Global epidemiology of hepatitis B and hepatitis C in people who inject drugs: results of systematic reviews

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Summary

Background Injecting drug use is an important risk factor for transmission of viral hepatitis, but detailed, transparent estimates of the scale of the issue do not exist. We estimated national, regional, and global prevalence and population size for hepatitis C virus (HCV) and hepatitis B virus (HBV) in injecting drug users (IDUs).

Methods We systematically searched for data for HBV and HCV in IDUs in peer-reviewed databases (Medline, Embase, and PsycINFO), grey literature, conference abstracts, and online resources, and made a widely distributed call for additional data. From 4386 peer-reviewed and 1019 grey literature sources, we reviewed 1125 sources in full. We extracted studies into a customised database and graded them according to their methods. We included serological reports of HCV antibodies (anti-HCV), HBV antibodies (anti-HBc), or HBV surface antigen (HBsAg) in studies of IDUs with more than 40 participants (<100% HIV-positive) and sampling frames that did not exclude participants on the basis of age or sex. With endorsed decision rules, we calculated prevalence estimates with anti-HCV and anti-HBc as proxies for exposure and HBsAg as proxy for current infection. We combined these estimates with IDU population sizes to calculate the number of IDUs with positive HBV or HCV statuses.

Findings We located eligible reports with data for prevalence of anti-HCV in IDUs for 77 countries; midpoint prevalence estimates suggested 60–80% of IDUs had anti-HCV in 25 countries and more than 80% of IDUs did so in 12 countries. About 10·0 million (range 6·0–15·2) IDUs worldwide might be anti-HCV positive. China (1·6 million), USA (1·5 million), and Russia (1·3 million) had the largest such populations. We identified eligible HBsAg reports for 59 countries, with midpoint prevalence estimates of 5–10% in 21 countries and more than 10% in ten countries. Worldwide, we estimate 6·4 million IDUs are anti-HBc positive (2·3–9·7 million), and 1·2 million (0·3–2·7 million) are HBsAg positive.

Interpretation More IDUs have anti-HCV than HIV infection, and viral hepatitis poses a key challenge to public health. Variation in the coverage and quality of existing research creates uncertainty around estimates. Improved and more complete data and reporting are needed to estimate the scale of the issue, which will inform efforts to prevent and treat HCV and HBV in IDUs.

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Introduction

Injecting drug use is an important public health issue around the world: 16 million people injected drugs in 2007 (range 11–21 million).[1] Much of the estimated burden of disease attributable to the use of illicit drugs is probably due to blood-borne viral infections through unsafe drug injection.[2] Hepatitis B and C viruses (HBV and HCV, respectively) are even more efficiently spread by this practice than is HIV.[3]

About 80% of individuals exposed to HCV develop chronic infection,[4] and 3–11% of people with chronic HCV infection will develop liver cirrhosis within 20 years,[5] with associated risks of liver failure and hepatocellular carcinoma.[6] Transmission of HCV increasingly occurs through injecting drug use,[7] but in many developing countries unsafe medical injections and transfusions are predominant sources of infection. The emergence of injecting drug use is an additional threat in settings where the prevalence of HCV is high (eg, Africa, the Middle East, and southeast Asia).

HBV is highly contagious through parenteral, sexual, and vertical (perinatal transmission) routes. About 5% of adults exposed to HBV develop chronic HBV infection;[4] most of the 350 million chronically infected people worldwide were infected in childhood.[8] Cirrhosis and death because of hepatocellular carcinoma are important sequelae of chronic HBV infection.[9]

Despite the higher prevalence and transmissibility of viral hepatitis, the disease has received far less global attention than has HIV. WHO called prevention and control efforts "successful but fragmented...[with no] comprehensive strategy for viral hepatitis".[10] At WHO's 63rd World Health Assembly in May, 2010, a resolution was passed to establish "goals and strategies for disease control, increasing education and promoting screening and treatment"[10] of people infected with HBV and HCV. WHO argues that injecting drug users (IDUs) are a key group that need to be specifically targeted for prevention and treatment of viral hepatitis.[10] For such efforts to be appropriately scaled and targeted, policy makers and health-care professionals need accurate and detailed data for the size of the population at risk, as exist for HIV.[1]

There have been no global systematic reviews of HBV prevalence in IDUs.[11] Previous reviews of HCV in this

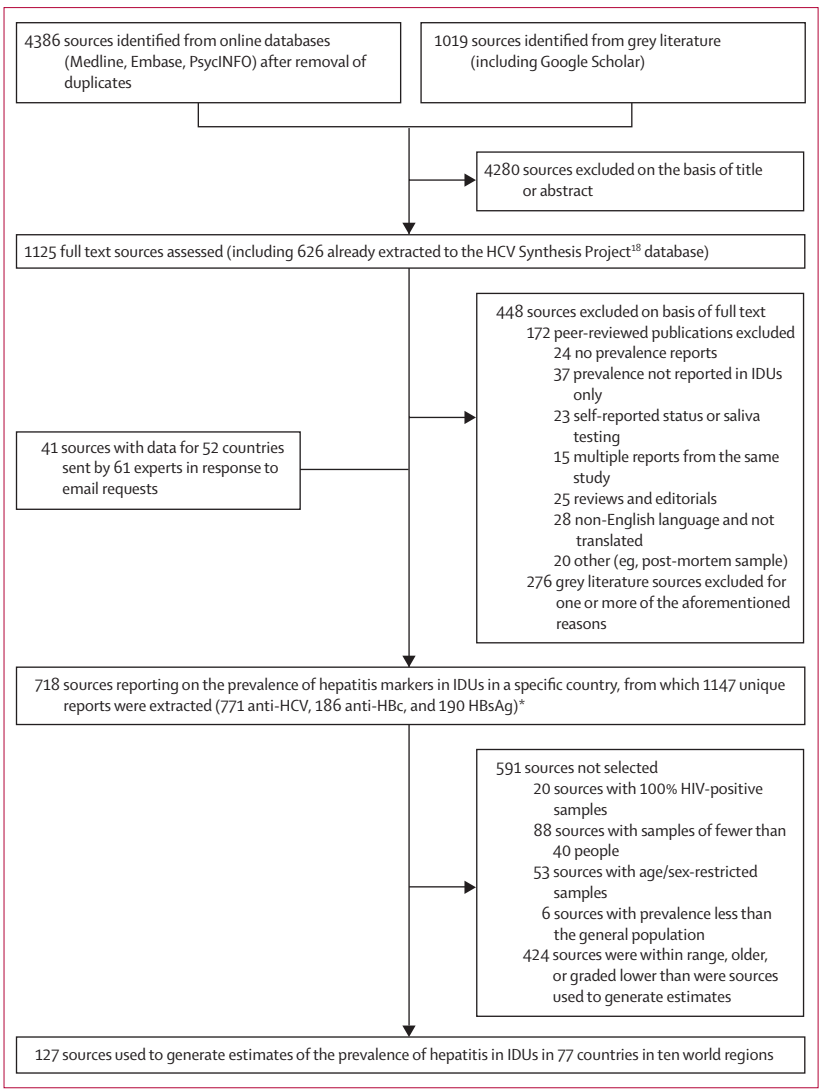

Figure 1: **Systematic review process**
In this study, for sources that reported for several years, only the most recent data were extracted. For sources reporting prevalence between sites or samples within a study, the overall report was extracted (individual reports within a study were not). HCV=hepatitis C virus. IDU=injecting drug user. Anti-HCV=hepatitis C antibodies. Anti-HBc=hepatitis B core antibodies. HBsAg=hepatitis B surface antigen. *Sources could contain more than one report (several hepatitis markers, samples, or locations).

For the **Global Burden of Disease (GBD) project** see http://www.globalburden.org

See **Online** for webappendix

For **members of the GBD Illicit Drug Use Expert Group** see http://www.gbd.unsw.edu.au/gbdweb.nsf/page/ExpertGroups

population have been selective in their geographical coverage,[12] have not provided sources or estimation methods,[13] or did not make estimates of population size.[14] Here, we report a systematic search and critical review of the peer-reviewed and grey literature on hepatitis C antibodies (anti-HCV), hepatitis B core antibodies (anti-HBc), and hepatitis B surface antigens (HBsAg) in IDUs, showing the best available country-level data, and the first regional and global estimates of the number of IDUs living with HCV and HBV.

