Original Research Article

Longitudinal impact of stressful life events on HIV-related risk and psychosocial problems among MSM in Chennai and Mumbai, India

William Lodge II[1] , Katie Biello[1,2,3], Beena Thomas[4], Shruta Rawat[5], Dicky Baruah[5], Alpana Dange[5], Vivek Anand[5], Soumya Swaminathan[4], Senthil Kumar[4], Vinoth Balu[4], Sunil Menon[6], Conall O'Cleirigh[3,7,8], Kenneth H Mayer[3,8], Steven A Safren[3,9] and Matthew J Mimiaga[3,10,11,12]

Abstract

Background: Studies show that stressful life events (SLE) (e.g., discrimination, financial problems) can lead to psychosocial problems and exacerbate condomless anal sex (CAS) without protection via pre-exposure prophylaxis (PrEP) among men who have sex with men. However, few studies have examined this relationship among men who have sex with men in India, and none have examined this longitudinally.

Methods: As a part of an HIV-prevention intervention, 608 MSM from Chennai and Mumbai, India, completed behavioral surveys at baseline, 4, 8, and 12 months. We used longitudinal generalized estimating equations (GEE) modeling to examine the relationship between SLE and its severity and subsequent psychosocial problems, CAS, and history of diagnosed sexually transmitted infection (STI). All models are adjusted for age, sexual identity, intervention arm, human immunodeficiency virus status, and recruitment city.

Results: The number of SLE and their corresponding perceived impact score remained consistent at each time point. In multivariable GEE models, the number of SLE was predictive of CAS, depression, and harmful drinking. Similarly, the ratio of the impact of SLE was predictive of CAS, depression, and diagnosed STI. However, harmful drinking was not predictive in this model.

Conclusions: These findings provide evidence that can inform future interventions, which can be used to enhance self-acceptance, coping skills, and other forms of resiliency.

[1] Department of Behavioral and Social Health Sciences, Brown University School of Public Health, Providence, RI, USA
[2] Department of Epidemiology, Brown University School of Public Health, Providence, RI, USA
[3] The Fenway Institute, Fenway Health, Boston, MA, USA
[4] National Institute for Research in Tuberculosis (NIRT), Chennai, India
[5] The Humsafar Trust, Mumbai, India
[6] Sahodaran, Chennai, India
[7] Department of Psychiatry, Massachusetts General Hospital, Boston, MA, USA
[8] Harvard Medical School, Boston, MA, USA
[9] Department of Psychology, Center for HIV and Research in Mental Health (CHARM), University of Miami, Coral Gables, FL, USA
[10] UCLA Center for LGBTQ+ Advocacy, Research & Health, Los Angeles, CA, USA
[11] Department of Epidemiology, UCLA Fielding School of Public Health, Los Angeles, CA, USA
[12] Department of Psychiatry & Biobehavioral Sciences, UCLA David Geffen School of Medicine, Los Angeles, CA, USA

Corresponding author:
William Lodge II, Department of Behavioral and Social Health Sciences, Brown University School of Public Health, 121 S Main St, Providence, RI 02903, USA.
Email: william_lodge@brown.edu

Introduction

Sexual minority populations experience significantly poorer mental health than their heterosexual counterparts.[1] In India, studies have found high rates of depression, suicidal ideation, and anxiety disorders among men who have sex with men (MSM) that contribute to condomless anal sex without protection via pre-exposure prophylaxis (PrEP) and negative psychosocial factors.[2–4] The relationship between mental health and condomless anal sex and sexually transmitted infection (STI) among MSM may be critical to public health because India has approximately 2.1 million people living with HIV, the third-largest in the world. MSM are among the key populations disproportionately affected, with an HIV prevalence of 3% compared to 0.2% in the general population.[5–8] However, HIV prevalence varies greatly between areas. For example, in the states the cities examined in this study, HIV prevalence is as high as 2.4% of MSM in Tamil Nadu, and 9.9% in Maharashtra are estimated to be living with HIV.[9]

