Sex Work, Syndemic Conditions, and Condomless Anal Intercourse among Men Who Have Sex with Men Who Engage in Sex Work in Latin America

İbrahim Sönmez [a,1,2], Nicolas Lorente[1,3,10], Jocelyn Mesías-Gazmuri[1,2,4], Axel J. Schmidt[5], Kai J. Jonas[6], Valeria Stuardo Avila[7], Ulrich Marcus[8], Maria Amelia Veras[9], Jordi Casabona Barbarà[1,2], Cinta Folch[1,2,10]

Affiliations

[1] Centre d'Estudis Epidemiològics sobre les ITS i Sida de Catalunya (CEEISCAT)

[2] Germans Trias i Pujol Research Institute (IGTP)

[3] Community‐Based Research Laboratory, Coalition PLUS, Pantin, France

[4] Doctorat Metodologia de la Recerca Biomèdica i Salut Publica, Universitat Autònoma de Barcelona, Bellaterra, Spain

[5] Sigma Research, Department of Public Health, Environments and Society, London School of Hygiene and Tropical Medicine, London, United Kingdom

[6] Faculty of Psychology and Neuroscience, Maastricht University, The Netherlands

[7,] Institute of Public Health, Universidad Andrés Bello, Santiago de Chile

[8,]

[9] Santa Casa de São Paulo School of Medical Sciences, São Paulo, Brazil

[10] CIBER Epidemiologia y Salud Pública (CIBERESP), Madrid, Spain

[a] Corresponding author Centre d'Estudis Epidemiològics sobre les ITS i Sida de Catalunya (CEEISCAT), Edifici Muntanya, Carretera de Can Ruti, Camí de les Escoles s/n, 08916 Badalona. Telèfon : (+34) 655304784. Emailsonmezibr@gmail.com

Journal to be sent to

Sexual health

Contributions: Methodology, formal analysis and investigation: İS. Conceptualization and design: İS, CF, NL, JMG, KJ, AJS. Resources and data: AJS. Implementation and data collection in LA: MAV, VSA. Writing—original draft preparation: İS. Writing—sample and data: NL. Writing—measures: İS, AJS. Comments on drafts: CF, NL, JMG, KJ, AJS, VSA, UM. MAV. Editing: AJS. Supervision of development: CF.

Abstract

Background: In Latin American countries and Suriname (LA) sexual transmission is one of the most common modes of HIV transmission and men who have sex with men who engage in sex work (MSM-SW), constitute a key population.

Methods: In a sample of MSM (N=53,166) from the Latin American Internet Survey (2018) across 18 countries we examined how sex work engagement is associated with syndemic conditions (multi-drug use, homophobic abuse, depression/anxiety, alcohol dependency (CAGE alcohol questionnaire); and internalised homonegativity) and condomless anal intercourse with non-steady male partners (nsCAI) using separate logistic regressions. We then used a structural equation model (SEM) to determine if and how syndemic conditions mediate the relationship between sex work engagement and nsCAI.

Results: We found that getting paid for sex was associated with less condom use for anal intercourse with non-steady male partners and particular syndemic conditions such as multi-drug use, homophobic abuse, and alcohol dependency. In our SEM, the results showed that the direct relationship between sex work engagement and nsCAI was positive and significant, and syndemic conditions partially mediated this relationship.

Conclusion: Our results highlight the continuing need for including MSM who engage in sex work and those who experience syndemic conditions in the prevention strategies targeted to MSM in Latin America and Suriname, in order to prevent the transmission of HIV.

Introduction

In Latin American countries and Suriname (which are abbreviated in this study as LA), sexual transmission is one of the most common modes of HIV transmission and men who have sex with men (MSM) constitute a key population affected by HIV (1). UNAIDS data showed that MSM constituted 40% of new HIV infections in 2018 in Latin America (2). MSM who engage in sex work (MSM-SW), where sex work refers to any form of providing sex services for money or goods, are at higher risk of sexually transmitted infections (STIs) including HIV, compared to the general male population. In 2021, 6% of new HIV infections occurred among sex workers in LA (3). Vulnerability of MSM-SW with respect to HIV infection is heightened (4) due to several risk factors, such as poverty, high proportions of mental health problems (5), polydrug use (i.e., the use of several substances jointly or in short succession) (6), substance use (7,8), condomless anal intercourse with non-steady male partners (nsCAI) (6), and violence (8).

The framework of syndemic conditions first put forward by Singer (1994, 2009), has been postulated as a method to study the impact of co-occurring conditions, which are simultaneously at play in harmful social and physical conditions that can affect the disease burden of a population (10). Indeed, multiple syndemic conditions can not only affect adverse health-related outcomes, but also each other (9,11–13). Among MSM, syndemic theory has been mostly applied to predict HIV and STI acquisition. For example, psychosocial conditions such as sexual childhood abuse and internalised homonegativity (14), depression and victimisation (15), heavy alcohol use and polydrug consumption (16) have been associated with condomless anal intercourse among MSM. Likewise, variables commonly examined within the syndemic conditions framework have been shown to be associated with sex work among MSM. A study among black MSM-SW documented that MSM-SW were more likely than other MSM to report particular determinants, such as intimate partner violence, assault victimization, polydrug use, and depression symptoms (17).

