The Journal of Sexual Medicine, 2026, 23(8), qdag230
https://doi.org/10.1093/jsxmed/qdag230
Published: 29 July 2026
Review Article

Beyond erectile dysfunction: recreational use of PDE5 inhibitors among men who have sex with men—a systematic review and meta-analysis

Daniele Tienforti, MD, FECSM[1,*], Carolina Moretto, MD[1], Luca Spagnolo, MD[1], Adriano Ciriani, MD[1], Elisa Cocci, MD[1], Elisabetta Perfetto, MD[1], Giovanni Terrana, MD[1], Arcangelo Barbonetti, MD, PhD[1], Antonio Prunas, PhD, ECPS[2]

[1]Department of Clinical Medicine, Life Health and Environmental Sciences, Andrology Unit, University of L'Aquila, 67100 L'Aquila, Italy
[2]Department of Psychology, University of Milan-Bicocca, 20126 Milan, Italy
[*]Corresponding author: Department of Clinical Medicine, Life Health and Environmental Sciences, Andrology Unit, University of L'Aquila, L'Aquila, Italy. Email: daniele.tienforti@graduate.univaq.it

Abstract

Introduction: **Phosphodiesterase type 5 inhibitors (PDE5i) are increasingly used beyond the treatment of erectile dysfunction, including for non-medical, performance-oriented purposes among men who have sex with men (MSM). This study aimed to systematically review the literature and meta-analyze the prevalence of recreational or non-medical PDE5i use among MSM and to explore potential sources of between-study heterogeneity.**

Methods: **A systematic review and meta-analysis of observational studies was conducted according to Preferred Reporting Items for Systematic Reviews and Meta-Analyses guidelines. PubMed/MEDLINE, Scopus, Cochrane Library, and Web of Science were searched from inception to March 2026. Studies reporting quantitative estimates of recreational, non-prescribed, or general PDE5i use among MSM were included. Pooled prevalence estimates were calculated using random-effects meta-analysis of proportions with logit transformation. Sensitivity analyses, subgroup analyses, and assessment of small-study effects using the Doi plot and Luis Furuya-Kanamori index were performed.**

Results: **Five cross-sectional studies including 4390 MSM met the eligibility criteria. Reported prevalence ranged from 16.1% to 53.6%. The pooled prevalence of PDE5i use was 24.4% (95% CI, 16.7%-34.2%; $I^2 = 97.1\%$). Exclusion of the main outlier reduced the pooled estimate to 19.1% (95% CI, 17.0%-21.4%; $I^2 = 62.3\%$). Prevalence was higher in venue-based than community-based samples (32.4% vs. 19.9%) and in studies with a 6-month compared with a 3-month recall period (21.2% vs. 16.8%). The Luis Furuya-Kanamori index (2.43) suggested major asymmetry, consistent with possible small-study effects.**

Discussion: **Recreational or non-medical PDE5i use appears common among MSM, affecting approximately one in four individuals overall and approximately one in five after exclusion of the main methodological outlier. Although this represents the first systematic review and meta-analysis addressing this topic, interpretation is limited by the small number of available studies, their cross-sectional design, reliance on convenience sampling, heterogeneous outcome definitions, and substantial between-study heterogeneity. These findings support routine clinical assessment of recreational PDE5i use among MSM, particularly in the context of concomitant illicit drug use, and highlight the need for standardized definitions and more robust epidemiological research.**

Keywords PDE5 inhibitors, men who have sex with men, sexual behavior.

Introduction

Phosphodiesterase type 5 inhibitors (PDE5i) are increasingly used beyond the treatment of erectile dysfunction (ED), including for non-medical, performance-oriented purposes. Among men who have sex with men (MSM), PDE5i use may be embedded within specific sexual contexts characterized by performance enhancement, sexualized drug use, and higher-risk sexual behaviors. In this context, it is important to distinguish between two related but conceptually distinct phenomena. Chemsex refers to the intentional use of specific psychoactive substances, most commonly methamphetamine, mephedrone, and gamma-hydroxybutyrate/gamma-butyrolactone (GHB/GBL), to facilitate, prolong, or intensify sexual activity and is predominantly

Received: 28 April 2026. **Revised:** 28 June 2026. **Accepted:** 6 July 2026

described among MSM.[1] Medicated sex, by contrast, denotes the use of pharmacological agents primarily aimed at enhancing sexual performance or counteracting drug-induced erectile difficulties, with PDE5i representing the archetypal example.[2,3] Although PDE5 inhibitors frequently co-occur with chemsex-associated substances, they are generally considered distinct from core chemsex drugs because their primary effect is the enhancement of erectile function rather than the induction of psychoactive states.[4] Some authors have proposed the broader concept of "pharmacosex" to describe the diverse ways in which licit and illicit substances are used to modify, enhance, facilitate, or transform sexual experiences, extending beyond the narrower framework of chemsex.[5]

