Global, regional, and country-level coverage of testing and treatment for HIV and hepatitis C infection among people who inject drugs: a systematic review

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Summary

Background People who inject drugs are disproportionately affected by HIV and hepatitis C virus (HCV) infections, while there is little global data on HIV and HCV testing and treatment coverage of this population. We conducted a systematic review to evaluate country-level, regional, and global coverage of HIV and HCV testing and treatment among people who inject drugs.

Methods We did a systematic review, and searched bibliographic databases (MEDLINE, Embase, and PsycINFO) and grey literature for studies published between Jan 1, 2017, and April 30, 2022, that evaluated the proportion of people who inject drugs who received testing or treatment for HIV or HCV. For each country, we estimated the proportion of people who inject drugs tested for HIV antibodies in the past 12 months (recent), people who inject drugs ever tested for HCV antibodies and HCV RNA, people who inject drugs with HIV currently receiving antiretroviral therapy, and people who inject drugs with HCV ever receiving HCV antiviral treatment. Regional and global estimates, weighted by the population size of people who inject drugs, were generated where sufficient data were available. This study is registered with PROSPERO (CRD42020173974).

Findings 512 documents reported data eligible for analyses, including 337 peer-reviewed articles, 27 conference abstracts or presentations, and 148 documents from grey literature or supplementary searches. Data of recent HIV antibody testing were available for 67 countries and ever having had HCV antibody testing were available for 49 countries. Globally, an estimated 48·8% of people who inject drugs were recently tested for HIV antibodies (95% uncertainty interval [UI] 43·3–54·2%; range 0·9–86·0%), and 47·1% had ever been tested for HCV antibodies (95% UI 43·4–51·0%; range 0·0–93·3%). HCV RNA testing data were available from three countries. Coverage of HIV antibody testing was high (>75%) in four countries and for HCV antibody testing in 15 countries. The estimated uptake of current HIV treatment (18 countries) ranged from 2·6% to 81·9%, and the estimated uptake of ever having HCV treatment (23 countries) ranged from 1·8% to 88·6% across countries. Uptake of HIV treatment was high in two countries, and of HCV treatment in one country.

Interpretation HIV and HCV testing and treatment uptake among people who inject drugs was highly variable, and suboptimal in most countries. Strategies to improve access to HIV and HCV care among people who inject drugs and the availability of public health surveillance are urgently required.

Funding Australian National Health and Medical Research Council and UK National Institute for Health and Care Research Health Protection Research Unit in Behavioural Science and Evaluation.

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Lancet Glob Health 2023; 11: e1885–98

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Introduction

Hepatitis C virus (HCV) and HIV infections are major public health threats worldwide.[1] People who inject drugs are greatly affected by both infections, with an estimated 5·8 million people who inject drugs living with HCV and 2·2 million living with HIV in 2022, globally.[2] Strategies to reduce HCV and HIV infections and their associated morbidity and mortality require enhanced access to testing and treatment among people who inject drugs.

WHO's targets for 2030 include 95% of people living with HIV and 90% of people with HCV diagnosed, and 95% of people diagnosed with HIV and 80% of people diagnosed with HCV accessing treatment.[3] However, there are few global data on HIV and HCV testing and treatment coverage among people who inject drugs. International agencies such as UNAIDS develop annual reports of HIV testing and treatment uptake, which include data on key populations, including people who inject drugs.[4] However, these data have limitations.[5–7] The data are reported by country authorities, and not necessarily evaluated for shortcomings in their methods. The estimated proportion of people who inject drugs

Research in context

Evidence before this study

Existing estimates of global HIV and hepatitis C virus (HCV) testing and treatment uptake included overall data on people living with HIV or HCV, whereas there are few such data among people who inject drugs. Peer-reviewed and grey literature databases, including MEDLINE, Embase, and PsycInfo, were searched for systematic reviews evaluating HIV and HCV testing and treatment uptake among people who inject drugs from database inception to April 30, 2022, with no language restrictions. Combinations of a large list of search terms, relating to HCV, HIV, and injecting drugs use were used. Examples of search terms include "HIV", "AIDS", "human immunodeficiency virus", "acquired immunodeficiency syndrome", "hepatitis C", "HCV", "IDU", "PWID", "injecting drug*", "intravenous drug*", "injecting substance*", "intravenous substance*", "people who inject*", and "injection drug*". In 2017, a global systematic review provided estimates of the uptake of HIV testing and treatment among people who inject drugs. This study did not incorporate the coverage of HCV testing and treatment, and updated data of HIV testing and treatment are also required to assess the temporal change. No other systematic review on this topic was found. Although international agencies such as UNAIDS develop annual reports of HIV testing and treatment uptake among people who inject drugs, the data are mostly reported by country authorities, and not necessarily evaluated for shortcomings in the methods. These data are not the output of systematic reviews of evidence, and do not follow the principles of the GATHER guidelines. Subsequently, we conducted this systematic review to evaluate HIV and HCV testing and treatment uptake among people who inject drugs at a country level, regional level, and global level, using the most recently available and verifiable quality data.

Added value of this study

To our knowledge, this study is the first to generate regional and global estimates of HCV testing and treatment uptake among people who inject drugs. This multi-stage systematic review has also provided updated estimates of HIV testing and treatment uptake among people who inject drugs at regional and global levels. For each country, we used verifiable evidence and developed estimated proportions of people who inject drugs tested for HIV antibodies, HCV antibodies, and HCV RNA, and the proportions of people who inject drugs with HIV or HCV receiving antiviral treatment, where available. We also developed a grading classification to evaluate the selection bias of country-level data. In our methods, we followed the principles of evidence-based medicine, and developed the estimates on the basis of available quality data with a verifiable source in the public domain. Accordingly, for several countries, our estimates were different from those reported by country authorities or international agencies. This is mainly because we used more recent data, or that the data used for generating estimates reported elsewhere did not meet our inclusion criteria or were not verifiable. This systematic review identified data gaps in many countries, particularly on the uptake of HCV RNA testing, HIV treatment, and HCV treatment. Among countries with available data, we showed a wide range in the uptake of HIV and HCV testing and treatment among people who inject drugs across countries, with a suboptimal uptake in most countries.

Implications of all the available evidence

The findings of this study show the crucial need for producing quality data on HIV and HCV care coverage among people who inject drugs at a country level. In countries with available data, our findings have implications for guiding progress in HIV and HCV testing and linkage to care among people who inject drugs. Our data, identifying the suboptimal HIV and HCV testing and treatment uptake in most countries, highlight the need for more investments and efforts at national and international levels to provide equitable access to HIV and HCV testing and treatment, and the need for development of targeted strategies and interventions to improve the linkage of people who inject drugs to HIV and HCV clinical care.

receiving HIV testing and treatment that are derived from registry or service programme data have further limitations, given that the denominators (eg, number of people who inject drugs living with HIV) are synthesised by mathematical modelling.[5] A systematic review might overcome these limitations. In 2017, a systematic review estimated that 1–94% of people who inject drugs in 49 countries with available survey data received HIV testing in the past year, whereas 5–67% of people who inject drugs with HIV in seven countries received antiretroviral therapy.[8] This review did not include studies on the coverage of HCV testing and treatment, which is crucial given the advent of highly effective direct-acting antiviral (DAA) therapy and the necessity of monitoring access to DAA therapy among people who inject drugs. To update the findings from the previous review and address the gap in HCV data, we conducted a systematic review to evaluate country-level, regional, and global estimates of the coverage of testing and treatment for HCV and HIV infections among people who inject drugs.

