

# Using Survey Data to Understand the Health Needs of Difficult to Reach Populations

Evidence from a Community Survey Regarding the Individual and Contextual Correlates of Sex Life Happiness Among European Men Who Have Sex With Men

*Alexander Hamilton*

*Ford Hickson*

*Axel J. Schmidt*



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## Abstract

Being happy with one's sex life is an important facet of sexual health. Several studies have found associations between sex life happiness and a range of individual (or proximate) and contextual (usually country-level) factors amongst men who have sex with men (MSM). Using a novel dataset, the 2017 European Men-Who-Have-Sex-With-Men Internet Survey (EMIS-2017), this paper simultaneously explores the association of both individual and contextual variables, sex life happiness, and health. Understanding and quantifying this link is important for policy makers concerned with improving health outcomes in minority, and often marginalized, populations. Results: Recency of sex and/or being in a steady sexual relationship had the largest positive associations with higher self-reported sex life happiness.

Being single had the largest negative association. Among individual-level factors, not having experienced homophobia and being out to a majority of one's social network were most strongly associated with sex life happiness. At the country-level, there is evidence that living in a country with a more authoritarian political regime is associated with less sex life happiness. Mediation analysis shows that authoritarian regimes are also indirectly negatively associated with sex life happiness via the likelihood of being open about one's sexuality. This study provides a strong basis for further research exploring the potentially complex associations between proximate and contextual variables in determining sex life happiness amongst populations of men who have sex with men.

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# Using Survey Data to Understand the Health Needs of Difficult to Reach Populations

Evidence from a Community Survey Regarding the Individual and Contextual Correlates of Sex Life Happiness Among European Men Who Have Sex With Men\*

Alexander Hamilton<sup>1</sup>

Ford Hickson<sup>2</sup>

Axel J. Schmidt<sup>2</sup>

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<sup>1</sup> United Kingdom Foreign, Commonwealth, and Development Office, London, UK. Corresponding author: [alexander.hamilton@fcdo.gov.uk](mailto:alexander.hamilton@fcdo.gov.uk)

<sup>2</sup> Department of Public Health, Environments & Society, London School of Hygiene and Tropical Medicine, London, UK

## Introduction

It is increasingly recognized that sexual health resides in subjectivities as well as bodies. Well-being is a feeling, rather than a bodily state or a set of behaviors (Michaelson *et al.*, 2012). Given that subjective aspects of sexual health (such as happiness with one's sex life) are associated with both individual characteristics and behaviors as well as contextual social, economic, and political factors, measuring and understanding these associations is important in developing interventions that protect and promote sexual health. This is particularly the case for men-who-have-sex-with-men (MSM), as there is considerable variation in the acceptance of homosexuality across countries. Specifically, there is great variability in MSM's access to services (such as sex education or health care) as well as variation in legal and social acceptance of their relationships.

A holistic understanding of sexual health acknowledges that it consists of positive emotional and social well-being, physiological capabilities, and the absence of disease, as well as an absence of (societal) discrimination and violence (WHO, 2023). Research has yielded important insights regarding the role of individual and contextual factors in determining the sexual health outcomes for MSM. Several studies have found an association between sexual health behaviors and homophobia, with increased levels of homophobia being associated with riskier individual behaviors (Lorenc *et al.*, 2011; Lott *et al.*, 2022). Conversely, increased civil and political freedoms have been found to have positive psycho-social effects. In their review of 59 research papers, Drabble *et al.* (2021) found a link between the legalization of same-sex marriage and improvements in psycho-social wellbeing.

## Method

### Data Sources

Our main data source is the 2017 wave of the European Men-who-have-sex-with-men Internet Survey (Weatherburn *et al.*, 2019). The objective of the survey is "to indicate the levels and distributions of sexual health outcomes, risk and precaution behaviors, health promotion needs and the coverage (or uptake) of interventions" among MSM in Europe (Hickson & Schmidt, 2021, p.2).

Inclusion criteria were identification as a man or trans man; sexual attraction to men and/or ever

Hatzenbuehler *et al.* (2018) found that change in social, political, and legal stigma toward MSM was associated with improved mental health among MSM in Sweden. Complementing the focus on individual-level studies, ecological studies, such as Lamontagne *et al.* (2018), have found that higher levels of homophobia and stigmatization of MSM are associated with a range of negative country-level characteristics such as poorer human rights, lower quality-of-life in the general population and lower GDP per capita. Thus, there is evidence of associations between self-rated sexual happiness, sexual health behaviors, and homophobia.

In this study, we seek to contribute to this literature by exploring how both individual and contextual variables are associated with self-rated sex life happiness amongst MSM in Europe. Specifically, we used the 2017 European Men Who Have Sex with Men Internet Survey (EMIS-2017) to explore which individual and country-level factors are associated with self-reported happiness with a respondent's sex life and the strengths of those associations. EMIS-2017 provides us with a unique opportunity to explore the association between a critical component of sexual health (self-rated sexual happiness) and individual and contextual variables because it is the largest dataset of European MSM and because of its comparative reach (including 50 predominantly European and some Middle East countries of which 43 have a sample size larger than 100). We can therefore explore the relationship between sex life happiness and both individual and country-level variables simultaneously, as well as how the two levels (individual and contextual) might interact with each other.

having had sex with men; and above the legal age of sexual consent in country of residence.

EMIS is the largest of its kind and the 2017 wave includes 111,456 respondents living in 43 countries in the WHO European region who provided information on our dependent variable of interest (sex-life happiness). The sample was predominantly recruited through advertisement on dating apps for MSM (*e.g.* Romeo, Grindr, Hornet) with additional community-based recruitment by NGO (non-governmental organization) partners. The major limitation of the survey is its self-selected sample, meaning that

extrapolation to the population of MSM in Europe cannot be assumed. Still, it provides the most comprehensive survey instrument of this population available.

EMIS provides a large number of potential independent variables of interest at the individual level. Using evidence from the literature, we identified 33 individual-level variables that might be associated with sex life-happiness (see Table 1) which we grouped into 12 thematic categories for analysis (Tables 2 and 3). These variables are primarily individual behaviors (such as recency of sexual intercourse or substance use), morbidities (such as HIV diagnosis), lifestyle factors (such as financial coping), and societal experiences (such as experience of homophobia).

Given that we have only 43 observations at the country-level, we focus on including a limited set of country-level variables that theory or empirical evidence suggests might be associated with sexual happiness of MSM (Table 1). The majority of these variables come from the World Bank's Open Data Portal (2023, online) and include GDP per capita (in current USD); health care expenditure (as a percentage of GDP); urbanization rate (percentage of the population); and total population.

Regime type is taken from Freedom Houses' Freedom in the World Country Territories and Status Dataset (Freedom House, 2023, online). This index ranges from a value of 2 (denoting a fully functional liberal democracy) to 14 (fully authoritarian regime). Freedom House classifies countries into groups of 'free' (scores <3), 'partly free' (scores of 3–5), and 'not free' (>5). While the majority of the countries in EMIS are classified as free (31 of 43 countries<sup>3</sup>), eight are classified as partly free (Bosnia and Herzegovina, Moldova, North Macedonia, Serbia, Hungary, Lebanon, and Ukraine), and three are classified as not free (Belarus, the Russian Federation, and Türkiye).

Supplementing this general measure of democratic freedoms and civil liberties, we also include the Varieties of Democracies (V-DEM) LGBTQ Access to Power Index which aims to measure "how the LGBTQ community fares across the world in terms of their [actual] political power" (V-Dem, 2016, online; Coppedge, *et al.*, 2023, online). The index takes the value of 0 (LGBTQ are totally excluded from the political

process) to 4 (LGBTQ enjoy somewhat more political power than heterosexuals).

