance of each outcome to each respondent (e.g. according to HIV-testing history). Less than one percent ($n=144; 0.1\%$) of respondents did not provide data for the concealment variable. Missing data on outcomes ranged from 226 (0.1\%) for service coverage to 8301 (5.3\%) for STI screening.
**Results**

Table 1 reports descriptive statistics by concealment status. Respondents who reported high concealment were significantly younger, more likely to be single, be employed, have less education, live in a smaller settlement, be not diagnosed HIV-positive, and live in a high-stigma country than those who reported low concealment.

**Country-level stigma and HIV outcomes: main effects**

Country-level stigma, examined as a continuous variable in all models, predicted HIV diagnosis, number of nonsteady sex partners, and HIV-preventive services, knowledge, and behaviours in the expected direction (Table 2). Specifically, MSM living in countries with higher levels of stigma had lower odds of diagnosed HIV \[ \text{AOR} = 0.68, 95\% \ CI 0.57–0.82 \], fewer nonsteady sex partners \[ \text{AOR} = 0.74, 95\% \ CI 0.67–0.83 \] and higher odds of: inadequate HIV-related knowledge; not testing for HIV or STIs; not using condoms at last sexual intercourse; and not discussing sexual behaviour during HIV testing \[ \text{range: AORs} = 1.14–1.52 \]. Nonsignificant outcomes included incorrect condom use and HIV status disclosure to nonsteady partners.

**Mediation analyses**

Table 2 summarizes the mediation models. Providing support for the second mediation pathway (from the predictor to the hypothesized mediator), country-level stigma significantly predicted the odds of concealment \[ \text{AOR: 2.47, 95\% CI 2.10–2.91} \].

We also found support for the third mediation pathway (from the hypothesized mediator to the outcome). Concealment predicted all outcomes in the expected direction (i.e. lower odds of HIV diagnosis; fewer sex partners; higher odds of inaccessible services, knowledge and behaviour) except HIV status disclosure to nonsteady partners, which was not statistically significant.

Finally, we tested mediation for the outcomes wherein relationships were statistically significant and in the expected direction for each mediation pathway. We found support for mediation for each of these outcomes.

**Sensitivity analyses**

We ran sensitivity analyses in which we defined concealment as no other person knowing of a participant’s attraction to men. In every case, the direction and magnitude of associations and mediation findings remained the same.

**Discussion**

Although researchers have hypothesized that structural factors, including country-level stigma, contribute to HIV-related outcomes among MSM \[ 4,22 \], it has proven difficult to empirically test these hypotheses due to challenges in operationalizing country-level stigma and to the lack of data structures with adequate variation in its distribution. Our study overcomes many of these methodological difficulties through the use of a unique dataset, the European MSM Internet Survey (EMIS). EMIS provides a rare opportunity to capture...
country-level variation in HIV-related variables in a single survey. It also provides the ability to examine an individual-level mechanism, sexual orientation concealment, through which country-level stigma predicts HIV-related outcomes.

Our study shows that country-level stigma is associated with lower odds of HIV diagnosis and fewer sex partners but with higher odds of unmet needs, sexual risk behaviours and suboptimal service use. Further, concealment was more likely to occur in countries with high levels of stigma. In turn, concealment mediated the relationship between country-level stigma and HIV diagnosis and preventive outcomes. These findings suggest that, by keeping MSM relatively invisible, even from each other, stigma suppresses opportunities for HIV transmission while also limiting MSM’s easy access to HIV prevention services, knowledge and precautionary behaviours [23,24]. Our results suggest that MSM in highly stigmatizing countries are particularly vulnerable to HIV infection (i.e. have little control over it) if and when they have opportunity to be exposed to it [25]. Although the high-stigma European countries identified in our country-level index have historically reported lower prevalence of HIV among MSM than low-stigma countries, recent surveillance indicates an increase in new HIV diagnoses among MSM across Europe, especially in high-stigma European countries [18,25]. Our findings, therefore, suggest that stigma might increase the rate of new HIV infections as opportunities for transmission increase with technological advancements. Stigma’s impact on the future of the epidemic might be particularly relevant in those countries where technology (e.g. mobile sex seeking applications) is quickly overcoming the relative lack of brick-and-mortar MSM venues (e.g. bars, saunas) to facilitate sexual contact among men. Stigma, therefore, can serve to exacerbate other determinants of the epidemic, such as technology and travel that are increasingly relevant to the future epidemic among MSM in high-stigma locales.