In LA, only a handful of studies have examined the role of syndemic conditions on adverse health-related outcomes among MSM. In a study among online survey respondents Mimiaga et al[18]found that each of the seven syndemic conditions examined, including depression, hazardous drinking and alcohol dependence, were associated with a higher risk of condomless anal intercourse across 17 LA. In another study, higher odds of non-adherence to antiretroviral therapy and detectable viral load were

associated with syndemic factors among MSM in LA (19). In a study from Colombia among a diverse sample, syndemic variables such as childhood sexual abuse, drug use, and frequent alcohol use were associated with transactional sex among MSM (20).

On the one hand, previous studies showed that syndemic conditions associated with health-related risks among MSM may operate similarly among MSM-SW (8,17). On the other hand, MSM-SW may experience distinct conditions such as different condom use patterns with their clients (i.e., sexual partners in the context of transactional sex) vs. other sexual partners. MSM-SW may have the intention to protect their steady partners from STI transmission from clients and through them by using condom more frequently with clients. For example, a study showed that male escorts are more likely to use condoms when having intercourse with clients compared with other sexual partners (21). However, clients may offer greater monetary incentives (22), or use violence to force engagement in condomless anal intercourse (6,23) and substance use during sex can impair condom use (22). For example, in a study among MSM-SW in Mexico, participants said that they earn significantly more if they offered condomless sex to their clients (22). Less consistent condom use and different patterns of condom use with clients (5,24) can have implications for HIV prevention for MSM-SW and their partners. To develop effective prevention strategies, it is important to take the potential similarities and differences in syndemic conditions that contribute to health risks among MSM-SW and other MSM into account.

Despite the studies showing direct associations both between sex work and HIV risks and syndemic conditions and HIV risk, research is yet to address the possible mediator role of syndemic conditions in the relationship between sex work engagement and CAI among MSM in LA. In this study, we use nsCAI as an indicator for HIV risk. The main objectives of this study are to compare the following between MSM-SW and other MSM: (i) socio-demographic characteristics, (ii) syndemic conditions and nsCAI, which are used to determine (iii) how sex work engagement is associated with syndemic conditions outcomes and CAI, and (iv) if and how syndemic conditions mediate the relationship between sex work engagement and nsCAI among MSM in 18 LA.

Data and Methods

Sample and Data

The Latin American MSM Internet survey (LAMIS-2018) was a cross-sectional online survey implemented simultaneously in 18 LA countries in the framework of a collaboration between the *Red Ibero-Americana de estudios en hombres gay, otros hombres que tienen sexo con hombres y personas trans* (RIGHT PLUS), researchers from Germany and the Netherlands, and Sigma Research (London School of Hygiene and Tropical Medicine) who developed EMIS-2017; an online survey covering 50 countries funded by the European Commission (25). RIGHT PLUS is one of the thematic networks of Coalition PLUS, a union of 16-member community-based organisations (CBOs) and around 100 partner CBOs involved in the fight against HIV and viral hepatitis across 52 countries in Africa, Asia, the Americas, and Europe.

LAMIS-2018 is based on EMIS-2017. CBOs from LA were involved in pre-testing and adapting the Spanish, Portuguese, and Dutch version of the EMIS-2017 questionnaire to their cultural contexts (26). The main objective of LAMIS-2018 was to collect information on morbidities including HIV, STIs, and mental health, sexual behaviours, sexual health needs and intervention performance, including use of pre-exposure prophylaxis (PrEP), among gay and other MSM.

A total of 64,655 MSM participated in the LAMIS survey between 24 January and 13 May, 2018. In this study, we excluded 10,192 HIV-diagnosed MSM reporting undetectable HIV viral load, and 570 PrEP users, because condomless anal intercourse among men with undetectable viral load or those using PrEP does not hold any intrinsic HIV risk. The analytical sample thus consists of 53,166 MSM who reside in 18 Central and South American countries: Argentina, Bolivia, Brazil, Chile, Colombia, Costa Rica, Ecuador, El Salvador, Guatemala, Honduras, Mexico, Nicaragua, Panama, Paraguay, Peru, Suriname, Uruguay, and Venezuela.

Measures

Sex work engagement – sex work engagement of MSM in our sample was assessed at two stages. Firstly, participants were asked “when was the last time you were paid by a man to have sex with him – by paid we mean he gave you money, gifts or favours in return for sex”, and participants could answer with a recency scale of 8 items, which ranged from “never” to “in the last 24 hours”. Those who answered “within the last 12 months” or more recently, were asked how often they had done so in the previous 12 months. Those who reported selling sex three or more times in the past

year were categorized as those who engage in sex work, and those who sold sex twice or less were included as not-engaging in sex work, similar to other studies (27–29).

