

HIV-1 Prevalence and Pre-Exposure Prophylaxis Uptake Among Key Populations in High-Income Economies (2017–2023): a Systematic Review and Meta-Analysis of Real-World Studies

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Conclusions

- In this systemic literature review (SLR) of HIV-1 prevalence in key populations, overall HIV-1 prevalence ranged from <1% to 29% among high-income economies (36 countries, Hong Kong, and Taiwan)
 - Within economies, HIV-1 prevalence also varied widely among key populations
 - HIV-1 prevalence among pre-exposure prophylaxis (PrEP) users was <0.5%, underscoring the high effectiveness of PrEP in reducing new HIV-1 diagnoses
- Disparities in HIV-1 prevalence and PrEP uptake highlight the need for targeted strategies to provide equitable access to PrEP to strengthen local HIV-1 prevention initiatives
 - In regions with high HIV-1 prevalence, a low PrEP uptake suggests a need to focus on increasing access, while a high PrEP uptake suggests a need for other methods of prevention

Plain Language Summary

- Efforts across the world have lowered the number of HIV infections, but many people are still told they have HIV each year, and some groups of people have higher chances of getting HIV than others
- HIV prevention medications called "PrEP" help to lower the chances of getting HIV, but the number of people who use PrEP varies between regions
- The aim of this study was to better understand which groups of people had HIV and which used PrEP, by looking at previously published data in several high-income regions
- The study found that HIV infection rates were different in each region and in different groups of people, but were much lower in people who used PrEP
 - The number of people using PrEP was much lower in some regions than in others
- This study shows that different HIV prevention plans and policies are needed to encourage more people to take PrEP in different regions and populations

Background

- While the number of new HIV-1 infections is declining globally, 1.3 million new infections occurred in 2023, significantly exceeding the 2030 target of 350,000 new infections set by the United Nations Political Declaration on HIV/AIDS^{1,2}
 - PrEP can help significantly reduce new HIV-1 acquisition³; however, PrEP remains underutilised⁴
- Among high-income economies, HIV-1 incidence and prevalence,⁵ as well as PrEP availability and uptake,^{6,7} vary by region and by population⁸
- A previous study in Europe (2009–2019) found HIV-1 prevalence to be highly diverse across populations and countries, although data were limited⁹; overall, few studies have compared HIV-1 prevalence in higher-income economies outside of the United States and Africa

Objective

- This SLR and meta-analysis aimed to provide a comprehensive summary of real-world evidence on HIV-1 prevalence and the uptake and effectiveness of PrEP among key populations in World Bank-defined high-income economies, excluding the United States and African countries

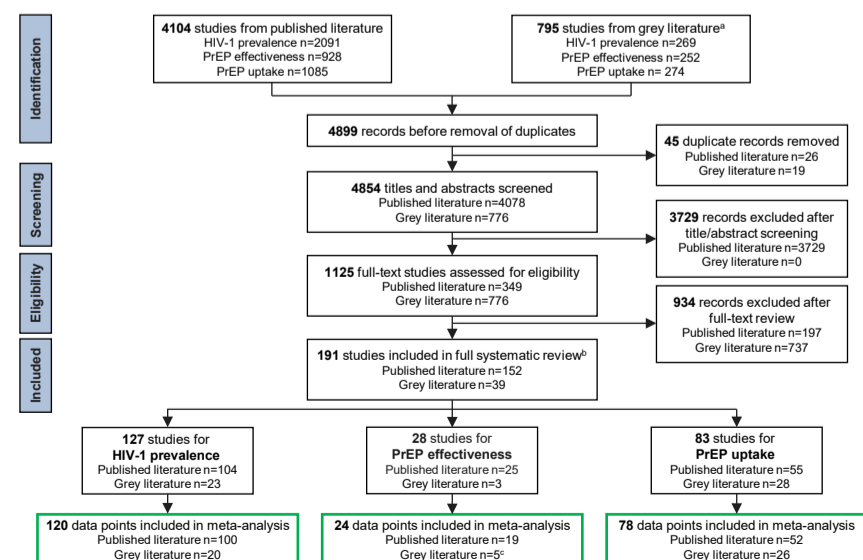
Methods

- This systematic review and meta-analysis was conducted in accordance with the PRISMA guidelines
- A systematic search was performed in July 2023 of Embase, Cochrane Library, and PubMed for peer-reviewed publications of real-world data, supplemented with a search of conference publications
 - A grey literature search was performed in November 2023 of local and international public health, research organisations, and HIV advocacy websites
- Data were restricted to key populations and included: men who have sex with men (MSM), transgender women (TGW), transgender men (TGM), people who inject drugs (PWID), people in prison (PIP), and women who engage in sex work (SW)
- Included sources were restricted to similarly-resourced high-income economies, excluding the United States and African economies to reduce the overall scope of the study, with no requirement for country-level data
 - Exclusion criteria: no original data, single site studies, clinical trials, not in English, more recent versions available
- Sources were selected in Covidence systemic review software¹⁰ based on predetermined criteria using a standard two-reviewer approach, with discrepancies resolved by a third reviewer
 - Selected sources were assessed for bias using the modified Joanna Briggs Institute's critical appraisal tool
- Included full-texts were extracted into a prespecified Microsoft Excel grid by a single reviewer and verified by a second independent reviewer¹¹
- Meta-analyses, using random effects models, were used to estimate (1) HIV-1 prevalence, (2) PrEP uptake, and (3) HIV-1 prevalence in PrEP users, as a measure of PrEP effectiveness

