Published in final edited form as:

Sex Health. 2018 July ; 15(4): 370–373. doi:10.1071/SH17217.

Use of poppers and HIV risk behaviours among men who have sex with men in Paris, France: an observational study

H. Rhodes Hambrick[A,D], **Su Hyun Park**[A], **Joseph J. Palamar**[A], **Anthony Estreet**[B], **John A. Schneider**[C], and **Dustin T. Duncan**[A]

[A]Spatial Epidemiology Lab, Department of Population Health, New York University School of Medicine, 227 East 30th Street, 6th Floor, Room 621, New York, NY 10016, USA.

[B]Department of Social Work, Morgan State University School of Social Work, 1700 E. Cold Spring Lane, Jenkins Behavioral Science Building, Room 343, Baltimore, MD 21251, USA.

[C]Departments of Medicine and Public Health Sciences, University of Chicago School of Medicine, and Chicago Center for HIV Elimination, 5841 S. Maryland Avenue, MC 5065 Room L-330, Chicago, IL 60637, USA.

Abstract

The use of inhaled nitrites, or poppers, among men who have sex with men (MSM) is prevalent, yet has been associated with HIV seroconversion. We surveyed 580 MSM from a geosocial networking smartphone application in Paris, France, in 2016. Of the respondents, 46.7% reported popper use within the previous 3 months. Regression models adjusted for sociodemographic characteristics found that the use of poppers was significantly ($P < 0.05$) associated with the following during the prior 3 months: condomless anal intercourse (adjusted relative risk (aRR) 1.27, 95% confidence interval (CI) 1.07–1.50), use of alcohol and/or drugs during sex once or twice (adjusted relative risk ratio (aRRR) 2.33, 95% CI 1.44–2.03), three to five times (aRRR 5.41, 95% CI 2.98–9.84) or six or more times (aRRR 4.09, 95% CI 2.22–7.56), participation in group sex (aRRR 3.70, 95% CI 2.33–5.90) and self-reported diagnosis with any sexually transmissible infection over the previous year (aRR 1.63, 95% CI 1.18–2.27), specifically chlamydia (aRR 2.75, 95% CI 1.29–4.29) and syphilis (aRR 2.27, 95% CI 1.29–4.29).

Keywords

substance use; HIV prevention; STIs

Introduction

HIV continues to have a disproportionate effect on men who have sex with men (MSM) in France: MSM accounted for 38% of new infections in 2015,[1,2] despite comprising only 3.9% of the population.[3] One factor that may contribute to HIV transmission among MSM,

[D]Corresponding author. rhodeshambrick@gmail.com.

Conflicts of interest

The authors declare no conflicts of interest.

including French MSM, is the use of inhaled nitrates, or poppers.[4–6] Poppers are recreational drugs that produce a rapid 'head rush' and facilitate anal receptive intercourse. Although they may facilitate the spread of sexually transmissible infections (STIs) and HIV via behavioural disinhibition[7,8] and vasodilatory and immunosuppressive[9–12] effects, many lay websites[13–15] portray poppers as an innocuous alternative to 'harder' drugs. As such, MSM in France may not be sufficiently aware of the risk posed by popper use, given that over half of Parisian MSM reported popper use within the past year.[6] Despite such widespread use, only two studies have explored popper use among French MSM,[16,17] with neither examining the relationship between popper use and sexual behaviour. Thus, the aim of the present study was to quantify associations of popper use with sexual risk behaviours and HIV and STI diagnoses among a population of geosocial networking (GSN) app-using MSM in Paris, France.

Methods

As reported in prior research,[18] in October 2016 we surveyed users of a popular GSN smartphone application among MSM via broadcast announcements in the Paris metropolitan area; 580 MSM completed the survey. After obtaining sociodemographic information (age, employment status, born in France or elsewhere, sexual orientation, relationship status), we assessed the following during the previous 3 months: popper use (any vs none), use of drugs or alcohol during sex (none, any, three to five times, six or more times), condomless insertive and receptive intercourse (any vs none) and group sex (never, within the past 3 months, before the past 3 months). We also queried self-reported HIV serostatus and diagnosis with another STI (gonorrhoea, chlamydia, syphilis, herpes simplex virus (HSV), human papillomavirus (HPV) or hepatitis C virus (HCV); analysed individually and together) within the past year. After calculating descriptive statistics, we used log-binomial regression models to estimate the adjusted relative risk (aRR) and 95% confidence intervals (CIs) of dichotomous outcomes, as well as multinomial logistic regression models to estimate the aRR ratios (aRRR) and 95% CIs of variables with multiple outcomes.