We do not report estimates of chronic hepatitis A, D, or E viral infection (HAV, HDV, and HEV, respectively). Chronic HAV infection does not occur, and in developing countries most adults are immune, making epidemics uncommon; however, with increased sanitation this epidemiological pattern might change in some populations.[15] HDV has been associated with injecting drug use; however, the extent of the published work on HDV (which needs concurrent HBV for infection to be established) is small and the diversity in prevalence, even in countries with a high prevalence of HBV, makes extrapolation between countries difficult.[16] HEV is enterically transmitted and HEV data for IDUs is scarce.

Methods

Study design and search strategy

We undertook our review in line with the methods outlined by the Global Burden of Disease (GBD) project and complied with PRISMA guidelines relevant to a descriptive review of this nature.[17] Our searches consisted of multiple stages of searches of the peer-reviewed and grey literature, international consultations, and expert critique and review, as undertaken in a previous review of HIV in IDUs.[1] Data from the HCV Synthesis Project[18] were also provided for review and inclusion. The HCV Synthesis Project was a systematic global review of published and unpublished sources containing reports of HCV infection and co-occurring HBV infection in IDUs until 2006.

We searched peer-reviewed databases (Medline, Embase, and PsycINFO) of the published work in November, 2010, with search strings developed in consultation with specialist drug and alcohol librarians (see webappendix pp 1–4). We included abstracts published in English but translations were sought for promising non-English papers, and searches were updated in May, 2011.

We searched the grey literature and online databases, including websites of drug surveillance systems, regional harm-reduction networks, and country-specific ministries of health. Methods to identify and systematically search these sources have been described previously[19,20] and we have used them in previous systematic reviews. 18 of 127 (14%) sources that we used to generate regional estimates were from the grey literature. We last updated searches of the grey literature in May, 2011.

To identify additional studies, we emailed GBD Illicit Drug Use Expert Group members, UN agency staff, relevant international email lists, and other contacts of our team (about 300 initial recipients) in December, 2010. The email was redistributed by staff from the WHO, United Nations Office on Drugs and Crime (UNODC), US Centers for Disease Control and Prevention (CDC), and the European Monitoring Centre for Drugs and Drug Addiction (EMCDDA). The email requested information that might inform estimates of the prevalence of hepatitis in IDUs (webappendix p 5). By June, 2011, replies were received from 61 experts about 52 countries in all 12 world regions. These responses included data for 14 countries in eight regions

Panel 1: Classification system for assessment of study designs

Grade A
Multisite seroprevalence study with multiple sample types (eg, injecting drug users in outpatient drug-treatment centres and in prisons)

Grade B
B1: Seroprevalence study, one sample type and multiple sites
B2: Seroprevalence study, multiple sample types and one site

Grade C
Seroprevalence study, one sample type

Grade D
Registration or notification of cases of hepatitis infection

Grade E
Prevalence study using self-reported hepatitis status, saliva, or RNA testing only

Ungraded
Report with other or unknown design

No hierarchical relationship was assumed between B1 and B2. Grades D and E and ungraded data were not included in the estimates made in our report.

Panel 2: Decision rules for data selection and extraction processes

Selection, grading, and clarification of hepatitis reports
- Hepatitis reports were restricted to serological test results for hepatitis C antibodies (anti-HCV), hepatitis B core antibodies (anti-HBc), and hepatitis B surface antigens (HBsAg)
- Hepatitis B reports that did not specify a specific serological marker were reviewed by BC (an infectious diseases physician) and assigned a serological marker or excluded, as appropriate
- If hepatitis reports were available from the same sample(s) and same site(s) in several years, only the most recent report was selected
- Hepatitis reports from one city were assumed to be from one site unless otherwise stated
- Hepatitis reports were assumed to be from one site and one sample type unless otherwise stated
- If calculation or typographical errors were detected in source documents, reports were recalculated and clarified with authors when possible

Grade and date-based selection of reports
- If grade A (see panel 1) reports were available, we selected the range of these and did not select lower-graded reports; if recent reports (2000 onwards) were available, older (before 2000) reports were not selected
- If grade A reports were unavailable, we selected the range of recent reports of the next highest grade; older reports were selected if no recent reports were available
- Recent grade B reports were selected in preference to older grade B reports; recent grade C reports were selected in preference to older grade B reports; older grade C reports were selected if no grade B reports were available
- Reports from before 1990 were selected only if more recent reports were unavailable

Exclusion criteria
- Reports from case notifications (grade D), self-report studies (grade E), or unspecified methodologies (ungraded)
- Reports of genetic or saliva testing, or testing of residue from syringes
- Reports of 100% HIV positive samples from injecting drug users (IDUs)
- Studies restricted to young IDUs, and baseline descriptions of studies of primarily hepatitis C virus (HCV)-negative or hepatitis B virus (HBV)-negative IDUs (some seroincidence studies)
- Reports from studies excluding IDUs of either sex if mixed sex reports were available
- Reports of any hepatitis marker in IDUs that were lower than the general population prevalence for that marker
- Reports based on test results of fewer than 40 IDUs

IDU prevalence reports and estimates
- Mathers and colleagues[1] detail the selection of IDU prevalence reports and generation of IDU estimates

that were reported here. Data were received, and clarification sought, until June, 2011.

Data extraction and selection

We catalogued documents with Endnote X4. Figure 1 shows the search process and flow chart. Two authors (PKN and DH) systematically screened search results. Studies in the HCV Synthesis Project[18] database were automatically included. Other references were reviewed if the title or abstract suggested that the document had relevant information about the prevalence of HCV or HBV in IDUs. We reviewed 1125 documents (peer-reviewed and grey literature) in full. Data were regarded as eligible when the number or prevalence of hepatitis-infected IDUs in a country or subnational area were mentioned.

We extracted information about study methods (specimen type, eligibility criteria, recruitment and enrolment dates, and recruitment methods and locations), participant characteristics (age range and sex), and hepatitis reports (number of participants tested, number and proportion of patients who tested positive for anti-HCV, anti-HBc, and HBsAg, and reports broken down by age and sex). Detailed methodological information was used to grade and select studies for inclusion because such study information is thought to strongly influence descriptive methods.[18] Extracted information was initially reviewed by two authors (PKN and DH), and valid reports were included in a Microsoft Access database and reviewed by another author (LD). We graded data as shown in panel 1.

For this analysis, we selected the highest and lowest reports of every seromarker for every country in accordance with the decision rules described in panel 2. These were entered into Microsoft Excel by one author (LD) and independently reviewed by two others (PKN and BMM). Provisional reports were circulated to all authors for review and comment. External checks were made with specific requests to experts in countries if additional data or clarification were needed.

Data for prevalence of viral hepatitis

Existing reports about HCV prevalence in IDUs are based predominantly on serological testing for anti-HCV. A

