



Associations Between Sexual Behavior Stigma and HIV Risk Behaviors, Testing, Treatment, and Infection Among Men Who have Sex with Men in Ukraine

Ben Alvey¹ · Jack Stone^{1,2} · Tetyana Salyuk³ · Ezra J. Barzilay⁴ · Ivan Doan⁴ · Peter Vickerman^{1,2} · Adam Trickey¹

Accepted: 15 September 2023 / Published online: 4 October 2023
© The Author(s) 2023

Abstract

Stigma toward same-sex behaviors may be a structural driver of HIV epidemics among men who have sex with men (MSM) in Eastern Europe and has been linked to adverse HIV-outcomes elsewhere. We explored associations between sexual behavior stigma with HIV risk behaviors, testing, treatment, and infection. From November 2017 to February 2018, MSM across 27 Ukrainian cities were recruited to cross-sectional surveys using respondent driven sampling. Eligible participants were cisgender males aged ≥ 14 years residing in participating cities that reported ≥ 1 sexual contact with another man in the prior 6 months. Participants self-reported experience of stigma (ever) and various HIV-outcomes and were tested for HIV antibodies. Regression models were used to explore associations between three sexual behavior stigma variables with demographic and HIV-related variables. Of 5812 recruited cisgender MSM, 5544 (95.4%) were included. 1663 (30.0%) MSM reported having experienced stigma due to being MSM from family and friends, 698 (12.6%) reported anticipated healthcare stigma, and 1805 (32.6%) reported general public/social stigma due to being MSM (enacted). All forms of stigma were associated with heightened HIV risk behaviors; those experiencing stigma (vs not) had more anal sex partners in the prior month and were less likely to have used condoms during their last anal intercourse. Stigma was not associated with HIV infection, testing, or treatment variables. A sizeable proportion of Ukrainian MSM reported ever experiencing stigma due to being MSM. MSM that had experienced stigma had higher odds of HIV sexual risk behaviors. Further study using longitudinal designs is required to determine causality.

Keywords IBBS · Homosexual · Bisexual · Antiretroviral therapy · Stigma · Ukraine

Introduction

Eastern Europe and Central Asia (EECA) currently reports the fastest growing HIV epidemic of any region worldwide [1]. Within the region, Ukraine has the second largest HIV

burden with an estimated 250,000 people living with HIV (PLHIV) [2]. HIV prevalence is high among the estimated 180,000 MSM living in Ukraine, estimated to be 7.5% in 2019 [2]. In Ukraine, same sex sexual activity was legalised in 1991 after the dissolution of the Soviet Union. Although

✉ Adam Trickey
Adam.trickey@bristol.ac.uk

Ben Alvey
benalvey@aol.com

Jack Stone
jack.stone@bristol.ac.uk

Tetyana Salyuk
salyuk@aph.org.ua

Ezra J. Barzilay
bwk9@cdc.gov

Ivan Doan
oph9@cdc.gov

Peter Vickerman
peter.vickerman@bristol.ac.uk

¹ Population Health Sciences, University of Bristol, Bristol, UK

² Health Protection Research Unit in Behavioural Science and Evaluation at University of Bristol, Bristol, UK

³ Alliance for Public Health, Kyiv, Ukraine

⁴ Centers for Disease Control, Kyiv, Ukraine

Ukraine is one of the few EECA countries to have anti-discrimination laws concerning sexual orientation, an ‘anti-propaganda laws’ has been proposed that would impose administrative and criminal liability to ‘propaganda of homosexuality’ [3].

Individual-level HIV risks [e.g. high transmission probability during unprotected anal intercourse (UAI)] and network-level risks (e.g. high prevalence within sexual-networks) may be compounded by community-level and structural-level risks such as stigma to increase HIV-risk among MSM [4]. Stigma has been conceptualised as a social process labelling individual or groups as less valuable than others within a larger community based on actual or perceived characteristics, resulting in adverse-experiences, reduced opportunity, and reduced wellbeing [5]. Different forms of stigma have been characterised [6]. Perceived stigma is a person’s belief that others treat or think about individuals with a stigmatised characteristic differently. Enacted stigma is the explicit experience of mistreatment because of a stigmatised characteristic. Anticipated stigma is the expectation of future stigma experiences. Internalised stigma is a person’s acceptance and application of negative feelings to oneself because of one’s stigmatised characteristic [6].

Multiple stigma constructs are relevant to MSM, including sexual behavior stigma, defined as stigma based on one’s sexual practices [6], and stigma based on sexual-orientation, gender identity and HIV status (HIV stigma) [7]. These stigma constructs may also co-occur and interact within individuals or groups of MSM, termed intersecting stigma [6].

Intersecting sexual behavior, sexual orientation, and gender identity stigmas have been linked with adverse HIV-related outcomes among MSM which impede HIV prevention, diagnosis, and treatment [6, 8]. At the individual-level, these intersecting stigma have been associated with UAI, fear and avoidance of seeking health care, and reduced HIV testing in the US, Namibia, and South Africa [9–12]. Within Europe, MSM living in countries with higher levels of stigma are less likely to use testing services, discuss their sexuality in testing services, and have diagnosed HIV infection, but are more likely to have greater unmet prevention needs, a lack of HIV transmission knowledge, and higher levels of sexual risk behavior [13]. High levels of sexual risk behavior could lead to increased risk of HIV infection among MSM [14, 15].

Initiatives (termed societal enablers) to remove punitive laws and policies and to reduce stigma and discrimination are a central focus of the 2021 UN declaration to eliminate AIDS by 2030, including a target to invest \$3.1 billion in societal enablers [16]. However, evidence on the prevalence and effects of stigma among MSM—and indeed other key populations—is lacking in many countries and regions and unable to adequately inform an evidence-based response. Much of the current data on stigma among MSM is on

stigma due to having HIV [17, 18], while stigma relating to sexual behaviors of MSM irrespective of HIV status is comparatively neglected [6]. Moreover, it is critical to study sexual behavior stigma in countries with sustained HIV epidemics alongside continuing high stigmatisation of MSM. Multi-country studies considering relationships between HIV and stigma towards MSM include data from Eastern Europe [13, 19]. However, these either consider structural-level sexual behavior stigma [13], or measured stigma relating to sexual orientation [19]. Measures of stigma based on sexual orientation, such as homosexuality, may inadequately apply to MSM not identifying as homosexual [8]. No studies known to the authors explored associations between community-level sexual behavior stigma and HIV-related outcomes in Eastern Europe.

In this context, this study aims to explore whether there are associations between sexual-behavior stigma with concealment of sexual orientation, high-risk sexual behaviors, HIV testing behaviors, HIV prevalence, and HIV treatment, among MSM in Ukraine, using data from a national survey of MSM from 2017 to 2018.