Results

Table 1 summarises sample characteristics and associations of popper use with outcomes of interest. Nearly half (46.7%) the respondents reported popper use within the past 3 months. In multivariate associations adjusted for sociodemographic characteristics, popper use was significantly ($P < 0.05$) associated with a diagnosis of any STI in the previous year (aRR 1.63, 95% CI 1.18–2.27), specifically chlamydia (aRR 2.75, 95% CI 1.29–4.29) and syphilis (aRR 2.27, 95% CI 1.29–4.29), condomless anal intercourse (aRR 1.27, 95% CI 1.07–1.50), use of alcohol or drugs during sex once or twice (aRRR 2.33, 95% CI 1.44–2.03), three to five times (aRRR 5.41, 95% CI 2.98–9.84) or six or more times (aRRR 4.09, 95% CI 2.22–7.56) and participation in group sex within the past 3 months (aRRR 3.70, 95% CI 2.33–5.90) and more than 3 months ago (aRRR 2.23, 95% CI 1.44–3.46). The association with HIV approached significance ($P = 0.051$).

Discussion

Although these data are cross-sectional and do not imply causality, potential explanations for the observed associations include the direct disinhibitory effects of popper use, that MSM who use poppers may be more likely to engage in sexual risk behaviours at baseline, perhaps due to personalities prone to sensation seeking,[19,20] or the direct vasodilatory and/or immunosuppressive effects of inhaled nitrites.[9,21–24] Regardless of the underlying causal links, these findings affirm that popper use remains a meaningful proxy for high-risk sexual behaviour among MSM. Given that social desirability bias may affect patients' willingness to report total numbers of partners and episodes of condomless anal intercourse,[25–28] enquiring about popper use could serve as an additional method to identify patients who could benefit from intensive efforts towards HIV and STI prevention and treatment, including pre-exposure prophylaxis (PrEP), while signalling to the patient that the provider is aware of sexual practices common among MSM and will be non-judgmental when discussing behaviours pertinent to HIV and STI risk.

The present study's limitations include that the data were self-reported rather than gathered objectively, that generalisability to MSM populations outside of France or who do not use GSN apps may not be possible, that we did not specify the site of STI diagnoses (because chlamydial and gonococcal infections of the anorectum, but not the oropharynx or urethra, predispose to HIV seroconversion) and that these data are observational and cannot be interpreted as causal. Further research is warranted to explore patients' and providers' understanding of the risks of popper use.

Acknowledgements

Dustin T. Duncan was funded, in part, by grants from the National Institutes of Health (R01MH112406, R21MH110190, and R03DA039748) and the Centers for Disease Control and Prevention (U01PS005122). This work was supported by Dustin T. Duncan's New York University School of Medicine Start-Up Research Fund. The authors thank the translators and participants of this study who contributed to the project.