### Dependent Variable Specification

Our dependent variable is the response to the question: "On a scale of 1 to 10 (where 1 is the most unhappy and 10 is the happiest), how happy are you with your sex life?" This is an ordinal specification of the binary (yes/no) question asked of participants in the first EMIS wave in 2010 (Hickson and Schmidt, 2021, p.35). The use of the word 'happy' in that earlier survey was justified through a randomized survey experiment among British MSM (N=1,297) that compared responses when the word 'happy' was replaced by either 'satisfied' or 'content'. While aggregate differences were small, fewer men indicated 'I'm not sure' when the word was 'happy', perhaps because it avoided the implication that a state of satiety was required for a positive response.

Using the ordinal rather than binary specification of the question has the potential advantage of eliciting a more gradated description of respondents' subjective reality. However, if respondents have different understandings of the scales, a binary response (where respondents who rate their sex life using a score 1-5 are classified as being unsatisfied and those scoring their sex life happiness 6–10 are classified as being satisfied with their sex life) might be more appropriate. Of course, there is no way to verify which of these specifications is, in fact, most appropriate.

However, a binary version of the dependent variable has the added advantage that, in future analyses, it might allow for comparison with the previous wave of EMIS. Given this fact, we began our analysis by using both specifications of the dependent variable and, where there appeared to be no significant differences in results, focused on reporting the analysis using the binary specification in order to enable a potential comparison with the prior wave of EMIS in future work.

### Analytical Strategy

Given our substantive interest in exploring associations between contextual variables and sex life happiness, as well as how contextual variables may be associated with sex life happiness through individual-level independent variables (mediation

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<sup>3</sup> Austria, Belgium, Bulgaria, Croatia, Cyprus, Czechia, Denmark, Germany, Estonia, Finland, France, Greece, Iceland, Ireland, Israel, Italy, Latvia, Lithuania, Luxemburg,

Malta, the Netherlands, Norway, Poland, Portugal, Romania, the Slovak Republic, Slovenia, Spain, Sweden, Switzerland, and the United Kingdom.

analysis), a mixed-effect rather than a fixed-effect model specification is most appropriate.

Furthermore, as post-estimation tests can provide empirical evidence as to whether a mixed-effect model is a better fit with the data than a fixed-effect model (likelihood ratio test), and the proportion of variation at the different levels of analysis (intraclass correlation) can help as gauge the importance of the different levels, we can verify whether our preferred model specification is indeed the most appropriate one empirically.

### Model Specification

We use a mixed effect logistic (or ordered logistic) regression model to identify associations between a respondent's sex life happiness and individual and country-level independent variables of interest. Specifically, we model the following relationship:

$$P(y_{ij} = 1) = \beta_0_j + \beta_1 X_{ij} \dots + \beta_r X_{ij} + \varepsilon_{ij} \quad (1.1a)$$

Or, for ordered logistical specifications:

$$P(y_{ij} \leq v) = \beta_0_j + \beta_1 X_{ij} \dots + \beta_r X_{ij} + \varepsilon_{ij} \quad (1.1b)$$

Where:

$$\beta_0_j = \gamma_{00} + \gamma_{01} X_j + \dots + \gamma_{06} X_j + \varepsilon_{0j} \quad (1.2)$$

And:

$Y_{ij}$  is individual  $i$ 's happiness with their sex life in country  $j$ ;  $\beta_1 X_{ij} \dots + \beta_r X_{ij}$  is the vector of individual-level independent variables of interest;  $v = 1 \dots V - 1$  are the categories of the dependent variable in the ordinal specification of the model;  $\beta_0_j$  is the country-level intercept and is composed of: the grand mean for all countries ( $\gamma_{00}$ ) and  $\gamma_{01} X_j \dots + \gamma_{06} X_j$ , the vector of the six country-level independent variables of interest.

For the exploratory mediation analysis we altered the above expressions to allow for the calculation and disaggregation of the total effect of a contextual variable into two discrete elements: the direct effect of the contextual variable on sex life happiness of a respondent in country  $j$  ( $\gamma_{01} X_j$ ), and the indirect effect via an individual-level variable  $\hat{X}_{ij}(\beta_1 P_{ij})$  on sex life happiness. Formally, we used a simplified version of (1.1a) to capture the three steps of mediation analysis. For notational simplicity we do not model the random

effects (1.2), although we show that part of the country-level intercept is determined by the contextual variable of interest ( $\gamma_{01} X_j$ ) by using  $\beta_{1j}(\gamma_{01} X_j)$  to denote the contribution of this contextual variable and  $\beta_{0j}$  which now includes all the other contextual variables in the model.

Firstly, we established whether the contextual variable is associated with the outcome of interest (sex life happiness) when holding constant for all other variables in the model, that is the variable has a *direct effect*:

$$P(y_{ij} = 1) = \beta_0_j + \beta_{1j}(\gamma_{01} X_j) + \beta_r \theta_{ij} + \varepsilon_{ij} \quad (2.1)$$

Where,  $\beta_{1j}(\gamma_{01} X_j)$  is the component of the random effect part of the model that includes the country-level contextual variable of interest and  $\beta_r \theta_{ij}$  represents the vector of all individual-level independent variable of interest.

Next, it is essential to determine whether there is evidence of an association between the contextual variable of interest and the individual-level variable (potential mediator variable). That is:

$$\hat{X}_{ij} = \beta_0_j + \beta_{1j}(\gamma_{01} X_j) + \beta_2 Z_{ij} + \varepsilon_{ij} \quad (2.2)$$

Where  $\hat{X}_{ij}$  is the predicted value of the potential (mediator) variable—as determined by the contextual variable of interest ( $\gamma_{01} X_j$ ) controlling for all other contextual and individual variables of interest. Thus, this predicted value calculates the *indirect effect* of the contextual variable on sex life happiness via the individual-level independent variable of interest. We can then calculate the total effects of a contextual variable on sex life happiness:

$$P(y_{ij} = 1) = \beta_0_j + \underbrace{\beta_{1j}(\gamma_{01} X_j)}_{\text{Direct effect}} + \underbrace{\hat{X}_{ij}(\beta_2 P_{ij})}_{\text{Indirect effect}} + \beta_3 Z_{ij} + \varepsilon_{ij} \quad (2.3)$$

Where  $\beta_{1j}(\gamma_{01} X_j)$  is the direct effect of the contextual variable,  $\hat{X}_{ij}(\beta_2 P_{ij})$  is the indirect effect of the contextual variable (via the individual-level mediator) on sex life happiness and controls,  $\beta_0_j$  includes the vector of all the other contextual variables of interest, and  $\beta_3 Z_{ij}$  is the vector of all other individual-level variables of interest

## Results

Table 1 provides the descriptive statistics for our independent variables of interest stratified on the binary version of the dependent variable (sex life happiness). The table shows that there is a sufficient number of observations in each stratified sub-category to facilitate our analysis, at least for the pooled dataset. Specifically, when stratified by the dependent variable, there are only four independent variables for which there are fewer than 1,000 observations in any sub-category. In all cases there are more than 350 observations in each sub-category.

Table 2 shows the results of our pooled regression analysis using two different specifications of the dependent variable (binary for Model 2.1 and ordinal for Model 2.2). The first thing to note from Table 2 is that the specification of the dependent variable changed only a few results. For only three independent variables (tobacco use, PrEP use, and born abroad) there is evidence of a difference between Model 2.1 and Model 2.2.

Furthermore, the likelihood ratio tests in Table 2 provide very strong evidence that our mixed-effect model is a better fit with the data than a fixed-effect model. Although, paradoxically, the intraclass correlation suggests that less than 1% of the variation in sex life happiness is due to variation at the country level.

Focusing on the results from Model 1, the variable which has the largest positive association with happiness in one's sex life is recency of sex with a man. There is very strong evidence that respondents who report having had sex with a man in the previous month are 2.68 times (95%CI: 2.56–2.80) more likely to report being satisfied with their sex lives than respondents for whom this was not the case.

Conversely, the variable that has the biggest negative association with happiness with one's sex life is being single. Specifically, there is very strong evidence that being single reduces the likelihood of reporting being satisfied with one's sex life by 40% (or 0.60, 95%CI: 0.58–0.62). Many of the other variables representing sex with men and relationship status have associations with the dependent variable that are consistent with these two main findings. Thus, there is strong evidence of a negative association between having had a non-steady male partner in the previous 12 months and the dependent variable (0.65, 95%CI: 0.61–0.69).