The prevalence of medicated sex practices among MSM is not well established, and existing estimates derive largely from convenience and clinic-based samples. In a recent Belgian study of MSM engaged in chemsex contexts, 53% reported using PDE5i in sexual settings.[6] Among PrEP users and people living with HIV in Milan, Fusetti et al. (2025) documented PDE5i use in 29% of participants.[7] These figures, while not population-representative, suggest that medicated sex practices are common in certain MSM subpopulations. However, prevalence estimates from broader MSM samples remain inconsistent, reflecting variability in definitions, sampling strategies, and recall periods. For comparison, recreational PDE5i use has also been documented in heterosexual male populations, with reported prevalence ranging from approximately 4% among US undergraduates[8] to 15%-18% in community samples from Brazil and Egypt,[9,10] suggesting that non-medical PDE5i use is not exclusive to MSM, though its contextual drivers may differ substantially.

To date, no systematic review or meta-analysis has quantified the prevalence of recreational PDE5i use specifically among MSM. Available cross-sectional data suggest substantial variation in reported estimates, likely reflecting differences in sampling methods, outcome definitions, and recall periods. The present systematic review and meta-analysis was therefore conducted to synthesize the available evidence, quantify the pooled prevalence of recreational or non-medical PDE5i use among MSM, and explore potential sources of between-study heterogeneity.

Methods

Study design and registration

This systematic review and meta-analysis was conducted and reported in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) 2020 guidelines.[11] The review protocol was prospectively registered in the PROSPERO international prospective register of systematic reviews (registration number CRD420261378563).

Eligibility criteria

Studies were eligible for inclusion if they: (1) enrolled adult MSM (≥18 years); (2) reported quantitative estimates (proportions or frequencies) of PDE5i use; and (3) were observational in design (cross-sectional, cohort, or case–control). No restrictions were applied regarding publication date, country, or setting. Case reports, qualitative studies, and studies exclusively reporting therapeutic PDE5i use for diagnosed ED were excluded.

Given the considerable variability in how non-medical PDE5i use is operationalized across the literature, studies reporting recreational, non-prescribed, or general PDE5i use were all considered eligible for inclusion. For the purposes of this review, "recreational use" was operationally defined as any use of PDE5i not prescribed for a diagnosed medical condition (including ED), encompassing use for sexual performance enhancement, prolongation of sexual activity, or counteraction of drug-induced erectile difficulties. This definition was applied consistently during title/abstract and full-text screening. Where individual studies employed narrower or broader definitions (eg, in which "Viagra use" was recorded without explicit exclusion of therapeutic use), these were noted as potential sources of heterogeneity and addressed in sensitivity analyses.

Information sources and search strategy

A comprehensive electronic search was conducted in PubMed/MEDLINE, Scopus, Cochrane Library, and Web of Science from database inception to March 2026. No language restrictions were applied at the search stage; however, only English-language full texts were included at the eligibility assessment stage. Reference lists of included studies and relevant reviews were hand-searched to identify additional eligible records.

The following search strategy was used in PubMed/MEDLINE (adapted for other databases):

("phosphodiesterase 5 inhibitors"[MeSH Terms] OR "sildenafil"[tiab] OR "tadalafil"[tiab] OR "vardenafil"[tiab] OR "avanafil"[tiab] OR "PDE5 inhibitor*"[tiab] OR "PDE-5 inhibitor*"[tiab]) AND ("men who have sex with men"[tiab] OR "MSM"[tiab] OR "gay men"[tiab] OR "homosexual men"[tiab] OR "bisexual men"[tiab]) AND ("recreational use"[tiab] OR "non-medical use"[tiab] OR "non-prescribed"[tiab] OR "misuse"[tiab] OR "abuse"[tiab] OR "sexual enhancement"[tiab] OR "performance enhancement"[tiab] OR "chemsex"[tiab] OR "sexualized drug use"[tiab] OR "medicated sex"[tiab])

In Scopus and Web of Science, equivalent search strings were constructed using TITLE-ABS-KEY fields with the same Boolean operators (AND/OR) and truncation symbols. In the Cochrane Library, the search was conducted using the same terms within the title, abstract, and keywords fields.

Study selection

Two independent reviewers screened titles and abstracts, followed by full-text assessment of potentially eligible records. Disagreements were resolved by consensus or by a third reviewer. The study selection process is summarized in the PRISMA flow diagram (Figure 1).