Non-steady condomless anal intercourse (nsCAI)— nsCAI of the respondents was assessed through the question: "how many non-steady male partners have you had intercourse without a condom with in the last 12 months?" (non-steady partners were defined as those "men you have had sex with once only, and/or men you have sex with more than once but who you don't think of as a steady partner, including one-night stands, anonymous and casual partners, regular sex buddies"). Possible answers were 0, 1, 2, …, 10; 11-20; 21-30; 31-40; 41-50; and more than 50 non-steady male partners respondents had had condomless intercourse with. We categorised this variable as a binary variable, with value 0 indicating 0-10 partners and value 1 indicating 11 or more nsCAI partners. We conducted sensitivity analysis with different cut-offs and we did not find any significant differences, therefore: we kept the aforementioned categorization.

Syndemic conditions – these were assessed including five variables: multi-drug use, homophobic abuse, depression/anxiety (PHQ-4) (30), alcohol dependency (CAGE-4), and internalised homonegativity.

Multi-drug use – This was assessed asking "how long has it been since you last consumed the following substances in any context?" from a list of eight options including gamma-hydroxybutyric acid/butyrolactone (GHB/GBL), ecstasy (as in the form of pill and crystal, included separately), amphetamine (speed), ketamine, cocaine, mephedrone (4-MMC), and methamphetamine. If the respondent reported having used two or more different types of drugs within the previous 6 months, we coded the variable as 1, and as 0 in the case of reporting having used one type or no drugs.

Homophobic abuse – Participants were asked the following three questions: in the past 6 months "When was the last time you were stared at or intimidated because someone knew or presumed you are attracted to men?; When was the last time you had verbal insults directed at you, because someone knew or presumed you are attracted to men?; When was the last time you were punched, hit, kicked, or beaten because someone knew or presumed you are attracted to men?" Participants could answer the three questions with a recency scale, which ranged from "never" to "in the last 24 hours". This variable was then categorised and grouped as; experienced none, experience aggressions or intimidations, and, verbally abused or physically attacked.

Internalised homonegativity (IH) — To assess IH, we used the Short Internalised Homonegativity Scale (SIHS) (33). Ross and colleagues (31) coined the term

Internalised Homonegativity (IH) to refer to the internalisation of homophobic attitudes among lesbian, gay, and bisexual individuals (33). In the SIHS participants respond to 7 items on a 7-point scale (disagree–agree, with "does not apply" option). These items assessed their comfort level in social situations with gay men, their moral acceptance of homosexuality, their reluctance to change their sexual orientation, their comfort in gay bars, their comfort being seen in public with an obviously gay person, and their comfort being a homosexual man. The validity and reliability of the SIHS were confirmed in 38 European countries, with multigroup validation showing good fit for the 7-item scale across all country groups (the comparative fit Index (CFI) = 0.982, Tucker-Lewis Index (TLI) = 0.983, and the root mean square error of approximation (RMSEA) = 0.032) (for further statistics, see (32)).

Depression/Anxiety – The presence of depression/anxiety symptoms was evaluated from the ultra-brief screening scale for anxiety and depression (PHQ-4, 30). Participants were asked; “over the last 2 weeks, how often have you been bothered by: (i) feeling nervous, anxious or on edge, (ii) not being able to stop or control worrying, (iii) little interest or pleasure in doing things, (iv) feeling down, depressed, or hopeless?” The answer options were: “not at all=0; some days=1; more than half the days=2; and nearly every day=3”. The final score ranged from 0 to 12 points. Based on the standard classification we coded participants who scored 0–2 points as "normal level of depression/anxiety symptoms", 3–5 points as "mild", 6–8 points as "moderate" and those who scored 9–12 points were coded "severe depression/anxiety".

Alcohol dependency – To assess alcohol use, a scale based on the CAGE-4 indicator of alcohol dependency (35) was used. This scale includes the following binary-answered questions; “have you tried to cut down on your drinking?”; “Have people annoyed you by criticising your drinking?”; “Have you felt bad or guilty about your drinking?”; “Have you taken a drink first thing in the morning to steady your nerves or get rid of a hangover?” Respondents who did not report drinking alcohol in the previous 12 months and those who had one “yes” as an answer to any of these questions were coded as not alcohol dependent. Two or more “yes” answers to any of these four questions was coded as an indication for alcohol dependency.

Covariates –The following variables were considered as covariates: age, education level (low: no studies or incomplete basic [primary] education; mid: secondary studies, high school studies, tertiary or technological studies or technical-professional training; and high: university studies [bachelor's degree], postgraduate,

specialization, master's degree, doctorate), country of residence, occupation (full-time employed or part-time employed, self-employed, student, retired, long-term medical leave, or other), sexual identity (gay/homosexual, bisexual, or straight/heterosexual), gender identity ("man" or "trans man"). We also included the total number of non-steady male sexual partners (regardless of intercourse and condom use) in the previous 12 months as a covariate.

Statistical Analysis

Descriptive analysis compared MSM-SW and other MSM using t- and chi-square-test. Due to the large sample size, we randomly chose 1,000 respondents and have examined these tests only within this sample. Next, we conducted univariable logistic regressions to examine the associations between sex work engagement and each of the syndemic condition variables and nsCAI. These analyses were used to produce odds ratios (ORs). Then, we conducted multivariable logistic regressions including statistically significant variables from the univariable analysis. The multivariable models were controlled for all of the covariates and clustered at country level. These analyses were used to produce adjusted odds ratios (aORs). All analyses were performed in RStudio.