However, there is strong evidence of a positive association between the *number* of non-steady male sex partners in the previous 12 months and happiness, meaning that the likelihood happiness is similar if the respondent did not have any non-steady sex partners in the previous 12 months (reference category odds ratio of 1.00) and a respondent who had at least 4 non-steady sex partners, as each non-steady partner adds a nine percentage point increase in likelihood of sex life happiness (1.09, 95%CI: 1.092–1.094). In other words, a respondent with 4 non-steady partners had an odds ratio of 1.01 (0.65 + 0.36) versus 1.00 for respondents who reported no non-steady sex partners. Mirroring this finding, there very strong evidence of a positive association between having a steady male partner in the previous 12 months and being satisfied (1.81 95%CI: 0.73–1.89), and strong evidence that increasing numbers of steady male partners (reflecting frequency of break-ups) was negatively associated with happiness (0.97 95%CI: 0.95–0.99). In the case of both non-steady and steady sexual encounters there is very strong evidence of a positive association between condomless sex and happiness: 1.01 (95%CI: 1.011–1.013) and 1.06 (95%CI: 1.04–1.08) respectively.

Summarizing findings from each of the other major thematic categories of Model 1 in Table 2, we can observe the following.

*Drug and substance use:* there is no evidence of an association between alcohol consumption and sex life happiness, some evidence of a positive association between poppers use and sex life happiness, strong evidence of a negative association between the number of other drugs used (in general) and sex life happiness, but there is very strong evidence of a positive association between sex life happiness and drug use during sex.

*Sex with women:* there is very strong evidence that both the recency and number of female sexual partners is positively associated with sex life happiness. Given that the majority of the respondents identify as gay, this is surprising and provides a justification of sub-group analysis undertaken in Table 3.

*Payment for sex:* there is strong evidence that receiving payment for sex is positively associated with sex life happiness while, conversely, there is very strong evidence of a negative association if the respondent reports having paid for sex.

**Table 1: Descriptive statistics stratified by happiness with sex life**

	No		Happy with sex life? Yes		Total	
<b>All</b>	41,839	(37.5%)	69,617	(62.5%)	111,456	(100.0%)
<b>Alcohol consumption, 4 w</b>						
No	8,410	(45.0%)	10,269	(55.0%)	18,679	(100.0%)
Yes	33,429	(36.0%)	59,348	(64.0%)	92,777	(100.0%)
<b>Poppers use, 4 w</b>						
No	35,982	(40.8%)	52,171	(59.2%)	88,153	(100.0%)
Yes	5,857	(25.1%)	17,446	(74.9%)	23,303	(100.0%)
<b>Tobacco use, 4 w</b>						
No	24,149	(37.6%)	40,091	(62.4%)	64,240	(100.0%)
Yes	17,690	(37.5%)	29,526	(62.5%)	47,216	(100.0%)
<b>Viagra use, 4 w</b>						
No	38,011	(39.3%)	58,701	(60.7%)	96,712	(100.0%)
Yes	3,828	(26.0%)	10,916	(74.0%)	14,744	(100.0%)
<b>Sex under the influence of drugs, ever</b>						
No	17,368	(39.3%)	26,848	(60.7%)	44,216	(100.0%)
Yes	17,081	(30.7%)	38,634	(69.3%)	55,715	(100.0%)
<b>Sex under the influence of drugs, 4 w</b>						
No	40,183	(38.4%)	64,472	(61.6%)	104,655	(100.0%)
Yes	1,166	(20.6%)	4,496	(79.4%)	5,662	(100.0%)
<b>Sex with a female partner, 4 w</b>						
No	39,828	(38.0%)	65,070	(62.0%)	104,898	(100.0%)
Yes	2,011	(30.7%)	4,547	(69.3%)	6,558	(100.0%)
<b>Sex with a male partner, 4 w</b>						
No	19,022	(64.7%)	10,366	(35.3%)	29,388	(100.0%)
Yes	22,817	(27.8%)	59,251	(72.2%)	82,068	(100.0%)
<b>Sex with a non-steady male partner, 12 m</b>						
No	13,215	(44.4%)	16,528	(55.6%)	29,743	(100.0%)
Yes	28,318	(35.0%)	52,543	(65.0%)	80,861	(100.0%)
<b>Sex with a steady male sex partner, 12 m</b>						
No	28,795	(48.9%)	30,099	(51.1%)	58,894	(100.0%)
Yes	12,930	(24.7%)	39,352	(75.3%)	52,282	(100.0%)
<b>Received payment for sex, ever</b>						
No	34,626	(37.5%)	57,758	(62.5%)	92,384	(100.0%)
Yes	5,181	(32.6%)	10,729	(67.4%)	15,910	(100.0%)
<b>Has paid for sex, ever</b>						
No	32,297	(36.5%)	56,308	(63.5%)	88,605	(100.0%)
Yes	7,492	(38.1%)	12,155	(61.9%)	19,647	(100.0%)
<b>Diagnosed HIV</b>						
No	37,955	(38.1%)	61,552	(61.9%)	99,507	(100.0%)
Yes	3,670	(32.4%)	7,655	(67.6%)	11,325	(100.0%)
<b>Alcohol dependent (CAGE-4)</b>						
No	32,820	(36.4%)	57,229	(63.6%)	90,049	(100.0%)
Yes	8,518	(42.3%)	11,627	(57.7%)	20,145	(100.0%)
<b>I find it easy to say no to sex I don't want</b>						
Not agree	9,583	(47.6%)	10,546	(52.4%)	20,129	(100.0%)
Agree	32,256	(35.3%)	59,071	(64.7%)	91,327	(100.0%)
<b>Sex is always as safe as I want it to be</b>						
Not agree	11,218	(47.0%)	12,645	(53.0%)	23,863	(100.0%)
Agree	30,621	(35.0%)	56,972	(65.0%)	87,593	(100.0%)
<b>Used PrEP, ever</b>						
No	40,716	(38.0%)	66,381	(62.0%)	107,097	(100.0%)
Yes	1,051	(25.1%)	3,142	(74.9%)	4,193	(100.0%)
<b>Age in years</b>						
Less than 20	2,747	(45.2%)	3,329	(54.8%)	6,076	(100.0%)
20–24	5,879	(40.1%)	8,799	(59.9%)	14,678	(100.0%)
25–29	5,974	(36.3%)	10,489	(63.7%)	16,463	(100.0%)
30–34	5,457	(36.4%)	9,537	(63.6%)	14,994	(100.0%)
35–39	5,241	(37.0%)	8,928	(63.0%)	14,169	(100.0%)
40–44	4,569	(37.1%)	7,753	(62.9%)	12,322	(100.0%)
45–49	4,093	(37.0%)	6,961	(63.0%)	11,054	(100.0%)
50–54	3,547	(36.0%)	6,302	(64.0%)	9,849	(100.0%)
55–59	2,209	(36.9%)	3,780	(63.1%)	5,989	(100.0%)
60–64	1,154	(36.5%)	2,004	(63.5%)	3,158	(100.0%)
65+	969	(35.8%)	1,735	(64.2%)	2,704	(100.0%)