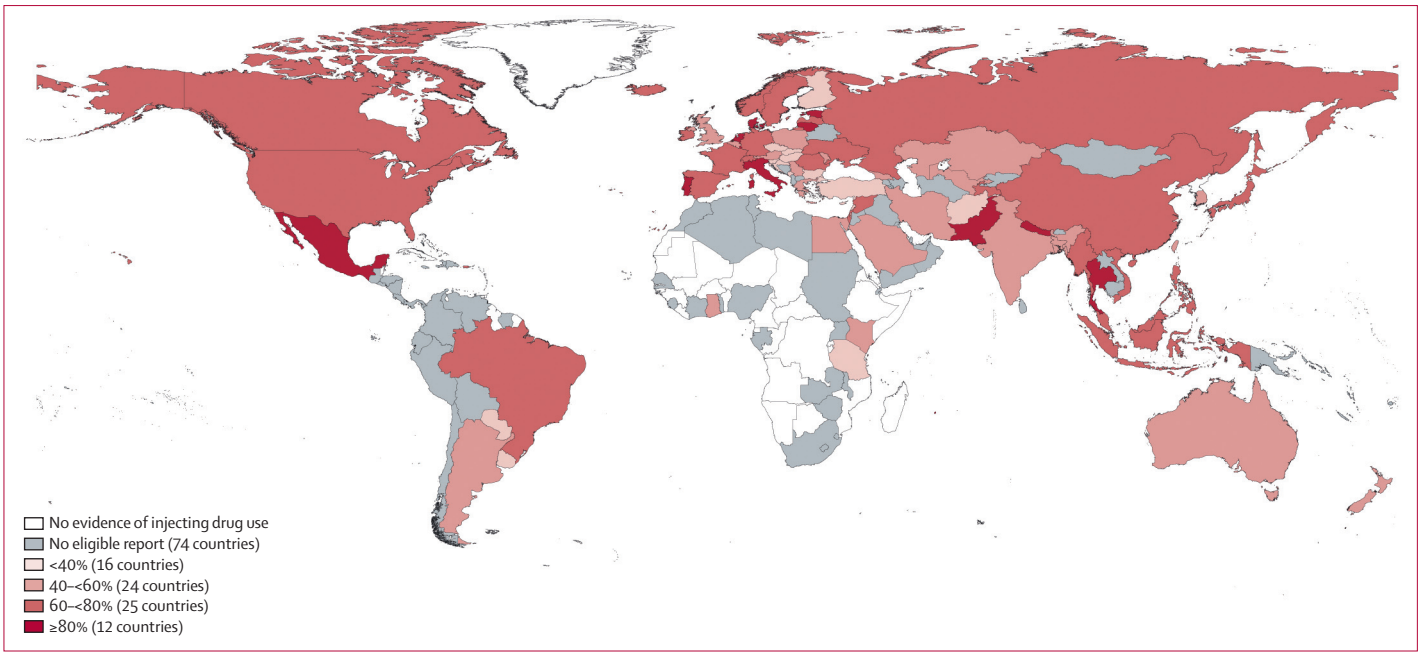

Figure 2: **Prevalence of hepatitis C antibodies in injecting drug users**

	Prevalence of anti-HCV in injecting drug users (%)					Prevalence of anti-HBc in injecting drug users (%)					Prevalence of HBsAg in injecting drug users (%)				
	Report year	Lower	Mid	Upper	Grade	Report year	Lower	Mid	Upper	Grade	Report year	Lower	Mid	Upper	Grade
Eastern Europe															
Armenia	..	..	NK	..	..	..	..	NK	..	..	..	..	NK	..	..
Azerbaijan	..	..	NK	..	..	..	..	NK	..	..	..	..	NK	..	..
Belarus	..	..	NK	..	..	..	..	NK	..	..	..	..	NK	..	..
Bosnia and Herzegovina	..	..	NK	..	..	..	..	NK	..	..	..	..	NK	..	..
Bulgaria	2006, 2008	17·9	37·7	57·5	B1, B2	2003	..	6·0	..	B2	2008, 2006	5·5	8·6	11·6	B2, B1
Croatia	2008, 2007	27·1	36·6	46	A	2008, 2007	7·5	13·8	20	A	2008, 2007	0·0	0·4	0·8	A
Czech Republic	2001*, 2002–03	20·8	25·3	29·7	A	..	..	NK	..	..	2010	..	15·1	..	C
Estonia	2002	..	90·5	..	C	2004, 2007	76·8	81·0	85·1	C	2004	..	21·3	..	C
Georgia	1997–98	..	58·2	..	B1	1997–98	..	51·3	..	A	2002–03	..	7·2	..	A
Hungary	2008	..	22·6	..	A	..	..	NK	..	..	2008	..	0·5	..	A
Latvia	2007	..	74·4	..	C	2007	..	55·8	..	C	..	..	NK	..	..
Lithuania	2005	85	89·4	93·7	B1, B2	..	..	NK	..	..	2005	9·5	11·2	12·9	B2, B1
Moldova	2007	..	42·7	..	B1	..	..	NK	..	..	..	..	NK	..	..
Poland	2005	43·7	53·9	64·0	A	2005	24·4	40·1	55·7	A	2005	1·2	4·9	8·5	A
Romania	2007, 2009	65·6	74·3	83	B2, B1	..	..	NK	..	..	2009, 2006	5	6·9	8·8	B1
Russia	2008	49	72·5	96	B1	2002	..	38·0	..	C	2002	..	9·0	..	C
Slovakia	2002	..	32·5	..	C	2002	..	6·3	..	C	..	..	NK	..	..
Ukraine	2005	60·9	67·0	73	C	2005	..	46·7	..	C	2005	..	6·7	..	C
Western Europe															
Albania	..	..	NK	..	..	..	..	NK	..	..	..	..	NK	..	..
Andorra	..	..	NK	..	..	..	..	NK	..	..	..	..	NK	..	..
Austria	2008	..	47·1	..	A	2008	..	19·0	..	A	..	..	NK	..	..
Belgium	2008	27	55·0	82·7	B1, B2	2004, 2008	16·7	37·0	57·3	C	2008	1·9	3·0	4·0	B1
Denmark	1996	..	85·0	..	B2	2007	..	65·0	..	C	2007	..	1·3	..	C
Finland	2007	20·7	21·1	21·4	B1	..	..	NK	..	..	..	..	NK	..	..

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	Prevalence of anti-HCV in injecting drug users (%)					Prevalence of anti-HBc in injecting drug users (%)					Prevalence of HBsAg in injecting drug users (%)				
	Report year	Lower	Mid	Upper	Grade	Report year	Lower	Mid	Upper	Grade	Report year	Lower	Mid	Upper	Grade
(Continued from previous page)															
France	2006	..	73·8	..	A	1995	26·9	41·6	56·2	C	1995, 1992	3·4	4·8	6·2	C
Germany	2001–03	..	75·0	..	C	2001–03	..	53·0	..	C	1994, 1992–93	6	7·2	8·4	B2
Greece	2008	44·9	50·2	55·5	A	2008	14·6	20·5	26·3	B1	2008	2·3	2·5	2·7	B2
Iceland	1990–93	..	63·0	..	C	..	..	NK	..	..	..	..	NK	..	..
Ireland	2003, 2001	72·3	74·6	76·9	C	2003	..	17·5	..	B1	2003	..	0·0	..	C
Italy	2000, 2005–07	72·9	81·1	89·3	B1	2000, 2005	39·8	55·1	70·4	B1	1992–93, 1990–91	0·9	5·1	9·3	C
Luxembourg	2005	..	81·3	..	A	2005	..	24·7	..	A	2005	..	3·9	..	A
Macedonia	..	..	NK	..	..	..	..	NK	..	..	..	..	NK	..	..
Malta	2006	..	33·1	..	B2	..	..	NK	..	..	..	..	NK	..	..
Monaco	..	..	NK	..	..	..	..	NK	..	..	..	..	NK	..	..
Montenegro	2008, 2005	22	37·8	53·6	C	..	..	NK	..	..	2008	..	0	..	C
Netherlands	2008	..	86·2	..	A	1999	..	67·5	..	A	2000	..	3·0	..	A
Norway	2008	68·4	71·3	74·1	A	2008	..	41·0	..	A	2008	..	1·2	..	A
Portugal	2009	..	83·1	..	B1	2000	..	53·7	..	C	2009	..	2·9	..	B1
San Marino	..	..	NK	..	..	..	..	NK	..	..	..	..	NK	..	..
Serbia	2008	45	57·0	69	C	..	..	NK	..	..	..	..	NK	..	..
Slovenia	2002, 2008	21·0	21·7	22·3	B1	2008	..	4·2	..	B1	2002	..	3·4	..	B1
Spain	2003, 1999–2001	73·3	79·6	85·9	B1	2003	..	22·5		B1	2006	1·8	3·6	5·3	C
Sweden	2007	62·0	75·1	88·2	A	2006	..	52·1	..	C	2006	..	2·3	..	C
Switzerland	2002	..	78·3	..	B1	2000–02	..	83·3	..	C	1996	..	4	..	C
UK	2004, 2009	47	50·5	54	A	2003–05	..	32	..	A	1996–2000	0†	8·9	17·8	C

We identified no reports of injecting drug use for Liechtenstein. Estimates received for Scotland and Wales are not reported separately. Source documents for all figures listed in tables are shown in webappendix pp 9–16. When more than one year or grade is shown, these are listed in order of the report they refer to (ie, lowest report first. NK=although injecting drug use has been identified or injecting drug use prevalence estimated, no eligible report of HCV or HBV in injecting drug users were located. HCV=hepatitis C virus. HBV=hepatitis B virus. *Publication year minus 3 (year of estimate not stated). †100% hepatitis A virus positive.

Table 1: **Prevalence of hepatitis C antibodies (anti-HCV), hepatitis B core antibodies (anti-HBc), and hepatitis B surface antigen (HBsAg) in injecting drug users in Europe**

positive anti-HCV test result can show acute, chronic, or resolved HCV infection. A PCR test is used to test for HCV viraemia, showing present infection; however, PCR test results are rarely reported in epidemiological studies. Our review focuses exclusively on reports of prevalence of anti-HCV.