References

1. European Centre for Disease Prevention and Control. HIV/AIDS surveillance in Europe, 2015 Stockholm: European Centre for Disease Prevention and Control; 2016.
2. Santé publique France. Infection par le VIH et les IST bactériennes. Point épidémiologique du 29 novembre 2016 France: French Institute for Public Health Surveillance; 2016 Available online at: http://invs.santepubliquefrance.fr/Dossiers-thematiques/Maladies-infectieuses/VIH-sida-IST/Infection-a-VIH-et-sida/Actualites/Infection-par-le-VIH-et-les-IST-bacteriennes.-Point-epidemiologique-du-29-novembre-2016 [verified 23 Apr 2018].
3. McCormack SM, Noseda V, Molina J-M. PrEP in Europe – expectations, opportunities, and barriers. J Int AIDS Soc 2016; 19(Suppl 6): 21103–7. [PubMed: 27760681]
4. Hunter LJ, Dargan PI, Benzie A, White JA, Wood DM. Recreational drug use in men who have sex with men (MSM) attending UK sexual health services is significantly higher than in non-MSM. Postgrad Med J 2014; 90: 133–8. doi:10.1136/postgradmedj-2012-131428 [PubMed: 24390619]
5. Bracchi M, Stuart D, Castles R, Khoo S, Back D, Boffito M. Increasing use of 'party drugs' in people living with HIV on antiretrovirals: a concern for patient safety. AIDS 2015; 29: 1585–92. doi:10.1097/QAD.0000000000000786 [PubMed: 26372268]
6. Schmidt AJ, Bourne A, Weatherburn P, Reid D, Marcus U, Hickson F. EMIS Network Illicit drug use among gay and bisexual men in 44 cities: findings from the European MSM Internet Survey (EMIS). Int J Drug Policy 2016; 38: 4–12. doi:10.1016/j.drugpo.2016.09.007 [PubMed: 27788450]

7. Colfax G, Vittinghoff E, Husnik MJ, McKirnan D, Buchbinder S, Koblin B, Celum C, Chesney M, Huang Y, Mayer K, Bozeman S, Judson FN, Bryant KJ, Coates TJ. EXPLORE Study Team Substance use and sexual risk: a participant- and episode-level analysis among a cohort of men who have sex with men. Am J Epidemiol 2004; 159: 1002–12. doi:10.1093/aje/kwh135 [PubMed: 15128613]

8. Daskalopoulou M, Rodger A, Phillips AN, Sherr L, Speakman A, Collins S, Elford J, Johnson MA, Gilson R, Fisher M, Wilkins E, Anderson J, McDonnell J, Edwards S, Perry N, O'Connell R, Lascar M, Jones M, Johnson AM, Hart G, Miners A, Geretti AM, Burman WJ, Lampe FC. Recreational drug use, polydrug use, and sexual behavior in HIV-diagnosed men who have sex with men in the UK: results from the cross-sectional ASTRA study. Lancet HIV 2014; 1: e22–31. doi:10.1016/S2352-3018(14)70001-3 [PubMed: 26423813]

9. Newell GR, Adams SC, Mansell PW, Hersh EM. Toxicity, immunosuppressive effects and carcinogenic potential of volatile nitrites: possible relationship to Kaposi's sarcoma. Pharmacotherapy 1984; 4: 284–91. doi:10.1002/j.1875-9114.1984.tb03376.x [PubMed: 6150466]

10. Dax EM, Adler WH, Nagel JE, Lange WR, Jaffe JH. Amyl nitrite alters human in vitro immune function. Immunopharmacol Immunotoxicol 1991; 13: 577–87. doi:10.3109/08923979109019724 [PubMed: 1685501]

11. Hersh EM, Reuben JM, Bogerd H, Rosenblum M, Bielski M, Mansell PWA, Rios A, Newell GR, Sonnenfeld G. Effect of the recreational agent isobutyl nitrite on human peripheral blood leukocytes and on in vitro interferon production. Cancer Res 1983; 43: 1365–71. [PubMed: 6186374]

12. Wilson H The poppers–HIV connection. Focus 1999; 14: 5–6.

13. PowerPoppers. Aroma poppers and safety 2011 Available online at: http://powerpoppers.com/aroma_poppers.shtml [verified 23 Apr 2018].

14. PsychonautWiki. Poppers 2017 Available online at: https://psychonautwiki.org/wiki/Poppers [verified 23 Apr 2018].

15. Tinoco J Poppers? What are poppers? 2012 Available online at: http://poppersguide.com/ [verified 23 Apr 2018].

16. Champenois K, Cousien A, Ndiaye B, Soukouna Y, Baclet V, Alcaraz I, Choisy P, Chaud P, Velter A, Gallay A, Yazdanpanah Y. Risk factors for syphilis infection in men who have sex with men: results of a case-control study in Lille, France. Sex Transm Infect 2013; 89: 128–32. doi:10.1136/sextrans-2012-050523 [PubMed: 22679099]