**Table 1 (continued): Descriptive statistics stratified by happiness with sex life**

			Happy with sex life?			
	No		No		No	
<b>Relationship status</b>						
Not single	13,206	(25.7%)	38,131	(74.3%)	51,337	(100.0%)
Single	28,633	(47.6%)	31,486	(52.4%)	60,119	(100.0%)
<b>Not working due to medical status</b>						
No	40,883	(37.3%)	68,758	(62.7%)	109,641	(100.0%)
Yes	956	(52.7%)	859	(47.3%)	1,815	(100.0%)
<b>Unemployed</b>						
No	38,904	(36.9%)	66,456	(63.1%)	105,360	(100.0%)
Yes	2,935	(48.1%)	3,161	(51.9%)	6,096	(100.0%)
<b>Financially struggling</b>						
No	32,088	(34.8%)	60,224	(65.2%)	92,312	(100.0%)
Yes	9,577	(51.2%)	9,124	(48.8%)	18,701	(100.0%)
<b>Born abroad</b>						
No	35,906	(37.9%)	58,745	(62.1%)	94,651	(100.0%)
Yes	5,887	(35.3%)	10,795	(64.7%)	16,682	(100.0%)
<b>Settlement size</b>						
Rural area (<10,000 residents)	5,814	(41.9%)	8,058	(58.1%)	13,872	(100.0%)
Urban area (>10,000 residents)	36,025	(36.9%)	61,559	(63.1%)	97,584	(100.0%)
<b>Out to majority of social network</b>						
No	20,439	(45.9%)	24,099	(54.1%)	44,538	(100.0%)
Yes	20,815	(31.7%)	44,769	(68.3%)	65,584	(100.0%)
<b>Identifies as a trans man</b>						
No	41,414	(37.4%)	69,182	(62.6%)	110,596	(100.0%)
Yes	425	(49.4%)	435	(50.6%)	860	(100.0%)
<b>Identifies as Gay</b>						
No	10,424	(42.4%)	14,140	(57.6%)	24,564	(100.0%)
Yes	31,390	(36.2%)	55,426	(63.8%)	86,816	(100.0%)
<b>Identifies as Heterosexual</b>						
No	41,455	(37.5%)	69,177	(62.5%)	110,632	(100.0%)
Yes	359	(48.0%)	389	(52.0%)	748	(100.0%)
<b>Identifies as Bisexual</b>						
No	34,780	(36.9%)	59,412	(63.1%)	94,192	(100.0%)
Yes	7,034	(40.9%)	10,154	(59.1%)	17,188	(100.0%)
<b>Identifies as other sexuality</b>						
No	41,340	(37.5%)	68,956	(62.5%)	110,296	(100.0%)
Yes	474	(43.7%)	610	(56.3%)	1,084	(100.0%)
<b>Does not identify with any sexuality</b>						
Does identify with a category	39,257	(37.1%)	66,579	(62.9%)	105,836	(100.0%)
Does not identify with any category	2,557	(46.1%)	2,987	(53.9%)	5,544	(100.0%)
<b>Numeric variables</b>	<b>Mean</b>	<b>SD</b>	<b>Mean</b>	<b>SD</b>	<b>Mean</b>	<b>SD</b>
Number of other drugs ever used	0.65	(0.72)	0.65	(0.71)	0.65	(0.71)
Number of female sex partners, 12 m	0.16	(0.75)	0.21	(0.93)	0.20	(0.87)
Number of non-steady male partners, 12 m	3.78	(4.25)	5.83	(5.12)	5.06	(4.91)
Number of non-steady male condomless intercourse partners, 12 m	1.10	(2.52)	1.92	(3.61)	1.61	(3.27)
Number of steady male partners, 12 m	0.58	(1.38)	1.14	(1.93)	0.93	(1.76)
Number of steady male condomless intercourse partn., 12 m	0.29	(0.84)	0.63	(1.23)	0.50	(1.11)
Number of STI diagnoses, ever	0.40	(0.71)	0.56	(0.83)	0.50	(0.79)
Type of different homophobic attacks NOT experienced [0–3]	1.65	(1.10)	1.70	(1.08)	1.68	(1.09)
<b>Country-level variables</b>	<b>Mean</b>	<b>SD</b>	<b>Mean</b>	<b>SD</b>	<b>Mean</b>	<b>SD</b>
(log) Country population (millions)	17.26	(1.16)	17.26	(1.10)	17.26	(1.13)
(log) GDP per capita (current USD)	10.30	(0.67)	10.38	(0.60)	10.35	(0.63)
Percent urban population	75.71	(9.43)	76.66	(9.46)	76.30	(9.46)
More authoritarian political system	3.28	(2.89)	2.89	(2.38)	3.04	(2.59)
Health expenditure (% of GDP)	9.21	(2.03)	9.42	(1.88)	9.34	(1.94)
LGBTQ Access to Power Index	2.36	(0.93)	2.46	(0.82)	2.42	(0.86)

Legend: 4 w, past 4 weeks; 12 m, past 12 months; GDP, gross domestic product; PrEP, HIV pre-exposure prophylaxis; SD, standard deviation

**Table 2: Baseline Regression Analysis**

Independent variables	Dependent variable: how happy are you with your sex life?	
	Binary (Model 2.1) [0=unhappy, 1= happy] aOR	Ordinal (Model 2.2) [1=most unhappy, 10=most happy] aOR
<b>Individual behaviors: drug &amp; substance use</b>		
Alcohol consumption, 4 w	1.04 (0.02)	0.98 (0.02)
Tobacco consumption, 4 w	1.02 (0.02)	1.09*** (0.01)
Poppers use, 4 w	1.20*** (0.03)	
Viagra use, 4 w	1.05* (0.03)	1.05** (0.02)
Number of other drugs ever used	0.87*** (0.01)	0.86*** (0.01)
Sex under the influence of drugs, ever	1.25*** (0.02)	1.17*** (0.02)
Sex under the influence of drugs, 4 w	1.21*** (0.05)	1.21*** (0.04)
<b>Individual behaviors: sex with women</b>		
Sex with a female partner, 4 w	1.69*** (0.08)	1.44*** (0.05)
Number of female sex partners, 12 m	1.09*** (0.01)	1.11*** (0.01)
<b>Individual behaviors: sex with non-steady male partners</b>		
Sex with a male partner, 4 w	2.68*** (0.06)	2.71*** (0.05)
Sex with a non-steady male partner, 12 m	0.65*** (0.02)	0.58*** (0.01)
Number of non-steady male partners, 12 m	1.09*** (0.00)	1.07*** (0.00)
Number of non-steady male condomless intercourse partners, 12 m	1.01*** (0.00)	1.02*** (0.00)
<b>Individual behaviors: sex with steady male partners</b>		
Sex with a steady male partner, 12 m	1.81*** (0.04)	1.67*** (0.03)
Number of steady male partners, 12 m	0.97*** (0.01)	0.98*** (0.01)
Number of steady male condomless intercourse partners, 12 m	1.06*** (0.01)	1.07*** (0.01)
<b>Individual behavior: transactional sex</b>		
Received payment for sex, ever	1.08*** (0.03)	1.10*** (0.02)
Has paid for sex, ever	0.79*** (0.02)	0.77*** (0.01)
<b>Individual-level morbidities</b>		
HIV diagnosis	1.00 (0.03)	1.00 (0.02)
Number of other STIs ever diagnosed with	1.04*** (0.01)	1.03*** (0.01)
Alcohol dependency (CAGE-4)	0.79*** (0.02)	0.80*** (0.01)
<b>Individual-level needs, opportunities, &amp; capabilities</b>		
Easy to say no to sex I don't want (agree)	1.61*** (0.03)	1.56*** (0.03)
Sex is always as safe as I want it to be (agree)	1.62*** (0.03)	1.54*** (0.02)
PrEP use, ever	1.12** (0.05)	1.05 (0.03)
<b>Individual-level characteristics: age and relationship status</b>		
Age in years		
<20	Ref.	Ref.
20–24	0.84*** (0.03)	0.83*** (0.03)
25–29	0.76*** (0.03)	0.76*** (0.02)
30–34	0.66*** (0.03)	0.71*** (0.02)
35–39	0.59*** (0.03)	0.66*** (0.02)
40–44	0.58*** (0.03)	0.64*** (0.02)
45–49	0.55*** (0.02)	0.65*** (0.02)
50–54	0.61*** (0.03)	0.73*** (0.03)
55–59	0.62*** (0.03)	0.77*** (0.03)
60–64	0.70*** (0.04)	0.87*** (0.04)
65+	0.77*** (0.05)	0.98 (0.05)
Relationship status: single	0.60*** (0.01)	0.59*** (0.01)
<b>Individual-level demographics: economic status</b>		
Not working due to medical status	0.86** (0.06)	0.85*** (0.05)
Unemployed	0.90*** (0.03)	0.93*** (0.03)
Financially struggling	0.61*** (0.01)	0.66*** (0.01)
<b>Individual-level demographics: geographical status</b>		
Born abroad	0.98 (0.02)	1.04** (0.02)
Urban area (>10,000 residents)	1.10*** (0.03)	1.08*** (0.02)
<b>Individual-level demographics: societal relations</b>		
Homophobic violence, NOT experienced	1.12*** (0.01)	1.13*** (0.01)
Out to a majority of social network	1.43*** (0.03)	1.44*** (0.02)
<b>Individual-level demographics: sexual and gender identity</b>		
<b>Sexual identity</b>		
Gay/homosexual	Ref.	Ref.
Heterosexual	0.96 (0.12)	0.95 (0.10)
Bisexual	1.09*** (0.03)	1.07*** (0.02)
Other sexual identity	1.02 (0.09)	1.04 (0.07)
No sexual identity	0.89*** (0.03)	0.93** (0.03)
<b>Gender identity</b>		
Man	Ref.	Ref.
Trans man	1.07 (0.11)	1.09 (0.09)