We included studies of HBV if they reported serological testing for HBsAg or anti-HBc. HBsAg testing shows active (either acute or chronic) infection, but about 95% of adults with acute HBV infection will clear the virus, lose HBsAg and develop anti-HBc and hepatitis B surface antibodies (anti-HBs). However, clearance rates for HBV might be lower for IDUs than they are for the general population because more IDUs might become chronically infected; this effect could relate to repeated exposure or lower immunity due to worse health and other viral infections.[21] The presence of anti-HBc shows previous exposure and is a more durable marker than is presence of HBsAg. To clearly establish whether HBV infection was resolved or resulted in immunity, or to establish vaccination-related immunity, the results of more than one test in combination would need to be assessed; however, this duplicity is rarely available in population-scale or other large epidemiological studies.

Data for prevalence of injecting drug use

We obtained prevalence data for injecting drug use and HIV from a previously published systematic review by the Reference Group to the United Nations on HIV and Injecting Drug Use (herein termed the Reference Group review),[1] adhering to international guidelines for systematic reviews,[22] with decision rules and estimates approved by all Reference Group members. During the course of a subsequent review of HIV prevention, treatment, and care for IDUs, updated prevalence data for some countries were submitted to the Reference Group.[23] These data were included in our analysis, together with more recent data for injecting drug use and HIV prevalence reported by EMCDDA and Joint United Nations Programme on HIV/AIDS (UNAIDS). Overall, we included updated estimates of IDU population size for Belarus, Brazil, Croatia, Cyprus, Czech Republic, Greece, Nepal, Philippines, and Ukraine and updated estimates of HIV prevalence for Croatia, Cyprus, Mauritius, Moldova, Norway, Pakistan, Portugal, Sierra Leone, Somalia, Swaziland, Togo, Ukraine, UK, and Zimbabwe.

Statistical analysis

We used MapInfo 10.0 to generate maps of prevalence estimates for injecting drug use and hepatitis in IDUs.

	Prevalence of anti-HCV in injecting drug users (%)					Prevalence of anti-HBc in injecting drug users (%)					Prevalence of HBsAg in injecting drug users (%)				
	Report year	Lower	Mid	Upper	Grade	Report year	Lower	Mid	Upper	Grade	Report year	Lower	Mid	Upper	Grade
East and southeast Asia															
Brunei	..	..	NK	..	..	..	..	NK	..	..	..	..	NK	..	..
Burma	2009	..	79·2	..	B1	..	..	NK	..	..	2009	..	9·1	..	B1
Cambodia	..	..	NK	..	..	..	..	NK	..	..	..	..	NK	..	..
China*	2010	60·9	67·0	73·1	B1	2002–03	..	36·5	..	C	1999–2000	3·8	9·6	15·4	C
Indonesia	2007–09	..	77·3	..	C	2007–09	..	57·6	..	C	2007–09	..	2·9	..	C
Japan	1993–94, 1993	55·0	64·8	74·5	C	..	..	NK	..	..	1993–94, 1993	2·0	3·2	4·3	C
Laos	..	..	NK	..		..	..	NK	..	..	..	..	NK	..	..
Malaysia	2006–07	..	67·1	..	B1	..	..	NK	..	..	..	..	NK	..	..
Mongolia	..	..	NK	..		..	..	NK	..	..	..	..	NK	..	..
Philippines	2002	..	70	..	C	..	..	NK	..	..	..	..	NK	..	..
Singapore	2005–06	..	42·5	..	C	..	..	NK	..	..	2005–06	..	8·5	..	C
South Korea	2005	..	57	..	C	2005	..	51	..	C	1994–95	..	4·0	..	C
Taiwan	2001	..	41	..	B2	1984, 1986	11·3	50·7	90	C	2005	..	16·7	..	C
Thailand	2000	..	89·8	..	B2	1996	..	76·5	..	C	..	..	NK	..	..
Timor Leste	..	..	NK	..		..	..	NK	..	..	..	..	NK	..	..
Vietnam	2003	..	74·1	..	B1	..	..	NK	..	..	1993	..	19·5	..	B1
South Asia															
Afghanistan	2008	..	36·0	..	A	..	..	NK	..	..	2008	..	5·8	..	A
Bangladesh	1999–2005	..	48·2	..	A	1996–97	..	31·8	..	C	2002	..	9·4	..	C
Bhutan	..	..	NK	..	..	..	..	NK	..	..	..	..	NK	..	..
India	2006	..	41·0	..	B1	..	..	NK	..	..	2006	2·7	10·2	17·8	C
Iran	2007, 2001	34·5	50·2	65·9	B2	2001–02	..	61·2	..	B2	2001, 2006–07	3·7	17·3	30·9	B2
Maldives	..	..	NK	..	..	..	..	NK	..	..	..	..	NK	..	..
Nepal	1997–2002, 1997	80·5	87·3	94·0	C	1993†	..	82·0	..	C	1996–97	5·5	5·8	6·0	C
Pakistan	2003–04	75·0	84·0	92·9	B1	..	..	NK	..	..	2004, 2003	6·0	6·8	7·5	C
Sri Lanka	..	..	NK	..	..	..	..	NK	..	..	..	..	NK	..	..
Central Asia															
Kazakhstan	2005	..	58·8	..	C	2002	..	79·5	..	A	2002	..	7·9	..	A
Kyrgyzstan	..	..	NK	..	..	..	..	NK	..	..	..	..	NK	..	..
Tajikistan	2004	..	61·3	..	C	..	..	NK	..	..	..	..	NK	..	..
Turkmenistan	..	..	NK	..	..	..	..	NK	..	..	..	..	NK	..	..
Uzbekistan	2001	..	51·7	..	A	..	..	NK	..	..	..	..	NK	..	..

We identified no reports of injecting drug use for North Korea. Source documents for all figures listed in tables are shown in webappendix pp 9–16. When more than one year or grade is shown, these are listed in order of the report they refer to (ie, lowest report first). NK=although injecting drug use has been identified or injecting drug use prevalence estimated, no eligible report of HCV or HBV in injecting drug users were located. HCV=hepatitis C virus. HBV=hepatitis B virus. *A systematic review and meta-analysis by Xia and colleagues[45] was not included here as the source documents were in Chinese and could not be verified. In that review, the pooled prevalence was 61·4% (IQR 55·7–67·2) across 53 Chinese and two English language multiregion studies of HCV in injecting drug users in China. †Publication year minus 3 (year of estimate not stated).

Table 2: **Prevalence of hepatitis C antibodies (anti-HCV), hepatitis B core antibodies (anti-HBc), and hepatitis B surface antigen (HBsAg) among injecting drug users in Asia**

After collation of country-specific estimates, we derived regional and global estimates for 2010. All authors reviewed the estimates, and regional or country-specific queries were made to experts when clarification was needed. Prevalence of injecting drug use was assumed to be the same in 2010 as it was in the year of the estimate. We used UN Population Division estimates to establish population sizes of people aged 15–64 years in 2010.[24] Regional estimates were derived through estimation of region-specific, weighted estimates of the prevalence of injecting drug use and hepatitis infection and uncertainty bounds, with methods previously endorsed by the Reference Group[1] (webappendix pp 6–8). We grouped regions on the basis of previous UNAIDS categories to ease comparisons with the Reference Group HIV review.[1] We used Microsoft Excel to calculate prevalence estimates.