Methods

Integrated Bio-behavioral Survey (IBBS) Data

We used data from a nationwide cross-sectional IBBS of MSM in Ukraine undertaken by the Alliance for Public Health, a non-governmental organisation (NGO) working to control HIV in Ukraine [20]. Data collection occurred between November 19th 2017 and February 3rd 2018. Eligible participants were MSM that reported at least one sexual contact with another man in the past 6 months. These MSM must have resided in 27 participating cities (Supplementary Table 1), were ≥ 14 years old, and consented to completing a questionnaire, providing a dried blood spot sample, and participating in HIV testing. The surveys were carried out in different venue types, mostly rented office blocks, AIDS centres and, in some cases, the offices of non-governmental organisations. HIV testing was performed in each survey to determine a respondent’s HIV status using Profitest HIV test [NEW VISION DIAGNOSTICS Inc. (Bayamon, Puerto Rico)] and confirmed using SD Bioline HIV 1/2 3.0 [ABBOTT LABORATORIES (Chicago, IL)]. Rapid testing of the blood samples was carried by experts of regional AIDS centers or other authorized medical institutions, with dry blood samples collected for further analysis by the National Reference Laboratory. Participants were recruited using respondent driven sampling (RDS) [6, 20]. We excluded transgender individuals from this analysis, as an analysis of stigma among transgender individuals has been planned separately.

Measures

The IBBS included survey items asking participants whether they had ever experienced any of 13 stigma-related situations relating to someone knowing or finding out that they have sex with men. Three sexual behavior stigma measures were created from these individual items based on methods developed by Augustinavicius et al. [8] to separate the types of stigma and who stigmatised them. These measures of stigma have not been validated for Ukrainian MSM, although they have been used previously in the United States and sub-Saharan Africa [8, 15]. These binary measures were:

- “Stigma from family and friends”
- “Anticipated healthcare stigma”
- “General enacted public/social stigma”

The individual questions and how they are grouped into the binary variables above are listed in Supplementary Tables 2 and 3. A person was considered to have experienced one of these grouped measures of stigma if they experienced any of the individual items within the grouped measure of stigma. For “General social stigma” we chose to remove the item “Afraid to be in public because they were MSM” from this category, so that the category solely contained enacted stigma, rather than anticipated stigma. The reliability of these composite measures of stigma was assessed using Cronbach’s Alpha.

Data Analysis

Stata 16.1 was used for all analyses. Observations with missing data on stigma items were excluded. RDS weights were avoided because of insufficient consensus regarding their validity in regression models and were therefore not included in any analyses for consistency [21]. Variables of interest were cross tabulated against each stigma measure. Denominators may vary between cross-tabulations if data was missing on a given variable of interest.

Socio-demographic Characteristic Predictors of Stigma

We examined associations between socio-demographic characteristics, as independent variables, with each of the stigma measures as dependent variables using mixed-effects logistic regression models with city as the random-effect. In unadjusted and adjusted analyses, we tested whether age (per 10 year increase), education level (categorical), ever having been imprisoned (versus not), marital status (categorical), cohabitation status (categorical), sexual orientation (categorical), sexual-orientation concealment (categorical), and reporting being an NGO client [22, 23] (versus not) were

associated with the three stigma measures. Being an NGO client was defined as reporting having an NGO membership card. Monthly income was excluded due to high missingness for this variable.

Stigma Predicting Demographics, Sexual Behaviors, and HIV Testing, Status, and Treatment

We tested associations between having ever experienced each stigma measure, as the independent variable, with various HIV risk-behavior, testing, and HIV treatment variables as dependent variables (Table 3). These variables were: concealing their sexual orientation from everyone, being a client of NGO which provides prevention services to MSM (as somebody that receives stigma may look to an NGO for support, or being a client of an NGO may mean that person is more likely to be ‘outed’), age at first oral or anal sex with a man (years), having had anal sex with a man in the last 6 months, number of anal intercourses in last 30 days, number of male anal sex partners in last 30 days, reporting always using a condom for male anal sex during last 30 days, reporting using a condom for last anal sex with a man, having ever been remunerated for sex, reporting having group sex in the last 6 months, reporting having chemsex in last 30 days [24], considers knowing sexual partners’ HIV status to be very important, considers disclosing HIV status to sexual partners be very important, being aware of last permanent partner’s HIV status, ever being tested for HIV, being tested for HIV in the last year, self-reporting having HIV, testing HIV positive, reporting being registered at AIDS centre, and reporting receiving ART.

For binary dependent variables we used mixed-effects logistic regression models with city as the random-effect. For numeric dependent variables we used mixed-effects linear regression models if the variable was normally distributed (age of first sexual contact with a man) or mixed-effects negative binomial regression models if the variable had a negative binomial distribution (number of male anal intercourses in last 30 days and number of male anal sex partners in last 30 days). Unadjusted and adjusted models, adjusting for age, education level, imprisonment history, marital status, cohabitation status, sexual orientation, sexual orientation concealment, and reporting being an NGO client, were assessed.

We hypothesised sexual orientation concealment and NGO client status could either result from or induce stigma. Therefore, these variables were tested firstly as independent variables with stigma as the dependent variable, and secondly as dependent variables with stigma as the independent variable. In adjusted analyses sexual orientation concealment and NGO client status were not adjusted on themselves.

When testing associations of stigma with being registered at an AIDS centre and with receiving ART the denominator was participants testing HIV seropositive, giving a sample size of only 293. To enable model convergence, the models of registration at an AIDS centre and receiving ART were adjusted on fewer explanatory variables. These variables were age (which associates with both sexual behavior stigma and HIV outcomes in other settings [25]), plus additional variables chosen using a stringent cut-off of $p < 0.01$ in univariable analyses: imprisonment, marital status, cohabitation status, concealment, and NGO membership.

Results

Of the surveyed cisgender MSM, 5544 of 5812 (95.4%) had complete data on stigma variables and were included in our analyses. Table 1 and Supplementary Table 4 show sample characteristics of included MSM stratified by whether they ever experienced each stigma measure. 1663 (30.0%) MSM reported having experienced enacted stigma from family and friends, whilst 698 (12.6%) reported anticipated healthcare stigma, and 1805 (32.6%) reported general, enacted social stigma. Overall, 2577 (46%) of MSM reported experience of at least one of these stigma constructs. Each of these composite measures of stigma was deemed to be reliable based on the Cronbach's Alpha scores of over 0.6: 0.6106 for stigma from family and friends, 0.7684 for anticipated healthcare stigma, and 0.6407 for general, enacted social stigma. Overall, the median age of included MSM was 27 with an interquartile range (IQR) of 21–35. Testing seropositive for HIV were 286 MSM (5.2%), but just 141 (49.3%) of these self-reported as being aware they had HIV.