**Table 2 (continued): Baseline Regression Analysis**

Independent variables	Dependent variable: how happy are you with your sex life?	
	Binary (Model 2.1) aOR	Binary (Model 2.1) aOR
<b>Country-level variables</b>		
(log) Population in millions	1.05* (0.03)	1.00 (0.02)
(log) GDP per capita in current USD	0.99 (0.07)	0.94 (0.05)
Percent urban population	1.00 (0.00)	1.00 (0.00)
Regime type: increasingly authoritarian political system	0.94*** (0.02)	0.95*** (0.02)
Health expenditure, percent of GDP	0.99 (0.03)	0.99 (0.02)
LGBTQ Access to Power Index: increased political voice	0.98 (0.06)	0.99 (0.05)
<b>Observations</b>	88,633	88,633
<b>Number of groups</b>	41	41
<b>Intraclass correlation</b>	0.01	0.01
<b>Likelihood ratio test</b>	<0.000	<0.000
<b>AIC</b>	96,605.62	354,171.4
<b>BIC</b>	97,122.19	354,763.1

Legend: 4 w, past 4 weeks; 12 m, past 12 months; GDP, gross domestic product; PrEP, HIV pre-exposure prophylaxis; aOR, adjusted Odds Ratio; Standard errors in parentheses; \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

*Morbidities:* there is no evidence that living with diagnosed HIV is associated with sex life happiness, possibly due to the fact that most countries in the sample provide adequate health care services for people with HIV. Interestingly, there is very strong evidence of a positive association between past STI diagnosis and the dependent variable. Conversely, there is strong evidence of a negative association between alcohol dependency and sex life happiness.

*Needs, opportunities, and capabilities:* there is very strong evidence that respondents who feel they can say ‘no’ to sex they do not want and whose sex life is as safe as they want it to be, are more likely to report being satisfied with their sex life. Furthermore, there is strong evidence that PrEP use is positively associated with sex life happiness.

*Age:* there is generally strong evidence of an association between age and sex life happiness. However, the relationship is not linear. Compared to those under 20, all other age categories are likely to have lower levels of happiness with their sex life. However, this negative association becomes increasingly pronounced until age 45–49, after which the gap in happiness compared to those below the age of 20 narrows, but remains negative.

*Economic status:* there is strong evidence of a negative association between being on medical leave and happiness with one’s sex life. There is also very strong evidence that both being unemployed and financially struggling are negatively associated with sex life happiness.

*Geographical status:* There is strong evidence that having been born in a country other than the one a respondent currently resides in is positively associated with sex life happiness. There is also very strong evidence of a positive association between the respondent living in an urban area and sex life happiness.

*Societal relations:* there is very strong evidence that both the absence of having experienced different types of homophobic behavior and being out to the majority of one’s social network are positively associated with sex life happiness.

*Sexual identity:* there is no evidence that those who self-identity as heterosexual or a sexuality other than gay or bisexual are more or less satisfied with their sex lives vis-à-vis the reference category (those who identify as gay). Conversely, there is very strong evidence of a positive association between those respondents who identify as bisexual or with no sexuality category and sex life happiness vis-à-vis the reference category.

*Country-level variables:* there is no evidence of an association between any of the country-level variables and sex life happiness with the exception of regime type and the log of a country’s population. In the case of regime type there is strong evidence that more authoritarian (less liberal democratic) political systems are associated with lower levels of sex life happiness. In the case of population size, there is some evidence that more respondents in countries with a larger population report happiness with their sex life.