Methods

Search strategy and selection criteria

This systematic review is reported in accordance with the PRISMA[9] and GATHER[10] statements. The protocol was registered with PROSPERO (CRD42020173974), with the results regarding the coverage of HIV and HCV testing and treatment reported in this manuscript. Studies were eligible for inclusion if the study population included people who inject drugs, and the study provided data of the number or proportion of people who inject drugs who received testing or treatment for HIV or HCV.

People who inject drugs were defined as people injecting drugs in the past 12 months. For countries with no available eligible study based on this definition, other definitions of people who inject drugs were accepted (eg, recent, ongoing, active, or lifetime experience of injecting drug use). Studies evaluating testing uptake were eligible if they reported a history of HIV antibody, HCV antibody, or HCV RNA testing based on the participant's self-report or clinical records. Studies evaluating treatment uptake were eligible if they reported history of HIV antiretroviral therapy, based on the participant's self-report or clinical records among people diagnosed with HIV, or a history of HCV DAA or interferon-containing treatment among people diagnosed with HCV. Studies evaluating the uptake of testing or treatment received through an interventional component of the same study, or which generated their estimates on the basis of the data from registries or service programmes, were excluded. Studies evaluating treatment uptake were excluded if the participant's HIV or HCV positive status (ie, denominator) was based on the participant's self-report, given that evidence shows the inaccuracy of this measure.[11,12] To minimise the risk of selection bias, studies were excluded if the study population was not representative of people who inject drugs, including studies recruiting a subpopulation of people who inject drugs (eg, people incarcerated or people with HCV and HIV co-infection) or a study population restricted to one gender. Studies were also excluded if there were missing data for 15% or more of the study population, or if the study population included less than 40 people. Studies evaluating HIV or HCV treatment uptake were excluded if the number of participants who were HIV or HCV positive who were evaluated for treatment uptake was less than 20. The estimates reported in review articles or found through the grey literature search were only included if the source of the estimate was available in the public domain (to enable the evaluation of the methods) and the numerator and denominator were reported or extractable (to enable computing the CI). No language restriction was considered for the inclusion of studies (ie, only English keywords were used in the search, but if any non-English eligible papers were found through the search, they were included).

Data sources included peer-reviewed databases and grey literature and consultation with international experts in the field. We searched three bibliographic databases: MEDLINE (Pubmed), Embase, and PsycINFO. The search strategies, including the search terms, are detailed in the appendix (pp 5–6). Grey literature sources, such as websites of relevant international agencies, were searched (appendix pp 7–14). Searches covered data published between Jan 1, 2017, and April 30, 2022, and included the records found through our previous reviews (covering 2008–17)[8,13] and an updated search for data published in 2017–22. A global expert inquiry was undertaken to request relevant data (appendix pp 15–17), whereas several international experts were also contacted individually. Our initial findings were then discussed with UN agencies, including WHO, UNAIDS, and UN Office on Drugs and Crime, and additional eligible grey literature reports were identified in consultation with these international agencies. Reference lists of reviews identified via the search were hand searched.

Identified documents were de-duplicated and screened by title and abstract. Eligible records were included in the full-text review, and eligible studies after the full-text review were included in analysis (appendix p 22). Records in languages other than English were translated using Google Translate. Each step of study selection was conducted by independent reviewers (BH, JG, LD, SO, PW, AK, SC-F, AWi, AWh, EC, JI, LTT, and OP) with discrepancies discussed between them to reach consensus.

Data were extracted into a database (Microsoft Access). Extracted data included items related to study setting (eg, country, state or city, number of study sites, and services available in the site); participant recruitment method; inclusion and exclusion criteria; basic characteristics of participants (eg, gender and age); the number or proportion of participants tested for HIV antibodies, HCV antibodies, and HCV RNA; the number or proportion of participants with a positive HIV or HCV test; and the number or proportion of participants who were HIV or HCV positive and receiving antiviral treatment (appendix pp 19–21). Authors were contacted if supplementary data were required. For each included study, the representativeness of the study population (ie, selection bias) was assessed and studies were classified as grade A–C, with studies recruiting participants from multiple settings and multiple geographical locations being considered the most representative and designated grade A (appendix p 18).

Data synthesis

HIV and HCV testing uptake

The primary analysis outcomes included the proportion of people who inject drugs recently tested for HIV antibodies (ie, within the past 12 months) and the proportion of people ever receiving testing for HCV antibodies or RNA. Secondary outcomes included the proportion of people who inject drugs ever tested for HIV antibodies and those recently tested for HCV antibodies.

HIV treatment uptake

See Online for appendix

The primary outcome was the proportion of people living with HIV who were currently receiving antiretroviral therapy. The secondary outcome was the proportion of people ever receiving treatment. People living with HIV were defined as those with a clinically confirmed HIV antibody positive test at the time of study.

HCV treatment uptake

The primary outcome was the proportion of people diagnosed with chronic HCV (ie, those eligible for treatment) who ever received HCV DAA or interferon-containing treatment. The secondary outcome included the proportion of those receiving treatment in the past 12 months. In studies not providing the number of people diagnosed with chronic HCV, the number of those with a clinically confirmed HCV antibody positive test at the time of study was adjusted to subtract the number of individuals with spontaneous HCV clearance, using an adjustment factor of 25%.[14]

In all analyses, a history of HIV or HCV testing or treatment more than 12 months ago (or any history of testing or treatment if the timeframe was not reported) was considered as having ever received testing or treatment. For

	Estimated number of people who inject drugs*	HIV antibody prevalence among people who inject drugs*	Proportion of people who inject drugs tested for HIV antibodies in the past 12 months	Estimated number of people who inject drugs living with HIV*	Proportion of people who inject drugs with HIV currently receiving antiretroviral therapy
Australasia					
Australia	98 500	1·3%	49·5% (48·7–50·3)	1500	76·3% (63·4–86·4)
New Zealand	22 500	0·1%	57·0% (53·3–60·6)	<500	..
Caribbean					
Puerto Rico	21 000	6·0%	31·2% (27·6–35·0)	1500	..
Central Asia					
Kyrgyzstan	28 000	12·4%	43·0% (39·8–46·3)	3500	..
East and southeast Asia					
Cambodia	4500	8·0%	39·7% (35·9–43·6)	500	47·7% (32·5–63·3)
China	2 561 000	11·9%	59·0% (56·3–61·7)	304 000	..
Indonesia	204 000	39·1%	39·0% (36·4–41·6)	80 000	..
Malaysia	144 000	14·1%	41·4% (39·0–43·8)	20 000	54·5% (32·2–75·6)
Myanmar	96 000	26·4%	24·0% (23·1–24·9)	25 500	47·8% (26·8–69·4)
Philippines	24 000	6·2%	6·8% (5·7–7·9)	1500	..
Thailand	54 000	22·2%	53·1% (50·4–55·9)	12 000	..
Viet Nam	214 000	22·5%	28·3% (27·0–29·6)	48 000	81·9% (79·1–84·5)
Eastern Europe					
Armenia	9000	1·1%	33·0% (29·2–36·9)	<500	..
Azerbaijan	43 000	9·8%	11·0% (8·1–14·5)	4000	..
Belarus	79 500	25·2%	54·5% (52·0–56·9)	20 000	..
Bosnia and Herzegovina	10 500	0·1%	28·4% (25·0–32·1)	<500	..
Estonia	7000	51·4%	53·7% (48·3–59·0)	3500	57·3% (38·2–75·4)
Georgia	108 000	1·6%	24·4% (16·6–33·1)	2000	..
Hungary	6500	<0·1%	7·1% (3·5–12·7)	<500	..
Latvia	7000	16·2%	44·2% (39·3–49·2)	1000	..
Lithuania	8000	8·3%	72·5% (67·8–76·8)	500	..
Moldova	11 500	28·3%	36·8% (34·3–39·4)	3500	..
Romania	78 000	9·7%	35·1% (30·3–40·1)	7500	..
Russia	1 274 000	49·8%		634 500	17·2% (15·5–19·1)
Ukraine	296 000	20·4%	33·3% (23·9–43·6)	60 500	39·8% (28·0–52·3)
Latin America					
Colombia	51 500	5·7%	86·0% (79·8–90·8)	3000	..
Mexico	111 500	15·8%	35·0% (31·7–38·4)	17 500	..
Nicaragua	6500	0·0%	71·0% (61·1–79·6)	<500	..
Middle East and North Africa					
Algeria	17 000	1·1%	72·6% (62·5–81·3)	<500	..
Lebanon	9500	0·3%	45·7% (28·8–63·4)	<500	..
Libya	2000	89·6%	29·0% (24·1–34·2)	2000	..
Morocco	31 500	6·4%	14·0% (11·4–16·7)	2000	..
Occupied Palestinian territory	3000	<0·1%	30·7% (24·3–37·6)	<500	..
Tunisia	8000	3·1%	18·2% (15·6–21·1)	<500	..