In 2018, consensual same-sex sexual relationships were decriminalized between consenting adults. The decision overturned Section 377 of the Indian Penal Code, a British pre-colonial era anti-sodomy law that resulted in a maximum jail sentence of 10 years and was a non-bailable offense.[10] Although Section 377 was turned down, MSM and other sexual minorities continue to be stigmatized and experience discrimination. This results in limitations in accessing HIV-related services, contributing to poor psychosocial and physical health outcomes. Many MSM in India face unique stressful life events, which contribute to poor mental health outcomes, such as the pressure of marriage, fear of having one's sexual orientation known to others, and stigma.[3,11–13] It is important to note that these stressful life events vary among MSM based on being recognized as preferring same-sex partners and/or being perceived as effeminate, socioeconomic class, and social support system. Among these stressful life events, MSM and other sexual and gender minorities in India are disproportionately impacted by discrimination and harassment at the social, legal, and health system levels.[14–19]

Given the multiple stressors MSM experience and its association with condomless anal sex, STI diagnosis and mental health problems, few studies have examined individual stressors and the reported impact of these stressors on their lives using repeated measures in longitudinal data. The present study examines the predictive relationship between stressful life events, their severity, and subsequent psychosocial problems (e.g., depression, heavy alcohol use) and condomless anal sex and STI diagnosis. A greater understanding of the level of impact on specific stressful life events among MSM in India and its association with condomless anal sex and psychosocial factors is necessary for developing targeted and effective behavioral interventions that mediate these specific stressful life events.

Methods

Participants and procedures

The longitudinal data used for this analysis are derived from a randomized controlled efficacy trial of self-acceptance-based psychosocial HIV prevention intervention among 608 MSM in Chennai and Mumbai, India.[20,21] The study enrolled MSM who were living with or without HIV in Chennai and Mumbai. To be eligible for the study, participants were: (a) age 18 or older; (b) biologically male and reported having sex with men; (c) a *Kothi*, predominantly receptive partners in anal or oral sex or Double Decker, both insertive or receptive partners; (d) fluent Tamil, Hindi or English; and (e) at risk for acquisition of HIV or transmission (defined by any of the following in the four months before screening: any anal sex with four or more male partners, a diagnosis of an STI, a history of transactional sexual activity, or condomless anal sex with a man whose HIV status was unknown or serodiscordant).[20]

Participants were recruited by non-governmental organizations (NGOs) with extensive experience working with and recruiting MSM. The full details of this study have been previously described elsewhere.[20] The Institutional Review Board approved all study procedures at Partners Health Care (Massachusetts General Hospital, Boston, MA, USA), Humsafar Trust in Mumbai, India, and the National Institute for Research in Tuberculosis in Chennai, India. It was also approved by the Indian Council of Medical Research (ICMR). All participants must complete informed consent procedures to participate.

Measures

Predictors of interest. Stressful life events: Based on the format of the Life Experiences Survey,[22] this measure was adapted to assess 26 specific stressful life events over the past 4 months, including fear of being infected with HIV, financial problems, the experience of discrimination, and experiences of harassment. The study team adapted the specific events with input provided by The Humsafar Trust and National Institute for Research in Tuberculosis staff.[3] The assessment allowed the participants to indicate if the stressful event applied to them and rate the event's severity on a scale from extremely positive (0) to extremely negative.[6] We created three dummy variables[1]: the total number of stressful life events over time,[2] perceived positive or negative impact, with higher scores being more unpleasant/ alarming, ranging from 0 to 156, and[3] the ratio of the number of stressful life events and perceived impact

including that more than 6 indicates an extremely negative impact on average. For the complete survey, see the supplementary appendix.