Socio-demographic Characteristic Predictors of Stigma

Table 2 reports unadjusted and adjusted odds ratios of each stigma measure for socio-demographic characteristics, where the measures of stigma are the dependent variables. In adjusted analyses, MSM with higher levels of education had reduced odds of anticipated healthcare stigma and general social stigma. MSM that were divorced or widowed had reduced odds of anticipated healthcare stigma compared with those that had never been married. Compared with MSM that live alone, those that live with a male partner had higher odds of stigma from family and friends, whilst those living with a female partner had lower odds. MSM living with parents/relatives or a female partner had lower odds of general social stigma than those living alone. MSM that had ever been imprisoned were more likely to report ever having experienced all three stigma measures. Compared to MSM reporting homosexual orientation, those reporting bisexual

or other sexual orientation had higher odds of anticipated healthcare stigma but lower odds of general social stigma. For sexual-orientation concealment, MSM with higher levels of concealment had reduced odds of stigma from family and friends and general social stigma, and increased odds of anticipated healthcare stigma. MSM that were clients of an MSM-focused NGO organisation had increased odds of reporting general social stigma than non-members.

Associations of Stigma with Demographics, Sexual Behaviors and HIV Disclosures

Table 3 reports unadjusted and adjusted odds ratios of the measures of stigma with dependent variables regarding: sexual orientation concealment, NGO client status, and sexual behaviors, HIV testing, HIV infection, and HIV treatment. MSM reporting stigma from family and friends and general social stigma had lower odds of concealing their sexual orientation from everyone, whilst those reporting anticipated healthcare stigma had higher odds. MSM that reported general social stigma were more likely to be members of an NGO. MSM reporting stigma from family and friends or general social stigma had lower ages of first sexual encounters with men. MSM reporting each stigma measure had higher odds of having had anal sex with a man in the last 6 months, had had more male anal sex partners in the last 30 days, and had lower odds of always using a condom for anal sex and of using a condom during their previous anal sexual intercourse. For each stigma measure, MSM reporting stigma had higher odds of having ever been remunerated for sex, having had group sex in the last 6 months, and having had chemsex in the last 30 days. MSM reporting general social stigma had lower odds of considering it to be very important to know of their sexual partners' HIV status, whilst MSM reporting stigma from family and friends or general social stigma were less likely to consider disclosing their HIV status to be very important. For each stigma measure, MSM reporting stigma had lower odds of being aware of their last permanent sexual partner's HIV status.

Associations of Stigma with HIV Testing, Status, and Treatment

Table 3 also reports unadjusted and adjusted odds ratios of stigma with HIV testing, HIV infection, and HIV treatment. There were few associations between any of the stigma measures and these variables, including having been tested for HIV ever or in the prior year (among MSM without HIV). MSM with anticipated healthcare stigma had higher odds of self-reporting their awareness of having HIV, but this association was not seen with the HIV test results. Among those with HIV, there were no associations between

Table 1 Characteristics of MSM by whether they have experienced each stigma measure (N and column percentages)

Variable	“Stigma from family and friends” (n = 5544 unless otherwise specified)		“Anticipated healthcare stigma” (n = 698, 12.6%)		“Enacted general social stigma” (n = 1805, 32.6%)	
	Never (n = 3881, 70.0%)	Ever (n = 1663, 30.0%)	Never (n = 4846, 87.4%)	Ever (n = 698, 12.6%)	Never (n = 3739, 67.4%)	Ever (n = 1805, 32.6%)
Education						
Secondary	1670	709	2047	332	1544	835
Incomplete higher	946	408	1188	166	954	400
Complete higher	1265	546	1611	200	1241	570
Official marital status						
Never married	3122	1383	3945	560	2996	1509
Officially married	252	41	259	34	231	62
Divorced or widowed	507	239	642	104	512	234
Cohabitation status						
Live with parents/relatives	1524	608	1870	262	1467	665
Live alone	1552	668	1933	287	1474	746
Live with male partner	557	349	791	115	564	342
Live with female partner	248	38	252	34	234	52
Ever imprisoned						
Don't report ever being imprisoned	3789	1588	4719	658	3651	1726
Previously imprisoned	92	75	127	40	88	79
Sexual orientation						
Homosexual	2443	1140	3182	401	2326	1257
Bisexual or other	1438	523	1664	297	1413	548
Sexual orientation concealment^a						
Did not report any concealment	262	212	426	48	257	217
Partial concealment	2387	1095	3079	403	2271	1211
Conceal from everyone	1232	356	1341	247	1211	377
Client of MSM-focused NGO						
Does not report as being an NGO client	2871	1145	3493	523	2798	1218
NGO client	1010	518	1353	175	941	587
Self-reported HIV status (of n = 3625 ever HIV-tested)						
HIV negative self-report	2080	911	2662	329	1998	993
HIV positive self-report	101	40	117	24	85	56
Declined to disclose HIV status	306	187	399	94	301	192
HIV antibody test result						
Negative	3675	1583	4604	654	3562	1696
Positive	206	80	242	44	177	109

Table 1 (continued)

Variable	“Stigma from family and friends”		“Anticipated healthcare stigma”		“Enacted general social stigma”	
	Never	Ever	Never	Ever	Never	Ever
<i>n</i> = 5544 unless otherwise specified	(<i>n</i> = 3881, 70.0%)	(<i>n</i> = 1663, 30.0%)	(<i>n</i> = 4846, 87.4%)	(<i>n</i> = 698, 12.6%)	(<i>n</i> = 3739, 67.4%)	(<i>n</i> = 1805, 32.6%)
Median age (interquartile range)	27 (21–35)	27 (21–35)	27 (21–35)	27 (21–36)	27 (21–35)	27 (21–34)

MSM men who have sex with men; NGO non-governmental organisation; HIV human immunodeficiency virus

^aThe question available in the questionnaire was “Do you suppress the fact that you have sex with men?”. The possible answers were “Suppress this from everybody”, “Do not suppress this and is ready to say it anywhere”, and “Do not suppress this, but I will not talk about this first”

stigma and being registered at an AIDS centre or receiving ART.

Discussion

Our finding that a sizeable proportion of MSM in Ukraine have experienced some form of sexual behavior stigma across their lifetimes is consistent with findings in other settings [15, 26]. Particularly, vulnerable populations, including those less educated or ever imprisoned, experienced more stigma than those with higher levels of education or who had never been imprisoned. Our analysis of data from a national IBBS demonstrates that ever experiencing sexual behavior stigma is associated with greater levels of sexual risk behaviors among Ukrainian MSM. Associations were relatively consistent across multiple forms of sexual behavior stigma and for multiple sexual risk behaviors. For example, the three included sexual behavior stigma measures were all independently associated with having more anal sex partners last month, as well as with being less likely to have used condoms at last anal intercourse. However, sexual behavior stigma was not associated with HIV infection, HIV testing, or HIV treatment in our analyses.