(Table 1 continues on next page)

	Estimated number of people who inject drugs*	HIV antibody prevalence among people who inject drugs*	Proportion of people who inject drugs tested for HIV antibody in the past 12 months	Estimated number of people who inject drugs living with HIV*	Proportion of people who inject drugs with HIV currently receiving antiretroviral therapy
(Continued from previous page)					
North America					
Canada	174 500	5·8%	68·7% (66·1–71·3)	10 000	70·7% (64·3–76·6)
USA	3 141 000	5·9%	60·6% (54·8–66·3)	190 500	54·5% (51·0–57·9)
South Asia					
Afghanistan	80 000	3·8%	78·9% (74·1–83·2)	3000	..
Bangladesh	73 000	2·5%	78·7% (76·0–81·2)	2000	..
India	878 000	13·6%	56·8% (36·1–76·4)	119 500	46·6% (38·4–55·0)
Maldives	2500	0·0%	17·0% (12·8–22·0)	<500	..
Nepal	38 000	4·6%	33·7% (24·8–43·2)	2000	30·0% (16·6–46·5)
Pakistan	497 000	30·9%	34·1% (32·8–35·5)	153 500	8·2% (2·3–19·6)
Sri Lanka	2500	<0·1%	10·7% (8·4–13·3)	<500	..
Sub-Saharan Africa					
Benin	14 000	5·1%	52·1% (47·0–57·2)	500	..
Chad	18 000	11·2%	40·0% (26·4–54·8)	2000	..
Republic of the Congo	36 500	2·4%	..	1000	2·6% (0·1–13·8)
Ethiopia	139 500	6·3%	33·3% (27·4–39·7)	9000	..
Ghana	20 000	2·7%	0·9% (0·1–3·2)	500	..
Kenya	36 000	11·3%	73·5% (71·7–75·2)	4000	..
Mauritius	12 000	32·3%	40·8% (36·5–45·3)	4000	63·1% (55·1–70·6)
Mozambique	33 000	35·5%	23·4% (19·7–27·4)	12 000	31·4% (25·1–38·2)
Nigeria	177 500	3·8%	27·6% (25·4–29·9)	7000	..
Seychelles	2000	12·6%	27·7% (23·1–32·8)	500	..
Sierra Leone	2000	8·5%	2·5% (1·3–4·1)	<500	..
South Africa	82 000	17·9%	54·8% (50·5–59·0)	14 500	20·1% (16·3–24·3)
Uganda	9500	11·2%	76·0% (67·5–83·2)	1000	..
Tanzania	398 500	14·0%	30·3% (27·5–33·1)	56 000	..
Western Europe					
Albania	7000	0·5%	59·8% (55·1–64·4)	<500	..
Belgium	7000	4·5%	64·5% (57·9–70·7)	500	..
England	208 000	0·9%	34·5% (31·6–37·5)	2000	..
France	125 500	9·3%	36·3% (25·8–47·8)	11 500	..
North Macedonia	6500	<0·1%	40·3% (34·6–46·2)	<500	..
Germany	129 500	4·1%	64·1% (61·9–66·3)	5500	..
Italy	320 500	7·7%	37·4% (35·2–39·6)	24 500	..
Northern Ireland	4000	0·4%	33·4% (29·5–37·4)	<500	..
Scotland	15 500	1·9%	49·8% (44·3–55·3)	500	..
Serbia	28 500	<0·1%	20·8% (17·4–24·7)	<500	..
Spain	9000	26·5%	59·2% (57·1–61·3)	2500	74·9% (69·3–80·1)
Wales	7000	1·1%	34·8% (31·5–38·2)	<500	..

Data are n, %, or % (95% CI). There were no countries with available data for Pacific Island states and territories. The uncertainty intervals for these estimates are presented in the appendix (pp 30–31). Estimated numbers were rounded to the nearest 500 to ensure an appropriate level of precision. *Estimates of number of people who inject drugs, HIV prevalence, and number of people who inject drugs living with HIV were derived from another study.[2]

Table 1: **Country-level estimates of HIV prevalence and HIV testing and treatment uptake among people who inject drugs, by region**

the estimation of past 12 month HCV or HIV testing or HCV treatment, if studies did not report data on testing or treatment in the past 12 months, the closest timeframe in the past 12 months with available data (eg, in the past 3 months or 6 months) was used. For countries with no estimates of current HIV treatment, history of HIV treatment in the past 12 months was used if available. For each country, estimates from studies with grades A–C (appendix p 18) conducted in the last 4 years of the most recently available estimate were included in the analysis. For HCV treatment uptake, given the major increase in treatment uptake after access to DAA therapy in most

countries, the most recently available data with grade A or B were included in the analysis, whereas grade C data were only included if higher grade data were not available.

On the basis of the targets recommended by UN agencies,[15] HIV testing uptake was categorised as low if the proportion of people who inject drugs tested for HIV in the past 12 months was less than 40%, moderate if the proportion was between 40 and 75%, and high if the proportion was more than 75%. HIV treatment coverage among people who inject drugs was categorised as low if the proportion of people who inject drugs living with HIV who receive antiretroviral therapy was less than 25%, moderate if the proportion was between 25 and 75%, and high if the proportion was more than 75%. Similar benchmarks were used for HCV testing and treatment uptake, given no available HCV-specific targets.

For each study, all analysis outcome measures and corresponding 95% CIs were calculated. If multiple estimates were available for a country, estimates were pooled using random effects meta-analysis with variance stabilising Freeman–Tukey double arcsine transformation. For each outcome measure, heterogeneity across studies was assessed using the I^2 statistic. The weighting scheme commonly used in meta-analyses (based on weighting individual studies by their inverse variance) does not consider the actual target population size and thus was not appropriate for estimating regional estimates in this study. Subsequently, we weighted country-level estimates in each region by the population size of people who inject drugs in each country,[2] whereas regional estimates were applied to the countries with no available country-level data. A Monte Carlo simulation, taking 100 000 draws, was used to compute 95% uncertainty intervals (UIs). Uncertainty sources considered in the Monte Carlo simulation included the uncertainty of the population size of people who inject drugs in each country and 95% CIs of the corresponding estimate of the analysis outcome. All analyses were done with Stata version 14.0.

For each outcome measure, the country-level estimates were reported if data were available. Regional estimates were developed for the regions where there were two or more countries with available estimates, or where data were available for one country and this country accounted for more than 50% of the estimated regional population of people who inject drugs (applicable to Australasia and North America). Global estimates were developed only for HIV and HCV testing uptake given that sufficient data were available for these measures.