**Table 3: Subgroup Analysis by Sexual Identity**

Sample Independent variables	Dependent variable: how happy are you with your sex life? Binary [0=unhappy, 1= happy]					
	Pooled aOR (1)	Gay aOR (2)	Bisexual aOR (3)	Heterosexual aOR (4)	Other sex. id. aOR (5)	No sex. id. aOR (6)
<b>Individual behaviors: drug &amp; substance use</b>						
Alcohol consumption, 4 w	1.04* (0.02)	1.04 (0.03)	0.96 (0.05)	0.66 (0.27)	1.33 (0.34)	1.23** (0.11)
Tobacco consumption, 4 w	1.02 (0.02)	1.00 (0.02)	1.06 (0.05)	1.50 (0.50)	1.01 (0.20)	1.10 (0.09)
Poppers use, 4 w	1.19*** (0.03)	1.21*** (0.03)	1.05 (0.07)	1.71 (0.98)	1.40 (0.44)	1.13 (0.14)
Viagra use, 4 w	1.05* (0.03)	1.07** (0.03)	1.04 (0.07)	1.50 (0.78)	0.55 (0.21)	0.74** (0.10)
Number of other drugs ever used	0.87*** (0.01)	0.87*** (0.01)	0.88*** (0.03)	0.55** (0.14)	1.00 (0.14)	0.89** (0.05)
Sex under the influence of drugs, ever	1.25*** (0.02)	1.23*** (0.03)	1.33*** (0.06)	1.43 (0.51)	1.16 (0.26)	1.36*** (0.11)
Sex under the influence of drugs, 4 w	1.21*** (0.05)	1.23*** (0.06)	1.11 (0.16)	0.08 (0.21)	1.80 (1.02)	0.89 (0.20)
<b>Individual behaviors: sex with women</b>						
Sex with a female partner, 4 w	1.75*** (0.08)	0.80* (0.11)	1.83*** (0.11)	2.26** (0.92)	1.69 (0.63)	2.52*** (0.47)
Number of female sex partners, 12 m	1.10*** (0.01)	1.14*** (0.05)	1.07*** (0.02)	1.16* (0.10)	1.36** (0.16)	1.05 (0.04)
<b>Individual behaviors: sex with non-steady male partners</b>						
Sex with a male partner, 4 w	2.67*** (0.06)	2.95*** (0.07)	1.91*** (0.09)	3.63*** (1.27)	2.70*** (0.61)	2.70*** (0.25)
Sex with a non-steady male partner, 12 m	0.66*** (0.02)	0.63*** (0.02)	0.75*** (0.05)	0.49* (0.21)	1.31 (0.36)	0.63*** (0.07)
Number of non-steady male partners, 12 m	1.09*** (0.00)	1.09*** (0.00)	1.09*** (0.01)	1.00 (0.06)	1.07** (0.03)	1.09*** (0.01)
Number of non-steady male condomless intercourse partners, 12 m	1.01*** (0.00)	1.02*** (0.00)	1.01 (0.01)	1.06 (0.10)	1.03 (0.05)	0.99 (0.02)
<b>Individual behaviors: sex with steady male partners</b>						
Sex with a steady male partner, 12 m	1.80*** (0.04)	1.75*** (0.05)	2.23*** (0.15)	1.54 (0.93)	2.12*** (0.59)	1.67*** (0.19)
Number of steady male partners, 12 m	0.97*** (0.01)	0.98*** (0.01)	0.94*** (0.02)	1.03 (0.15)	0.81* (0.09)	1.01 (0.04)
Number of steady male condomless intercourse partners, 12 m	1.06*** (0.01)	1.08*** (0.01)	1.00 (0.03)	0.52* (0.18)	1.22 (0.18)	1.00 (0.06)
<b>Individual behavior: transactional sex</b>						
Received payment for sex, ever	1.08*** (0.03)	1.06** (0.03)	1.05 (0.07)	3.91*** (1.89)	1.33 (0.32)	1.30** (0.14)
Has paid for sex, ever	0.79*** (0.02)	0.78*** (0.02)	0.82*** (0.05)	0.77 (0.32)	0.48** (0.15)	0.79** (0.08)
<b>Individual-level morbidities</b>						
HIV diagnosis	1.00 (0.03)	0.99 (0.03)	1.10 (0.12)	3.01 (2.36)	1.24 (0.53)	1.00 (0.15)
Number of other STIs ever diagnosed	1.04*** (0.01)	1.03*** (0.01)	1.04 (0.04)	0.83 (0.27)	0.94 (0.13)	1.11* (0.07)
Alcohol dependency (CAGE-4)	0.79*** (0.02)	0.79*** (0.02)	0.82*** (0.05)	1.64 (0.67)	0.78 (0.19)	0.83* (0.08)
<b>Individual-level needs, opportunities, &amp; capabilities</b>						
Easy to say no to sex I don't want (agree)	1.61*** (0.03)	1.60*** (0.04)	1.52*** (0.08)	2.96** (1.40)	1.80*** (0.37)	1.83*** (0.17)
Sex is always as safe as I want it to be (agree)	1.62*** (0.03)	1.64*** (0.04)	1.56*** (0.08)	1.73 (0.69)	1.73** (0.39)	1.45*** (0.13)
PrEP use, ever	1.12** (0.05)	1.12** (0.06)	1.04 (0.16)	1.15 (1.40)	0.87 (0.46)	1.31 (0.36)
<b>Individual-level characteristics: age and relationship status</b>						
Age in years						
<20	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
20–24	0.83*** (0.03)	0.80*** (0.04)	0.91 (0.08)	1.23 (1.07)	1.00 (0.36)	0.90 (0.14)
25–29	0.76*** (0.03)	0.72*** (0.03)	0.93 (0.09)	1.21 (1.09)	1.05 (0.40)	0.65*** (0.11)
30–34	0.66*** (0.03)	0.62*** (0.03)	0.83* (0.08)	1.35 (1.23)	0.70 (0.29)	0.71** (0.12)
35–39	0.59*** (0.03)	0.56*** (0.03)	0.66*** (0.07)	0.78 (0.71)	0.69 (0.29)	0.76 (0.13)
40–44	0.57*** (0.03)	0.55*** (0.03)	0.59*** (0.06)	0.96 (0.89)	1.04 (0.49)	0.78 (0.14)
45–49	0.55*** (0.02)	0.51*** (0.03)	0.69*** (0.07)	1.36 (1.27)	0.51 (0.25)	0.60*** (0.12)
50–54	0.60*** (0.03)	0.57*** (0.03)	0.65*** (0.07)	1.17 (1.19)	1.35 (0.74)	0.91 (0.18)
55–59	0.62*** (0.03)	0.58*** (0.04)	0.69*** (0.08)	0.55 (0.56)	0.74 (0.52)	0.98 (0.23)
60–64	0.70*** (0.04)	0.69*** (0.05)	0.71** (0.10)	0.42 (0.52)	0.33 (0.39)	1.06 (0.30)
65+	0.77*** (0.05)	0.80*** (0.07)	0.69*** (0.10)	3.94 (5.57)	5.72 (6.12)	0.77 (0.26)
Relationship status: single	0.60*** (0.01)	0.60*** (0.01)	0.69*** (0.03)	0.43** (0.16)	0.39*** (0.09)	0.54*** (0.05)
<b>Individual-level demographics: economic status</b>						
Not working due to medical status	0.86** (0.06)	0.84**	0.96 (0.18)	37.64** (53.40)	0.46 (0.26)	1.07 (0.32)
Unemployed	0.90*** (0.03)	0.87*** (0.03)	1.09	2.15	1.45	0.82
Financially struggling	0.61*** (0.01)	0.62*** (0.02)	0.57*** (0.03)	0.55 (0.24)	0.54*** (0.11)	0.61*** (0.06)
<b>Individual-level demographics: geographical status</b>						
Born abroad	0.98 (0.02)	0.98 (0.02)	1.02 (0.06)	0.82 (0.36)	0.72 (0.18)	0.88 (0.09)
Urban area (>10,000 residents)	1.10*** (0.03)	1.10*** (0.03)	1.15** (0.07)	1.14 (0.48)	1.02 (0.30)	0.99 (0.11)
<b>Individual-level demographics: societal relations</b>						
Homophobic violence, NOT experienced	1.12*** (0.01)	1.11*** (0.01)	1.15*** (0.03)	1.21 (0.22)	1.21** (0.12)	1.14*** (0.04)
Out to a majority of social network	1.42*** (0.03)	1.41*** (0.03)	1.55*** (0.09)	1.27 (0.75)	2.16*** (0.46)	1.39*** (0.11)

**Table 3 (continued): Subgroup Analysis by Sexual Identity**

Sample Independent variables	Dependent variable: how happy are you with your sex life? Binary [0=unhappy, 1= happy]					
	Pooled aOR (1)	Sample Independent	Pooled aOR (1)	Sample Independent	Pooled aOR (1)	Sample Independent
<b>Individual-level demographics: gender identity</b>						
<b>Gender identity</b>						
Man	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
Trans man	1.07 (0.11)	0.93 (0.15)	1.30 (0.23)	0.87 (1.32)	0.96 (0.30)	1.00 (0.29)
<b>Country-level characteristics</b>						
(log) Population in millions	1.05* (0.03)	1.06* (0.03)	1.01 (0.05)	1.03 (0.15)	1.07 (0.10)	1.11** (0.06)
(log) GDP per capita in current USD	1.00 (0.07)	1.03 (0.07)	0.97 (0.10)	1.20 (0.49)	0.71 (0.23)	0.83 (0.10)
Percent urban population	1.00 (0.00)	1.01 (0.00)	1.00 (0.01)	0.99 (0.02)	1.01 (0.01)	1.01** (0.01)
Regime type: authoritarian	0.94*** (0.02)	0.95** (0.02)	0.93** (0.03)	0.81* (0.10)	0.88 (0.07)	0.87*** (0.03)
Health expenditure, percent of GDP	0.99 (0.03)	0.98 (0.03)	0.99 (0.04)	0.79 (0.12)	1.02 (0.10)	0.99 (0.05)
LGBTQ Access to Power Index	0.98 (0.06)	1.00 (0.07)	0.96 (0.09)	0.77 (0.27)	0.88 (0.22)	0.80** (0.09)
<b>Observations</b>	88,667	71,026	12,458	324	743	4,082
<b>Number of groups</b>	41	41	41	35	38	41
<b>Intraclass correlation</b>	0.01	0.01	0.02	<0.000	0.01	0.01
<b>Likelihood ratio test</b>	<0.000	<0.000	<0.000	1.000	0.378	0.004
<b>AIC</b>	96,660.86	76,050.14	14,483.94	439.34	872.05	4,783.64
<b>BIC</b>	97,139.88	76,517.85	14,862.88	632.16	1,107.19	5,105.67

*Legend:* 4 w, past 4 weeks; 12 m, past 12 months; GDP, gross domestic product; PrEP, HIV pre-exposure prophylaxis; aOR, adjusted Odds Ratio; Standard errors in parentheses; \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Table 3 reproduces Model 2.1 but disaggregates by, rather than controlling for, self-identification as gay (Model 3.2), bisexual (Model 3.3), heterosexual (Model 3.4), another sexuality identity (Model 3.5) and no sexuality identity (Model 3.6)- with Model 3.1 showing the pooled results without controlling for sexuality-identity. The distribution of sexuality-identity is heavily skewed toward those who identify as gay (80% of respondents), followed by bisexuals (14%), and then those who identify with the no sexuality group (5%). Only 743 respondents (0.8%) identify as another sexuality, and only 324 respondents (0.2%) identify as heterosexual. Given that small number of respondents for Model 3.4 (heterosexual) and Model 3.5 (another sexuality) we include the results in Table 3 for completeness, but the results for these models need to be interpreted cautiously, especially for independent variables which do not have many respondents in some of their sub-categories (such as on medical leave or using poppers, see Table 1). Therefore, we focus our analysis primarily on comparison of Model 3.1, and Models 3.2 (gay), Model 3.3 (bisexuals) and Model 3.6 (no sexuality-identity).