17. Greacen T, Friboulet D, Fugon L, Hefez S, Lorente N, Spire B. Access to and use of unauthorised online HIV self-tests by Internet-using French-speaking men who have sex with men. Sex Transm Infect 2012; 88: 368–74. doi:10.1136/sextrans-2011-050405 [PubMed: 22436195]

18. Hambrick HR, Park SH, Goedel WC, Morganstein JG, Kreski NT, Mgbako O, Duncan DT. Rectal douching among men who have sex with men in Paris: implications for HIV/STI risk behaviors and rectal microbicide development. AIDS Behav 2018; 22: 379–387. [PubMed: 28766026]

19. Grov C, Parsons JT, Bimbi DS. Sexual compulsivity and sexual risk in gay and bisexual men. Arch Sex Behav 2010; 39: 940–9. doi:10.1007/s10508-009-9483-9 [PubMed: 19308715]

20. Kalichman SC, Simbayi L, Jooste S, Vermaak R, Cain D. Sensation seeking and alcohol use predict HIV transmission risks: prospective study of sexually transmitted infection clinic patients, Cape Town, South Africa. Addict Behav 2008; 33: 1630–3. doi:10.1016/j.addbeh.2008.07.020 [PubMed: 18790575]

21. Chesney MA, Barrett DC, Stall R. Histories of substance use and risk behavior: precursors to HIV seroconversion in homosexual men. Am J Public Health 1998; 88: 113–16. doi:10.2105/AJPH.88.1.113 [PubMed: 9584015]

22. Buchbinder SP, Vittinghoff E, Heagerty PJ, Celum CL, Seage GR,, Judson FN, McKirnan D, Mayer KH, Koblin BA Sexual risk, nitrite inhalant use, and lack of circumcision associated with HIV seroconversion in men who have sex with men in the United States. J Acquir Immune Defic Syndr 2005; 39: 82–9. doi:10.1097/01.qai.0000134740.41585.f4 [PubMed: 15851918]

23. Scott HM, Vittinghoff E, Irvin R, Sachdev D, Liu A, Gurwith M, Buchbinder SP Age, race/ethnicity, and behavioral risk factors associated with per contact risk of HIV infection among men

who have sex with men in the United States. J Acquir Immune Defic Syndr 2014; 65: 115–21. doi: 10.1097/QAI.0b013e3182a98bae [PubMed: 24419067]

24. Weber AE, Craib KJ, Chan K, Martindale S, Miller ML, Cook DA, Schechter MT, Hogg RS. Determinants of HIV seroconversion in an era of increasing HIV infection among young gay and bisexual men. AIDS 2003; 17: 774–7. doi:10.1097/00002030-200303280-00024 [PubMed: 12646809]
25. Crosby RA. Condom use as a dependent variable: measurement issues relevant to HIV prevention programs. AIDS Educ Prev 1998; 10: 548–57. [PubMed: 9883289]
26. Lowndes CM, Jayachandran AA, Branandur P, Ramesh BM, Washington R, Sangameshwar BM. Polling booth surveys: a novel approach for reducing social desirability bias in HIV-related behavioural surveys in resource-poor settings. AIDS Behav 2012; 16: 1054–62. doi:10.1007/s10461-011-0004-1 [PubMed: 21811840]
27. Phillips AE, Gomez GB, Boily MC, Garnett GP. A systematic review and meta-analysis of quantitative interviewing tools to investigate self-reported HIV and STI associated behaviours in low- and middle-income countries. Int J Epidemiol 2010; 39: 1541–55. doi:10.1093/ije/dyq114 [PubMed: 20630991]
28. Phillips AE, Molitor J, Boily MC, Lowndres CM, Gurav K, Blanchard J. Informal confidential voting interviewing in a sexual risk assessment of men who have sex with men (MSM) and transgenders (hijra) in Bangalore, India. Sex Transm Infect 2013; 89: 245–50. doi:10.1136/sextrans-2011-050373 [PubMed: 23241967]

Table 1.