Data extraction and quality assessment

Data were extracted independently by two reviewers using a standardized form capturing: study design, country, setting (venue-based vs. community-based), sample size, participant age, prevalence estimate, recall period, operational definition of PDE5i use, and co-occurring drug use. Risk of bias was assessed independently by two reviewers using the Joanna Briggs Institute

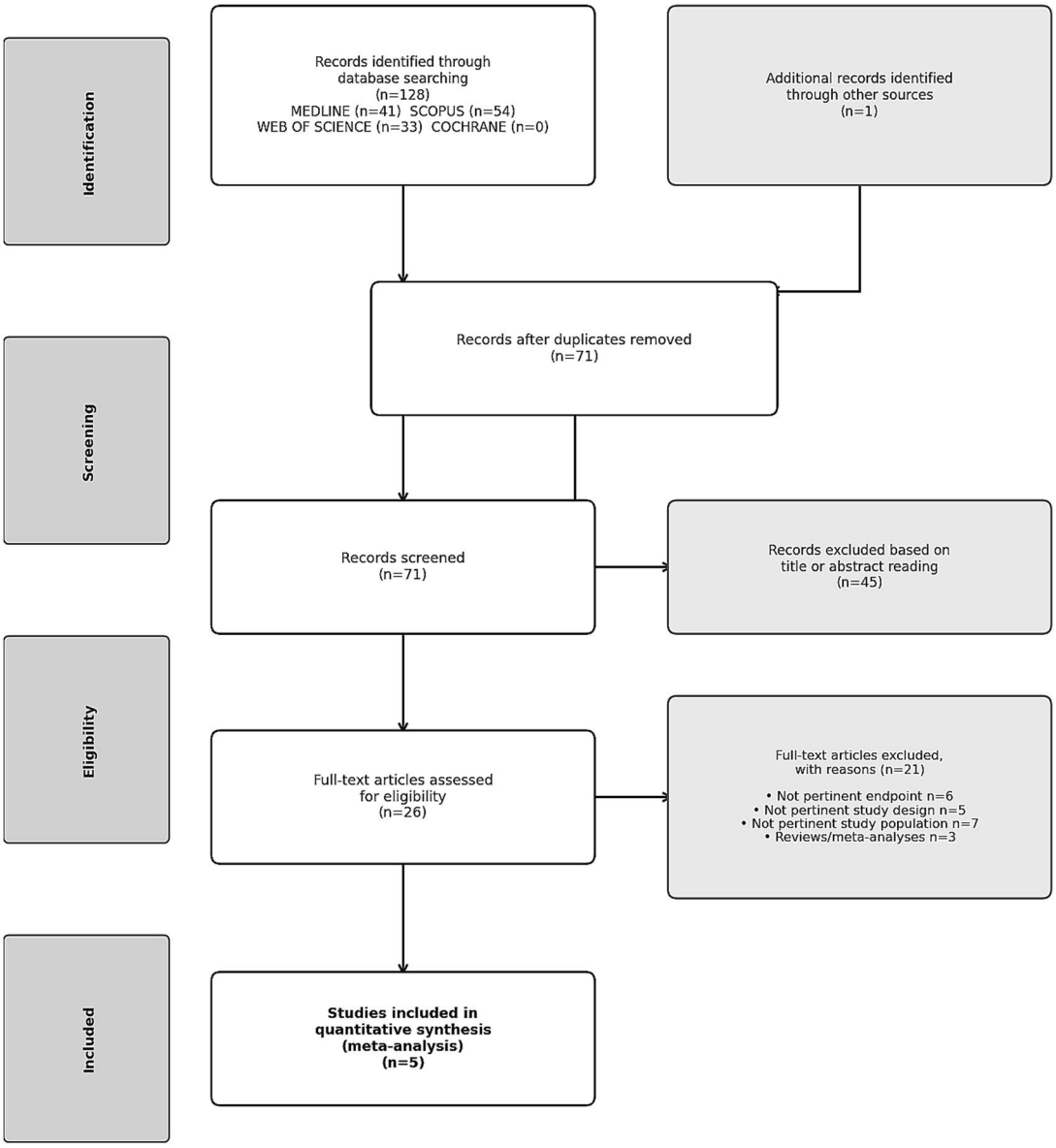

Figure 1 Flow diagram illustrating the study selection process for the meta-analysis of recreational phosphodiesterase type 5 (PDE5) inhibitor use among men who have sex with men (MSM). The diagram shows the numbers of records identified, screened, excluded, assessed for eligibility, and included in the qualitative and quantitative syntheses, together with reasons for full-text exclusions.

(JBI) Critical Appraisal Checklist for Studies Reporting Prevalence Data, a widely used instrument specifically designed to evaluate the methodological quality of prevalence studies.[12] The tool assesses nine domains including the appropriateness of the sampling frame, recruitment methods, sample size adequacy, description of study subjects and setting, validity and reliability of outcome measurement, statistical analysis, and response rate management. Each domain was rated according to JBI guidance, and disagreements were resolved through discussion. Given the small number of available studies, risk-of-bias assessments were used to inform the interpretation of findings rather than as criteria for study exclusion.