The study has several limitations. Given the cross-sectional observational design, we infer, but cannot test, causal relationships. Although a significant strength of the study is that the outcome cannot cause the predictor, it is possible that an unmeasured common factor (e.g. HIV criminalization) could still underlie the observed associations. At the same time, because it is unethical to randomly assign individuals to environments with and without stigma, observational studies are the most feasible method to test associations between country-level stigma and HIV risk outcomes. Because no MSM sampling frame exists, it is not possible to create an adequate probability sample, which limits generalizability of the results. EMIS participants differ from the broader population of MSM, overrepresenting younger men and men with diagnosed HIV [11,26]. However, the degree and direction that this selection bias might under or overestimate the relationship between country-level stigma, sexual orientation concealment and HIV outcomes remains unknown. Although the EMIS relies on self-reported HIV diagnosis, previous research demonstrates that diagnosis as measured by the EMIS is highly correlated with actual prevalence as measured with biological and modelling approaches using country-level surveillance data [27]. Our finding of lower HIV-positive diagnosis among MSM in high-stigma countries is further supported by our finding that stigma is associated with fewer male sexual partners. For these reasons, our interpretation that stigma predicts reduced opportunities for HIV transmission is unlikely to be confounded by avoidance of testing, inaccurate risk attribution or inadequate surveillance. Finally, this study captures stigma at the country level, which may obscure

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important within-country variation. Because of this potential limitation, our results are particularly noteworthy, given that country-level factors are distal determinants of health; thus, our results are likely conservative estimates of the sexual health consequences of structural stigma.

The study also has numerous methodological strengths, including the largest and most geographically diverse dataset to date to examine country-level stigma and the pathways through which it operates to suppress both HIV-risks and HIV-precautions among MSM. The use of an objectively coded measure of stigma overcomes same-source bias, which can create spurious associations when both the exposure and outcome are self-reported [28]. Further, through linking country-level stigma to individual-level measures, we overcome the ecological fallacy [29], which can occur when inferences about the effect of ecological influences on health rely solely on aggregated reports of the outcome.

Although individual-level HIV prevention interventions are capable of reducing the risk of HIV infection among individual MSM [30], structural-level interventions are increasingly recognized as essential to tackling HIV incidence in populations [31,32]. Our results support a theory whereby oppressive legislation and social attitudes regarding homosexuality encourage the concealment of same-sex attraction, which suppresses both the odds of HIV diagnosis and opportunities for sexual contact, as well as access to prevention services and accompanying knowledge and precautionary behaviours. These results therefore contribute to a growing empirical literature documenting the role of social and political drivers of the HIV epidemic among MSM [3,22], as well as other syndemic risks among MSM, including mental health, substance use and suicidality [33–35].

This study highlights the need for structural and policy-level interventions to reduce the burden of oppression among this highly stigmatized population, without increasing opportunities for HIV risks. Our results suggest both practical and ethical considerations in developing such interventions. Practically, structural and policy interventions must simultaneously reduce stigma towards MSM while also providing support to reduce their HIV transmission risk especially in current high-stigma countries. Ethically, arguments for reducing stigma among MSM cannot rely on demonstrating stigma’s negative health effects, because some forms of stigma might be associated with lower prevalence of behaviours linked to disease [36,37]. In addition to showing associations between stigma and HIV-relevant outcomes (i.e. lower odds of diagnosis; fewer sex partners; lower odds of access to preventive knowledge, services and behaviour), our results also show that stigma restricts MSM’s public visibility. Although the case for strengthening sexual minority civil rights must cooccur with the case for strengthening MSM’s health, these arguments cannot be contingent on each other. Those interested in public health should encourage open self-expression among all individuals and promote the environmental conditions that facilitate it, regardless of individuals’ sexual orientation, and regardless of associations among stigma, concealment and health.