Primary outcomes. Condomless anal sex: The participants were asked via audio computer assistant self-interview (ACASI) about the number of condomless anal sex acts (CAS) they engaged in over the prior month. For the present analysis, we created a binary dummy variable for participants engaging in any CAS – 1 for "engaging in CAS" and 0 for "not engaging in CAS." We also examined any history of diagnosed sexually transmitted infection (STI) in the past 4 months (i.e., syphilis, gonorrhea, chlamydia, herpes, and genital warts).

Psychosocial assessments: Depression was assessed through the Center for Epidemiological Studies Depression Scale (CES-D),[23] a validated survey of clinically significant distress as a marker for clinical depression (coefficient alpha = 0.90; Cronbach's alpha 0.89), which has been used extensively in India. The scale consists of 20 items and is scored on a 4-point Likert scale and were asked if they experienced any of the items within the past week. A score of 16 or higher indicates screening positive for clinically significant depressive symptoms. Alcohol use in the past 4 months was assessed using the AUDIT instrument, with a score of 8 or higher categorized as harmful drinking.[24]

All predictor and outcome measures were assessed at baseline, 4 months, 8 months, and 12 months.

Covariates. Demographics: Information was collected at baseline on participants' age, education attainment level, MSM subtype (e.g., *Kothi, double-decker*, or Gay), and education level (i.e., no formal, primary, middle, secondary, higher secondary, college, or graduate), religious affiliation (Hindu, Christian, Muslim, Other/none), employment status (full-time, part-time, or unemployed), living with parents, marital status, and HIV status.

Data analysis

Statistical analysis was conducted in R.[25] Means and frequencies were calculated to describe participant characteristics at baseline, stressful life events, sexual risk behaviors, and psychosocial factors over time. We conducted a series of generalized estimating equation (GEE) models with an unstructured covariance matrix, and binomial distribution was conducted to estimate the longitudinal relationship between the number of stressful life events and the impact of those stressful life events, and CAS, STI diagnosis and psychosocial (i.e., depression and harmful drinking) factors. First, bivariate models were built to assess the association between the number of stressful life events and the impact of the stressful life event, respectively, and each dependent variable, including CAS, STI diagnosis,

and psychosocial (i.e., depression and harmful drinking) factors. Second, multivariable models included potentially confounding factors, including age, sexual orientation, intervention arm, study site, and HIV status at baseline. The confounding factors included in the model were selected a priori. Statistical significance was determined at the *p*-value of <0.05.

Results

The sample's demographic, CAS, STI diagnosis, and psychosocial factors are outlined in Table 1 and have been presented previously.[21,26] Participants' mean age was 26.3 years (SD: 6.29), with 82.2% of the participants completing above a secondary education. Nearly half had full-time employment (48.4%), while one-third (35.5%) reported unemployment or other. MSM described themselves as *Kothi* (44.5%), *double-decker* (33.3%), and Gay/Other (22.2%). Nearly three-quarters (73.8%) of the participants reported having condomless anal sex in the past month, 3.3% reported being diagnosed with an STI in the past 4 months, and 9.4% were HIV infected. Participants reported moderate to high rates of psychosocial problems, including major depression (56.3%) and harmful drinking (14.3%).

At baseline, the mean number of stressful life events was 9.26 (SD: 4.35). The perceived impact of stressful life event was 5.86 (SD = 0.81) on a scale from 0, extremely positive, to 6, extremely negative. The top five stressful events over time were[1] attraction towards a man whose sexuality is not known (74.8%),[2] financial problems (67.0%),[3] fear of having your sexual orientation known to others (53.4%),[4] fear of being infected with HIV (52.0%), and[5] difficulties telling people that you are sexually attracted or sexually active with men (49.4%).

Table 2 displays bivariate and multivariable GEE analyses that present the number of stressful life events are significantly associated with an increased odds of condomless anal sex (aOR 1.07, 95% CI [1.05–1.10]), clinically significant depressive symptoms (aOR 1.23, 95% CI [1.19–1.26]), and harmful drinking (aOR 1.11, 95% CI [1.08–1.14]). However, the number of stressful events was not significantly associated with STI diagnosis (aOR 1.02, 95% CI [0.98–1.06]) in the bivariate and multivariable analysis.