Role of the funding source

The funders of the study had no role in study design, data collection, data analysis, data interpretation, or writing of the report.

Results

Overall, 512 documents reported data eligible for analyses, including 337 peer-reviewed articles, 27 conference abstracts or presentations, and 148 documents from grey literature or supplementary searches (appendix p 22). In 372 studies, people who inject drugs as the study population were defined as people injecting drugs in the past 12 months, whereas in 140 studies, a lifetime of injecting drug use or other definitions were used to define people who inject drugs.

Estimates of recent HIV antibody testing (ie, in the past 12 months) were available from 67 countries (table 1) with 132 estimates (median one estimate per country),

	Proportion of people who inject drugs tested for HIV antibodies in the past 12 months			Proportion of people who inject drugs with HIV currently receiving HIV antiretroviral therapy		
	Number of countries with data	Proportion of people who inject drugs in region with data	Estimate	Number of countries with data	Proportion of people who inject drugs in region with data	Estimate
Eastern Europe	12/17 (71%)	29·1%	33·7 (26·8–41·2)	3/17 (18%)	69·1%	21·7 (17·9–25·5)
Western Europe	12/31 (39%)	87·6%	40·8 (37·1–44·8)	1/31 (3%)	0·9%	..
East and southeast Asia	8/17 (47%)	86·4%	53·5 (51·0–56·0)	4/17 (24%)	12·0%	65·9 (53·0–78·3)
South Asia	7/9 (78%)	89·8%	51·1 (38·5–63·0)	3/9 (33%)	80·8%	32·6 (25·1–42·3)
Central Asia	1/5 (20%)	11·5%	..	..	..	..
Caribbean	1/8 (13%)	21·8%	..	..	..	..
Latin America	3/19 (16%)	28·0%	51·9 (47·5–55·9)	..	..	..
North America	2/2 (100%)	100·0%	61·0 (55·4–66·5)	2/2 (100%)	100%	55·3 (51·7–58·9)
Australasia	2/2 (100%)	100·0%	50·9 (49·5–52·2)	1/2 (50%)	81·4%	76·3 (63·4–86·4)
Middle East and North Africa	6/21 (29%)	22·3%	34·1 (27·5–40·5)	..	..	..
Sub-Saharan Africa	13/44 (30%)	75·0%	34·2 (30·6–37·9)	4/44 (9%)	13·0%	21·6 (17·2–28·1)
Global	67/190 (35%)	74·4%	48·8 (43·3–54·2)	18/190 (9%)	47·5%	..

Data are n (%), %, or estimate (95% uncertainty interval). Estimates of number of people who inject drugs in each country and region were derived from another study.[2] There were no available data for Pacific Island states and territories.

Table 2: **Regional-level estimates of HIV testing and treatment uptake among people who inject drugs**

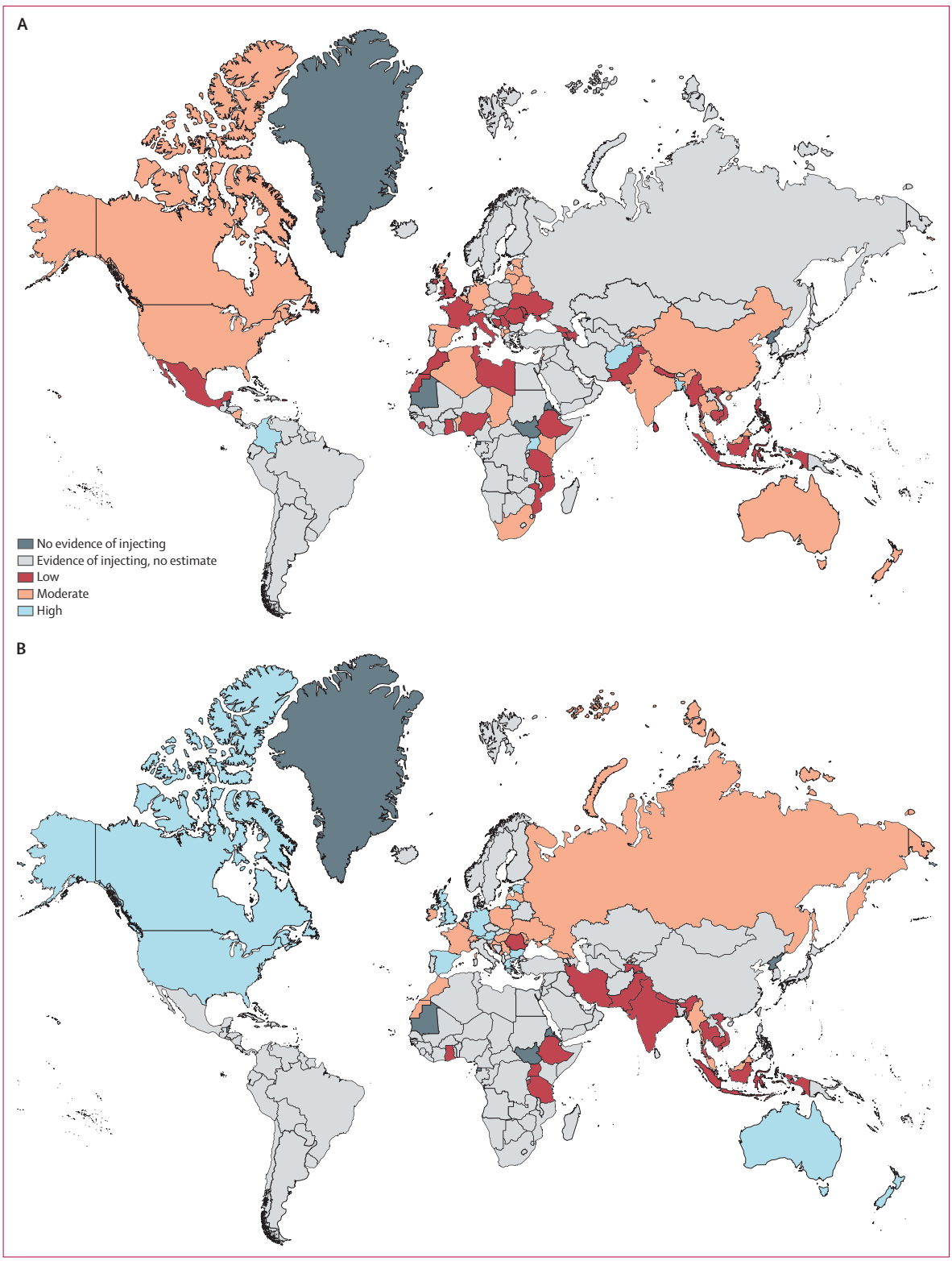

Figure 1: **Estimated proportion of people who inject drugs tested for HIV or HCV antibodies by country**
(A) People who inject drugs tested for HIV antibodies in the past 12 months. (B) People who inject drugs ever tested for HCV antibodies. Low indicates less than 40% of people who inject drugs were tested, moderate indicates 40–75% were tested, and high indicates that more than 75% were tested. HCV=hepatitis C virus.