Statistical analysis

Pooled prevalence estimates were calculated using random-effects meta-analysis of proportions with logit transformation (DerSimonian-Laird method).[13] Statistical heterogeneity was assessed using the I^2 statistic and Cochran's Q test.[14] Sensitivity analyses were performed using a leave-one-out approach. Subgroup analyses were conducted by sampling setting (venue-based vs. community-based) and recall period (3 months vs. 6 months). Small-study effects were assessed using the Doi plot and Luis Furuya-Kanamori (LFK) index.[15]

Results

Study selection

The electronic search identified 128 records. After removal of duplicates, 71 records were screened at the title/abstract stage. Following full-text assessment, five cross-sectional studies[16–20] met the eligibility criteria and were included in the meta-analysis (Figure 1).

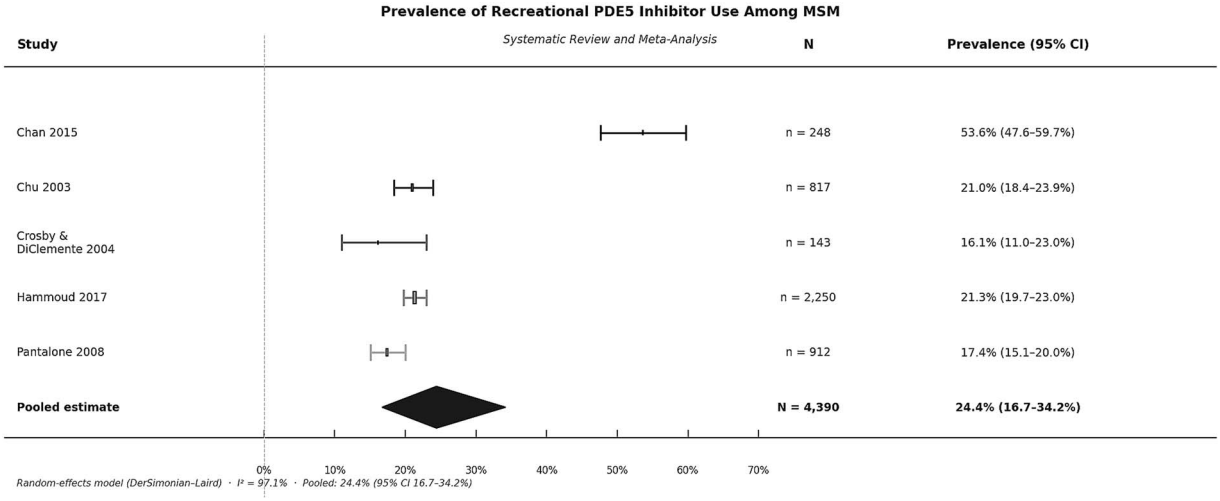

Figure 2 Forest plot of five studies estimating the prevalence of recreational or non-medical phosphodiesterase type 5 inhibitor use among men who have sex with men. Individual study estimates are shown with 95% confidence intervals, and the random-effects pooled prevalence is 24.4% (95% CI, 16.7%–34.2%), with substantial heterogeneity (I^2 = 97.1%).

Study characteristics

The five included studies enrolled a total of 4,390 MSM. Three studies were conducted in the United States (Chu et al.,[17] Crosby and DiClemente, and Pantalone et al.),[18] one in the United Kingdom (Chan et al.),[16] and one in Australia (Hammoud et al.).[19] Study characteristics, including sampling method, operational definition of PDE5i use, recall period, and co-occurring drug use, are summarized in Table 1.

Pooled prevalence

Prevalence estimates across included studies ranged from 16.1% to 53.6%. The pooled prevalence of recreational or non-medical PDE5i use was 24.4% (95% CI, 16.7%-34.2%; I^2 = 97.1%; Figure 2). Exclusion of the main outlier (Chan et al., 2015) reduced the pooled estimate to 19.1% (95% CI, 17.0%-21.4%; I^2 = 62.3%). Prevalence was higher in venue-based than community-based samples (32.4% vs. 19.9%) and in studies with a 6-month versus 3-month recall period (21.2% vs. 16.8%). The LFK index of 2.43 suggested major asymmetry, which reduced to minor asymmetry (1.92) after outlier exclusion.

Discussion

This systematic review and meta-analysis provides the first pooled estimate of recreational or non-medical PDE5i use among MSM, with a pooled prevalence of 24.4% (approximately one in four individuals). When the main outlier was excluded, a more conservative and homogeneous estimate of 19.1% was obtained, suggesting that approximately one in five MSM reports recreational PDE5i use in settings where definitions and sampling methods are more consistent. Given the limited number of included studies and the substantial residual heterogeneity, these findings should be interpreted as preliminary.