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EMIS Collaborating Partners: AT: Aids-Hilfe Wien; BE: Institute of Tropical Medicine, Facultés Universitaires Saint-Louis, Ex Aequo, Sensoa, Arc-en-ciel Wallonie; BG: National Centre of Infectious and Parasitic Diseases, Quer Bulgaria Foundation; BY: Vstrecha; CH: Institut universitaire de médecine sociale et préventive, Aids-Hilfe Schweiz; CY: Research Unit in Behaviour & Social Issues; CZ: Charles University (Institute of Sexology), Ceska spolecnost AIDS pomoc; DE: Berlin Social Science Research Center (WZB), Deutsche AIDS-Hilfe; Federal Centre for Health Education (BZgA); DK: Statens Serum Institut, Department of Epidemiology, STOP AIDS; ES: National Centre of Epidemiology, stopsida, Ministry of Health, Social Policy and Equality; EE: National Institute for Health Development; FI: University of Tampere (Nursing Science), HIV-saatio/Aids-tukikeskus; FR: Institut de veille sanitaire (InVS), AISDeS, Act Up Paris, Sida Info Service, Le Kiosque, The Warning; GR: Positive Voice; HR: University of Zagreb (Humanities and Social Sciences); HU: Hungarian Civil Liberties Union (TASZ), Hättér; IE: Gay Men’s Health Service, Health Services Executive; IT: University of Bologna, Arcigay, Instituto Superiore di Sanita ; LT: Center for Communicable Diseases and AIDS; LV: The Infectiology Center of Latvia; Mozaika; MD: Gender-Doc-M; MK: Equality for Gays and Lesbians (EGAL); NL: schorer; NO: Norwegian Knowledge Centre for the Health Services, Norwegian Institute of Public Health; PL: National AIDS Centre, Lambda Warszawa; PT: GAT Portugal, University of Porto (Medical School), Institute of Hygiene and Tropical Medicine; RO: PSI Romania; RU: Safe Pulse of Youth; RU: PSI Russia, LaSky; SE: Malmö University, Riksforbundet for homosexuellas, bisexuellas och transpersoners rattigheter (RFS); SL: National Institute of Public Health, Legebitra, ŠKUC-Magnus, DH; SK: OZ Odyseus; TR: Turkish Public Health Association, KAOS-GL, Istanbul LGBT, Siyah Pembe Ucgen İzmir; UA: Gay Alliance, Nash Mir, LiGA Nikolaev; UK: City University, London, CHAPS (Terrence Higgins Trust); EU: ILGA-Europe, Aids Action Europe, European AIDS Treatment Group, PlanetRomeo, Manhunt & Manhunt Cares.

EMIS Advisory Partners: Executive Agency for Health and Consumers (EAHC), European Centre for Disease Prevention and Control (ECDC), WHO-Europe.

The survey was designed and executed by A.J.S., U.M., F.H. and P.W. in association with The EMIS Network (see Acknowledgements). A.J.S. coordinated the study, P.W. coordinated the survey promotion, U.M. initiated the study. Data were prepared and coded by F.H. and A.J.S. J.P. and M.H. designed the analysis with suggestions from F.H. and A.J.S. J.P. and M.H. conducted the statistical analyses. The manuscript was drafted by J.P. and M.H. and coauthored by all other authors. All authors approved the final manuscript.