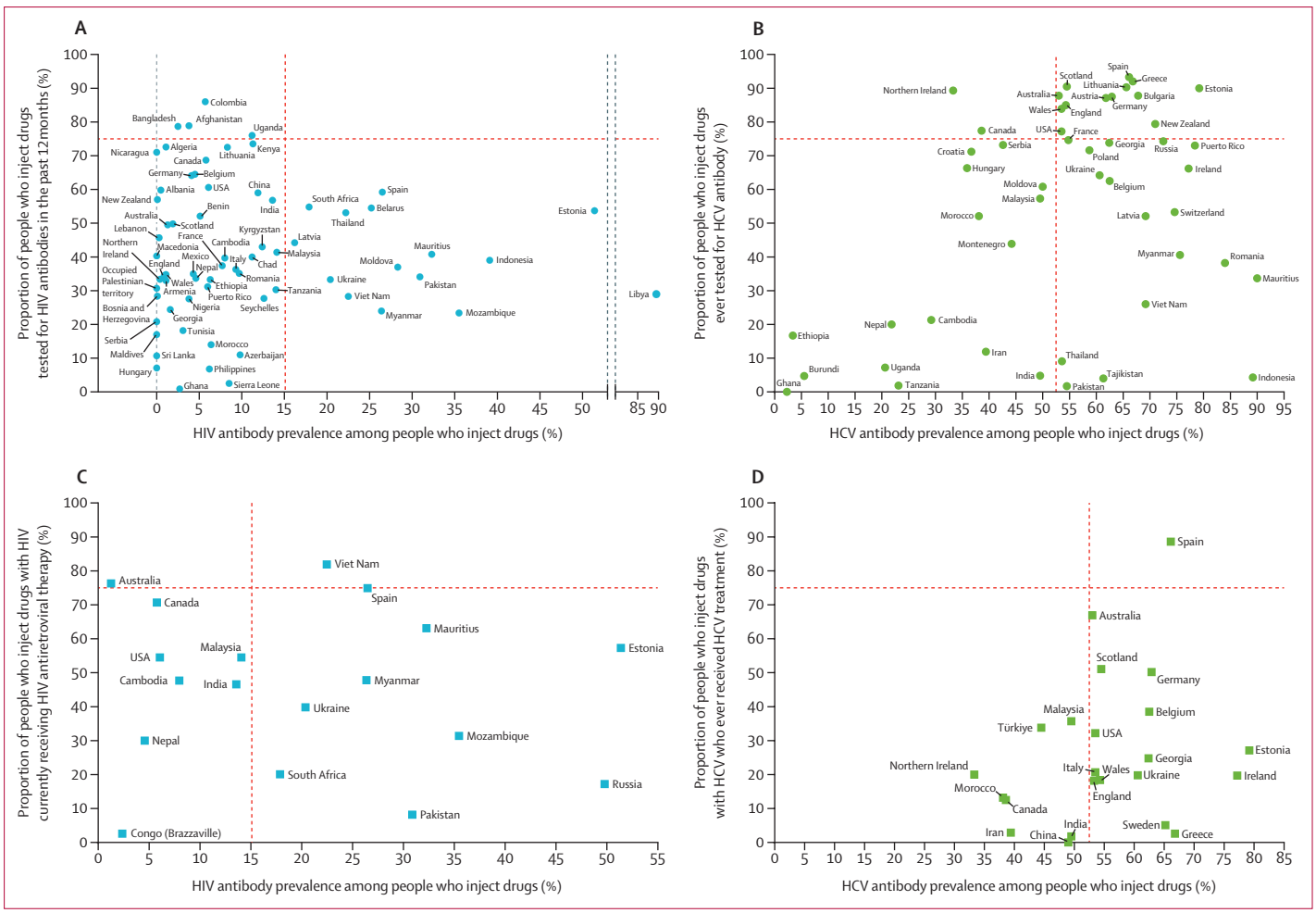

***Figure 2*: Country-level estimates of HIV and HCV testing and treatment uptake among people who inject drugs, by HIV or HCV prevalence**

(A) People who inject drugs tested for HIV antibody by HIV antibody prevalence. (B) People who inject drugs tested for HCV antibodies by HCV antibody prevalence. (C) People who inject drugs with HIV receiving HIV antiretroviral therapy by HIV antibody prevalence. (D) People who inject drugs with HCV ever receiving HCV antiviral therapy by HCV antibody prevalence. The horizontal dotted lines represent the cutoff for high testing or treatment coverage (75%), as recommended by UN agencies.[15] The vertical dotted lines represent the estimated global prevalence of HIV (15·1%) and HCV (52·5%) among people who inject drugs.[2] HCV=hepatitis C virus.

whereas 190 countries and territories globally had documented evidence of injecting drug use.[2] In 62 countries, estimates were derived from studies conducted in multiple settings or multiple geographical locations, or both (appendix pp 23–24), defined as study grades A and B (appendix p 18).

The 67 countries with available recent HIV testing estimates covered 74% of the estimated number of people who inject drugs globally. Regional estimates of recent HIV testing were available for nine regions with sufficient data (range 33·7–61·0%). Globally, an estimated 48·8% of people who inject drugs (95% UI 43·3–54·2) had recently been tested for HIV (table 2).

The proportion of people who inject drugs recently tested for HIV antibodies varied widely across countries (table 1), ranging from 0·9% (Ghana) to 86·0% (Colombia). Based on the definitions by the UN agencies,[15] coverage of recent HIV antibody testing was low (<40%) in 36 countries, moderate (40–75%) in 27 countries, and high (>75%) in four countries. Countries with high coverage were Colombia, Afghanistan, Bangladesh, and Uganda (figures 1A, 2A). The estimate for Afghanistan (from 2012) might not be representative of the status in 2023 (appendix pp 23–24). Globally, an estimated 15% of people who inject drugs were living with HIV.[2] Among the 15 countries with an HIV prevalence among people who inject drugs of more than 15% and available data of recent HIV antibody testing, no country had a high testing coverage (figure 2A).

The estimates of the proportion of people who inject drugs ever tested for HIV antibodies were available from 70 countries (appendix pp 23–24), ranging from 8·8% (Tunisia) to 98·1% (Spain). Estimates of the proportion of people who inject drugs living with HIV who were currently receiving antiretroviral therapy were available from 18 countries (table 1) with 29 estimates

(median one estimate per country), whereas in 100 countries and territories the HIV prevalence among people who inject drugs was greater than zero.[2] Estimates were derived from study grades A or B in 16 countries (appendix p 25).

The 18 countries with available estimates of current HIV treatment uptake comprised 47·5% of the estimated number of people who inject drugs globally (table 2). Regional estimates of treatment uptake were developed in six regions with sufficient data (range 21·6–76·3%; table 2). There were insufficient data to collate a global estimate of HIV treatment uptake.

Among countries with available grade A or B data (table 1), the proportion of people who inject drugs living with HIV currently receiving therapy ranged from 2·6% (Congo [Brazzaville]) to 81·9% (Viet Nam). Based on the UN agencies' definitions,[15] the proportion of people who inject drugs living with HIV who receive therapy was low (<25%) in four countries, moderate (25–75%) in 12 countries, and high (>75%) in two countries. Countries