HIV Risk-Behaviors and HIV Infection

In general, the three measures of lifetime stigma behaved similarly, and all three measures were associated with multiple sexual risk behaviors. Generally, fewer associations were observed between perceived or anticipated stigma and sexual risk behaviors than for the enacted stigma measure. Much of the literature focuses on internalised stigma [8], so this iterates the value of considering alternative types of stigma.

Our finding that sexual behavior stigma associates with HIV risk behaviors among MSM has been found elsewhere [14]. In other settings, sexual behavior stigma is associated with increased rates of UAI [26–28], concurrent sex partners [26–28], and being reimbursed for sex [26, 29]. Our finding that sexual behavior stigma is negatively associated with discussing/valuing discussing HIV status with sex partners contrasts findings from a Europe-wide internet survey [13]. This could be because we measured sexual behavior stigma at the individual-level rather than country-level stigma which includes legislation and general population attitudes towards sexual minorities [13]. Our study builds on the literature by demonstrating associations between HIV risk behaviors with community-level sexual behavior stigma in an understudied Eastern European context.

Paradoxically, ever receiving sexual-behavior stigma was not associated with testing HIV seropositive in our analysis despite associations with numerous HIV-related sexual risk-behaviors. Notably, HIV seropositivity was the only variable

Table 2 Unadjusted and adjusted odds ratios of reporting ever (versus never) experiencing each stigma measure for socio-demographic characteristics

Independent variable	Stigma measures (dependent variable)					
	“Stigma from family and friends” (ever vs never)		“Anticipated healthcare stigma” (ever vs never)		“Enacted general social stigma” (ever vs never)	
<i>n</i> = 5544 unless otherwise specified	Unadjusted OR (95% CI)	Adjusted OR (95% CI)	Unadjusted OR (95% CI)	Adjusted OR (95% CI)	Unadjusted OR (95% CI)	Adjusted OR (95% CI)
Median age (per 10 years)	0.98 (0.93, 1.05)	0.94 (0.87, 1.02)	1.06 (0.97, 1.15)	1.11 (1.00, 1.24)	0.97 (0.91, 1.03)	0.97 (0.90, 1.05)
Education						
Secondary	1.00	1.00	1.00	1.00	1.00	1.00
Incomplete higher	1.06 (0.91, 1.24)	1.06 (0.91, 1.25)	0.93 (0.75, 1.15)	0.92 (0.75, 1.15)	0.89 (0.76, 1.03)	0.86 (0.73, 1.00)
Complete higher	1.07 (0.93, 1.22)	1.06 (0.91, 1.23)	0.82 (0.67, 1.00)	0.79 (0.64, 0.98)	0.89 (0.77, 1.01)	0.84 (0.73, 0.98)
Official marital status						
Never married	1.00	1.00	1.00	1.00	1.00	1.00
Officially married	0.35 (0.25, 0.49)	0.72 (0.41, 1.29)	0.82 (0.56, 1.21)	0.72 (0.36, 1.47)	0.49 (0.37, 0.67)	1.30 (0.75, 2.25)
Divorced or widowed	1.06 (0.89, 1.26)	1.12 (0.90, 1.38)	1.02 (0.80, 1.29)	0.74 (0.55, 0.98)	0.90 (0.76, 1.08)	0.95 (0.77, 1.18)
Cohabitation status						
Live with parents/relatives	0.91 (0.79, 1.04)	0.94 (0.81, 1.08)	0.90 (0.75, 1.08)	0.90 (0.73, 1.10)	0.87 (0.76, 0.99)	0.84 (0.73, 0.97)
Live alone	1.00	1.00	1.00	1.00	1.00	1.00
Live with male partner	1.41 (1.19, 1.66)	1.29 (1.09, 1.53)	0.99 (0.78, 1.26)	1.11 (0.87, 1.42)	1.12 (0.94, 1.32)	1.00 (0.85, 1.19)
Live with female partner	0.33 (0.23, 0.47)	0.53 (0.29, 0.95)	0.80 (0.54, 1.18)	0.72 (0.36, 1.47)	0.40 (0.29, 0.55)	0.41 (0.23, 0.72)
Ever imprisoned						
Don't report ever being imprisoned	1.00	1.00	1.00	1.00	1.00	1.00
Previously imprisoned	1.88 (1.36, 2.59)	2.15 (1.53, 3.02)	2.19 (1.49, 3.23)	2.05 (1.38, 3.06)	1.87 (1.35, 2.59)	2.12 (1.51, 2.98)
Sexual orientation						
Homosexual	1.00	1.00	1.00	1.00	1.00	1.00
Bisexual or other	0.76 (0.66, 0.86)	0.92 (0.80, 1.06)	1.33 (1.12, 1.58)	1.39 (1.15, 1.68)	0.72 (0.64, 0.82)	0.85 (0.74, 0.98)
Sexual orientation concealment						
Did not report any concealment	1.00	1.00	1.00	1.00	1.00	1.00
Partial concealment	0.59 (0.48, 0.72)	0.63 (0.51, 0.77)	1.14 (0.82, 1.57)	1.16 (0.84, 1.62)	0.69 (0.57, 0.85)	0.74 (0.60, 0.91)
Conceal from everyone	0.33 (0.27, 0.42)	0.39 (0.31, 0.49)	1.44 (1.02, 2.02)	1.45 (1.02, 2.06)	0.38 (0.30, 0.48)	0.43 (0.34, 0.55)
Client of MSM-focused NGO						
Does not report as being an NGO client	1.00	1.00	1.00	1.00	1.00	1.00
NGO client	1.21 (1.05, 1.39)	1.09 (0.94, 1.26)	0.91 (0.74, 1.11)	0.95 (0.77, 1.18)	1.31 (1.14, 1.51)	1.21 (1.04, 1.39)

MSM men who have sex with men; OR odds ratio; 95% CI 95% confidence interval; NGO non-governmental organisation

^aFrom mixed-effects logistic regression, with city as the random-effect

^bThe question available in the questionnaire was “Do you suppress the fact that you have sex with men?”. The possible answers were “Suppress this from everybody”, “Do not suppress this and is ready to say it anywhere”, and “Do not suppress this, but I will not talk about this first”

Table 3 Unadjusted and adjusted odds ratios (ORs) for HIV-related risk behaviors, testing, serostatus, or treatment by ever (versus never) having experienced each indicated stigma measure