The disaggregated analysis of Table 3 can help partially explain one of the unexpected results from Table 2, namely the very strong evidence of a positive association between sex life happiness and the recency and number of female sex partners in a dataset composed predominately of individuals who identify as gay. As Model 3.2 of Table 3 indicates, there is some evidence that the *recency* of sex with a female partner is negatively

associated with happiness with one’s sex life for those who identify as gay, with the overall positive association in the pooled result (Model 3.1) being driven by very strong evidence of as positive association between recency of sex with a female partner and overall sex life happiness amongst those who identify as bisexual and no sexuality-identity, and strong evidence of a positive association amongst those who identify as heterosexual. Still, there remains very strong evidence that the *number* of female sex partners is positively associated with one’s sex happiness even amongst the sub-sample who identify as gay.

Unsurprisingly, given the skew of the data towards those who identify as gay, some of the results in the pooled model (Model 3.1) are purely driven by the results of this subgroup. Specifically, the very strong evidence of a positive association with sex life happiness and poppers use, sex under the influence of drugs, condomless sex with both steady and non-steady male partners, the number of past STI diagnosis, and the strong evidence of a positive association with PrEP use, is driven by the results for respondents who self-identified as gay. Conversely, some evidence of a positive association between the dependent variable and alcohol use is driven by a positive association in the sub-group of respondents who don’t identify with any sexual identity category (Model 3.6).

Finally, Table 4 explores the potential non-linear dynamics that may exist between our contextual and individual-level independent variables of interest. As already noted, from the intraclass

correlation in Table 2, the majority of variance is found at the individual versus the country level, although the likelihood ratio test also provides very strong evidence that a mixed-effect model is a better fit than a fixed-effect one. Another advantage of a mixed-effect model is that it may be the case that some of the country-level variables may be indirectly associated with the dependent variable via specific individual-level variables. As we can only include country-level variables in a mixed-effect versus a fixed-effect model, we can use this fact to explore whether contextual variables have both a direct effect on the dependent variable and an indirect effect, because, for example, they may incentivize different actions by individuals.

One well theorized association is that more authoritarian (less liberal democratic) regimes are associated with fewer rights for LGBTQ people, a fact confirmed empirically by Lamontagne et al (2018) who found a strong negative association between homophobia and civil liberties. We have already seen that the existence of political systems with fewer civil liberties (including for LGBTQ rights as measured by our Freedom House variable on political regime) is *directly* negatively associated with sex life happiness (Tables 2 and Table 3). Theoretically, in more socially conserva-

tive authoritarian systems – such as Russia or Türkiye in our sample, this negative association could plausibly reduce happiness in one’s sex life *directly* because of increased social stigma or even the risks of legal repercussions and the feelings of guilt and fear such a legal context creates. Furthermore, in such contexts, fewer LGBTQ individuals may be out to the majority of their social network because they fear legal or societal discrimination, so living in a more authoritarian regime could *indirectly* reduce the likelihood of being ‘out’ to the majority of one’s social network (indirect effect). At this point the causality of this association is not something we can interrogate further.

As Table 4 shows, when we use mediation analysis to explore the total effect of living in more authoritarian regimes on sex life happiness, this effect is composed of two different pathways: a direct negative association between greater authoritarianism and reduced sex life happiness (already visible from Tables 2 and 3), but also an indirect effect through the reduced likelihood of

being out in more authoritarian contexts. Thus, we find that the total effect (direct effect plus indirect effect) of regime type on the dependent variable is much larger than just the direct effect.

**Table 4: Mediation Analysis**

Sample Effect	Dependent variable: how happy are you with your sex life? Binary [0=unhappy, 1= happy]					
	Direct	Pooled Sample Indirect via 'out'	Total	Direct	Gay Men Sample Indirect via 'out'	Total
Independent variables	aOR (1)			aOR (2)		
Regime type	0.95*** (0.02)	0.96*** (0.01)	0.91*** (0.03)	0.94*** (0.02)	0.96*** (0.01)	0.91*** (0.03)
All other independent variables from replicated models (2.1 and 3.2)		Yes			Yes	
<b>Observations</b>		88,633			71,026	
<b>Number of groups</b>		41			41	
<b>AIC</b>		184,971.20			148,464.30	
<b>BIC</b>		185,996.30			149,391.80	

Legend: aOR, adjusted Odds Ratio; Standard errors in parentheses; \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

## Discussion and Policy Implications

We sought to examine the association between individual and contextual factors and sex life happiness among MSM in Europe. Our unique cross-country dataset means that we were able to bring together the insights of both individual-level and ecological studies. Our initial findings suggest that most of the variation associated with sex life happiness is found at the individual level, with recency of sex with a man (positively) and not being in a relationship (negatively) having the

biggest associations with sex life happiness. However, we also find that living in more authoritarian regimes is associated with less sex-life happiness. Furthermore, our exploratory mediation analysis suggests that contextual variables may be working through individual variables, as authoritarian regimes are also associated with a reduced likelihood of being out to one’s social network – which is also negatively associated with sex-life happiness. In fact,

approximately 40% of the association between more authoritarian regimes and lower levels of happiness with one's sex life happen indirectly via the reduced probability of being out. While this is only an indicative result, it provides a strong justification for the use of mixed-effect modeling and future research exploring the potentially complex links between contextual and individual-level variables that could be associated with the dependent variable. A simple regression analysis that does not consider this mediating dynamic significantly underestimates (only quantifies approximately 60%) the impact of political context on sex life happiness.

Our results are important because, when trying to understand individual motivations, and possibly designing successful public health policies to incentivize particular behaviors, it is essential to be able to quantify not just the potential costs of an action or behavior, but also the potential benefits (as measured by sexual happiness) with which given behaviors may be associated. Our exploratory analysis shows that a wide variety of variables are associated with self-reported sex happiness in the self-selecting group of respondents. While we cannot ascertain causality and the generalizability of our findings, the associations we find are a useful basis for further research and some are clearly consistent with other findings in the literature.

The fact that there are clusters of related variables that all seem to be consistently associated with sex happiness is one of our most important findings. Variables that capture dimensions of singleness (currently being single or more frequent dissolution of relationships) have some of the biggest negative associations with self-reported sex happiness, a finding that is consistent with a much larger literature linking loneliness and a lack of social bonds with a variety of negative health outcomes (Park et al, 2020). Conversely, the very strong association of frequency and recency of sexual contact is an intuitive finding, although the fact that the number of sexual encounters with women is positively associated with sexual happiness, even among the sub-group of participants who identify as gay, merits further investigation.

Our findings may also help explain some of the recent evolutions in sexual behaviors among MSM. The finding that, for gay-identified men, but not other sexuality identities, sex under the influence of drugs is associated with increased happiness with one's sex life is consistent with the

rise of chemsex amongst gay men (Borne et al, 2015). Furthermore, the fact that, for gay-identified men, condomless sex with both steady and non-steady partners is associated with increased sexual pleasure is consistent with literature that has long suggested that increased sexual pleasure and intimacy may be driving this behavior despite the fact that, from a health cost minimizing perspective, this is not optimal (Rhodes and Cusick, 2000). Of course, given that the analysis is focused mostly on high-income countries, in which there are fewer AIDS-related deaths, our results may not be applicable in other contexts where this is not the case. That HIV diagnosis is not associated with sexual happiness may well be conditional on this fact. Further research exploring variation on the socio-economic associates of sex life happiness between countries of different income groups would be useful.