Similarly, Table 3 shows the bivariate and multivariable models of the perceived impact of stressful events are significantly associated with increased odds of engaging in condomless anal sex (aOR 1.11, 95% CI [1.01–1.23]), clinically significant depressive symptoms (aOR 1.46, [1.31–1.63]), STI diagnosis by a provider (aOR 1.40, 95% CI [1.03–1.90]). However, in the bivariate and multivariable analysis, the perceived impact of stressful events was not significantly associated with harmful drinking (aOR 0.95, 95% CI [0.86–1.06]).

Table 1. Demographic characteristics and sexual and psychosocial factors (N = 608).

	Total N = 608
	Mean (SD)
Age	26.3 (6.29)
	n (%)
Study site	
Mumbai	304 (50)
Chennai	304 (50)
Education	
Less than secondary	107 (17.6)
Secondary	122 (20.1)
High secondary	147 (24.2)
College	146 (24.0)
Graduate/Professional	86 (14.1)
Employment	
Full time	294 (48.4)
Part time	98 (16.1)
Unemployed/other	216 (35.5)
Marital status	
Married	38 (6.5)
Not married	546 (93.5)
Sexual orientation	
Kothi	270 (44.5)
Double decker	202 (33.3)
Gay/other	135 (22.2)
Religion	
Hindu	441 (72.5)
Muslim	79 (13.0)
Christian	57 (9.4)
Other	31 (5.1)
Live with parents	
Yes	395 (65)
No	205 (35)
HIV status	
HIV Infected	57 (9.4)
HIV Uninfected	551 (90.6)
Randomization aim	
Intervention	305 (50.2)
Control	303 (49.8)
Engaged in condomless anal sex	449 (73.8)
STI diagnosis	20 (3.3)
Clinically depressive symptoms	339 (56.3)
Harmful drinking	87 (14.3)
	Mean (SD)
Number of stressful life events	9.26 (4.35)
Perceived impact of stressful life events	5.86 (0.81)

Discussion

MSM in India face substantial marginalization and discrimination due to their sexuality, resulting in psychosocial problems, including depressive episodes, anxiety disorder, low self-esteem, and heavy drinking.[2,15] Previous studies have found a statistically significant relationship between psychosocial challenges and HIV- related risk among MSM in India.[3,27–30] The current study expands upon this work by demonstrating the following main findings: (1) identifies the most prevalent stressful events impacting a sample of MSM in India over one year of follow-up, and (2) and shows the association between the number of stressful life events and their impact on CAS, STI diagnosis, and psychosocial factors over time.

Table 2. Bivariate and multivariable models examining the longitudinal association of number of stressful life events and condomless anal sex, STI diagnosis, and psychosocial factors.

	Number of stressful life events					
	Bivariate[a]			Multivariable[b]		
	OR	95% CI	p	aOR	95% CI	p
Engaged in condomless anal sex	1.06	1.04–1.09	**<0.001**	1.07	1.05–1.10	**<0.001**
STI diagnosis	1.01	0.97–1.06	0.49	1.02	0.98–1.06	0.33
Clinically depressive symptoms	1.22	1.19–1.25	**<0.001**	1.23	1.19–1.26	**<0.001**
Harmful drinking	1.12	1.08–1.15	**<0.001**	1.11	1.08–1.14	**<0.001**

CI, confidence interval; OR, odds ratio; aOR, adjusted odds ratio. The **bold** entries are the p-values that are statistically significant (p <0.05).
[a]Logistic generalized estimating equation.
[b]Multivariable logistic generalized estimating equation adjusting for age, sexual orientation, intervention arm, HIV status, and study site at baseline.

Table 3. Bivariate and multivariable models examining the longitudinal association of the impact of stressful life events and condomless anal sex, STI diagnosis, and psychosocial factors.