	Estimated number of people who inject drugs*	HCV antibody prevalence among people who inject drugs*	HCV RNA prevalence among people who inject drugs*	Proportion of people who inject drugs ever tested for HCV antibodies	Proportion of people who inject drugs ever tested for HCV RNA	Estimated number of people who inject drugs with HCV RNA*	Proportion of people who inject drugs with HCV who ever received HCV treatment
Australasia							
Australia	98 500	53·0%	17·8%	87·8% (85·3–90·2)	77·0% (50·4–95·3)	17 500	66·9% (64·5–69·3)
New Zealand	22 500	71·0%	53·0%	79·4% (73·2–84·7)	..	12 000	..
Caribbean							
Puerto Rico	21 000	78·4%	58·7%	73·0% (64·4–80·8)	..	12 500	..
Central Asia							
Tajikistan	26 000	61·3%	46·0%	4·0% (2·1–6·9)	..	12 000	..
East and southeast Asia							
Cambodia	4500	29·2%	21·8%	21·3% (16·7–26·5)	..	1000	..
China	2 561 000	49·0%	35·8%	..	..	916 000	0·0% (0·0–1·9)
Indonesia	204 000	89·2%	66·9%	4·3% (1·9–8·3)	..	136 500	..
Malaysia	144 000	49·5%	37·0%	57·3% (52·9–61·5)	..	53 500	35·7% (23·4–49·6)
Myanmar	96 000	75·6%	55·2%	40·6% (39·3–41·8)	..	53 000	..
Thailand	54 000	53·6%	40·3%	9·1% (5·2–14·6)	..	22 000	..
Viet Nam	214 000	69·2%	52·7%	26·0% (24·1–28·0)	5·5% (3·7–7·9)	112 500	..
Eastern Europe							
Bulgaria	17 000	67·8%	50·8%	87·8% (85·5–89·9)	..	8500	..
Estonia	7000	79·2%	58·2%	90·0% (82·4–95·1)	..	4000	27·1% (17·2–39·1)
Georgia	108 000	61·9%	26·7%	73·8% (58·1–87·0)	..	29 000	24·8% (23·4–26·3)
Hungary	6500	35·9%	26·8%	66·3% (61·9–70·5)	..	1500	..
Latvia	7000	69·2%	51·7%	52·1% (47·1–57·0)	..	3500	..
Lithuania	8000	65·6%	47·5%	90·3% (86·9–93·0)	..	4000	..
Moldova	11 500	50·0%	37·1%	60·8% (58·1–63·4)	..	4500	..
Poland	269 500	58·7%	44·0%	71·6% (66·6–76·3)	..	119 000	..
Romania	78 000	84·0%	62·9%	38·2% (34·0–42·6)	..	49 000	..
Russia	1 274 000	72·5%	53·2%	74·3% (71·9–76·6)	..	677 500	..
Ukraine	296 000	60·6%	45·4%	64·2% (62·1–66·3)	..	134 500	19·8% (18·6–21·1)
Middle East and North Africa							
Morocco	31 500	38·1%	28·6%	52·1% (47·4–56·8)	..	9000	13·2% (7·8–20·6)
Türkiye	56 000	44·5%	33·2%	..	..	18 500	33·8% (22·8–46·3)
North America							
Canada	174 500	38·6%	20·6%	77·4% (59·0–91·5)	..	36 000	12·5% (10·0–15·4)
USA	3 141 000	53·5%	43·7%	77·2% (70·8–83·0)	64·9% (61·7–68·2)	1 373 000	32·2% (28·1–36·4)
South Asia							
India	878 000	49·5%	40·8%	4·8% (4·0–5·7)	..	358 000	1·8% (1·4–2·2)
Iran	177 000	39·4%	29·3%	11·9% (10·7–13·1)	..	52 000	2·9% (1·6–4·6)
Nepal	38 000	21·8%	13·4%	20·0% (17·9–22·2)	..	5000	..
Pakistan	497 000	54·5%	30·2%	1·7% (0·0–8·9)	..	150 500	..

(Table 3 continues on next page)

	Estimated number of people who inject drugs*	HCV antibody prevalence among people who inject drugs*	HCV RNA prevalence among people who inject drugs*	Proportion of people who inject drugs ever tested for HCV antibody	Proportion of people who inject drugs ever tested for HCV RNA	Estimated number of people who inject drugs with HCV RNA*	Proportion of people who inject drugs with HCV who ever received HCV treatment
(Continued from previous page)							
Sub-Saharan Africa							
Burundi	13 500	5·5%	3·9%	4·7% (1·8–10·0)	..	500	..
Ethiopia	139 500	3·4%	2·5%	16·7% (12·5–21·6)	..	3500	..
Ghana	20 000	2·3%	1·8%	0·0% (0·0–1·7)	..	500	..
Mauritius	12 000	90·0%	67·5%	33·7% (31·5–36·0)	..	8000	..
Uganda	9500	20·6%	15·3%	7·2% (3·3–13·2)	..	1500	..
Tanzania	398 500	23·1%	17·1%	1·9% (0·6–4·3)	..	68 000	..
Western Europe							
Austria	15 000	61·8%	46·0%	87·1% (76·1–94·3)	..	6900	..
Belgium	7000	48·8%	36·1%	62·5% (54·7–69·8)	..	2500	38·5% (25·3–53·0)
Croatia	6000	36·7%	27·6%	71·2% (68·0–74·3)	..	1500	..
England	208 000	54·3%	27·0%	85·0% (83·3–86·6)	..	56 500	18·4% (14·7–22·5)
France	125 500	54·8%	41·7%	74·6% (69·7–79·3)	..	52 500	..
Germany	129 500	62·9%	42·8%	87·5% (86·0–88·9)	..	55 500	50·2% (47·1–53·3)
Greece	3000	66·8%	67·2%	92·0% (90·6–93·2)	..	2000	2·6% (1·6–4·0)
Ireland	8500	77·2%	19·7%	66·2% (62·7–69·5)	..	1500	19·7% (11·2–30·9)
Italy	320 500	53·3%	39·6%	..	..	127 000	18·2% (12·6–24·9)
Montenegro	1500	44·2%	32·9%	43·9% (40·1–47·8)	..	500	..
Northern Ireland	4000	33·3%	12·4%	89·3% (85·5–92·6)	..	500	20·0% (5·7–43·7)
Scotland	15 500	54·5%	21·3%	90·5% (83·8–95·6)	..	3500	51·1% (47·9–54·3)
Serbia	28 500	42·6%	45·7%	73·2% (69·4–76·8)	..	13 000	..
Spain	9000	66·1%	36·6%	93·3% (85·7–98·2)	..	3500	88·6% (85·0–91·6)
Sweden	8000	65·2%	56·1%	..	..	4500	5·1% (2·4–9·4)
Switzerland	14 000	74·6%	56·1%	53·3% (50·1–56·5)	..	7500	..
Wales	7000	53·5%	24·3%	83·9% (81·3–86·3)	..	1500	20·7% (12·7–30·7)

Data are n, %, or % (95% CI). There were no countries with available data for Pacific Island states and territories or Latin America. The uncertainty intervals for these estimates are presented in the appendix (pp 30–31). Estimated numbers were rounded to the nearest 500 to ensure an appropriate level of precision. HCV=hepatitis C virus. *Estimates of number of people who inject drugs, HCV prevalence, and number of people who inject drugs living with HCV were derived from another study.[2]

Table 3: **Country-level estimates of HCV prevalence, and HCV testing and treatment uptake among people who inject drugs**

with high treatment coverage were Viet Nam and Australia (figure 2C). Estimates of the proportion of people who inject drugs who have ever received HIV treatment were available from 13 countries (appendix p 25), ranging from 3·1% (Lithuania) to 88·9% (Estonia).

Estimates of ever having had HCV antibody testing were available from 49 countries (table 3) with 122 estimates (median one estimate per country). In 48 countries, estimates were derived from study grades A and B (appendix pp 26–27). Countries with available estimates of HCV antibody testing comprised 61·2% of the estimated number of people who inject drugs globally (table 4). Regional estimates were developed from seven regions with sufficient data (range 5·0–86·3%). Globally, an estimated 47·1% of people who inject drugs (95% UI 43·4–51·0%) had ever been tested for HCV antibodies (table 4).

The proportion of people who inject drugs ever tested for HCV antibodies varied across countries (table 3), ranging from 0·0% (Ghana) to 93·3% (Spain). Testing coverage was low (<40%) in 16 countries, moderate (40–75%) in 18 countries, and high (>75%) in 15 countries (figure 1B, 2B). Globally, an estimated 53% of people who inject drugs were exposed to HCV (HCV antibody positive).[2] Among the 31 countries with an HCV prevalence among people who inject drugs of more than 53% and available data on HCV antibody testing, the coverage was high in 13 countries (figure 2B).