PDE5 inhibitors in erectile-intact males

A clinically important aspect of recreational PDE5i use among MSM is that a substantial proportion of users are likely erectile-intact, ie, they do not have a diagnosis of ED. In men with normal erectile function, PDE5 inhibition produces modest, transient reductions in systemic blood pressure without significant changes in heart rate,[21] so may facilitate erection onset and maintenance during pharmacologically or psychologically demanding sexual contexts. Users commonly report motives including performance enhancement, confidence augmentation, prolongation of sexual activity, and counteraction of drug-induced erectile difficulties.[22,23] However, controlled clinical evidence that PDE5i reliably enhance sexual performance in men without ED remains limited,[24] and the subjective benefits reported by recreational users may partly reflect expectation effects rather than direct pharmacological action.[22]

Comparison with heterosexual populations

Recreational PDE5i use is not exclusive to MSM. Available data from heterosexual or mixed-orientation male populations suggest that non-medical use occurs across sexual orientations, although contextual drivers and prevalence estimates differ substantially. Among US male undergraduates, Harte and Meston reported a lifetime prevalence of recreational ED medication use of approximately 4%, with recreational use independently associated with gay or bisexual identity.[8] In a national cross-sectional survey of 3000 Egyptian men, Attia et al. found that 31.5% reported ever using PDE5i, with 58% of users citing recreational motives, implying a population-level recreational use prevalence of approximately 18%.[10] In a Brazilian university sample, Freitas et al. reported PDE5i use in 15.1% of male students, primarily for curiosity and performance enhancement.[9]

Table 1 Characteristics of studies included in the meta-analysis of recreational PDE5i use among MSM.

Study	Country	Design	Setting/ population	*N* (MSM)	Age (mean/ median)	Recall period (months)	Definition of use	Prevalence (%)	Context	Substance use	Alcohol use	Motivation	HIV prevalence
Chan 2015	UK	Questionnaire survey (cross-sectional)	Nightclubs catering for MSM (South London)	248	31.6 ± 7.7	12	Sildenafil misuse (recreational use or use without medical indication)	53.6	Not specified	Mephedrone 74.1%, cocaine 61.3%, MDMA 59.2%, GHB/GBL 52.8%	94%	Not assessed	Not reported
Chu 2003	USA	Community-based anonymous survey (cross-sectional)	Community-based MSM (San Francisco outreach)	837	35 (mean)	6	Viagra use	21.0	Not specified	36% combined with other drugs; 18% with amyl nitrite	Not reported	Not assessed	12%
Crosby and DiClemente 2004	USA	Cross-sectional study	Men attending a sex resort (southern United States)	143	40.6 ± 9.4	3	Non-prescription Viagra use for sexual encounters	16.1	Not specified	Ecstasy and cocaine use associated; poppers assessed	Not reported	Not assessed	16.7%
Hammoud 2017	Australia	Online prospective observational study (baseline cross-sectional analysis)	Online survey of gay and bisexual men	2250	33 (median)	6	Any EDM use	21.3	Not specified	68.8% illicit drug use; amyl nitrite 52.9%, cannabis 35.4%, crystal metham-phetamine 32.4%	Not reported	Maintain erection longer (63.6%), make it easier to get hard (56.1%), counter effects of other drugs (40.6%)	7.6%
Pantalone 2008	USA	Cross-sectional street-intercept survey	Two large lesbian, gay, and bisexual community events (New York City)	912	37.45 ± 11.83	3	Recreational EEM use	17.4	Not specified	Alcohol, crystal metham-phetamine, cocaine, ecstasy (associated)	Reported	Add to the fun (72.2%), maintain erection with condom (60.1%), have sex for hours (48.3%), counteract alcohol/drugs (28.6%)	14.1%

Abbreviations: EDM, erectile dysfunction medication (any PDE5 inhibitor used in a sexual context, regardless of ED diagnosis); EEM, erectile enhancement medication (PDE5 inhibitor used specifically for sexual performance enhancement in the absence of a diagnosed erectile disorder); MSM, men who have sex with men; GHB/GBL, gamma-hydroxybutyrate/gamma-butyrolactone; MDMA, 3,4-methylenedioxymethamphetamine; CI, confidence interval.

The absence of a systematic review or meta-analysis specifically addressing recreational PDE5i use in heterosexual populations represents a notable gap in the literature, and direct comparisons with the present MSM-specific estimates are therefore limited by methodological heterogeneity.