Role of the funding source

The US National Institutes of Health supported the work of the HCV Synthesis Project, and the HIV department of WHO (Geneva, Switzerland) provided some funds to support our report. Staff from WHO assisted with data collection by circulating requests for data to WHO and other UN agency staff, and helped obtain access to reports

	Prevalence of anti-HCV in injecting drug users (%)					Prevalence of anti-HBc in injecting drug users (%)					Prevalence of HBsAg in injecting drug users (%)				
	Report year	Lower	Mid	Upper	Grade	Report year	Lower	Mid	Upper	Grade	Report year	Lower	Mid	Upper	Grade
Caribbean*															
Bahamas	..	..	NK	..	..	..	..	NK	..	..	..	..	NK	..	..
Bermuda	..	..	NK	..	..	..	..	NK	..	..	..	..	NK	..	..
Dominican Republic	..	..	NK	..	..	..	..	NK	..	..	..	..	NK	..	..
Haiti	..	..	NK	..	..	..	..	NK	..	..	..	..	NK	..	..
Jamaica	..	..	NK	..	..	..	..	NK	..	..	..	..	NK	..	..
Latin America															
Argentina	2000–01	..	54·6	..	B1	..	..	NK	..	..	2000–01	..	8·6	..	B1
Bolivia	..	..	NK	..	..	..	..	NK	..	..	..	..	NK	..	..
Brazil	2000–01	..	63·9	..	B1	1994–96	..	55·8	..	B2	2000	..	2·3	..	C
Chile	..	..	NK	..	..	..	..	NK	..	..	..	..	NK	..	..
Colombia	..	..	NK	..	..	..	..	NK	..	..	..	..	NK	..	..
Costa Rica	..	..	NK	..	..	..	..	NK	..	..	..	..	NK	..	..
Ecuador	..	..	NK	..	..	..	..	NK	..	..	..	..	NK	..	..
El Salvador	..	..	NK	..	..	..	..	NK	..	..	..	..	NK	..	..
Guatemala	..	..	NK	..	..	..	..	NK	..	..	..	..	NK	..	..
Honduras	..	..	NK	..	..	..	..	NK	..	..	..	..	NK	..	..
Mexico	2005	96	97·4	98·7	B1	2005	..	85·0	..	B1	..	..	NK	..	..
Nicaragua	..	..	NK	..	..	..	..	NK	..	..	..	..	NK	..	..
Panama	..	..	NK	..	..	..	..	NK	..	..	..	..	NK	..	..
Paraguay	2006	..	9·8	..	C	..	..	NK	..	..	..	..	NK	..	..
Peru	..	..	NK	..	..	..	..	NK	..	..	..	..	NK	..	..
Suriname	..	..	NK	..	..	..	..	NK	..	..	..	..	NK	..	..
Uruguay	2003	..	21·9	..	C	2003	..	19·6	..	C	2003	..	4·5	..	C
Venezuela	..	..	NK	..	..	..	..	NK	..	..	..	..	NK	..	..
North America															
Canada	2005–08	51	64	77	A	..	..	NK	..	..	..	..	NK	..	..
USA	2002–04, 2001	69·7	73·4	77	B2	2002–04	..	22·6	..	A	1992	3·5	11·8	20	B1, B2

We identified no reports of injecting drug use for Anguilla, Antigua and Barbuda, Aruba, Barbados, British Virgin Islands, Cayman Islands, Cuba, Dominica, Grenada, Guadaloupe, Martinique, Montserrat, Netherlands Antilles, Saint Kitts and Nevis, Saint Lucia, Saint Vincent and Grenadines, Trinidad and Tobago, and Turks and Caicos Islands in the Caribbean, and Belize, Falkland Islands, and Guyana in Latin America. Source documents for all figures listed in tables are shown in webappendix pp 9–16. When more than one year or grade is shown, these are listed in order of the report they refer to (ie, lowest report first. NK=although injecting drug use has been identified or injecting drug use prevalence estimated, no eligible report of HCV or HBV in injecting drug users were located. HCV=hepatitis C virus. HBV=hepatitis B virus. *A study in San Juan, Puerto Rico reported 89% HCV prevalence.[46]

Table 3: **Prevalence of hepatitis C antibodies (anti-HCV), hepatitis B core antibodies (anti-HBc), and hepatitis B surface antigen (HBsAg) in injecting drug users in the Americas**

that might have had data of use for this report. The sponsors of the study had no role in study design, data analysis, data interpretation, or writing of the report. All authors made decisions on analysis, write up, interpretation of results, and submission of the manuscript for publication.

Results

We identified eligible reports on anti-HCV in IDUs for 77 of the 152 countries or territories where injecting drug use has been reported (figure 2, tables 1–5, webappendix pp 9–16); these 77 countries hold 82% of the world's estimated population of IDUs. Anti-HCV prevalence varied greatly: midpoint reports ranged from 9·8% to 97·4% (tables 1–5).[19,20] Anti-HCV prevalence was 60–80% in IDUs in 25 countries, and 80% or higher in a further 12. The countries with the largest estimated populations of IDUs were China (midpoint estimate 67·0%), Russia (72·5%), and the USA (73·4%; tables 1–3). No studies were located for Caribbean countries or Pacific Island states and territories (table 3 and table 4).

HBV exposure (anti-HBc positive) was measured in 43 countries, accounting for 65% of the world's population of IDUs (webappendix p 17). Rates varied widely between countries, from 4·2% in Slovenia to 85·0% in Mexico (tables 1–5). Prevalence of HBsAg was measured in 59 countries, accounting for 73% of the world's population of IDUs (figure 3, tables 1–5). The highest rates of HBsAg were in countries (mostly in Asia) that have endemic HBV in the general population. HBsAg prevalence reports in IDUs varied substantially within countries; for example, prevalence reports of HBsAg ranged from 3·5% to 20·0% in the USA and 3·7% to 30·9% in Iran (table 3 and table 4).

	Prevalence of anti-HCV in injecting drug users (%)					Prevalence of anti-HBc in injecting drug users (%)					Prevalence of HBsAg in injecting drug users (%)				
	Report year	Lower	Mid	Upper	Grade	Report year	Lower	Mid	Upper	Grade	Report year	Lower	Mid	Upper	Grade
Australasia															
Australia	1991–95, 1990–91	41·2	54·6	68	A	1994, 1990–91	18·9	33	47·0	A	1999–02, 2005–08	2·9	4·0	5	B2, B1
New Zealand	2009	..	51·9	..	B1	..	..	NK	..	..	1994, 1991	1·2	2·8	4·4	C
Pacific Island states and territories															
Fiji	..	..	NK	..	..	..	..	NK	..	..	..	..	NK	..	..
French Polynesia	..	..	NK	..	..	..	..	NK	..	..	..	..	NK	..	..
Guam	..	..	NK	..	..	..	..	NK	..	..	..	..	NK	..	..
Kiribati	..	..	NK	..	..	..	..	NK	..	..	..	..	NK	..	..
Micronesia	..	..	NK	..	..	..	..	NK	..	..	..	..	NK	..	..
New Caledonia	..	..	NK	..	..	..	..	NK	..	..	..	..	NK	..	..
Papua New Guinea	..	..	NK	..	..	..	..	NK	..	..	..	..	NK	..	..
Samoa	..	..	NK	..	..	..	..	NK	..	..	..	..	NK	..	..
Solomon Islands	..	..	NK	..	..	..	..	NK	..	..	..	..	NK	..	..
Tonga	..	..	NK	..	..	..	..	NK	..	..	..	..	NK	..	..
Vanuatu	..	..	NK	..	..	..	..	NK	..	..	..	..	NK	..	..

We identified no reports of injecting drug use for American Samoa, Cook Islands, Marshall Islands, Nauru, Niue, Palau, Pitcairn, Tokelau, and Tuvalu in the Pacific Island region. Source documents for all figures listed in tables are shown in webappendix pp 9–16. When more than one year or grade is shown, these are listed in order of the report they refer to (ie, lowest report first). NK=although injecting drug use has been identified or injecting drug use prevalence estimated, no eligible report of HCV or HBV in injecting drug users were located. HCV=hepatitis C virus. HBV=hepatitis B virus.

Table 4: **Prevalence of hepatitis C antibodies (anti-HCV), hepatitis B core antibodies (anti-HBc), and hepatitis B surface antigen (HBsAg) in injecting drug users in Oceania**

Data quality varied between all three indicators of hepatitis, with only 20 countries having eligible grade A reports (panel 1) for at least one marker, and few of these reports were nationally representative (tables 1–5). In many countries, prevalence reports came from samples from different sites (grade B1). For most countries, we were able to use reports produced since 2000; however, about 25% of countries only had HBV reports from before 2000 (tables 1–5).

After extrapolation to all countries, we estimated that about 10·0 million IDUs (range 6·0–15·2) in 2010 were anti-HCV positive (table 6; a midpoint prevalence of 67·0% in IDUs globally). This value is about 3·5 times larger than the 2·8 million IDUs (range 0·8–6·2 million) who are estimated to be living with HIV (webappendix p 18).

The largest populations of HCV-positive IDUs lived in eastern Europe (2·3 million, range 1·2–3·9) and east and southeast Asia (2·6 million, 1·8–3·6). The three countries with the largest populations of IDUs living with HCV were China (1·6 million, range 1·1–2·2), Russia (1·3 million, range 0·7–2·3), and the USA (1·5 million, range 1·0–2·2).