Results

- Out of the 4854 unique sources that were captured and reviewed, a total of 191 real-world studies from 38 high-income economies (36 countries, Hong Kong, and Taiwan) were identified and included in the full SLR (Figure 1)
 - Characteristics of included sources for HIV-1 prevalence, PrEP uptake, and PrEP effectiveness are shown in Table 1
- From these sources, data were extracted for meta-analyses on HIV-1 prevalence (120 data points), PrEP effectiveness (24 data points), and PrEP uptake (78 data points)

Figure 1. PRISMA Flow Diagram and Study Selection



^aGrey literature was scrutinised before screening. ^bSome studies were included in more than one objective. ^cGrey literature sources could contain more than one data point. PrEP, pre-exposure prophylaxis.

Results (cont'd)

Table 1. Study Characteristics from Included Sources

	Study design (n)					Quality score ≥80% n (%)
	Cross-sectional	Prospective cohort	Retrospective cohort	Case-control	National registry or database	
HIV-1 prevalence	69	35	14	0	9	37 (29.1%)
PrEP uptake ^a	55	19	2	0	6	3 (3.8%)
PrEP effectiveness	3	18	5	1	1	10 (40.0%)

^aOne grey literature source for PrEP uptake did not report study design. Quality score was calculated using 9 sets of questions, with a total score of 11 points (modified Joanna Briggs Institute's critical appraisal tool). PrEP, pre-exposure prophylaxis.

Overall HIV-1 Prevalence Among Economies (2019–2023)

- The overall pooled HIV-1 prevalence, encompassing data from all key populations and economies, was 5.2% (95% CI, 4.3–6.2%) (Table 2)
- Economies with an overall HIV-1 prevalence <1% included South Korea, Hungary, Cyprus, Czechia, Austria, and Kuwait
- Economies with the highest overall HIV-1 prevalence included Romania (28.9%), Estonia (26.0%), Latvia (22.3%), and Chile (17.4%)

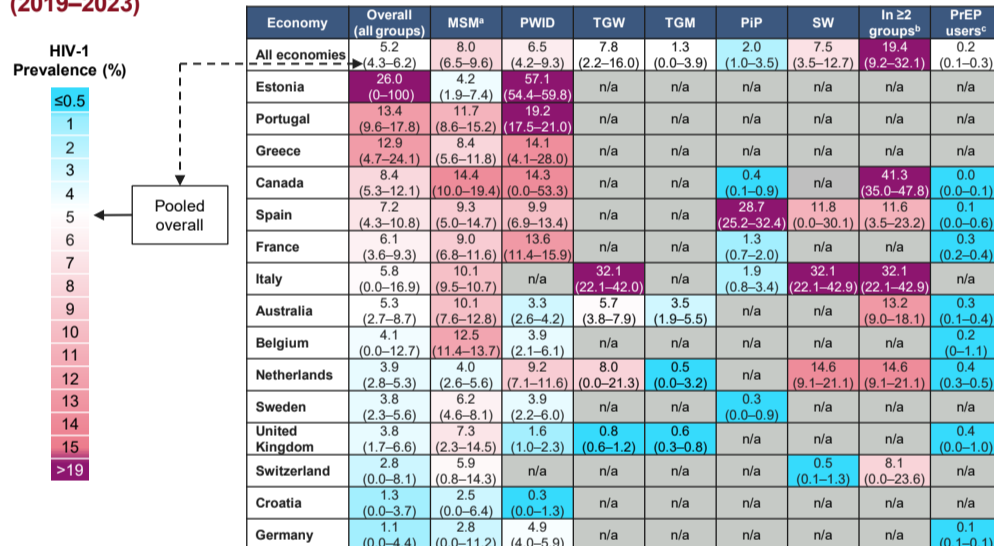
HIV-1 Prevalence Among Key Populations (Table 2)

- The prevalence of HIV-1 in MSM was 8.0% (25 economies) and ranged from 1.5% to 17.4%
 - Prevalence in MSM was lowest in New Zealand (1.5%), Croatia (2.5%), Hong Kong (2.7%), and Iceland (2.7%), and highest in Chile (17.4%), Canada (14.4%), and Denmark (13.5%)
- The prevalence of HIV-1 in PWID (22 economies) was 6.5% and ranged from 0.3% to 57.1%
 - Prevalence in PWID was lowest (<5%) in Hungary, Croatia, Cyprus, Czechia, and Austria, and highest in Estonia (57.1%) and Romania (28.9%)
- HIV-1 prevalence was 7.8% in TGW (4 economies) and 1.3% in TGM (3 economies)
- HIV-1 prevalence was 2.0% in PIP (6 economies) and 7.5% in SW (4 economies)
- HIV-1 prevalence was 19.4% for people in ≥2 key populations (6 economies)