	Impact of stressful life events					
	Bivariate[a]			Multivariable[b]		
	OR	95% CI	p	aOR	95% CI	p
Engaged in condomless anal sex	1.10	1.00–1.21	**0.030**	1.11	1.01–1.23	**0.030**
STI diagnosis	1.38	1.01–1.88	**0.044**	1.40	1.03–1.90	**0.034**
Clinically depressive symptoms	1.46	1.31–1.62	**<0.001**	1.46	1.31–1.63	**<0.001**
Harmful drinking	0.96	0.87–1.06	0.455	0.95	0.86–1.06	0.395

CI, confidence interval; OR, odds ratio; aOR, adjusted odds ratio.
The **bold** entries are the p-values that are statistically significant (p <0.05).
[a]Logistic generalized estimating equation.
[b]Multivariable logistic generalized estimating equation adjusting for age, sexual orientation, intervention arm, HIV status, and study site at baseline.

Our findings are similar to previous studies, in which stressors among MSM in India have been reported as disclosing sexuality or attraction to men to friends and family, fear of being infected with HIV, and the pressure of marriage.[13,30] In addition, our findings show the most stressful life events impacting MSM in Chennai and Mumbai are "attraction towards a man whose sexuality is not known" and "financial problems." Both stressful events are not in the individual's control but suggest that social and structural level stressors substantially impact MSM in India. Future interventions should address how to mitigate the social and structural stressors that impact MSM in India, such as promoting social support and social coercion to alleviate social and structural stressors.

Consistent with previous studies,[2–4] we found an association between stressful life events and condomless anal sex, STI diagnosis, and psychosocial factors. These findings consistently suggest that the number and impact of stressful life events should be considered in interventions aimed at reducing condomless anal sex and improving psychosocial factors. We did find in our adjusted multivariable models

that the number of stressful life events was not significantly associated with a provider STI diagnosis. However, there is a statistically significant association with the impact of stressful life events, which highlights the need for assessing the perceived effects in addition to the number of stressful life events. Additionally, we found that harmful drinking was not significantly associated with the impact of stressful life events. Our findings suggest that harmful drinking might not be the primary coping mechanism when examining the severity of stressful life events, but other factors need to be explored.

Finally, our study shows that MSM in India experiences an average of between 6–9 stressful life events per visit (baseline, 4 months, 8 months, and 12 months), about a third of the stressful life events indicated in the adapted Life Experience Survey. In addition, the proportion of the impact of stressful events was extremely negative among participants over time. Our study suggests that further investigation needs to be explored into MSM in India's resilience in the face of these stressful events over time. There is limited research in India identifying the various resilience responses (i.e., dismissing stigma, confronting/challenging stigma) to

stigmatization and discrimination among MSM; such research can help design and implement future interventions to improve psychosocial health and reduce condomless anal sex and STI diagnosis among this group.[21,27] This may be especially helpful in supporting interventions that build self-acceptance, coping skills, and other forms of resiliency.

This study has some limitations that are worth mentioning. First, it is unclear whether stressful life events are a causative factor in condomless anal sex, depression, STI diagnosis, and harmful drinking since we are examining cross-sectional association over time at multiple time points in our analysis. The cross-sectional nature of the analysis restricts specifying the directionality of the significant relationships. Causality in these relationships is even further removed as they are not examined within the context of an RCT or using the logic of causal inference analysis. Second, it is possible that MSM in India reported socially desirable responses to the questions related to sexual behavior; however, we used an audio computer-assisted self-interview (ACASI) to collect sensitive data. Despite using ACASI, the concerns of sexual history are still subject to socially desirable responses. Third, the data may not be generalizable to all MSM in India since we only surveyed MSM in two urban cities, and MSM's experiences may change from state to state in India. Also, MSM in more rural parts of India may experience different stressors than MSM in urban contexts. Finally, other stressful life events might not be included in the list, resulting in the under-reporting of stressful life events.