Selected characteristics and popper use (n = 580)

	Total	Popper use		Relative risk	
		Yes	No	Crude (95% CI)	Adjusted (95% CI)
Overall	580 (100)	271 (46.7)	309 (53.3)		
Age (years)					
18–24	84 (14.5)	28 (33.3)	56 (66.7)		
25–29	103 (17.8)	59 (57.3)	44 (42.7)		
30–39	180 (31.0)	89 (49.4)	91 (50.6)		
40–49	139 (24.0)	65 (46.8)	74 (53.2)		
≥50	54 (9.3)	24 (44.4)	30 (55.6)		
Sexual orientation					
Gay	487 (84.0)	236 (48.5)	251 (51.5)		
Bisexual	69 (11.9)	25 (36.2)	44 (63.8)		
Born in France					
Yes	450 (77.6)	217 (48.2)	233 (51.8)		
No	113 (19.5)	50 (44.3)	63 (55.8)		
Employment status					
Employed	388 (66.9)	186 (47.9)	202 (52.1)		
Unemployed	84 (14.5)	49 (58.3)	35 (41.7)		
Student	81 (14.0)	28 (34.6)	53 (65.4)		
Current relationship status					
Single	378 (65.2)	168 (44.4)	210 (55.6)		
Relationship with a man	172 (29.7)	94 (54.7)	78 (45.4)		
HIV status					
Negative	444 (76.6)	205 (46.2)	239 (53.8)	1.00	1.00
Positive	58 (10.0)	33 (56.9)	25 (43.1)	1.46 (0.90–2.39)	1.71 (1.00–2.93)
STI status (last year)					
No	451 (77.8)	197 (43.7)	254 (56.3)	1.00	1.00
Yes	129 (22.2)	74 (57.4)	55 (42.6)	1.53 (1.13–2.09) **	1.63 (1.18–2.27) **A
Condomless anal intercourse					

Sex Health. Author manuscript; available in PMC 2019 July 01.

	Total	Popper use		Relative risk	
		Yes	No	Crude (95% CI)	Adjusted (95% CI)
0 partners	269 (46.4)	105 (39.0)	164 (61.0)	1.00	1.00
≥1 partners	289 (49.8)	156 (54.0)	133 (46.0)	1.33 (1.14–1.57) **	1.27 (1.07–1.50) **A
Condomless receptive anal intercourse					
0 partners	340 (58.6)	136 (40.0)	204 (60.0)	1.00	1.00
≥1 partners	226 (39.0)	131 (58.0)	95 (42.0)	1.54 (1.26–1.90) **	1.45 (1.17–1.78) **A
Condomless insertive anal intercourse					
0 partners	371 (64.0)	157 (42.3)	214 (57.7)	1.00	1.00
≥1 partners	193 (33.3)	105 (54.4)	88 (45.6)	1.38 (1.09–1.73) **	1.43 (1.12–1.83) **A
Group sex					
No	198 (34.1)	134 (67.7)	64 (32.3)	1.00	1.00
Yes, in the past 3 months	177 (30.5)	68 (38.4)	109 (61.6)	3.36 (2.19–5.13) **	2.23 (1.44–3.46) **B
Yes, but not in the past 3 months	201 (34.7)	103 (51.2)	98 (48.8)	2.00 (1.33–2.99) **	3.70 (2.33–5.90) **B
Alcohol or drug use during sex					
0 times	272 (46.9)	90 (33.1)	182 (66.9)	1.00	1.00
1–2 times	153 (26.4)	83 (54.3)	70 (45.8)	2.40 (1.60–3.60) **	2.33 (1.51–3.61) **B
3–5 times	75 (12.9)	53 (70.7)	22 (29.3)	4.87 (2.79–8.51) **	5.41 (2.98–9.84) **B
≥6 times	65 (11.2)	44 (67.7)	21 (32.3)	4.24 (2.38–7.55) **	4.09 (2.22–7.56) **B

A Adjusted relative risks (aRRs) with 95% CIs were calculated using log-binomial regression adjusted for covariates (age, sexual orientation, origin, employment and relationship status).

B Adjusted relative risk ratios (aRRRs) with 95% CIs were calculated using log-binomial regression with covariates (age, sexual orientation, origin, employment, and relationship status).

Unless indicated otherwise, data are given as *n* (%).

* $P < 0.05$

** $P < 0.01$.

CI, confidence interval; STI, sexually transmissible infection