Dependent variable	Stigma measures (independent variable)					
	“Stigma from family and friends” (ever vs never)		“Anticipated healthcare stigma” (ever vs never)		“Enacted general social stigma” (ever vs never)	
	Unadjusted OR ^a (95% CI)	Adjusted OR ^a (95% CI)	Unadjusted OR ^a (95% CI)	Adjusted OR ^a (95% CI)	Unadjusted OR ^a (95% CI)	Adjusted OR ^a (95% CI)
<i>n</i> = 5544 unless otherwise specified						
Sexual orientation concealed from everyone	0.52 (0.45, 0.60)	0.58 (0.50, 0.67)	1.28 (1.07, 1.54)	1.26 (1.04, 1.52)	0.52 (0.45, 0.60)	0.56 (0.49, 0.65)
Client of NGO which provides prevention services to MSM	1.20 (1.04, 1.38)	1.09 (0.94, 1.26)	0.91 (0.74, 1.12)	0.96 (0.78, 1.19)	1.30 (1.13, 1.50)	1.22 (1.06, 1.41)
Age at first oral or anal sex with man (years) (<i>n</i> = 5470) ^b	0.56 (0.44, 0.73)	0.72 (0.57, 0.89)	1.36 (0.95, 1.93)	1.17 (0.86, 1.58)	0.44 (0.34, 0.57)	0.61 (0.49, 0.76)
Had anal sex with a man in the last 6 months	1.28 (1.03, 1.59)	1.19 (0.96, 1.49)	1.30 (0.94, 1.79)	1.39 (1.00, 1.92)	1.82 (1.45, 2.28)	1.76 (1.40, 2.21)
Number of anal intercourses in last 30 days (<i>n</i> = 5400) ^c	1.17 (1.10, 1.25)	1.09 (1.03, 1.16)	1.14 (1.04, 1.24)	1.17 (1.08, 1.28)	1.20 (1.13, 1.27)	1.14 (1.07, 1.21)
Number of male anal sex partners in last 30 days (<i>n</i> = 5519) ^c	1.18 (1.11, 1.25)	1.14 (1.07, 1.21)	1.24 (1.14, 1.35)	1.24 (1.14, 1.34)	1.36 (1.28, 1.44)	1.32 (1.24, 1.40)
Report always using a condom for male anal sex during last 30 days (<i>of n</i> = 4733 who had anal sex with a man in last 30 days)	0.65 (0.57, 0.74)	0.72 (0.63, 0.82)	0.72 (0.61, 0.87)	0.72 (0.59, 0.86)	0.50 (0.44, 0.57)	0.52 (0.45, 0.59)
Report using a condom for last anal sex with a man (<i>of n</i> = 5023 who had anal sex with a man in last 6 months)	0.73 (0.63, 0.84)	0.81 (0.70, 0.94)	0.82 (0.67, 0.99)	0.80 (0.65, 0.98)	0.57 (0.49, 0.65)	0.59 (0.51, 0.68)
Ever remunerated for sex (<i>of n</i> = 5023 who had male anal in last 6 months)	2.01 (1.71, 2.36)	1.92 (1.63, 2.27)	1.82 (1.47, 2.24)	1.85 (1.49, 2.30)	2.62 (2.23, 3.08)	2.50 (2.11, 2.95)
Report having group sex in the last 6 months	1.29 (1.11, 1.51)	1.20 (1.03, 1.41)	1.32 (1.07, 1.62)	1.32 (1.07, 1.63)	1.56 (1.35, 1.82)	1.47 (1.26, 1.72)
Report having chemsex in last 30 days	1.45 (1.13, 1.86)	1.36 (1.05, 1.76)	1.45 (1.05, 2.02)	1.39 (1.00, 1.94)	1.77 (1.38, 2.26)	1.66 (1.29, 2.14)
Considers knowing sexual partners’ HIV status to be very important (<i>n</i> = 5512)	0.95 (0.84, 1.07)	0.93 (0.82, 1.05)	1.15 (0.97, 1.36)	1.17 (0.98, 1.38)	0.74 (0.66, 0.83)	0.73 (0.64, 0.82)
Considers disclosing HIV status to sexual partners be very important (<i>n</i> = 5492)	0.87 (0.76, 0.98)	0.82 (0.73, 0.94)	1.00 (0.84, 1.19)	1.01 (0.85, 1.20)	0.71 (0.62, 0.80)	0.67 (0.59, 0.76)

Table 3 (continued)

Dependent variable	Stigma measures (independent variable)					
	“Stigma from family and friends” (ever vs never)		“Anticipated healthcare stigma” (ever vs never)		“Enacted general social stigma” (ever vs never)	
	Unadjusted OR ^a (95% CI)	Adjusted OR ^a (95% CI)	Unadjusted OR ^a (95% CI)	Adjusted OR ^a (95% CI)	Unadjusted OR ^a (95% CI)	Adjusted OR ^a (95% CI)
<i>n</i> = 544 unless otherwise specified						
Aware of last permanent partner's HIV status (<i>of n</i> = 5027 who report having had a permanent sexual partner)	0.99 (0.87, 1.12)	0.86 (0.75, 0.98)	0.80 (0.67, 0.95)	0.84 (0.70, 1.01)	0.85 (0.75, 0.96)	0.75 (0.65, 0.85)
Ever HIV tested	1.22 (1.07, 1.38)	1.05 (0.91, 1.21)	0.91 (0.77, 1.09)	0.95 (0.78, 1.16)	1.20 (1.06, 1.36)	1.06 (0.92, 1.22)
HIV tested in last year	1.11 (0.98, 1.26)	1.01 (0.88, 1.15)	0.96 (0.81, 1.14)	1.03 (0.85, 1.24)	1.13 (1.00, 1.28)	1.01 (0.88, 1.15)
Self-reporting HIV positive (<i>of n</i> = 3132 ever tested who disclosed HIV status)	0.94 (0.64, 1.38)	0.92 (0.62, 1.36)	1.95 (1.20, 3.15)	1.91 (1.16, 3.14)	1.36 (0.95, 1.96)	1.29 (0.88, 1.87)
Testing HIV positive	0.88 (0.67, 1.16)	0.85 (0.64, 1.12)	1.29 (0.91, 1.83)	1.31 (0.92, 1.87)	1.22 (0.94, 1.58)	1.12 (0.86, 1.47)
Registered at AIDS centre (<i>of n</i> = 286 testing HIV positive)	1.15 (0.63, 2.09)	1.02 (0.54, 1.90)	1.70 (0.81, 3.60)	1.35 (0.61, 2.95)	1.11 (0.64, 1.93)	1.05 (0.59, 1.85)
Receiving ART (<i>of n</i> = 286 testing HIV positive)	1.14 (0.62, 2.11)	1.06 (0.56, 2.00)	1.52 (0.70, 3.30)	1.27 (0.56, 2.86)	1.03 (0.58, 1.81)	0.99 (0.55, 1.78)