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References


# Table 1

Characteristics of study respondents by concealment status in the European MSM Internet Survey.  

<table>
<thead>
<tr>
<th>Variable</th>
<th>Analytic sample n =157 211</th>
<th>High concealment&lt;sup&gt;b&lt;/sup&gt; n =40 870 (26.0%)</th>
<th>Low concealment&lt;sup&gt;c&lt;/sup&gt; n =116 197 (73.9%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (mean, SD)</td>
<td>33.99 (11.19)</td>
<td>33.16 (11.90)</td>
<td>34.28 (10.91) ***</td>
</tr>
<tr>
<td>Relationship status</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Single</td>
<td>86 238 (54.9)</td>
<td>31 914 (58.4)</td>
<td>60 024 (51.7) ***</td>
</tr>
<tr>
<td>Steady relationship</td>
<td>70 566 (44.9)</td>
<td>22 583 (41.3)</td>
<td>55 584 (48.1)</td>
</tr>
<tr>
<td>Employment status</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unemployed</td>
<td>9391 (6.0)</td>
<td>2300 (5.6)</td>
<td>7079 (6.1) **</td>
</tr>
<tr>
<td>Employed/student/retired/sick leave</td>
<td>147 820 (94.0)</td>
<td>38 570 (94.4)</td>
<td>109 118 (93.9) **</td>
</tr>
<tr>
<td>Education (ISCED levels&lt;sup&gt;c&lt;/sup&gt;)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>High (ISCED 5,6)</td>
<td>79 192 (50.4)</td>
<td>20 813 (50.9)</td>
<td>58 310 (50.2) ***</td>
</tr>
<tr>
<td>Mid (ISCED 3,4)</td>
<td>64 644 (41.1)</td>
<td>16 383 (40.1)</td>
<td>48 261 (41.5)</td>
</tr>
<tr>
<td>Low (ISCED 1,2)</td>
<td>12 296 (7.8)</td>
<td>3262 (8.0)</td>
<td>9014 (7.8)</td>
</tr>
<tr>
<td>Settlement size</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>≥1 million</td>
<td>48 553 (30.9)</td>
<td>10 446 (25.6)</td>
<td>38 072 (32.8) ***</td>
</tr>
<tr>
<td>500 000–999 999</td>
<td>23 470 (14.9)</td>
<td>4 787 (11.7)</td>
<td>18 684 (16.1)</td>
</tr>
<tr>
<td>100 000–499 999</td>
<td>33 173 (21.1)</td>
<td>8345 (20.4)</td>
<td>24 799 (21.3)</td>
</tr>
<tr>
<td>10 000–99 999</td>
<td>29 415 (19.2)</td>
<td>9518 (23.3)</td>
<td>19 870 (17.1)</td>
</tr>
<tr>
<td>&lt;10 000</td>
<td>18 914 (12.3)</td>
<td>6659 (16.3)</td>
<td>12 238 (10.5)</td>
</tr>
<tr>
<td>HIV diagnosis</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Diagnosed positive</td>
<td>13 048 (8.3)</td>
<td>1498 (3.7)</td>
<td>11 534 (9.9) ***</td>
</tr>
<tr>
<td>Last test negative or untested</td>
<td>143 147 (91.1)</td>
<td>39 007 (95.4)</td>
<td>104 025 (89.5)</td>
</tr>
<tr>
<td>Country-level stigma&lt;sup&gt;d&lt;/sup&gt;</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>High</td>
<td>34 641 (22.0)</td>
<td>16 305 (39.9)</td>
<td>18 300 (15.7) ***</td>
</tr>
<tr>
<td>Low</td>
<td>122 570 (78.0)</td>
<td>24 565 (60.1)</td>
<td>97 897 (84.3)</td>
</tr>
</tbody>
</table>

Statistical significance for categorical demographic variables evaluated by Chi-square. Statistical significance for age evaluated by independent samples t-test.