An SEM analysis was performed to be able to test direct and mediator effects among particular variables using the 'lavaan' package (36). First, we conducted confirmatory factor analysis (CFA) to determine whether observed variables load on specific latent variables as expected (i.e., whether four variables of syndemic conditions load on syndemic condition latent variable correctly) (37). We then estimated an SEM (Figure 1) where the CAI latent variable was the outcome, and syndemic conditions latent variable (which includes variables that were found significant in the multivariable analysis) was the mediator of the relationship between sex work engagement and CAI, using the overall sample. Since we were estimating mediator effects, we have followed the method of Shrout & Bolger[38] and used the bias-corrected bootstrap method to estimate our model. Bootstrapping allows intervals to be estimated without relying on the normal distribution assumption and adjusts for possible bias and problematic skewness, if any, in the distribution of bootstrap samples (39). Thus, we estimated our SEM using a bootstrapped maximum likelihood (ML) estimator, which controlled for the respondents' age, education, and occupation, total number of different non-steady male partners, sexual identity, gender identity, and country of residence, on both the

mediator and outcome variables. We then estimated the proportion of the mediation effect and respective confidence intervals (CIs) of this proportion, with the percentage change in the regression coefficients comparing the non-mediated model to the mediated model (Ditlevsen et al.[40]; supplementary material). CIs of respective model parameters were calculated with the command "monteCarloCI" from the package "semTools".

[Figure 1 about here]

The fit of the CFA and SEM models to data has to be examined before proceeding to the results. We used commonly employed key fit indices, such as (a) the comparative fit Index (CFI); (b) the Tucker-Lewis Index (TLI); (c) the root mean square error of approximation (RMSEA) and (d) standardised root mean squared residual (SRMR) (37,41). Most studies suggest that values higher than .95 for CFI and TLI indicate good fit, and values of RMSEA and SRMR <.06 are acceptable (37,41). For our SEM, we provide standardised estimations since it depends on the equal variances from our specific sample (42) and to be able to compare the estimated coefficients across groups.

Finally, given the complexity of our SEM, we also considered different types of significant mediation results that might occur. Based on the current mediation literature (43–45) we sought two possible types of mediations; full and partial mediation. On the one hand full mediation would indicate that while we found no direct effect between our confounders, we would find an either positive or negative, but significant, indirect effect. On the other hand a partial mediation would mean that both the direct and indirect effects among confounders were significant. There are two types of partial mediation that could be distinguished: complementary and contradictory. While complimentary partial mediation refers to an indirect effect that is in the same direction as the direct effect found (i.e., positive confounding), contradictory partial mediation refers to an indirect effect that is in the opposite direction that of the direct effect (i.e., negative confounding) (see Zhao et al[45]for further discussion on types of mediation).

Results

[Table 1 about here]

Table 1 presents the characteristics of the analytic sample stratified by sex work engagement. Overall, 97.3% did not and 2.7% did engage in sex work according to our definition. MSM-SW were younger (mean age, other MSM=29.0, MSM-SW=25.3), had a higher prevalence of bisexual identity (other MSM=19.7%, MSM-SW=26.1%) and more of them identified as trans male than MSM (other MSM=0.5%, MSM-SW=1.4%).

[Table 2 about here]

In Table 2, we present the prevalence of nsCAI and syndemic condition variables according to sex work engagement. We found that MSM-SW have experienced a higher prevalence of verbal/physical homophobic abuse (MSM-SW=7.6%; other MSM=2.3%) than MSM.

[Table 3 about here]

In Table 3 presents the unadjusted and adjusted odds ratios for multivariable ordered logistic regressions. Multi-drug use (OR=3.07 [95%-CI: 2.60–3.63]), homophobic abuse (1.83 [1.64–2.04]), alcohol dependency (1.54 [1.37–1.73]), and nsCAI (6.01 [4.52–7.99]) had univariable associations with sex work engagement. Multivariable associations have shown that multi-drug use (aOR=2.62 [2.19–3.12]), homophobic abuse (1.69 [1.50–1.89]), alcohol dependency (1.32 [1.16–1.49]) and nsCAI (5.35 [3.99–7.17]) were associated with sex work, even after controlling for covariates.

[Figure 2 about here]

In Figure 2 and Table 4, we present the estimated SEM results. The SEM was adjusted for age, education, occupation, sexual identity, gender identity, number of non-steady partners in the previous 12 months, and country of residence of respondents. Model fit was considered to be good (CFI = 0.95, TLI = 0.90, RMSEA = 0.021 [90%-CI: 0.020–0.023], SRMR = 0.015). Figure 2 shows that the direct path between sex work engagement and CAI was statistically significant and engagement in sex work was associated with 0.041 standard deviation (SD) increase in nsCAI. Likewise, we found

that sex work engagement was positively associated with an increase of 0.185 SD in syndemic conditions, which the latent variable included multi-drug use, homophobic abuse, and alcohol dependency. Similarly, an increase in the syndemic conditions latent variable was associated with 0.218 SD increase in the CAI latent variable.