HIV human immunodeficiency virus; OR odds ratio; 95% CI 95% confidence interval; AIDS acquired immune deficiency syndrome; ART antiretroviral treatment

^aUnless otherwise specified, odds ratios (with 95% confidence intervals) from mixed-effects logistic regression, with city as the random-effect, are displayed. Adjusted analyses contained variables on age, education level, ever-imprisoned, marital status, cohabitation status, sexual-orientation, sexual-orientation concealment, and being an NGO client

^bBeta coefficient (with 95% confidence intervals) from mixed-effects linear regression, with city as the random-effect

^cIncidence rate ratio (with 95% confidence intervals) and p value from mixed-effects negative binomial regression, with city as the random-effect

not measured by self-report in this study and therefore the only variable not subject to recall bias. The apparent discrepancy between stigma associating with HIV risk-behavior but not HIV seropositivity may reduce confidence in the risk-behavior results. A potential explanation is that behaviors may change following a HIV diagnosis, or, alternatively, this could be due to a lack of statistical power due to there being 286 MSM testing positive for HIV. We cannot rule out that associations between stigma and risk-behaviors arose from unmeasured confounding or biases, such as recall or reporting bias. However, in cross-sectional analyses of IBBSs in other settings sexual-behavior stigma did associate with prevalent HIV [30, 31]. Furthermore, ever experiencing sexual-behavior stigma has been found to longitudinally associate with incidence of a combined measure of sexually transmitted infections and HIV in Nigeria, although it could not be assessed whether this association held for HIV incidence independently [28]. These studies utilised similar items to the Ukrainian IBBS but created different measures of stigma and were in sub-Saharan African settings, which might explain differential results [28, 30, 31].

HIV Testing and Treatment

Associations between stigmas experienced by MSM with HIV testing and treatment are noted by other studies [6, 14]. However, there is significant heterogeneity in constructs measured, varying by stigmatised characteristic (e.g. sexual behavior, sexual orientation, HIV stigma), form (e.g. internalised, enacted) and level (e.g. community-level, structural-level) [7]. Therefore, lack of associations between HIV-testing or treatment with specifically community-level sexual behavior stigma in Ukraine may not necessarily indicate divergence from the literature.

Multi-country studies have found associations between intersecting stigmas relating to particular sexual practices as well as stigma relating to sexual-orientation with accessibility of HIV-testing services for MSM [32, 33]. However, several single-country studies have failed to observe associations between community-level sexual behavior stigma and actual HIV testing behaviors, supported by our results in Ukraine [19, 34]. Elsewhere internalised sexual orientation stigma has been found to associate with HIV-testing in multivariate analyses [35, 36]. Therefore, internalised sexual orientation stigma, unmeasured here, might be the important stigma construct for HIV testing behavior [35]. Interestingly, our three measures of enacted stigma associated with increased HIV testing behaviors in univariable analyses but attenuated on adjustment. This could reflect known associations between being an NGO client and HIV testing in Ukraine [22]. In our analyses being an NGO client generally associated with receipt of enacted stigma. This could be because NGOs are successfully reaching at-risk

populations, or because those that are more willing to disclose their MSM status are accessing NGOs. Alternatively, MSM may be ‘outed’ by being an NGO client which could lead to experiences of stigma or that clients of NGOs are more aware of stigma. NGO contact might therefore result in univariate associations between enacted stigmas and increased HIV testing which attenuate following adjustment on NGO client status.

Our analyses did not identify associations between sexual behavior stigma and HIV treatment among HIV seropositive MSM. However, the small crude number of seropositive MSM in our sample mean our analyses may be underpowered to find such associations. In multi-country studies reported accessibility of HIV treatment negatively associates with sexual behavior stigma among MSM, and HIV stigma among HIV positive MSM [33], but this does not constitute direct evidence of reduced utilisation.

Strengths and Limitations

A key strength of our analyses is a large sample size of > 5500 MSM with survey data from 26 Ukrainian cities spanning all regions of Ukraine. However, the median age of included MSM was 27 indicating a significantly younger age profile than the general population of men in Ukraine [22]. This is a concern because older men may have experienced more stigma and consequently be more hidden, biasing estimations of stigma, or potentially may have experienced no stigma because they are more hidden. RDS sampling drew upon initial seeds in each city, potentially biasing the sample towards participants with characteristics similar to the initial seeds. We did not use RDS weights to directly adjust for the sampling method although we did account for clustering at the city level. Excluding observations with missing stigma data also risks biasing results, although the low proportion of excluded results means any effect is likely limited.

Importantly, the cross-sectional study design means the temporal ordering of variables in the dataset cannot be confirmed. Causality is therefore difficult to assess, and we can only consider associations, for example it is possible sexual behavior stigma followed sexual risk behaviors or other variables of interest rather than preceding them. Several self-reported variables were asked as lifetime experiences, including stigma, further obfuscating temporal ordering. While HIV seropositivity results were measured biologically, all other variables were self-reported so potentially subject to varying levels of bias. Participant responses, including refusal to answer questions, may be subject to social desirability bias which could plausibly differentially affect those who had and had not experienced stigma. Participants were asked about past behaviors and experiences over timeframes ranging from months to ever, so recall bias could influence results. Inconsistent timeliness of variables could

also introduce recency bias. ‘Ever’ variables such as stigma could greatly precede included dependent variables for any given observation, and so may be less likely to be recollected. Future studies should look to collect more detailed measures of stigma, included over more recent time-periods.

It is important to note that this study did not utilise a measure of sexual behavior stigma validated for Ukrainian MSM. It is not clear whether the survey items reflect the intended concepts in Ukraine, though they have been used in several settings in the United States and sub-Saharan Africa [8, 15]. However, the development of scales/measures that are contextually appropriate but also allow comparisons globally remains a challenge for the field. Notably, significant heterogeneity among stigma constructs used in other studies of sexual behavior stigma makes it difficult for us to meaningfully compare our findings [7]. Also, lack of observed associations with our stigma measures cannot preclude associations with forms of stigma not surveyed in the IBBS, as discussed for internalised stigma and HIV testing [28].

Finally, the data used in this analysis are from 2017 before the launch of the full invasion by Russia in 2022 and the impacts of this are unknown. The start of the war in 2014, including the annexation of Crimea, saw large increases in homophobic violence and hate crimes in Crimea and Eastern Ukraine, causing many MSM to flee to Western Ukraine [37]. The first few months of the full invasion has seen reports of homophobic and transphobic violence [38], in some cases perpetuated by the territorial defense. There are fears that Russia will impose oppressive laws in the occupied regions, which significantly impacted the mental health of MSM when passed in Russia [39]. However, there is also hope that the conflict, which has united the country against Russian aggression, may lead to increased advocacy capacity for the rights of Lesbian, Gay, Bisexual, Transgender, Queer, and Intersex (LGBTQI) people living in Ukraine [38].