<sup>a</sup>Percentages may not equal 100 due to missing data.

<sup>b</sup>High concealment respondents indicated that ‘few’ or ‘none’ of the people they know are aware of their same-sex attraction. Low concealment respondents indicated that ‘less than half’, ‘more than half’, or ‘all or almost all’ of the people they know are aware.

<sup>c</sup>ISCED: 1997 International Standardized Classification of Educational Degrees.

<sup>d</sup>High stigma is ≥median, low stigma is <median.

**P <0.01,**

***P <0.001.**
<table>
<thead>
<tr>
<th>Outcome</th>
<th>n</th>
<th>OR</th>
<th>95% CI</th>
<th>OR</th>
<th>95% CI</th>
<th>OR</th>
<th>95% CI</th>
<th>OR</th>
<th>95% CI</th>
<th>Mediation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diagnosed HIV-positive</td>
<td>151 297</td>
<td>0.41***</td>
<td>0.37–0.45</td>
<td>0.68***</td>
<td>0.57–0.82</td>
<td>0.78**</td>
<td>0.66–0.93</td>
<td>Yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Five or more nonsteady male sex partners (12 months)</td>
<td>153 494</td>
<td>0.73***</td>
<td>0.71–0.75</td>
<td>0.74***</td>
<td>0.67–0.83</td>
<td>0.78**</td>
<td>0.71–0.86</td>
<td>Yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inadequate HIV service coverage</td>
<td>151 292</td>
<td>1.48***</td>
<td>1.34–1.64</td>
<td>1.43***</td>
<td>1.27–1.62</td>
<td>1.34***</td>
<td>1.19–1.50</td>
<td>Yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lack of HIV transmission knowledge</td>
<td>151 242</td>
<td>1.29***</td>
<td>1.22–1.36</td>
<td>1.16***</td>
<td>1.08–1.26</td>
<td>1.11*</td>
<td>1.03–1.20</td>
<td>Yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No HIV test result (12 months)</td>
<td>142 047</td>
<td>1.70***</td>
<td>1.59–1.82</td>
<td>1.14*</td>
<td>1.05–1.24</td>
<td>1.04</td>
<td>0.96–1.13</td>
<td>Yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No STI screen (12 months)</td>
<td>143 680</td>
<td>1.60***</td>
<td>1.49–1.71</td>
<td>1.21**</td>
<td>1.07–1.36</td>
<td>1.12</td>
<td>0.99–1.26</td>
<td>Yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Any incorrect condom usage</td>
<td>91 837</td>
<td>1.13***</td>
<td>1.09–1.18</td>
<td>1.03</td>
<td>0.91–1.18</td>
<td>1.01</td>
<td>0.89–1.15</td>
<td>Yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Condoms never/seldom (nonsteady 12-month partners)</td>
<td>87 584</td>
<td>1.10*</td>
<td>1.03–1.17</td>
<td>1.30**</td>
<td>1.10–1.54</td>
<td>1.28**</td>
<td>1.09–1.51</td>
<td>Yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No discussion of sexuality when testing</td>
<td>109 543</td>
<td>1.83***</td>
<td>1.70–1.97</td>
<td>1.52***</td>
<td>1.29–1.80</td>
<td>1.39***</td>
<td>1.17–1.65</td>
<td>Yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Did not disclose HIV status (last nonsteady partner)</td>
<td>101 939</td>
<td>0.96</td>
<td>0.90–1.03</td>
<td>0.93</td>
<td>0.87–1.00</td>
<td>0.94</td>
<td>0.87–1.01</td>
<td>No</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

CI, confidence interval; OR, odds ratio.

All models adjusted for age, relationship status, employment status, education, settlement size, HIV status (except HIV diagnosis outcome) and Gini index.

Models run with covarying concealment.

Mediation tested with distribution-of-the-product method.

*P ≤0.05,

**P ≤0.01,

***P ≤0.001.