These findings are the first to provide evidence of the predictive relationship between stressful life events and their severity with subsequent psychosocial problems, condomless anal sex, and STI diagnosis among MSM in India over time. While previous studies examine this relationship, we examined the longitudinal impact of these stressful events and their severity, which can provide researchers with further details of stressful events and how these events impact MSM in India. With this information, we can examine how MSM in India are most impacted by social and structural factors impacting their condomless anal sex, psychosocial factors, and STI diagnosis. Future research should seek a greater understanding of the impact of stressful life events among MSM in India and their relationship in potentiating psychosocial problems, condomless anal sex, and STI diagnosis, which will inform interventions that can teach forms of resiliency.

Declaration of conflicting interests

Funding

ORCID iDs

William Lodge II ⓘD https://orcid.org/0000-0001-7058-2710
Steven A Safren ⓘD https://orcid.org/0000-0002-0121-0806

Supplemental Material

Supplemental material for this article is available online.

References

1. King M, Semlyen J, Tai SS, et al. A systematic review of mental disorder, suicide, and deliberate self harm in lesbian, gay and bisexual people. *BMC Psychiatry* 2008; 8: 1–17.
2. Sivasubramanian M, Mimiaga MJ, Mayer KH, et al. Suicidality, clinical depression, and anxiety disorders are highly prevalent in men who have sex with men in Mumbai, India: findings from a community-recruited sample. *Psychol Health Med* 2011; 16(4): 450–462.
3. Mimiaga MJ, Biello KB, Sivasubramanian M, et al. Psychosocial risk factors for HIV sexual risk among Indian men who have sex with men. *AIDS Care - Psychological and Socio-Medical Aspects of AIDS/HIV* 2013; 25(9): 1109–1113.
4. Tomori C, McFall AM, Srikrishnan AK, et al. Diverse rates of depression among Men Who Have Sex with Men (MSM) across India: insights from a multi-site mixed method study. *AIDS Behav* 2016; 20(2): 304–316.
5. (NACO). *HIV sentinel surveillance and HIV estimation in India: Technical brief*. New Delhi: NACO, 2007.
6. National AIDS Control Organization. *India HIV estimations 2017 - factsheets*. New Delhi, India: NACO, 2017.
7. National AIDS Control Organisation. *National integrated biological and behavioural surveillance (IBBS), hijras/transgender people, India 2014-15*. New Delhi, India: NACO, 2016.
8. UNAIDS. *Country factsheet INDIA 2018 [Internet]*. Geneva, Switzerland: UNAIDS, 2018. pp. 1–6. Available from: https://www.unaids.org/sites/default/files/media_asset/unaids-data-2018_en.pdf
9. National AIDS Control Organization. *State HIV epidemic fact sheets [Internet]*, 2014. [cited 2022 Mar 22]. Available from: http://naco.gov.in/sites/default/files/STATE_HIV_EPIDEMIC_FACT_SHEET.pdf
10. Beyrer C. Section 377: why sodomy statutes matter. *J Int AIDS Soc* 2019; 22(5): e25285.

11. Chakrapani V, Newman PA and Shunmugam M. Secondary HIV prevention among Kothi-identified MSM in Chennai, India. *Cult Health Sex* 2008; 10(4): 313–327.

12. Khan S. Culture, Sexualities, and Identities. *J Homosex* 2001; 40(3–4): 99–115.

13. Go VF, Srikrishnan AK, Sivaram S, et al. High HIV prevalence and risk behaviors in men who have sex with men in Chennai, India. *J Acquir Immune Defic Syndr 1988* 2004; 35(3): 314–319.

14. Chakrapani V, Newman PA, Shunmugam M, et al. Barriers to free antiretroviral treatment access for female sex workers in Chennai, India. *AIDS Patient Care STDS* 2009; 23(11): 973–980.

15. Chakrapani V, Newman PA, Shunmugam M, et al. Structural violence against Kothi-identified men who have sex with men in Chennai, India: a qualitative investigation. *AIDS Educ. Prev* 2007; 19(4): 346–364.