Conclusions

Ukraine is experiencing a sizeable and sustained HIV epidemic and HIV prevalence remains high among Ukrainian MSM [2, 20]. Our findings demonstrate that associations between sexual behavior stigma and increased HIV risk behaviors apply in an understudied Eastern European context. However, we did not observe associations between sexual behavior stigma with HIV-testing, treatment, and, notably, with HIV infection. Future research is warranted to elucidate the relationship between stigma, risk behavior and HIV infection in Ukraine. Particularly, there is need for longitudinal study designs to enable assessment of causality of stigma and its potential adverse effects on HIV-outcomes [6]. There is also a need to measure changes in stigma over

time, including over the course of the ongoing conflict with Russia.

Supplementary Information The online version contains supplementary material available at <https://doi.org/10.1007/s10461-023-04182-1>.

Acknowledgements We would like to thank all those who participated in or were involved with carrying out the integrated biobehavioural survey used in this study. JS and PV acknowledge support from the NIHR Health Protection Research Unit in Behavioural Science and Evaluation at University of Bristol.

Disclaimer The findings and conclusions in this manuscript are those of the authors and do not necessarily represent the official position of the funding agencies.

Author Contributions AT, JS, and PV formed the original concept for the manuscript. BA analysed the data and wrote the original draft of the manuscript. JS, TS, EJB, ID, PV, and AT provided supervision and contributed to writing the final manuscript. AT had the final decision to submit.

Funding This data collection activity has been supported by the President’s Emergency Plan for AIDS Relief (PEPFAR) through the Centers for Disease Control and Prevention (CDC) under the terms of Cooperative Agreement GH 12 1228-GH000840. PV and JS acknowledge funding from NIAID and NIDA (R01AI147490) and NIDA (R01DA033679 and R21DA047902). AT acknowledges funding from the Wellcome Trust (222770/Z/21/Z). JS, TS, and PV acknowledge funding from the Wellcome Trust (226619/Z/22/Z). For the purpose of Open Access, the author has applied a CC BY public copyright license to any Author Accepted Manuscript version arising from this submission.

Declarations

Conflict of interest JS reports nonfinancial support from Gilead Sciences, outside the submitted work. PV reports research grants from Gilead unrelated to this work. The other authors declare no conflict of interest.

Ethical Approval Study protocols involving human participants complied with the 1964 Helsinki Declaration or comparable ethical standards and were approved by the Institute of Epidemiology and Infectious Diseases of the Ukrainian Academy of Medical Sciences. The study was also reviewed in accordance with the U.S. Centers for Disease Control and Prevention (CDC) human research protection procedures and determined to be research, but CDC investigators did not interact with human subjects or have access to identifiable data or specimens for research purposes.

Informed Consent All participants gave informed consent.

Open Access This article is licensed under a Creative Commons Attribution 4.0 International License, which permits use, sharing, adaptation, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons licence, and indicate if changes were made. The images or other third party material in this article are included in the article’s Creative Commons licence, unless indicated otherwise in a credit line to the material. If material is not included in the article’s Creative Commons licence and your intended use is not permitted by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the copyright holder. To view a copy of this licence, visit <http://creativecommons.org/licenses/by/4.0/>.