Methodologically, our approach of using a mixed-effect model allows us to begin to explore the complex interplay between contextual country-level and individual-level variables. While the likelihood ratio established that a mixed-effect model provides a better fit to the data than a fixed-effect model, most of the variation in our model is at the individual level. Furthermore, only one of our contextual variables, regime type, appears to be directly associated with our independent variable of interest. However, the strength of the mixed-effect model is that it allows us to explore how individual and contextual variables may be linked. Thus, exploring an intuitive hypothesis in which contextual variables, like regime type, may work through behavioral change, such as the likelihood of coming out to friends and family, allows us to establish that a large proportion of the variation in sexual happiness due to regime change may be working indirectly, through individual-level behavioral change – something which would not have been possible if we used a fixed-effect model. Thus, our work provides a baseline approach for more sophisticated and theory-driven structural equation modeling that could explore the complex ways in which contextual and individual-level variables are associated with changes in sexual happiness.

Limitations of our study include the self-reported data, the brief measures and the non-probability, opportunistic sample. While sexual happiness, being an aspect of subjectivity, can only be self-reported, other biological and behavioral variables (such as HIV status and numbers of sexual partners) may also be subject to reporting bias. As

a self-selecting sample focused mainly on high-income liberal democracies, issues of external validity remain a concern – namely if our findings will be applicable to the general MSM populations of these countries, and whether our results are generalizable to developing countries. However, it is worth noting that a comparison of community-recruited opportunistic samples of MSM with a representative sample found them to be similar when considering those who had sex with men only, but less so for those who had sex with both men and women (Prah *et al.*, 2016).

In summary, while our exploratory analysis is limited by the fact that we cannot establish

causality, individual self-selection makes generalizability difficult, and the scope of the survey limits us to mostly high-income countries, it can still provide valuable insights. The patterns of association we identify are consistent with pre-existing literature linking relationship status with sexual happiness and can help make sense of some existing trends in the emerging behaviors and habits of MSM (such as the rise of Chemsex). Finally, our methodological approach provides a baseline model for further, more complex analysis, to explore the links between individual and contextual variables.

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**Europe:** PlanetRomeo, European AIDS Treatment Group (EATG), European Centre for Disease Prevention and Control (ECDC), European Monitoring Centre for Drugs & Drug Addiction (EMCDDA), European Commission (DG SANTE). **AT:** Aids Hilfe Wien, Dr Frank M. Amort. **BA:** lgbti.ba, Masha Durkalić. **BE:** SENSOA, exaequo, Observatoire du SIDA et des sexualités, Sciensano. **BG:** HUGE, GLAS Foundation, Dr Emilia Naseva, Petar Tsintsarski. **BY:** Vstrecha. **CH:** Swiss AIDS Federation, Cantonal Hospital St. Gallen, Centre Hospitalier Universitaire Vaudois, University Hospital Zurich, Swiss Federal Office of Public Health. **CY:** AIDS Solidarity Movement. **CZ:** AIDS pomoc, National Institute of Public Health, Tereza Zvolška, Dr Michal Pitoňák. **DE:** Deutsche Aidshilfe, Robert Koch Institute, BZgA, Dr Michael Bochow, Dr Richard Lemke. **DK:** AIDS-Fondet, Statens Serum Institut, François Pinchon, Jakob Haff. **EE:** Eesti LGBT, VEK LGBT, Estonia National Institute for Health Development, Dr Kristi Rüütel. **ES:** Stop Sida, CEEISCAT, Ministerio de Sanidad. **FI:** Positiiviset, Hivpoint, SeksiPertti, Trasek, National Institute for Health and Welfare. **FR:** AIDES, Coalition PLUS, SexoSafe, Santé Publique France, INSERM. **GR:** Ath Checkpoint, Thess Checkpoint; Positive Voice. **HR:** Iskorak, gay.hr, Zoran Dominković, Vjeko Vacek. **HU:** Háttér Society, Tamás Bereczky. **IE:** Gay Health Network, Man2Man, HIV Ireland, Outhouse, GOSHH, Sexual Health Centre Cork, AIDSWEST, Gay Community News, Health Service Executive, Gay Men's Health Service, Sexual Health and Crisis Pregnancy Programme, Health Protection Surveillance Centre. **IL:** Israel AIDS Task Force, Israel Ministry of Health, Dr Zohar Mor. **IS:** Samtökin78. **IT:** Arcigay, Fondazione LILA Milano ONLUS, University of Verona, Dr Raffaele Lelleri. **LB:** SIDC, Dr Ismaël Maatouk. **LT:** demetra, LGL, Gayline. **LV:** Testpunkts, Baltic HIV Association, Dr Antons Mozalevskis, Indra Linina. **MD:** GENDERDOC-M. **MK:** Subversive Front, Dr Kristefer Stojanovski. **MT:** Malta LGBTIQ Rights Movement, Allied Rainbow Communities, Infectious Disease Prevention and Control Unit, Silvan Agius, Russel Sammut. **NL:** Results in Health, Maastricht University, Amsterdam Pink Panel, Soa Aids Nederland, Rutgers, DrWim Vanden Berghe, Marije Veenstra. **NO:** Helseutvalget, Norwegian Directorate of Health, Folkehelseinstituttet, Dr Rigmor C. Berg. **PL:** Spoleczny Komitet ds AIDS, Kampania Przeciw Homofobii, Lambda Warszawa, Dr Lukasz Henszel. **PT:** GAT Portugal, CheckpointLX, Associação ABRAÇO, rede exaequo, SexED, dezanove, ILGA Portugal, Trombeta Bath, ISPUP. **RO:** Association “Eu sunt! Tu?”, PSI Romania, ARAS Romania, Tudor Kovacs. **RS:** Association Duga, Association Red Line, Omladina JAZAS-a Novi Sad, Institute of Public Health of Serbia, Sladjana Baros, Dr Marija Pantelic. **RU:** The Charity Foundation For Support of Social Initiatives and Public Health/LaSky Project. **SE:** RFSL, University of Gothenburg, Folkhälsomyndigheten. **SI:** ŠKUC, Legebitra, LJUDMILA. **SK:** PRIDE Košice, Light-House Slovakia, Slovak Medical University, Public Health Authority of the Slovak Republic, Dr Zuzana Klocháňová. **TR:** Pozitif Yaşam, SamiS. Yazıcılaroğlu. **UA:** Alliance for Public Health, alliance.global, msmua.org, Oleksii Shestakovskiy. **UK:** Terrence Higgins Trust, NAM, PrEPster, Antidote, Horizon Drugs and Alcohol Support, LGBT Foundation, Yorkshire MESMAC, MESMAC Newcastle, Derbyshire LGBT+, Trade Sexual Health, London Friend, GMFA, Spectra, International HIV Partnerships, International Planned Parenthood Federation, Bristol University, University College London, Sigma Research, Raul Soriano. **Other:** Dr John Pachankis, Dr Mark Hatzenbühler, Dr Valeria Stuardo Ávila, Dr. Michael Ross.

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### Conflict of Interest

The authors declare no conflict of interest.

### Author contribution

Author contribution: Conceptualization: [Alexander Hamilton, Ford Hickson]; Data Curation [Ford Hickson, Axel J Schmidt] Methodology: [Alexander Hamilton, Ford Hickson, Axel J Schmidt]; Formal analysis and investigation: [Alexander Hamilton], Writing – original draft preparation: [Alexander Hamilton]; Writing – review and editing: [Ford Hickson, Axel J Schmidt], Funding acquisition: [Ford Hickson, Axel J Schmidt], Supervision: [Ford Hickson, Axel J Schmidt]

### Institutional views

The views and opinions expressed are the authors' own and do not necessarily reflect the views of the FCDO, LSHTM, or the World Bank.

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