16. Chakrapani V, Newmanb PA, Shunmugama M, et al. Barriers to free antiretroviral treatment access among kothi-identified men who have sex with men and aravanis (transgender women) in Chennai, India. *AIDS Care - Psychological and Socio-Medical Aspects of AIDS/HIV* 2011; 23(12): 1687–1694.

17. Newman PA, Chakrapani V, Cook C, et al. Determinants of sexual risk behavior among men who have sex with men accessing public sex environments in Chennai, India. *J LGBT Health Res* 2008; 4(2–3): 81–87.

18. Shaw SY, Lorway RR, Deering KN, et al. Factors associated with sexual violence against men who have sex with men and transgendered individuals in Karnataka. In: IndiaVermund SH (ed). *PLoS One* 2012; 7(3): e31705.

19. Newman PA, Chakrapani V, Cook C, et al. Correlates of paid sex among men who have sex with men in Chennai, India. *Sex Transm Infect* 2008; 84(6): 434–438.

20. Mimiaga MJ, Thomas B, Mayer KH, et al. A randomized clinical efficacy trial of a psychosocial intervention to strengthen self-acceptance and reduce HIV risk for MSM in India: study protocol. *BMC Public Health [Internet]* 2018; 18(1). [cited 2020 Sep 23]. Available from: https://pmc/articles/PMC6052541/?report=abstract

21. Safren SA, Thomas B, Biello KB, et al. Strengthening resilience to reduce HIV risk in Indian MSM: a multicity, randomised, clinical efficacy trial. *Lancet Glob Health [Internet]* 2021; 9(4): e446. [cited 2022 Mar 11]. Available from: /pmc/articles/PMC8091574/

22. Sarason IG, Johnson JH and Siegel JM. Assessing the impact of life changes: development of the life experiences survey. *J Consult Clin Psychol* 1978; 46(5): 932–946.

23. Radloff LS. The CES-D scale: a self-report depression scale for research in the general population. *Appl Psychol Meas* 1977; 1(35): 385–401.

24. Saunders JB, Aasland OG, Babor TF, et al. Development of the Alcohol Use Disorders Identification Test (AUDIT): WHO Collaborative project on early detection of persons with harmful alcohol consumption-II. *Addiction* 1993; 88(6): 791–804.

25. Team RCR. *A language and environment for statistical computing*. Vienna, Austria: R Foundation for Statistical Computing, 2014.

26. Safren SA, Devaleenal B, Biello KB, et al. Geographic and behavioral differences associated with sexually transmitted infection prevalence among Indian men who have sex with men in Chennai and Mumbai. *Int J STD AIDS [Internet]* 2021; 32(2): 144–511. Feb 1 [cited 2022 Mar 22]. Available from: https://pubmed.ncbi.nlm.nih.gov/33323073/

27. Chakrapani V, Kaur M, Newman PA, et al. Syndemics and HIV-related sexual risk among men who have sex with men in India: influences of stigma and resilience. *Cult Health Sex* 2019; 21(4): 416–431. 2018 [cited 2020 Sep 26]; Available from: https://www.tandfonline.com/action/journalInformation?journalCode=tchs20

28. Thomas B, Mimiaga MJ, Mayer KH, et al. The influence of stigma on HIV risk behavior among men who have sex with men in Chennai, India. *AIDS Care - Psychological and Socio-Medical Aspects of AIDS/HIV.* 2012; 24(11): 1401–1406.

29. Safren SA, Thomas BE, Mimiaga MJ, et al. Depressive symptoms and human immunodeficiency virus risk behavior among men who have sex with men in Chennai, India. *Psychol Health Med* 2009; 14(6): 705–715.

30. Thomas B, Mimiaga MJ, Kumar S, et al. HIV in Indian MSM: reasons for a concentrated epidemic and strategies for prevention. *Indian J. Med. Res* 2011; 134.