The Chan et al. outlier

The study by Chan et al. yielded a markedly higher prevalence estimate (53.6%) compared to the other four included studies (range 16.1%-21.3%), and its exclusion substantially reduced both the pooled estimate and residual heterogeneity. Several methodological features may explain this outlier status. First, the study recruited participants through sexual health clinics and community venues in South London, a venue-based sampling strategy that likely overrepresents MSM with higher rates of sexualized drug use and risk behaviors compared to community-based or anonymous online samples. Second, the study population had high rates of concurrent illicit drug use (mephedrone 74.1%, cocaine 94%, 3,4-methylenedioxymethamphetamine 59.2%, GHB/GBL 52.8%), consistent with a chemsex-engaged subpopulation in which PDE5i use to counteract drug-induced erectile difficulties would be expected to be particularly prevalent. Third, the operational definition of PDE5i use in this study included "sildenafil misuse," a broader term that may have captured a wider range of behaviors than the recreational use definitions employed in other included studies. Taken together, these factors suggest that the Chan et al. estimate reflects a specific high-risk subpopulation rather than MSM in general, and potential selection bias cannot be excluded.

Temporal trends and accessibility

The five included studies span a period from 2003 to 2017, representing more than a decade of evolving patterns of PDE5i use. During this period, the landscape of PDE5i accessibility changed substantially: sildenafil became available as a generic formulation in many countries from 2013 onward, reducing cost barriers; online pharmacies and direct-to-consumer platforms expanded non-prescription access; and cultural acceptance of sexual-enhancement medications increased, particularly within MSM communities. It is therefore plausible that the prevalence of recreational PDE5i use has increased since the publication of the earliest included studies. The most recent included study (Hammoud et al., 2017) reported a prevalence of 21.3%, which is broadly consistent with the pooled estimate from the outlier-excluded analysis (19.1%), but the limited number of studies and the absence of data from 2017 onwards preclude meaningful assessment of temporal trends. Future studies using contemporaneous sampling are needed to capture current patterns of use.

Safety and risks of unsupervised PDE5i use

The recreational use of PDE5i outside medical supervision carries a clinically relevant risk profile that warrants discussion. Common adverse effects include headache, flushing, dyspepsia, nasal congestion, dizziness, and visual disturbances, as documented across clinical trials and postmarketing surveillance data.[25] More serious cardiovascular events, including myocardial infarction and cerebrovascular accidents, have been reported in case series involving non-prescription use, particularly when PDE5i are combined with nitrate donors (including amyl nitrite/poppers, which are frequently co-used in MSM sexual contexts) or with other vasoactive substances.[26–28] This combination represents an absolute contraindication due to the risk of life-threatening hypotension. An analysis of the EudraVigilance pharmacovigilance database identified 951 major adverse cardiovascular events associated with PDE5i, with approximately 48% occurring in individuals under 65 years of age.[29] Rare but serious complications including corpus cavernosum thrombosis and priapism have also been reported following recreational use.[30] Beyond physical harms, concerns have been raised regarding the development of psychological reliance on PDE5 inhibitors and reduced confidence in unaided sexual performance among some recreational users.[23] However, there is currently no evidence that PDE5i produce physiological dependence or addiction in the conventional pharmacological sense.[22] These safety considerations are particularly pertinent in the context of MSM recreational use, where PDE5i are frequently co-administered with illicit drugs (as evidenced by the high rates of polydrug use in included studies), and where acquisition without medical prescription is common.[6,20]

Limitations

Several limitations of this review merit explicit acknowledgment. First, only five studies met eligibility criteria, limiting the statistical power of subgroup and meta-regression analyses. Second, all included studies were conducted in three high-income, English-speaking countries (United States, United Kingdom, and Australia), which substantially restricts the generalizability of findings to MSM populations in other cultural, socioeconomic, and healthcare contexts, where patterns of PDE5i use, prescription norms, and cultural attitudes toward sexual enhancement may differ markedly. Third, all included studies employed cross-sectional designs, precluding causal inference. Fourth, the reliance on convenience samples (venue-recruited or online) in all included studies introduces selection bias and limits representativeness. Fifth, the heterogeneity in operational definitions of recreational PDE5i use across studies is a major source of statistical heterogeneity and limits the comparability of estimates. Sixth, variability in recall periods (ranging from 3 to 6 months, with some studies not specifying a recall window) introduces additional measurement heterogeneity. Finally, self-report data are subject to recall and social desirability bias.

Conclusion

This systematic review and meta-analysis provides preliminary evidence that recreational or non-medical PDE5i use is common among MSM, with a pooled prevalence of approximately one in four individuals and a more conservative estimate of approximately one in five when methodological outliers are excluded. PDE5i use in this population appears to be a context-dependent behavioral marker embedded within specific sexual practices and polydrug use environments, rather than a purely therapeutic exposure. Clinicians working with MSM should routinely enquire about recreational PDE5i use, particularly in the context of concurrent illicit drug use, given the associated cardiovascular and drug-interaction risks. Future research should prioritize standardized outcome definitions, population-representative

sampling, inclusion of non-Anglophone settings, and longitudinal designs to better characterize the epidemiology, determinants, and health consequences of recreational PDE5i use among MSM.