We estimate that globally in 2010, 1·2 million (range 0·3–2·7) IDUs were HBsAg positive, with an IDU population-weighted global prevalence of 8·4%. The largest populations by region are east Asia and southeast Asia (0·3 million, range 0·1–0·7) and eastern Europe (0·3 million, 0·1–0·5 million). The large ranges around all these estimates shows the uncertainty resulting from varying prevalence between different subpopulations of IDUs and different recruitment settings.

Discussion

Our global systematic review suggested that around 10·0 million IDUs are HCV positive and around 1·2 million are HBsAg positive. Clear geographical differences exist in prevalence. Eastern Europe, east Asia, and southeast Asia have the largest populations of IDUs infected with viral hepatitis.

Notably, the population size estimates we reported refer to the estimated number of current or recent users of injected drugs who were positive for anti-HCV, anti-HBc, or HBsAg, and not people who have ever injected drugs. Many people who inject drugs cease injecting at some point,[25] so our estimations cannot be interpreted as the total number of cases of HCV or HBV attributable to injecting drug use. Because of the limitations in understanding of the natural history of injecting drug use (such as the range in duration of injecting, and the likelihood and timing of resumption after cessation), especially in low-income and middle-income countries, defensible regional and global estimates cannot be made for the number of former IDUs, or concomitantly, the numbers of whom might be positive for anti-HCV, anti-HBc, and HBsAg. An estimate of the burden of chronic viral hepatitis in current IDUs is essential for assessment of secular trends in the risk of infection, the effect (and importance of implementation) of control strategies, and implications for future burden of disease and health-care needs.

Efforts to prevent, treat, and reduce harms related to liver disease in IDUs are essential—especially in situations in which HIV has successfully been prevented or managed—because the large numbers of IDUs

	Prevalence of anti-HCV in injecting drug users (%)					Prevalence of anti-HBc in injecting drug users (%)					Prevalence of HBsAg in injecting drug users (%)				
	Report year	Lower	Mid	Upper	Grade	Report year	Lower	Mid	Upper	Grade	Report year	Lower	Mid	Upper	Grade
Middle East and North Africa															
Algeria	..	..	NK	..	..	..	..	NK	..	..	..	..	NK	..	..
Bahrain	..	..	NK	..	..	..	..	NK	..	..	..	..	NK	..	..
Cyprus	2008	29·2	39·6	50·0	C	..	..	NK	..	..	2008	..	0·0	..	C
Egypt	1989–91, 1995	35·8	49·4	63·0	C	1989–91, 1995	53·6	57·8	62·0	C	1989–91, 1995	10·9	13·5	16·0	C
Iraq	..	..	NK	..	..	..	..	NK	..	..	..	..	NK	..	..
Israel	2001–03*	..	67·6	..	C	1988–89, 1986	26·0	39·0	52·0	C	1988–89, 1986	0·0	2·8	5·5	C
Jordan	..	..	NK	..	..	..	..	NK	..	..	..	..	NK	..	..
Kuwait	..	..	NK	..	..	..	..	NK	..	..	..	..	NK	..	..
Lebanon	2000–02, 2007–08	5·0	28·9	52·8	C	..	..	NK	..	..	2000–02, 2007–08	0	2·5	5	C
Libya	..	..	NK	..	..	..	..	NK	..	..	..	..	NK	..	..
Morocco	..	..	NK	..	..	..	..	NK	..	..	..	..	NK	..	..
Palestine	2007*	..	45·3	..	C	..	..	NK	..	..	2007*	..	6·4	..	C
Oman	..	..	NK	..	..	..	..	NK	..	..	..	..	NK	..	..
Qatar	..	..	NK	..	..	..	..	NK	..	..	..	..	NK	..	..
Saudi Arabia	2002, 2003–06	14·1	49·8	85·4	C	..	..	NK	..	..	1992–93	..	18·5	..	C
Sudan	..	..	NK	..	..	..	..	NK	..	..	..	..	NK	..	..
Syria	1999*	..	60·5	..	C	1999*	..	28·9	..	C	..	..	NK	..	..
Tunisia	..	..	NK	..	..	..	..	NK	..	..	..	..	NK	..	..
Turkey	2009	..	28·9	..	B1	..	..	NK	..	..	2009	..	5·2	..	B1
UAE	..	..	NK	..	..	..	..	NK	..	..	..	..	NK	..	..
Yemen	..	..	NK	..	..	..	..	NK	..	..	..	..	NK	..	..
Sub-Saharan Africa															
Côte d'Ivoire	..	..	NK	..	..	..	..	NK	..	..	..	..	NK	..	..
Djibouti	..	..	NK	..	..	..	..	NK	..	..	..	..	NK	..	..
Gabon	..	..	NK	..	..	..	..	NK	..	..	..	..	NK	..	..
Ghana	2004–05	..	40·1	..	B1	..	..	NK	..	..	..	..	NK	..	..
Kenya	2000	42·2	51·4	60·6	B1, B2	..	..	NK	..	..	2000	..	6·4	..	B2
Malawi	..	..	NK	..	..	..	..	NK	..	..	..	..	NK	..	..
Mauritius	2009	..	97·3	..	B1	..	..	NK	..	..	2009	..	9·0	..	B1
Nigeria	..	..	NK	..	..	..	..	NK	..	..	..	..	NK	..	..
Senegal	..	..	NK	..	..	..	..	NK	..	..	..	..	NK	..	..
Sierra Leone	..	..	NK	..	..	..	..	NK	..	..	..	..	NK	..	..
South Africa	..	..	NK	..	..	..	..	NK	..	..	..	..	NK	..	..
Swaziland	..	..	NK	..	..	..	..	NK	..	..	..	..	NK	..	..
Tanzania	2007	..	22·2	..	C	..	..	NK	..	..	2007	..	3·8	..	C
Togo	..	..	NK	..	..	..	..	NK	..	..	..	..	NK	..	..
Uganda	..	..	NK	..	..	..	..	NK	..	..	..	..	NK	..	..
Zambia	..	..	NK	..	..	..	..	NK	..	..	..	..	NK	..	..
Zimbabwe	..	..	NK	..	..	..	..	NK	..	..	..	..	NK	..	..

We identified no reports of injecting drug use for Angola, Benin, Botswana, Burkina Faso, Burundi, Cameroon, Cape Verde, Central African Republic, Chad, Comoros, Democratic Republic of Congo, Equatorial Guinea, Eritrea, Ethiopia, The Gambia, Guinea, Guinea-Bissau, Lesotho, Liberia, Madagascar, Mali, Mauritania, Mozambique, Namibia, Niger, Republic of the Congo, Rwanda, São Tomé and Príncipe, Seychelles, and Somalia. Source documents for all figures listed in tables are shown in webappendix pp 9–16. When more than one year or grade is shown, these are listed in order of the report they refer to (ie, lowest report first). NK=although injecting drug use has been identified or injecting drug use prevalence estimated, no eligible report of HCV or HBV in injecting drug users were located. HCV=hepatitis C virus. HBV=hepatitis B virus. UAE=United Arab Emirates. *Publication year minus 3 (year of estimate not stated).

Table 5: **Prevalence of hepatitis C antibodies (anti-HCV), hepatitis B core antibodies (anti-HBc), and hepatitis B surface antigen (HBsAg) in injecting drug users in the Middle East and Africa**

infected with HCV and significant morbidity resulting from this infection mean that the health and economic costs of HCV transmitted by injecting drug use might be as high as (or higher than) those of HIV. Nonetheless, HCV treatment is underused.[10] Part of the reason for this neglect is the high cost, which will remain a substantial barrier to increasing of treatment coverage in low-resource settings until costs are reduced. There is increasing attention on this issue among international groups who are advocating for cost reductions, generic