[Table 4 about here]

Table 4 presents the results of the defined parameters of the SEM. The indirect relationship between sex work and nsCAI through syndemic conditions was statistically significant and results show a complementary partial mediation. Syndemic conditions were estimated to account for 48.8% (95%-CI: 35.1%–61.6%) of this relationship. Therefore, the number of nsCAI partners is increased for those who engage in sex work; because sex work is associated with syndemic conditions and greater syndemic conditions increase nsCAI.

Discussion

Our findings suggest that MSM-SW in the 18 countries included in LAMIS-2018 who are neither HIV positive with suppressed viral load nor using PrEP experience a combination of syndemic conditions that contribute substantially to their disparity in CAI when compared to other MSM not engaging in sex work. Even when controlled for covariates, we found that MSM-SW had higher odds of reporting multi-drug use, homophobic abuse, and alcohol dependency in comparison to other MSM. Additionally, MSM-SW in our sample were more likely to report 10 or more nsCAI partners compared to other MSM. Furthermore, the relationship between sex work engagement and nsCAI was mediated by syndemic conditions. In other words, syndemic conditions have been shown to constitute a significant and complementary indirect effect on the relationship between sex work engagement and condomless anal intercourse. These results highlight the complex mechanisms through which the syndemic conditions operate, and these should be considered while tailoring prevention strategies.

Our results suggest that MSM-SW in our sample were more likely than other MSM to experience multi-drug use and alcohol dependency, which is in line with previous evidence. The general literature (46–50) and literature on HIV prevention (12)

among MSM documents well the heightened levels of substance use. For example, a study in the US showed that multi-drug use among MSM is not only high, but is also associated with HIV risk behaviours and subsequently risk of seroconversion (16). Similarly, MSM-SW have been shown to be at greater risk of substance use when compared to other MSM. In a study among 698 MSM in Vancouver, MSM who reported being paid for sex were more likely to report substance use, including crystal methamphetamine, poppers, GHB, when compared to other MSM (51). EMIS-2010 data showed that MSM-SW in Europe experienced greater substance use risks than other MSM, including heroin, crack cocaine, and injected drug use (28). A study from the Dominican Republic showed that MSM-SW are at the risk of heightened alcohol use, and this risk is driven by individual and social network characteristics (50).

In our sample, MSM-SW were at greater risk of reporting having experienced homophobic abuse and this result is in line with previous studies. A study on male and female sex workers in London showed that sex workers are at heightened risk of experiencing violence, especially those who identify as lesbian, gay, or bisexual (52). Homophobic experiences that men who sell sex to other men face could play a role as a barrier to effectiveness of prevention efforts. Altogether, the comparative odds ratios for multi-drug use, homophobic abuse, and alcohol dependency shown in our study provide evidence that MSM in Latin America would benefit from tailored prevention interventions.

We did not find any evidence for heightened depression/anxiety experienced by MSM-SW in comparison to other MSM. Previously, there has been mixed evidence. For example, a study among MSM in the US found that having reported depressive symptoms was associated with sex work engagement in the past three months (29). In another study among MSM, transactional sex was not associated with lifetime diagnosis of depression nor anxiety (6). Although we do not find any significant difference between MSM-SW and other MSM in experiencing depression/anxiety, this does not mean that MSM in general are not at heightened risk of experiencing it. This may be explained by the fact that MSM in general, regardless of sex work engagement, are at heightened risk of experiencing depression/anxiety (53).

Our results show that syndemic conditions partially mediate the relationship between sex work engagement and nsCAI. Based on the present finding, the mediating effect of syndemic conditions is one of the underlying factors of how engagement in sex work can result in nsCAI. Alternatively, it could be that MSM-SW in our sample

reported more nsCAI because they are more likely to experience syndemic conditions at a heightened level in the first place. Therefore, future prevention efforts should consider targeting not only MSM-SW, but also MSM-SW with high levels of syndemic conditions, especially: multi-drug use, homophobic abuse and alcohol dependency. These findings highlight MSM-SW as a group that needs immediate attention.

Indeed, syndemic conditions were previously shown to interact with each other and at times heighten the risk of disease transmission simultaneously (10,54). While we found that the four syndemic conditions we introduced in this study do play a role in the relationship between sex work engagement and nsCAI, the mediation results imply that there may be other factors affecting this relationship due to complimentary partial mediation found. Future studies should consider other syndemic factors, individually and in interaction with one another, that can possibly augment or diminish the relationship between sex work and condom use for anal intercourse. Similarly, we recommend future studies to focus on the relationship between different prevention strategies and sex work.