HIV-1 Prevalence Among PrEP Users (PrEP Effectiveness) (Table 2)

- HIV-1 prevalence among PrEP users (8 economies) was <0.5% in each economy, with an overall prevalence of 0.2% (95% CI, 0.1–0.3%)

Table 2. Heatmap of HIV-1 Prevalence (%) for Economies With Data for ≥2 Key Populations (2019–2023)

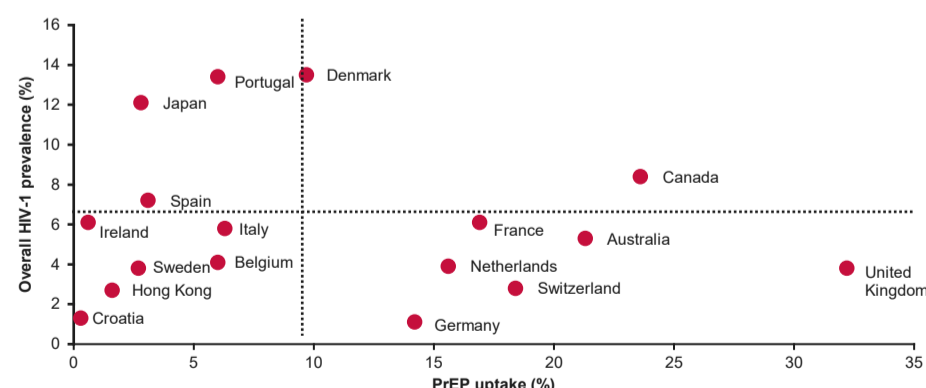


Data presented are percentage (95% CI). In total, 35 high-income economies had prevalence data for ≥1 key populations, and were included in the overall HIV-1 prevalence estimate. Individual economies with HIV-1 prevalence data for ≥2 subpopulations (n=15) were arranged in order of descending overall prevalence. Blue indicates a prevalence below, and red a prevalence above, the pooled overall prevalence (5.2%), shown in white; purple indicates a prevalence >19%. ^aMSM included men who identify as gay, bisexual, and otherwise, who have sex with men at first instance. ^bIncluded individuals who are members of ≥2 key population; for studies that reported data for individuals in overlapping groups, the same value was included for each key population. ^cPrEP users were included in the 'all groups' HIV-1 prevalence estimates. CI, confidence interval; MSM, men who have sex with men; n/a, not available; PIP, people in prison; PrEP, pre-exposure prophylaxis; PWID, people who inject drugs; SW, women who engage in sex work; TGM, transgender men; TGW, transgender women.

PrEP Uptake (2017–July 2023)

- The pooled overall PrEP uptake (20 economies) in all key populations was 17.7% (95% CI, 12.0–24.1%)
 - Uptake in all key populations ranged from 0.3% in Croatia to 32.2% in the United Kingdom
- Comparing PrEP uptake and HIV-1 prevalence in economies with available data revealed variation in presentation (Figure 2)
 - PrEP uptake ranged from 0.3%–32.2% in economies with lower HIV-1 prevalence, and from 2.8%–23.6% in economies with higher HIV-1 prevalence

Figure 2. Pooled Estimates Among All Key populations of Overall HIV-1 Prevalence and PrEP Uptake, by Economy (n=17)^a



^aAll World Bank-defined high-income economies were included except United States and African countries, to provide a comparable context with healthcare resources and transmission patterns. Out of a total of 38 high-income economies eligible for meta-analysis of the SLR, 17 economies with data available for both PrEP uptake and HIV-1 prevalence in key populations were plotted. The position of each economy represents pooled meta-analysis estimates for both statistics. The dashed lines represent the economy-level pooled estimated median overall HIV-1 prevalence (6.1% for 35 economies) and median PrEP uptake (9.6% for 17 economies). PrEP, pre-exposure prophylaxis; SLR, systematic literature review.

Limitations

- Unequal representation of economies, with some having significantly fewer studies, led to data gaps and insufficient representation in subsequent meta-analyses; this imbalance limits the generalisability of the findings and affects the robustness of cross-economy comparisons
- Included data points varied in scope, and included local, regional, and national data, which may limit comparisons across economies
- Several sources were excluded as they did not provide a denominator for the prevalence or uptake values reported
- Changes in HIV-1 prevention strategies and PrEP availability over time across different economies may affect the relevance of older data, potentially limiting the generalisability of findings to current conditions
- Heterogeneity across included studies, due to differences in targeted priority populations, study quality, and study design

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Conflicts of Interest: Li Tao, Xiwen Huang, Juan Yang, Jesse Najarro Cermeño, Soodi Navadeh, and Dylan Mezzio are employees and shareholders of Gilead Sciences, Inc. Julianna Catania, Kylie Scott, and Sophie Schoeni are employees of Costello Medical, who provided support conducting the systematic literature review funded by Gilead Sciences, Inc. Acknowledgements: Medical writing and editorial support were provided by Erin McMullin, PhD, and Sherridan Beard, MA, of Ashfield MedComms (Macclesfield, UK), an Inizio company, and funded by Gilead Sciences, Inc.