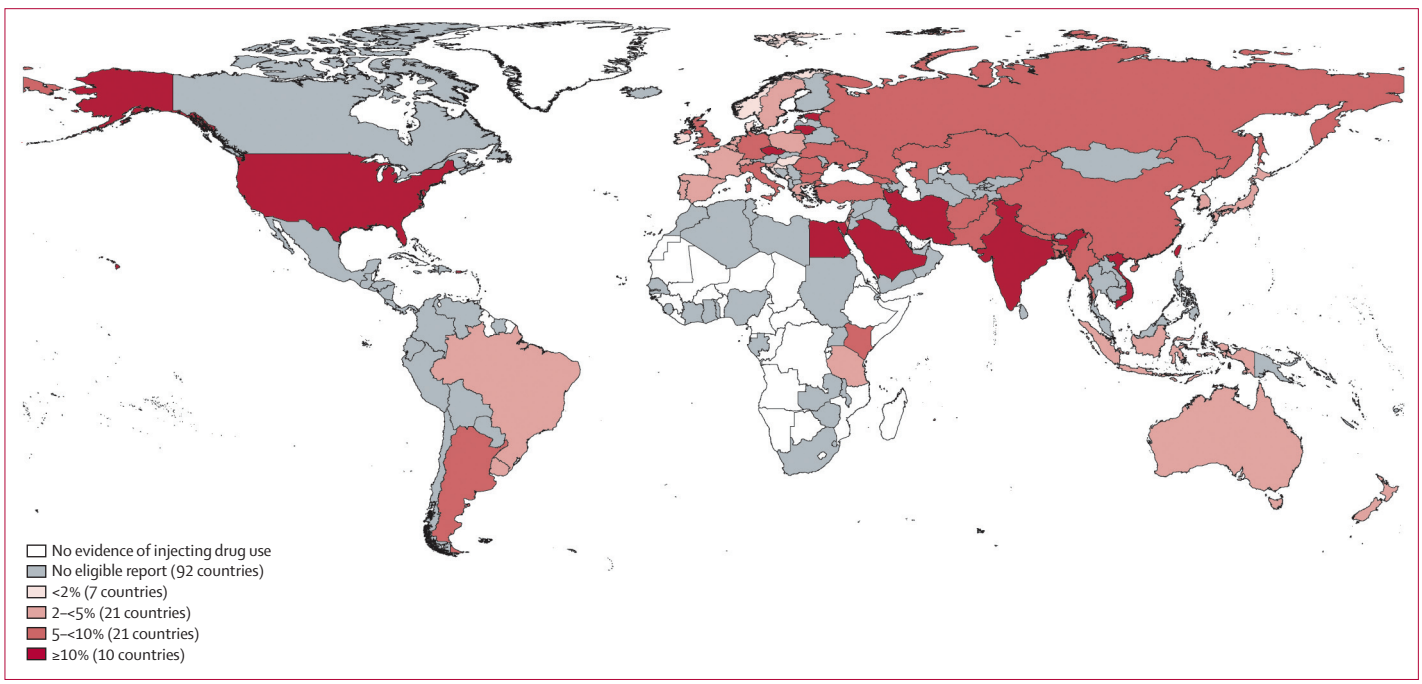

Figure 3: **Prevalence of hepatitis B surface antigen in injecting drug users**

manufacturing, and changes to licensing conditions.[10,26] Not long ago, the high cost of HIV antiretrovirals similarly prevented access in high prevalence, low-income countries: in recognition of this barrier, there are growing efforts to bring viral hepatitis treatments into the same (lower cost) access framework as HIV antiretrovirals.[10] Nonetheless, another barrier is the toxic effects of HCV treatment, although a large number of new HCV drugs are in development that will revolutionise HCV treatment in the next few years.[27]

More attention needs to be paid to reduction of the effect of other causes of progression of liver disease in people who are chronically infected with viral hepatitis. This attention includes addressing problems of alcohol use, and provision of HAV and HBV vaccination, particularly because liver-related disease will become a main cause of mortality as IDUs get older.[28]

Evidence about the effect of needle and syringe programmes[29] and provision of other injection equipment on prevention of HCV infection is scarce, but reduction of risk is paramount, particularly during the period of initiation to injecting when incidence of HCV is highest.[6,14] The potential for HCV treatment to reduce HCV prevalence in IDU populations and therefore reduce the force of infection acting on susceptible members of these populations has been supported by mathematical modelling.[30] This potential role of HCV treatment in the prevention of HCV transmission in IDU populations warrants further investigation.

Although we noted substantial variability in HBsAg prevalence reports, prevalence typically mirrored the differences in the rate of HBV infection in the general population. In countries with a low-intermediate rate, the prevalence of HBsAg in IDUs was typically less than 10%, whereas in countries with a high rate of HBV infection, prevalence of HBsAg in IDUs was around 10–20% (eg, east Asia and southeast Asia). Because of the high rate of chronic HCV infection in IDUs, HBV infection is particularly likely to show HBV and HCV co-infection, which is associated with more rapid progression of liver disease and attendant mortality;[31] this outcome is similarly the case for co-infection between HIV and viral hepatitis.[32]

Effective treatments for chronic HBV infection are available, which reduce progression of liver disease and complications such as hepatocellular carcinoma.[33] However, antiviral therapy for chronic HBV infection is often of indefinite duration, and access to modern, potent drugs with high resistance barriers is restricted in many high-prevalence, low-resource settings. Barriers to accessing treatment and care for chronic HBV infection result in poor outcomes for those affected, and ongoing transmission to susceptible contacts.

Vaccination against HBV must be prioritised for all susceptible IDUs, especially those already infected with HCV. However, selective vaccination programmes against HBV in this group have often been characterised by low uptake and difficulty reaching the most at-risk individuals.[34] A substantial reduction in the burden of HBV infection in IDUs is expected in countries with universal infant vaccination programmes, once these individuals reach the age at which acquisition of HBV

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	Estimated number of IDUs who are anti-HCV positive					Estimated number of IDUs who are anti-HBc positive					Estimated number of IDUs who are HBsAg positive				
	Eligible reports		Lower	Mid	Upper	Eligible reports		Lower	Mid	Upper	Eligible reports		Lower	Mid	Upper
	Countries (n)	ERIP (%)				Countries (n)	ERIP (%)				Countries (n)	ERIP (%)			
Eastern Europe	14	87%	1244500	2346000	3918000	9	80%	608500	1357500	2416500	11	86%	100000	280000	543000
Western Europe	22	99%	497000	727500	1018000	17	94%	188500	480000	595500	17	93%	13500	54000	108500
East and Southeast Asia	11	99%	1820000	2642000	3576500	5	77%	583000	1592500	2108500	8	88%	111000	340000	696000
South Asia	6	99%	232500	354500	532000	3	45%	135500	370500	500000	6	99%	20000	71500	154500
Central Asia	3	81%	91500	146000	213000	1	40%	51500	146000	201000	1	40%	6000	21500	46000
Caribbean	0	0%	..*	..	..	0	0%	..*	..	..	0	0%	..*	..	..
Latin America	5	67%	675500	1022000	1441000	3	60%	332000	926000	1262000	3	45%	12500	43500	90500
Canada and USA	2	100%	1099000	1673500	2471500	1	87%	177500	524500	765000	1	87%	57500	272500	642000
Pacific Island states and territories	0	0%	..*	..	..	0	0%	..*	..	..	0	0%	..*	..	..
Australia and New Zealand	2	100%	44500	97000	165000	1	88%	20500	60500	115000	2	100%	3000	7000	12000
Middle East and North Africa	8	54%	28500	63500	115500	3	26%	50000	74500	106000	7	49%	7500	14000	26500
Sub-Saharan Africa†	4	25%	206500	800000	1524000	0	0%	118000	827500	1486000	3	19%	11500	106500	296500
Extrapolated global	77	82%	6031000	10018000	15186500	43	65%	2295500	6446500	9676000	59	73%	346500	1229000	2654500

All figures rounded to nearest 500 people; global figure totalled from regional estimates prior to rounding. 2010 UN population division estimates were used to derive 2010 estimates of population sizes of IDUs. IDU=injecting drug user. ERIP=estimated regional population of IDUs. *Insufficient data to produce a region-specific estimate for populations of IDUs in this region; countries in this region were still included in global estimates. †Numbers of sub-Saharan African IDUs and derived population estimates should be viewed with caution because injecting drug user prevalence estimates were derived from three countries in the region (South Africa, Mauritius, and Kenya); the estimated range of IDUs was derived by applying the regional observed error (the large error band emphasises the uncertainty around these estimates).