Acknowledgments

None declared.

Author contributions

D.T.: Conceptualization-Lead, Data curation-Equal, Investigation-Equal, Methodology-Equal, Writing—original draft-Lead. C.M.: Data curation-Equal, Formal analysis-Equal. L.S. Data curation-Equal, Formal analysis-Equal, Investigation-Equal. A.C.: Data curation-Equal, Formal analysis-Equal. E.C.: Data curation-Equal, Formal analysis-Equal. E.P.: Data curation-Equal, Formal analysis-Equal. G.T.: Data curation-Equal, Formal analysis-Equal, Software-Equal. A.B.: Supervision-Equal, Validation-Equal, Visualization-Equal, Writing—review & editing-Equal. A.P.: Methodology-Equal, Supervision-Equal, Validation-Equal, Visualization-Equal, Writing—review & editing-Equal.

Supplementary material

Supplementary material is available at *The Journal of Sexual Medicine* online.

Funding

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

Conflicts of interest

The authors declare no conflicts of interest.

References

1. Hawkinson DE, Witzel TC, Gafos M. Exploring practices to enhance benefits and reduce risks of chemsex among gay, bisexual, and other men who have sex with men: a meta-ethnography. *Int J Drug Policy*. 2024;127:104398. https://doi.org/10.1016/j.drugpo.2024.104398
2. Giorgetti R, Tagliabracci A, Schifano F, Zaami S, Marinelli E, Busardò FP. When "chems" meet sex: a rising phenomenon called "ChemSex". *Curr Neuropharmacol*. 2017;15(5):762–770. https://doi.org/10.2174/1570159X15666161117151148
3. Nimbi FM, Rosati F, Esposito RM, Stuart D, Simonelli C, Tambelli R. Chemsex in Italy: experiences of men who have sex with men consuming illicit drugs to enhance and prolong their sexual activity. *J Sex Med*. 2020;17(10):1875–1884. https://doi.org/10.1016/j.jsxm.2020.07.001
4. Guerra FM, Salway TJ, Beckett R, Friedman L, Buchan SA. Review of sexualized drug use associated with sexually transmitted and blood-borne infections in gay, bisexual and other men who have sex with men. *Drug Alcohol Depend*. 2020;216:108237. https://doi.org/10.1016/j.drugalcdep.2020.108237
5. Moyle L, Dymock A, Aldridge A, Mechen B. Pharmacosex: reimagining sex, drugs and enhancement. *Int J Drug Policy*. 2020;86:102943. https://doi.org/10.1016/j.drugpo.2020.102943
6. Platteau T, Schrooten J, Herrijgers C, *et al.* Polydrug use during chemsex: single and intersecting sexual effects of commonly used drugs. *Front Public Health*. 2025;13:1618070. https://doi.org/10.3389/fpubh.2025.1618070
7. Fusetti C, Caruso E, Giacomelli A, *et al.* High rates of drug use and chemsex among PrEP users and people with HIV in Milan highlight need for targeted interventions. *AIDS Behav*. 2025;29(10):3315–3323. https://doi.org/10.1007/s10461-025-04778-9
8. Harte CB, Meston CM. Recreational use of erectile dysfunction medications in undergraduate men in the United States: characteristics and associated risk factors. *Arch Sex Behav*. 2011;40(3):597–606. https://doi.org/10.1007/s10508-010-9619-y
9. Freitas VM, Menezes FG, Antonialli MM, Nascimento JW. Use of phosphodiesterase-5 inhibitors by college students. *Rev Saude Publica*. 2008;42(5):965–967. https://doi.org/10.1590/S0034-89102008000500024
10. Attia AA, Abdel-Hameed AKS, Amer MAEM, Mamdouh H, GamalEl Din SF, El-Moslemany HEGM. Study of the prevalence and patterns of phosphodiesterase type 5 inhibitor use among sexually active Egyptian males: a national cross-sectional survey. *Andrologia*. 2019;51(9):e13364. https://doi.org/10.1111/and.13364
11. Page MJ, McKenzie JE, Bossuyt PM, *et al.* The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. *BMJ*. 2021;372:n71. https://doi.org/10.1136/bmj.n71
12. Munn Z, Moola S, Riitano D, Lisy K. The development of a critical appraisal tool for use in systematic reviews addressing questions of prevalence. *Int J Health Policy Manag*. 2014;3(3):123–128. https://doi.org/10.15171/ijhpm.2014.71
13. DerSimonian R, Laird N. Meta-analysis in clinical trials. *Control Clin Trials*. 1986;7(3):177–188. https://doi.org/10.1016/0197-2456(86)90046-2
14. Higgins JP, Thompson SG, Deeks JJ, Altman DG. Measuring inconsistency in meta-analyses, Measuring inconsistency in meta-analyses. *BMJ*. 2003;327(7414):557–560. https://doi.org/10.1136/bmj.327.7414.557
15. Furuya-Kanamori L, Barendregt JJ, Doi SAR. A new improved graphical and quantitative method for detecting bias in meta-analysis. *Int J Evid Based Healthc*. 2018;16(4):195–203. https://doi.org/10.1097/XEB.0000000000000141
16. Chan WL, Wood DM, Dargan PI. Significant misuse of sildenafil in London nightclubs. *Subst Use Misuse*. 2015;50(11):1390–1394. https://doi.org/10.3109/10826084.2015.1013135
17. Chu PL, McFarland W, Gibson S, *et al.* Viagra use in a community-recruited sample of men who have sex with men, San Francisco. *J Acquir Immune Defic Syndr*. 2003;33(2):191–193. https://doi.org/10.1097/00126334-200306010-00012
18. Crosby R, Diclemente RJ. Use of recreational Viagra among men having sex with men. *Sex Transm Infect*. 2004;80(6):466–468. https://doi.org/10.1136/sti.2004.010496
19. Hammoud MA, Jin F, Lea T, Maher L, Grierson J, Prestage G. Off-label use of phosphodiesterase type 5 inhibitor erectile dysfunction medication to enhance sex among gay