Estimates of the proportion of people who inject drugs ever tested for HCV RNA were available from only three countries (table 3): Australia (77·0%), the USA (64·9%), and Viet Nam (5·5%). Estimates of recent HCV antibody testing (ie, in the past 12 months) were available from 26 countries (appendix pp 26–27), ranging from 3·0% (Thailand) to 76·0% (Belgium).

Estimates of the proportion of people who inject drugs diagnosed with chronic HCV who have ever received HCV antiviral therapy were available from 23 countries

	Proportion of people who inject drugs ever tested for HCV antibodies			Proportion of people who inject drugs with HCV who ever received HCV treatment		
	Number of countries with data	Proportion of people who inject drugs in region with data	Estimate	Number of countries with data	Proportion of people who inject drugs in region with data	Estimate
Eastern Europe	11/17 (65%)	91·2%	71·2 (67·7–74·4)	3/17 (18%)	18·0%	21·3 (19·8–22·8)
Western Europe	15/31 (48%)	58·7%	81·6 (78·5–84·4)	11/31 (35%)	72·7%	25·6 (21·0–31·0)
East and southeast Asia	6/17 (35%)	18·7%	26·8 (24·1–30·0)	2/17 (12%)	70·8%	1·9 (1·2–4·4)
South Asia	4/9 (44%)	90·9%	5·0 (3·8–7·9)	2/9 (22%)	60·3%	2·0 (1·4–2·6)
Central Asia	1/5 (20%)	10·7%	..	..	..	..
Caribbean	1/8 (13%)	21·8%	..	..	..	..
North America	2/2 (100%)	100·0%	77·2 (70·2–83·5)	2/2 (100%)	100·0%	31·1 (27·2–35·3)
Australasia	2/2 (100%)	100·0%	86·3 (83–89·1)	1/2 (50%)	81·4%	66·9 (64·5–69·3)
Middle East and North Africa	1/21 (5%)	9·8%	..	2/21 (10%)	27·3%	26·4 (17·4–37·0)
Sub-Saharan Africa	6/44 (14%)	47·1%	6·1 (4·1–9·2)	..	..	..
Global	49/190 (26%)	61·2%	47·1 (43·4–51·0)	23/190 (12%)	56·6%	..

Data are n (%), %, or estimate (95% uncertainty interval). There were no available data for Pacific Island states and territories or Latin America. Estimates of number of people who inject drugs in each country and region were derived from another study.[2] HCV=hepatitis C virus.

Table 4: **Regional-level estimates of HCV testing and treatment uptake among people who inject drugs**

(27 estimates), whereas in 106 countries and territories, the HCV prevalence among people who inject drugs was higher than zero.[2] Estimates were derived from study grades A or B in 20 countries. Among countries with available data on HCV treatment regimen, in 11 countries the treatment uptake estimates included data on DAA therapy as well, whereas in five countries they were merely based on interferon therapy (appendix pp 28–29).

The 23 countries with available estimates of HCV treatment uptake covered 56·6% of the estimated number of people who inject drugs globally. Regional estimates of treatment uptake were developed for seven regions with sufficient data (range 1·9–66·9%; table 4).

Among countries with available grade A or B data (table 3), the proportion of people who inject drugs with chronic HCV who had ever received therapy ranged from 1·8% (India) to 88·6% (Spain). HCV treatment coverage was low (<25%) in 14 countries, moderate (25–75%) in eight countries, and high (>75%) in one country. Spain was the only country with high treatment coverage (figure 2D). Estimates of HCV treatment uptake in the past 12 months were available from 12 countries, of which four comprised data on DAA therapy (range 6·7–58·4%; appendix pp 28–29).

Discussion

This review demonstrated a wide variation across countries in HIV and HCV testing and treatment uptake among people who inject drugs, with suboptimal uptake globally. Data on HIV antibody testing were available from 67 countries covering 74·4% of people globally who inject drugs, and data on HCV antibody testing was available from 49 countries covering 61·2% of people globally who inject drugs. Among countries with available data, 54% (n=36/67) had low uptake (<40%) of HIV testing and 33% (n=16/49) had low uptake of HCV testing. There were fewer data on treatment uptake. Among countries with available data, 22% (n=4/18) had low uptake (<25%) of HIV antiretroviral treatment and 61% (n=14/23) had low uptake of HCV antiviral treatment. The findings of this study demonstrate the crucial need for representative data on HIV and HCV care coverage among people who inject drugs. These data also have implications for guiding progress in HIV and HCV testing and linkage to care among people who inject drugs and development of strategies and interventions to enhance these measures.

There were few data on HIV testing and treatment uptake among people who inject drugs, although more countries had available data compared with our previous review.[8] We identified estimates of recent HIV testing uptake for 67 countries and estimates of HIV treatment uptake for 18 countries, compared with 49 countries and seven countries, respectively, with survey data in the previous review.[8] We estimated that 48·8% of people who inject drugs globally were tested for HIV in the past 12 months, with only four countries having a high testing uptake (>75%). Among 18 countries with available data on HIV treatment uptake, the majority (n=16/18) had a treatment uptake of less than 75%. This is significantly lower than the global average of 73% treatment uptake among people living with HIV.[16] In eastern Europe, with a high regional HIV prevalence of 34% among people who inject drugs,[2] only 33·7% of people who inject drugs had recently been tested for HIV and 22% of people who inject drugs living with HIV were receiving antiretroviral treatment. Enhanced testing and treatment uptake among people who inject drugs is crucial to control HIV epidemics, particularly considering the HIV outbreaks

among people who inject drugs during 2011–20 in several countries in North America, Europe, and Asia.[17,18] Several barriers to HIV testing and treatment among people who inject drugs have been shown, including the criminalisation of drug use[19] or other repressive legislations,[20] and social disadvantage among people who inject drugs, such as higher rates of homelessness and incarceration.[21] Interventions tailored to engage people who inject drugs to HIV clinical care are required to enhance HIV testing and treatment in this marginalised population.

There were even fewer data on HCV testing and treatment uptake among people who inject drugs. Estimates of HCV antibody testing were available from 49 countries, and HCV RNA testing were available from only three countries. HCV RNA testing is essential for the diagnosis of those with current HCV who require antiviral treatment. Further work is required to integrate HCV RNA testing into HCV surveillance studies to monitor the effect of increased treatment on the prevalence of current HCV infection among people who inject drugs.

Our findings showed a wide variation in uptake of HCV testing across countries (range 0·0–93·3%). At a regional level, south Asia, where 46% of people who inject drugs are living with HCV,[2] had the lowest HCV testing uptake (5·0%). Traditional testing pathways involve HCV antibody tests to confirm exposure and HCV RNA tests to detect infection. This two-step diagnostic pathway has been identified as a barrier to HCV diagnosis.[22,23] Other barriers to HCV testing among people who inject drugs included social distress and stigma associated with HCV,[23,24] the high cost,[23] and venous access difficulties.[25] Innovative strategies addressing several of these concerns have enhanced testing uptake and linkage to care, including dried blood spot testing, point-of-care testing, reflex HCV RNA testing in people who are HCV antibody positive, and cheaper core antigen serology tests as an alternative to the HCV RNA test.[26,27]

Although there were few data on HCV treatment uptake (available in only 23 countries), our findings showed that between 1·8% and 88·6% of people who inject drugs with HCV have ever received treatment across countries, whereas in most countries (n=14/23), treatment uptake was less than 25%. This is significantly lower than the 45% estimated treatment uptake among the general population living with HCV.[28] DAA therapy has the potential to enhance HCV treatment uptake, given the high effectiveness and safety profile,[29,30] although several barriers are still in place. In low-income and middle-income countries, high drug pricing is the main barrier to access to DAA therapy.[31,32] Although generic DAA formulations have substantially reduced drug costs,[33] people in many low-income and middle-income countries still do not have access to affordable therapy.[32] More efforts at the country-level and global-level are needed to expand access in resource-limited settings, including the contribution of donor agencies (eg, The Global Fund to Fight AIDS, Tuberculosis and Malaria), in treatment programmes.