We evaluate the data considering its limitations. First, LAMIS-2018 was a cross-sectional study and we cannot deduct causal evidence, and our results are not representative of all MSM in Latin America. Second, LAMIS may have underrepresented MSM who do not have access to internet/smartphones. Third, all LAMIS data is self-reported. However, LAMIS-2018 represents one of the largest MSM samples in Latin America, and our results have shown important associations that can guide future studies and prevention interventions. Fourth, we could not differentiate whether respondents considered the men who they sold sex to as non-steady partners. Similarly, as we defined sex work engagement as having sold sex three or more times, we acknowledge that there might be respondents who are sex workers but are not included in the sex work group because they sold sex less than three times in the past year.

The impacts of sex work engagement and syndemic conditions on risk behaviours of MSM has been widely documented and we extend knowledge of the relationships among these in a large sample from Latin America. We found that sex work was associated with nsCAI and that syndemic conditions such as multi-drug use, homophobic abuse, and alcohol dependency are important syndemic conditions associated with not using condoms for anal intercourse and thus risk of HIV infection.

Similarly, our results suggest that the four syndemic conditions we have considered in this study play a significant role in the relationship between sex work and condom use. It is necessary to reinforce combined prevention in LA, prevention strategies should consider tailoring future efforts including MSM-SW-sensitive monitoring systems that allow timely detection of and approaches for these syndemic conditions and other determinants that play a possible role in this relationship. Our results showed that there is an interplay between contextual and behavioural factors that impact prevention efforts and this needs to be considered for the global health of MSM-SW.

Declaration of Funding

This research did not receive any specific funding.

Conflict of Interest

The authors declare no conflict of interest.

Data Availability Statement

Data is available upon reasonable request made to coordinator@emis-project.eu.

References

1. Sued O, Cahn P. Latin America Priorities after 40 years of the beginning of the HIV pandemic. Lancet Reg Health - Am. 2021 Sep;1:100024.

2. Joint United Nations Programme on HIV/AIDS (UNAIDS). UNAIDS DATA, 2019 [Internet]. 2019 [cited 2022 Oct 10]. Available from: https://www.unaids.org/sites/default/files/media_asset/2019-UNAIDS-data_en.pdf

3. IN DANGER: UNAIDS Global AIDS Update 2022 [Internet]. Geneva: Joint United Nations Programme on HIV/AIDS; 2022 [cited 2022 Oct 10]. Available from: https://www.unaids.org/sites/default/files/media_asset/2022-global-aids-update_en.pdf

4. Oldenburg CE, Perez-Brumer AG, Reisner SL, Mattie J, Bärnighausen T, Mayer KH, et al. Global Burden of HIV among Men Who Engage in Transactional Sex: A Systematic Review and Meta-Analysis. Prestage G, editor. PLoS ONE. 2014 Jul 28;9(7):e103549.

5. Mimiaga MJ, Reisner SL, Tinsley JP, Mayer KH, Safren SA. Street Workers and Internet Escorts: Contextual and Psychosocial Factors Surrounding HIV Risk Behavior among Men Who Engage in Sex Work with Other Men. J Urban Health. 2009 Jan;86(1):54–66.

6. Bond KT, Yoon IS, Houang ST, Downing MJ, Grov C, Hirshfield S. Transactional Sex, Substance Use, and Sexual Risk: Comparing Pay Direction for an Internet-Based U.S. Sample of Men Who Have Sex with Men. Sex Res Soc Policy. 2019 Sep;16(3):255–67.

7. Bacon O, Lum P, Hahn J, Evans J, Davidson P, Moss A, et al. Commercial sex work and risk of HIV infection among young drug-injecting men who have sex with men in San Francisco. Sex Transm Dis. 2006;33(4):931–48.

8. Biello KB, Colby D, Closson E, Mimiaga MJ. The Syndemic Condition of Psychosocial Problems and HIV Risk Among Male Sex Workers in Ho Chi Minh City, Vietnam. AIDS Behav. 2014 Jul;18(7):1264–71.

9. Singer M. AIDS and the health crisis of the US urban poor; the perspective of critical medical anthropology. Soc Sci Med. 1994;39(7):931–48.

10. Singer M. Introduction to syndemics: A critical systems approach to public and community health. John Wiley & Sons.; 2009.

11. Safren SA, Blashill AJ, Lee JS, O'Cleirigh C, Tomassili J, Biello KB, et al. Condom-use self-efficacy as a mediator between syndemics and condomless sex in men who have sex with men (MSM). Health Psychol. 2018 Sep;37(9):820–7.

12. Stall R, Mills TC, Williamson J, Hart T, Greenwood G, Paul J, et al. Association of Co-Occurring Psychosocial Health Problems and Increased Vulnerability to HIV/AIDS Among Urban Men Who Have Sex With Men. Am J Public Health. 2003 Jun;93(6):939–42.

13. Stall R, Friedman M, Catania JA. Interacting epidemics and gay men's health: a theory of syndemic production among urban gay men. Unequal Oppor Health Disparities Affect Gay Bisexual Men U S. 2008;1:251–74.

14. Chuang DM, Newman PA, Fang L, Lai MC. Syndemic Conditions, Sexual Risk Behavior, and HIV Infection Among Men Who Have Sex with Men in Taiwan. AIDS Behav. 2021 Nov;25(11):3503–18.