Table 6: **Regional and global estimates of the numbers of IDUs who were positive for hepatitis C antibodies (anti-HCV), hepatitis B core antibodies (anti-HBc), and hepatitis B surface antigen (HBsAg) in 2010**

through injecting drug use is most common. Correctional facilities provide one opportunity to vaccinate, treat, and reduce the transmission of viral hepatitis in a population with high rates of injecting drug use, HBV, and HCV, many of whom cycle in and out of the community.[35,36]

There are several key limitations to the existing data. One issue concerns the way in which HCV and HBV infection are measured and reported between studies: reporting of data was typically done on the basis of only one (or perhaps two) markers, making estimates of the true prevalence of chronic HBV and HCV difficult. Without the measurement and reporting of several markers (anti-HCV plus HCV RNA PCR, or HBsAg plus anti-HBc, and ideally anti-HBs) more accurate estimation of chronic infection, past infection, susceptibility or immunity is not possible. For HCV, we estimated the number of present IDUs who were anti-HCV positive; however, this assessment is not a measure of total chronic HCV infection but rather HCV exposure in IDUs, because a minority (~20%) of those infected with HCV (who would test positive for anti-HCV) will probably clear the virus.[4]

For HBsAg, we noted wide ranges in reports that met inclusion criteria. Furthermore, if anti-HBc was not reported, assessment of the proportion of individuals who were positive for HBsAg, acutely infected, and within the window before anti-HBc seroconversion was not possible. Future studies should include both markers to allow a more accurate understanding of study results. Additional sample details, including country of birth and ethnicity, would also assist interpretation.[37] An additional limitation of the existing data is the scarcity of data for the age range of samples and duration of drug-injecting history and therefore time of raised exposure to viral hepatitis, which would permit more accurate understanding of varying prevalence of both HCV and HBV between samples. Our reliance on older studies, with less accurate serological testing techniques and small sample sizes, and those undertaken in countries where laboratory capacity is low, increases uncertainty about the validity of both HCV and HBV reports.

A final issue relates to the representativeness of samples of people who inject drugs. Some studies of HBV and HCV recruited participants who had ever injected drugs, whereas others recruited those who had injected in the past year or were current users. Studies also recruited from various locations, including prisons, drug-treatment centres, outpatient clinics, and other medical settings, in which IDUs might differ in their risk behaviour and exposure to viral hepatitis. Moreover, convenience sampling is most often used, so samples

possibly do not represent the IDU population from which they are drawn. Data were also typically subnational and from a small number of locations that might or might not be representative of the epidemic nationally, particularly in larger countries where there might be much geographical variation, potentially restricting national representativeness.

We have used the same methods as in our previous reports.[1] As in these previous investigations, limitations of this report included the concentration of peer-reviewed data from high-income countries, the small team who undertook the analysis, and the potential for papers in languages other than English to be overlooked. We attempted to address these limitations by consulting widely with experts and stakeholders, seeking unpublished reports and verifying the data from reports included, and enlisting the support of UN and other agencies, who helped gain access to data and contact with relevant in-country personnel.

For the **Secretariat for the Reference Group** see http://www.idurefgroup.unsw.edu.au//IDURGWeb.nsf/page/Secretariat

The public-health response to blood-borne virus transmission in IDUs has mainly centred on HIV. Maintenance and strengthening of the response to HIV in IDUs remains crucial, but the significance of viral hepatitis needs to receive greater attention than it does at present. Investment in, and development of, comprehensive and effective strategies to prevent the transmission of viral hepatitis and reduce resultant morbidity and mortality in IDUs are urgently required. The viral hepatitis resolution of the 63rd World Health Assembly[10] requested that the Director General of WHO collaborate with all relevant stakeholders in supporting surveillance, prevention, and treatment goals, especially in developing countries. Policies and strategies for viral hepatitis need to include IDUs, who are at increased risk and often have poorer access to services than do the general population. Our report provides estimates of the scale of this problem at country, regional, and global scales, and the findings should inform efforts to accurately scale and appropriately target the response.

Contributors

PKN and LD developed the overall method for use in the report. HH and DDJ developed the methodology and oversaw data extraction for the HCV Synthesis Project, and provided these data for use in this report. DH maintained the customised database. PKN and DH did the literature searches, extracted data, and provisionally selected reports for use in generation of estimates. PKN and LD decided on the final set of reports, with advice from BC, which were reviewed by HH, DDJ, DH, and BMM. BMM developed the analysis technique and generated regional and global estimates, which were reviewed by PKN and LD. PKN and LD led the writing of the manuscript; HH, DDJ, DH, BC, and BMM commented and contributed text. PKN generated the maps.

Conflicts of interest

LD and BMM have received grant money and have acted as independent consultants to WHO, the Joint United Nations Programme on HIV/AIDS (UNAIDS) and the United Nations Office on Drugs and Crime (UNODC). DDJ has been funded by and consulted for WHO. LD received an untied educational grant (2006–08) from Reckitt Benckiser in Australia to do a postmarketing surveillance study of buprenorphine-naloxone for the treatment of heroin dependence in Australia.

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Hepatitis in drug users: time for attention, time for action

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In place of saints' days or public holidays, public health practitioners celebrate disease days: World Cancer Day in February,[1] Stroke Day in October,[2] and World AIDS Day on Dec 1.[3] The main reason for these days is to raise awareness, a key part of which is the presentation of descriptive statistics: without intervention, 84 million people will die of cancer between 2005 and 2015;[1] every 6 s someone will die from stroke;[2] and 33 million people are living with HIV.[3]

In *The Lancet*, Paul Nelson and colleagues[4] review 4386 peer-reviewed sources and 1019 grey literature sources to estimate—at national, regional, and global scales—prevalence and population estimates for hepatitis B and C in injecting drug users (IDUs). The investigators provide the requisite bold statistics: 10 million IDUs might be positive for hepatitis C antibodies and more than 80% of IDUs in 12 countries are estimated to be infected. More than 6 million IDUs might be positive for hepatitis B core antibodies. The investigators do not estimate the burden of death and disease from these infections, but it is likely to be substantial: more than 1·5 million deaths occur every year from acute hepatitis B and C infections, hepatocellular carcinoma, and cirrhosis.[5]

July 28 is World Hepatitis Day, and the article by Nelson and colleagues[4] forms part of the efforts to raise awareness about this disease. While focusing attention on hepatitis is a challenge generally, mobilisation of action to address the disease in drug users is even more difficult.

Drug users around the world face stigma, discrimination, mistreatment, and the systematic violation of their human rights.[6] Harm-reduction strategies that, in addition to prevention of HIV infection, could help to reduce hepatitis B and C transmission are widely underfunded or blocked by local or national governments altogether. In June, 2011, the United Nations General Assembly feebly called on nations to give "consideration, as appropriate" to implementation and expansion of harm-reduction programmes.[7] Not surprisingly, countries that do not find drug users worthy of consideration often find harm reduction inappropriate.[8]

Through country-by-country estimates, Nelson and colleagues provide an opportunity to examine striking disparities in rates of hepatitis B and C. Why is the prevalence of hepatitis C antibodies in IDUs in Hungary 23%, whereas it is about 90% in Estonia or Lithuania and 73% in Russia? Why do 85% of IDUs in Mexico have hepatitis B core antibodies compared with 20% of IDUs in Uruguay? These differences could be due to the limitations of the data: despite thousands of studies reviewed, grade A reports (ie, a multisite seroprevalence study with several sample types for at least one hepatitis marker) were only available for 20 of the 77 countries for which any data were available, and few studies provided truly national estimates.[4] However, the differences may also show trends and patterns of drug use, or important differences in state policies and investment in harm reduction. Large between-country variations emphasise how high rates of hepatitis B, hepatitis C, or HIV infection in drug users are not inevitable.[9] Moreover, the estimates provide a powerful means for health and human rights advocates to question government officials in countries with high prevalences, and to caution governments in countries with low prevalences about the potential costs (human and economic) of failing to put in place, or sustain, effective, rights-based policies.

Nelson and colleagues[4] conclude that improved recognition of hepatitis in IDUs and development of comprehensive and effective strategies are needed. No doubt this is true, to some extent. However, the history of HIV in IDUs shows that much more than awareness

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and evidence-based approaches are needed to bring about change.[10] A lesson to recall is the importance of looking to those most affected (ie, people who use drugs) for guidance and leadership in development of effective responses and identification of barriers to their implementation.

Until governments abandon the failed so-called war on drugs[11] and their reliance on repression in response to drug use, we will continue to need days to recognise and raise awareness of hepatitis in drug users. At the same time, we should remember the harm that arbitrary detention, forced labour, physical abuse, and torture causes to IDUs.[12] Health is often proclaimed to be at the centre of drug policy, but support for the protection and promotion of the right to health, and other human rights, of drug users is often wholly absent.[13]

Nelson and colleagues[4] provide us with a first step and powerful data to draw attention to the problem of viral hepatitis in people who use drugs. The next step is to challenge governments to act, and hold them accountable for implementation of rights-respecting and evidence-based programmes.

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I declare that I have no conflicts of interest.

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