References

- Frank TD, Carter A, Jahagirdar D, Biehl MH, Douwes-Schultz D, Larson SL, et al. Global, regional, and national incidence, prevalence, and mortality of HIV, 1980–2017, and forecasts to 2030, for 195 countries and territories: a systematic analysis for the Global Burden of Diseases, Injuries, and Risk Factors Study 2017. *Lancet HIV*. 2019;6(12):E831–59.
- UNAIDS. Global AIDS monitoring 2019: Ukraine. Geneva: UNAIDS; 2019.
- Coynash H, Kharkiv Human Rights Protection Group. Ukrainian MP introduces Russian-style law criminalizing ‘propaganda of homosexuality’. 2018. Available from: <https://khp.org/en/1539828666>.
- Stahlman S, Beyrer C, Sullivan PS, Mayer KH, Baral SD. Engagement of gay men and other men who have sex with men (MSM) in the response to HIV: a critical step in achieving an AIDS-free generation. *AIDS Behav*. 2016;20:S330–40.
- Link BG, Phelan JC. Conceptualizing stigma. *Annu Rev Sociol*. 2001;27:363–85.
- Stahlman S, Hargreaves JR, Sprague L, Stangl AL, Baral SD. Measuring sexual behavior stigma to inform effective HIV prevention and treatment programs for key populations. *JMIR Public Health Surveill*. 2017;3(2):e23.
- Fitzgerald-Husek A, Van Wert MJ, Ewing WF, Grosso AL, Holland CE, Katterl R, et al. Measuring stigma affecting sex workers (SW) and men who have sex with men (MSM): a systematic review. *PLoS ONE*. 2017;12(11):e0188393.
- Augustinavicius JL, Baral SD, Murray SM, Jackman K, Xue QL, Sanchez TH, et al. Characterizing cross-culturally relevant metrics of stigma among men who have sex with men across 8 sub-Saharan African countries and the United States. *Am J Epidemiol*. 2020;189(7):690–7.
- Babel RA, Wang P, Alessi EJ, Raymond HF, Wei CY. Stigma, HIV risk, and access to HIV prevention and treatment services among men who have sex with men (MSM) in the United States: a scoping review. *AIDS Behav*. 2021;25(11):3574–604.
- Fay H, Baral SD, Trapence G, Motimedi F, Umar E, Iiping S, et al. Stigma, health care access, and HIV knowledge among men who have sex with men in Malawi, Namibia, and Botswana. *AIDS Behav*. 2011;15(6):1088–97.
- Jeffries WL, Flores SA, Rooks-Peck CR, Gelaude DJ, Belcher L, Ricks PM, et al. Experienced homophobia and HIV infection risk among US gay, bisexual, and other men who have sex with men: a meta-analysis. *LGBT Health*. 2021;8(1):1–10.
- Tucker A, Liht J, de Swardt G, Jobson G, Rebe K, McIntyre J, et al. Homophobic stigma, depression, self-efficacy and unprotected anal intercourse for peri-urban township men who have sex with men in Cape Town, South Africa: a cross-sectional association model. *AIDS Care*. 2014;26(7):882–9.
- Pachankis JE, Hatzenbuehler ML, Hickson F, Weatherburn P, Berg RC, Marcus U, et al. Hidden from health: structural stigma, sexual orientation concealment, and HIV across 38 countries in the European MSM Internet Survey. *AIDS*. 2015;29(10):1239–46.
- Baral S, Holland CE, Shannon K, Logie C, Semugoma P, Sithole B, et al. Enhancing benefits or increasing harms: community responses for HIV among men who have sex with men, transgender women, female sex workers, and people who inject drugs. *J Acquir Immune Defic Syndr*. 2014;66:S319–28.
- Stahlman S, Sanchez TH, Sullivan PS, Ketende S, Lyons C, Charurat ME, et al. The prevalence of sexual behavior stigma affecting gay men and other men who have sex with men across sub-Saharan Africa and in the United States. *JMIR Public Health Surveill*. 2016;2(2):e35.
- Assembly UNG. Political declaration on HIV and AIDS: ending inequalities and getting on track to end AIDS by 2030. 2021.
- Rueda S, Mitra S, Chen S, Gogolishvili D, Globberman J, Chambers L, et al. Examining the associations between HIV-related stigma and health outcomes in people living with HIV/AIDS: a series of meta-analyses. *BMJ Open*. 2016;6(7):e011453.
- Smit PJ, Brady M, Carter M, Fernandes R, Lamore L, Meulbroek M, et al. HIV-related stigma within communities of gay men: a literature review. *AIDS Care*. 2012;24(4):405–12.
- Lelutiu-Weinberger C, Rendina HJ, Mirandola M, Gios L, Folch C, Rafla A, et al. The role of gay-related stigma in HIV-risk behavior among sexual minority men in Europe. *AIDS Behav*. 2019;23(3):684–94.
- Kasyanchuk M, Trofymenko O, Bilous Y, Sazonova Y. Monitoring of behavior and HIV prevalence among men having sex with men (National Part). ICF “Alliance of Public Health”. APH; 2017. 05/08/2022.
- Avery L, Rotondi N, McKnight C, Firestone M, Smylie J, Rotondi M. Unweighted regression models perform better than weighted regression techniques for respondent-driven sampling data: results from a simulation study. *BMC Med Res Methodol*. 2019. <https://doi.org/10.1186/s12874-019-0842-5>.
- Trickey A, Stone J, Semchuk N, Saliuk T, Sazonova Y, Varetka O, et al. Is contact between men who have sex with men and non-governmental organizations providing harm reduction associated with improved HIV outcomes? *HIV Med*. 2021;22(4):262–72.
- Trickey A, Walker JG, Bivegete S, Semchuk N, Saliuk T, Varetka O, et al. Impact and cost-effectiveness of non-governmental organizations on the HIV epidemic in Ukraine among men who have sex with men. *J Acquir Immune Defic Syndr*. 2022. <https://doi.org/10.1097/QAD.0000000000003347>.
- World Health Organization. HIV prevention, treatment, care and support for people who use stimulant drugs. Geneva: World Health Organization; 2019.
- Santos GM, Beck J, Wilson PA, Hebert P, Makofane K, Pyun T, et al. Homophobia as a barrier to HIV prevention service access for young men who have sex with men. *J Acquir Immune Defic Syndr*. 2013;63(5):E167–71.
- Balaji AB, Bowles KE, Hess KL, Smith JC, Paz-Bailey G, Grp NS. Association between enacted stigma and HIV-related risk behavior among MSM, National HIV Behavioral Surveillance System, 2011. *AIDS Behav*. 2017;21(1):227–37.
- Lyons C, Stahlman S, Holland C, Ketende S, Van Lith L, Kochelani D, et al. Stigma and outness about sexual behaviors among cisgendermen who have sex with men and transgender women in Eswatini: a latent class analysis. *BMC Infect Dis*. 2019. <https://doi.org/10.1186/s12879-019-3711-2>.
- Rodriguez-Hart C, Nowak RG, Musci R, German D, Orazulike I, Kayode B, et al. Pathways from sexual stigma to incident HIV and sexually transmitted infections among Nigerian MSM. *AIDS*. 2017;31(17):2415–20.
- Crowell TA, Keshinro B, Baral SD, Schwartz SR, Stahlman S, Nowak RG, et al. Stigma, access to healthcare, and HIV risks among men who sell sex to men in Nigeria. *J Int AIDS Soc*. 2017. <https://doi.org/10.7448/IAS.20.01.21489>.
- Hladik W, Barker J, Ssenkusu JM, Opio A, Tappero JW, Hakim A, et al. HIV infection among men who have sex with men in Kampala, Uganda—a respondent driven sampling survey. *PLoS ONE*. 2012;7(5):e38143.
- Rodriguez-Hart C, Musci R, Nowak RG, German D, Orazulike I, Ononaku U, et al. Sexual stigma patterns among Nigerian men who have sex with men and their link to HIV and sexually transmitted infection prevalence. *AIDS Behav*. 2018;22(5):1662–70.
- Arreola S, Santos GM, Beck J, Sundararaj M, Wilson PA, Hebert P, et al. Sexual stigma, criminalization, investment, and access

- to HIV services among men who have sex with men worldwide. *AIDS Behav.* 2015;19(2):227–34.
33. Ayala G, Makofane K, Santos GM, Beck J, Do TD, Hebert P, et al. Access to basic HIV-related services and PrEP acceptability among men who have sex with men worldwide: barriers, facilitators, and implications for combination prevention. *J Sex Transm Dis.* 2013;2013:953123.
 34. Rodriguez-Hart C, Bradley C, German D, Musci R, Orazulike I, Baral S, et al. The synergistic impact of sexual stigma and psychosocial well-being on HIV testing: a mixed-methods study among Nigerian men who have sex with men. *AIDS Behav.* 2018;22(12):3905–15.
 35. Andrinopoulos K, Hembling J, Guardado ME, Hernandez FD, Nieto AI, Melendez G. Evidence of the negative effect of sexual minority stigma on HIV testing among MSM and transgender women in San Salvador, El Salvador. *AIDS Behav.* 2015;19(1):60–71.
 36. Knox J, Sandfort T, Yi H, Reddy V, Maimane S. Social vulnerability and HIV testing among South African men who have sex with men. *Int J STD AIDS.* 2011;22(12):709–13.
 37. Jormanainen J, Ruffa C. Does armed conflict affect violence against the LGBT community: a comparative study of Moldova and Ukraine. Uppsala: Uppsala University; 2018.
 38. gay.org.ua. The situation of the Ukrainian LGBTQ community after the escalation of Russian aggression. 2022. Available from: <https://gay.org.ua/en/blog/2022/05/14/the-situation-of-the-ukrainian-lgbtq-community-after-the-escalation-of-russian-aggression/>.
 39. Hylton E, Wirtz AL, Zelaya CE, Latkin C, Peryshkina A, Mogilnyi V, et al. Sexual identity, stigma, and depression: the role of the “Anti-gay Propaganda Law” in mental health among men who have sex with men in Moscow, Russia. *J Urban Health.* 2017;94(3):319–29.

Publisher's Note Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.