15. Chakrapani V, Newman PA, Shunmugam M, Logie CH, Samuel M. Syndemics of depression, alcohol use, and victimisation, and their association with HIV-related sexual risk among men who have sex with men and transgender women in India. Glob Public Health. 2017 Feb;12(2):250–65.

16. Mimiaga MJ, O'Cleirigh C, Biello KB, Robertson AM, Safren SA, Coates TJ, et al. The Effect of Psychosocial Syndemic Production on 4-Year HIV Incidence and Risk Behavior in a Large Cohort of Sexually Active Men Who Have Sex With Men. JAIDS J Acquir Immune Defic Syndr. 2015 Mar 1;68(3):329–36.

17. Chandler CJ, Meunier É, Eaton LA, Andrade E, Bukowski LA, Matthews DD, et al. Syndemic Health Disparities and Sexually Transmitted Infection Burden Among Black Men Who Have Sex with Men Engaged in Sex Work in the U.S. Arch Sex Behav. 2021 May;50(4):1627–40.

18. Mimiaga MJ, Biello KB, Robertson AM, Oldenburg CE, Rosenberger JG, O'Cleirigh C, et al. High Prevalence of Multiple Syndemic Conditions Associated with Sexual Risk Behavior and HIV Infection Among a Large Sample of Spanish- and Portuguese-Speaking Men Who Have Sex with Men in Latin America. Arch Sex Behav. 2015 Oct;44(7):1869–78.

19. Biello KB, Oldenburg CE, Safren SA, Rosenberger JG, Novak DS, Mayer KH, et al. Multiple syndemic psychosocial factors are associated with reduced engagement in HIV care among a multinational, online sample of HIV-infected MSM in Latin America. AIDS Care. 2016 Mar 24;28(sup1):84–91.

20. Alvarado BE, Mueses HF, Galindo J, Martínez-Cajas JL. Application of the "syndemics" theory to explain unprotected sex and transactional sex: A cross-sectional study in men who have sex with men (MSM), transgender women, and non-MSM in Colombia. Biomédica. 2020;40(2):391–403.

21. Grov C, Rodríguez-Díaz CE, Jovet-Toledo GG, Parsons JT. Comparing male escorts' sexual behaviour with their last male client versus non-commercial male partner. Cult Health Sex. 2015 Feb 7;17(2):194–207.

22. Edeza A, Galárraga O, Santamaria EK, Sosa-Rubí S, Operario D, Biello KB. "I Do Try To Use Condoms, But…": Knowledge and Interest in PrEP Among Male Sex Workers in Mexico City. Arch Sex Behav. 2020 Jan;49(1):355–63.

23. Prestage G, Jin F, Bavinton B, Hurley M. Sex workers and their clients among Australian gay and bisexual men. AIDS Behav. 2014;18(7):1293–301.

24. Jerajani H, Shinde S, Setia M, Row-Kavi A, Anand V. Male sex workers: Are we ignoring a risk group in Mumbai, India? Indian J Dermatol Venereol Leprol. 2009;75(1):41.

25. Weatherburn P, Hickson F, Reid DS, Marcus U, Schmidt AJ. European Men-Who-Have-Sex-With-Men Internet Survey (EMIS-2017): Design and Methods. Sex Res Soc Policy [Internet]. 2019 Dec 18 [cited 2020 Mar 26]; Available from: http://link.springer.com/10.1007/s13178-019-00413-0

26. Reyes-Díaz M, Celly A, Folch C, Lorente N, Stuardo V, Veras MA, et al. Latin American Internet Survey for Men who have Sex with Men (LAMIS-2018): Design, methods and implementation. Infante Xibille C, editor. PLOS ONE. 2022 Nov 17;17(11):e0277518.

27. Berg RC, Schmidt AJ, Weatherburn P, The Emis Network. Transactional Sex: Supply and Demand Among European Men Who have Sex with Men (MSM) in the Context of Local Laws. Int J Sex Health. 2015 Jul 3;27(3):286–302.

28. Berg RC, Weatherburn P, Marcus U, Schmidt AJ. Links between transactional sex and HIV/STI-risk and substance use among a large sample of European men who have sex with men. BMC Infect Dis. 2019 Dec;19(1):686.

29. Walters SM, Braksmajer A, Coston B, Yoon I, Grov C, Downing MJ, et al. A Syndemic Model of Exchange Sex Among HIV-Positive Men Who Have Sex With Men. Arch Sex Behav. 2020 Aug;49(6):1965–78.

30. Kroenke K, Spitzer RL, Williams JB, Löwe B. An ultra-brief screening scale for anxiety and depression: the PHQ–4. Psychosomatics. 2009;50(6):613–21.

31. Berg RC, Ross MW, Weatherburn P, Schmidt AJ. Structural and environmental factors are associated with internalised homonegativity in men who have sex with men: Findings from the European MSM Internet Survey (EMIS) in 38 countries. Soc Sci Med. 2013 Feb;78:61–9.