and bisexual men in Australia: results from the FLUX study. *J Sex Med*. 2017;14(6):774–784. https://doi.org/10.1016/j.jsxm.2017.04.670
20. Pantalone DW, Bimbi DS, Parsons JT. Motivations for the recreational use of erectile enhancing medications in urban gay and bisexual men. *Sex Transm Infect*. 2008;84(6):458–462. https://doi.org/10.1136/sti.2008.031476
21. Kloner RA, Zusman RM. Cardiovascular effects of sildenafil citrate and recommendations for its use. *Am J Cardiol*. 1999;84(5B):11–17. https://doi.org/10.1016/s0002-9149(99)00114-9
22. Bechara A, Casabé A, De Bonis W, Helien A, Bertolino MV. Recreational use of phosphodiesterase type 5 inhibitors by healthy young men. *J Sex Med*. 2010;7(11):3736–3742. https://doi.org/10.1111/j.1743-6109.2010.01965.x
23. Mostafa T, Alghobary MF. Recreational use of oral PDE5 inhibitors: the other side of midnight. *Sex Med Rev*. 2022;10(3):392–402. https://doi.org/10.1016/j.sxmr.2021.10.004
24. Smith KM, Romanelli F. Recreational use and misuse of phosphodiesterase 5 inhibitors. *J Am Pharm Assoc (2003)*. 2005;45(1):63–75. https://doi.org/10.1331/1544345052843165
25. Giuliano F, Jackson G, Montorsi F, Martin-Morales A, Raillard P. Safety of sildenafil citrate: review of 67 double-blind placebo-controlled trials and the postmarketing safety database. *Int J Clin Pract*. 2010;64(2):240–255. https://doi.org/10.1111/j.1742-1241.2009.02254.x
26. Nagasawa S, Saka K, Yamagishi Y, *et al.* Association between sexual activity-related death and non-prescription use of phosphodiesterase type 5 inhibitors. *Leg Med (Tokyo)*. 2021;48:101815. https://doi.org/10.1016/j.legalmed.2020.101815
27. McLeod AL, McKenna CJ, Northridge DB. Myocardial infarction following the combined recreational use of Viagra and cannabis. *Clin Cardiol*. 2002;25(3):133–134. https://doi.org/10.1002/clc.4960250310
28. Pandit JN, Kumari R, Kumari M, Mp AR, Yadav A, Arava S. Rare fatal effect of combined use of sildenafil and alcohol leading to cerebrovascular accident. *J Forensic Leg Med*. 2023;95:102504. https://doi.org/10.1016/j.jflm.2023.102504
29. DE Nunzio C, Nacchia A, Grimaldi MC, *et al.* Major adverse cardiovascular events related to phosphodiesterase 5 inhibitors: analysis of real-life data from Eudra-vigilance database. *Minerva Urol Nephrol*. 2024;76(2):203–209. https://doi.org/10.23736/S2724-6051.23.05611-2
30. Baaklini G, Reed A, Tafti D, Henry A, Stackhouse D. Partial segmental thrombosis of the corpus cavernosum associated with recreational use of sildenafil. *Urol Case Rep*. 2021;36:101593. https://doi.org/10.1016/j.eucr.2021.101593

The Journal of Sexual Medicine, 2026, 23, qdag230
https://doi.org/10.1093/jsxmed/qdag230
Review Article