Several countries where health-care insurance is widely available face different barriers for HCV treatment scale-up. In some high-income countries or jurisdictions, abstinence from substance use is required to be eligible for DAA treatment,[34–36] despite strong evidence showing favourable DAA treatment outcomes[30,37] and low post-treatment reinfection[38] among people who inject drugs. Studies have demonstrated a substantial increase in treatment uptake after the removal of treatment restrictions, including among people who inject drugs.[39] Interventions that were effective in enhancing linkage to care and treatment uptake among people who inject drugs included those simplifying the HCV testing and care pathway (eg, point-of-care testing and integrating HCV care in drug treatment services), enhancing patient engagement (eg, patient navigation or care coordination), and provider-directed interventions (eg, medical chart reminders and provider education).[26]

Limitations of the existing evidence should be considered in the interpretation of our findings. We only included data with verifiable sources that met our other eligibility criteria. Accordingly, some of the estimates are different from the estimates reported in other sources. Our global estimates of HIV testing uptake were based on data from 33% of countries, and of HCV testing uptake from 24% of countries. Although many countries with no available data had a small population of people who inject drugs, several countries with a large population of people who inject drugs had no available data for HIV testing (eg, Russia, Japan, Iran, and Brazil) or HCV testing (eg, China, Afghanistan, Brazil, and Nigeria). We did not generate global estimates of HIV and HCV treatment uptake given the low amount of data. Given that recent data was unavailable for some countries, we had to use older data, which might have not been fully representative of the recent HIV and HCV testing and treatment status of those countries (eg, in China, Pakistan, Afghanistan, Viet Nam, and Canada for HIV testing or treatment; and Russia, Germany, and Tanzania for HCV testing or treatment). Country-level estimates derived from a single study with a small sample size, even if the study grade is A or B (eg, Colombia, Nicaragua, and Chad for HIV testing; and Colombia, Estonia, and Austria for HCV testing) should be interpreted conservatively.

This study also has several limitations. We undertook a comprehensive search of grey literature, including liaising with relevant international agencies, to obtain data not available in online resources. However, some data might have been available but not included in this review, particularly if they were not available in public domains. Although in most included studies people who inject drugs were defined as people injecting drugs in the past 12 months, for countries with no available data based on this definition, other definitions of people

who inject drugs were accepted. Among people injecting drugs in the past 12 months, a small proportion might have injected infrequently and thus might not be considered as people with regular injecting drug use. Our search did not cover studies published after April, 2022.

In conclusion, this review identified data gaps in many countries, particularly with regard to the uptake of HCV RNA testing, HIV treatment, and HCV treatment. The uptake of HIV and HCV testing and treatment among people who inject drugs varied widely across countries, with suboptimal uptake in most countries. More investments and efforts at national and international levels are required to produce and publish quality verifiable data of HIV and HCV care coverage among people who inject drugs. Although equitable access to HIV and HCV testing and treatment is crucial, targeted strategies and interventions are also needed to improve the linkage of people who inject drugs to HIV and HCV clinical care, and to control HIV and HCV epidemics and burden among people who inject drugs.

Contributors

The scope of the review was conceived by LD, JG, and MH. The concept sheet and analysis plan were developed by BH and revised by JG, EC, GJD, and LD. Data analysis and estimate generation were undertaken by AK, JI, and SO, supervised by BH. Tables, figures, and maps were developed by AK, JI, SO, AWi, and BH. BH and JG drafted the first iteration of the manuscript. All authors made substantial contributions to the critical review, editing, and revision of the manuscript. All authors approved the final version of the manuscript. All authors had full access to all the data in the study and had final responsibility for the decision to submit for publication. BH, AK, and JI directly accessed and verified the underlying data reported in this manuscript.

Declaration of interests

In the past 3 years, LD and MF have received investigator-initiated untied educational grants for studies of opioid medications in Australia from Indivior and Seqirus. JG is a consultant or adviser for and has received research grants from AbbVie, Camurus, Cepheid, Gilead Sciences, Hologic, Indivior, and Merck/MSD. GJD has received research grants from AbbVie, Gilead Sciences, and Merck/MSD. EC has received funding from the Canadian Network on Hepatitis C. All other authors declare no competing interests.

Data sharing

Researchers wishing to undertake additional analyses of the data or access original estimates are invited to contact the corresponding author (bhajarizadeh@kirby.unsw.edu.au). The study protocol and analysis plan are available on PROSPERO at https://www.crd.york.ac.uk/prospero/display_record.php?RecordID=173974.

Acknowledgments

This review was also supported by the Australian National Health and Medical Research Council (NHMRC) ASCEND Programme grant (1150078), NHMRC Investigator Grant (1176131), the National Drug and Alcohol Research Centre (NDARC), University of New South Wales (UNSW), and US National Institute of Allergy and Infectious Diseases (R01AI147490 RFA-AI-18–026). LD is supported by an NHMRC Senior Principal Research Fellowship (1135991) and an NHMRC Investigator Grant (2016825). SC-F acknowledges funding from the UNSW Scientia Scholarship Programme and the National Drug Research Institute Melbourne. GJD and JG (1176131) are supported by NHMRC Investigator Grant Awards. JL is supported by an NHMRC Emerging Leader Fellowship. MH and PV acknowledge support from the UK National Institute for Health and Care Research (NIHR) Health Protection Research Unit (HPRU) in Behavioural Science and Evaluation and NIHR Programme Grant EPIToPe. PV acknowledges support from the HPRU in Blood Borne and Sexually Transmitted Infections and National Institute for Drug Abuse (grant number R01 DA037773–01A1). PW acknowledges support from an Australian Government Research Training Programme Scholarship as well as an NDARC Higher Degree Research scholarship. LTT and OP acknowledge support from an NHMRC PhD scholarship as well as an NDARC Higher Degree Research scholarship. NDARC, the Kirby Institute, and National Centre for Youth Substance Use Research are funded by the Australian Government Department of Health. The views expressed in this publication do not necessarily represent the position of the Australian Government. We thank the people who assisted with the searches for and extraction of data from the eligible papers in this review: M J Stowe, Clare French, Tom Davies, Hannah Fraser, Aaron Lim, and Adelina Artenie. We also thank the individuals who provided encouragement and support in various ways throughout the conduct of this review, including circulating requests for data, providing contacts in countries, and assisting with locating data: Andrew Scheibe (University of Pretoria, South Africa), Angela Me (Research and Trend Analysis Branch, UN Office on Drugs and Crime [UNODC]), Annette Verster (Global HIV, Viral Hepatitis and STI Programmes, WHO), Antons Mozalevskis (Global HIV, Viral Hepatitis and STI Programmes, WHO), Chloe Carpentier (Drug Research Section, UNODC), Fariba Soltani (HIV/AIDS Section, UNODC), Kamran Niaz (Drug Research Section, UNODC), Monica Ciupagea (HIV/AIDS Section, UNODC), Niklas Luhmann (Global HIV, Viral Hepatitis and STI Programmes, WHO), Virginia MacDonald (Global HIV, Viral Hepatitis and STI Programmes, WHO), Keith Sabin (UNAIDS), and Teymur Noori (European Centre for Disease Prevention and Control).

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