32. Tran H, Ross MW, Diamond PM, Berg RC, Weatherburn P, Schmidt AJ. Structural Validation and Multiple Group Assessment of the Short Internalized Homonegativity Scale in Homosexual and Bisexual Men in 38 European Countries: Results from the European MSM Internet Survey. J Sex Res. 2018 Jun 13;55(4–5):617–29.

33. Newcomb ME, Mustanski B. Moderators of the Relationship Between Internalized Homophobia and Risky Sexual Behavior in Men Who Have Sex with Men: A Meta-Analysis. Arch Sex Behav. 2011 Feb;40(1):189–99.

34. Kroenke K, Williams JBW. An Ultra-Brief Screening Scale for Anxiety and Depression: The PHQ–4. Psychosomatics. 2009;50(6):613–21.

35. Shields AL, Caruso JC. A Reliability Induction and Reliability Generalization Study of the Cage Questionnaire. Educ Psychol Meas. 2004 Apr;64(2):254–70.

36. Rosseel Y. lavaan: An R Package for Structural Equation Modeling. J Stat Softw. 2012;48(2):1–36.

37. Weston R, Gore PA. A Brief Guide to Structural Equation Modeling. Couns Psychol. 2006 Sep;34(5):719–51.

38. Shrout PE, Bolger N. Mediation in experimental and nonexperimental studies: New procedures and recommendations. Psychol Methods. 2002;7(4):422–45.

39. Beaujean AA. Appendix: Bootstrapping Latent Variable Models, in Latent Variable Modeling using R: A Step-by-Step Guide [Internet]. New York: Routledge; 2014. Available from: https://cpb-us-w2.wpmucdn.com/blogs.baylor.edu/dist/0/4392/files/2013/12/AppendixBootstrapping-1gyf69b.pdf

40. Ditlevsen S, Christensen U, Lynch J, Damsgaard MT, Keiding N. A Structural Equation Approach for Estimating the Proportion of Exposure Effect on Outcome Explained by an Intermediate Variable. 2005;16(1).

41. Hu L, Bentler PM. Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. Struct Equ Model Multidiscip J. 1999 Jan;6(1):1–55.

42. Grace JB, Bollen KA. Interpreting the Results from Multiple Regression and Structural Equation Models. Bull Ecol Soc Am. 2005 Oct;86(4):283–95.

43. MacKinnon DP, Fairchild AJ, Fritz MS. Mediation analysis. Annu Rev Psychol. 2007;58:593.

44. Rucker DD, Preacher KJ, Tormala ZL, Petty RE. Mediation analysis in social psychology: Current practices and new recommendations. Soc Personal Psychol Compass. 2011;5(6):359–71.

45. Zhao X, Lynch Jr JG, Chen Q. Reconsidering Baron and Kenny: Myths and truths about mediation analysis. J Consum Res. 2010;37(2):197–206.

46. Griffin M, Callander D, Duncan DT, Palamar JJ. Differential Risk for Drug Use by Sexual Minority Status among Electronic Dance Music Party Attendees in New York City. Subst Use Misuse. 2020 Jan 1;55(2):230–40.

47. Kelly BC, Parsons JT, Wells BE. Prevalence and Predictors of Club Drug Use among Club-Going Young Adults in New York City. J Urban Health. 2006 Aug 25;83(5):884–95.

48. Roxburgh A, Lea T, de Wit J, Degenhardt L. Sexual identity and prevalence of alcohol and other drug use among Australians in the general population. Int J Drug Policy. 2016 Feb;28:76–82.

49. Sönmez İ, Palamar JJ. Sexual Orientation and Age of First Drug Use Among Adults in the United States. Subst Use Misuse. 2022 Jul 3;57(8):1313–21.

50. Tan D, Holloway IW, Gildner J, Jauregui JC, Garcia Alvarez R, Guilamo-Ramos V. Alcohol Use and HIV Risk Within Social Networks of MSM Sex Workers in the Dominican Republic. AIDS Behav. 2017 Nov;21(S2):216–27.

51. Armstrong HL, Sang JM, Skala A, Wang L, Zhu J, Lachowsky NJ, et al. Factors associated with transactional sex among a cohort of gay, bisexual, and other men who have sex with men in Vancouver, Canada. Leichliter J, editor. Sex Health. 2021 Nov 30;18(6):487–97.

52. Platt L, Bowen R, Grenfell P, Stuart R, Sarker MD, Hill K, et al. The Effect of Systemic Racism and Homophobia on Police Enforcement and Sexual and Emotional Violence among Sex Workers in East London: Findings from a Cohort Study. J Urban Health. 2022 Dec;99(6):1127–40.

53. Corboz J, Dowsett G, Mitchell A, Couch M, Agius P, Pitts M. Feeling Queer and Blue: A Review Of The Literature On Depression And Related Issues Among Gay, Lesbian, Bisexual And Other Homosexually Active People. Melbourne: Australian Research Centre in Sex, Health and Society, La Trobe University; 2003. (beyondblue: the national depression initiative).

54. Tsai AC, Venkataramani AS. Syndemics and Health Disparities: A Methodological Note. AIDS Behav. 2016 Feb;20(2):423–30.