TECHNICAL REPORT

# Epidemiological assessment of hepatitis B and C among migrants in the EU/EEA

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# Epidemiological assessment of hepatitis B and C among migrants in the EU/EEA

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# Abbreviations

| | |
|---|---|
| CHB | Chronic hepatitis B infection |
| CHC | Chronic hepatitis C |
| CI | Confidence interval |
| EMR | Eastern Mediterranean Region |
| ESS | European Statistical System |
| EU/EEA | European Union/European Economic Area |
| FB | Foreign-born |
| FGM | First-generation migrant |
| GBD | Global Burden of Disease |
| GP | General practitioner |
| HBsAg | Hepatitis B surface antigen |
| HBV | Hepatitis B virus |
| HCC | Hepatocellular carcinoma |
| HCV | Hepatitis C virus |
| OECD | Organisation for Economic Co-operation and Development |
| PHC | Public health centre |
| SGM | Second-generation migrant |
| STI | Sexually transmitted infection |

# Executive summary

## Introduction

Hepatitis B and C are viruses that infect the liver and can silently progress to become serious diseases such as cirrhosis and liver cancer. Effective antiviral treatment is available and timely treatment of eligible patients can prevent hepatitis-related burden of disease and death. The main bottleneck in providing treatment to those who could benefit occurs with case detection. 'Foreign-born migrants' – those born outside their current country of residence (hereafter referred to as migrants) are one of the key populations at higher risk of hepatitis B and C in the EU/EEA and thus important targets for hepatitis-specific prevention and care programmes. In order to inform policy-making and healthcare planning, it is crucial to have a good understanding of the burden of hepatitis B and C infection among migrants. This will enable policymakers to prepare the ground for targeted screening programmes and other prevention measures. This report gives an overview of chronic hepatitis B and C virus infection among foreign-born migrants in the EU/EEA.

## Methods

Two systematic literature searches were conducted: one to find estimates of the hepatitis B surface antigen (HBsAg) and anti-hepatitis C virus (HCV) prevalence of migrants by country of origin (from published reviews); and a second to identify studies on the prevalence in migrant populations across the EU/EEA. Using a systematic approach based on demographic data detailing the size of the foreign-born population in EU/EEA countries (extracted from Eurostat, OECD and European Statistical System databases) (Table 1) and estimates for the prevalence in the countries of origin, estimates were derived for the number of infected migrants. To assess the relative burden among migrants in proportion to the overall burden of chronic viral hepatitis in each of the EU/EEA countries, the estimated number of infections in the migrant population was compared to the estimated number of infections in the total population of each EU/EEA country (derived using the same methods and data on prevalence and population size). For further insight the findings from the literature search for prevalence studies in migrant populations were analysed and compared to prevalence estimates in the countries of origin for different types of migrant populations.

## Key findings

### Number of chronic hepatitis B and C infections in the general population

With an estimated 4 to 7.5 million chronic (HBsAg positive) hepatitis B infected people (Table 3), and 2 to 6.6 million chronic (viraemic, i.e. HCV RNA positive) hepatitis C cases (Table 7), the burden of these chronic liver infections (at 6 to 14 million cases) in the general population of the EU/EEA is substantial. Chronic hepatitis B prevalence in the general population ranges from 0.1% in Ireland and the Netherlands, to 5.5% in Romania. The anti-HCV prevalence estimates in the general population range from 0.2% in the Netherlands to 4.4% in Italy. Overall, the estimated prevalence for both HBsAg and anti-HCV is around 1% in the EU/EEA as a whole. In terms of absolute numbers the EU/EEA countries with highest absolute number of estimated chronic hepatitis B (CHB) cases are Italy and Romania (both with over 1 million cases); Poland, Germany, France, UK, Bulgaria and Spain (ranging from 550 000 to 300 000 cases); Greece, Portugal and Hungary (ranging from 260 000–100 000 cases). In terms of absolute numbers the EU/EEA country with the highest absolute number of estimated chronic hepatitis C (CHC) cases among adults is Italy with ~1.6 million cases. Other EU/EEA countries with a high CHC case burden in terms of absolute numbers are Romania (~380 000) and Spain (~470 000).

## Migrants in the EU/EEA

The total foreign-born population living in the 31 countries of the EU/EEA exceeds 50 million (Tables 1 & 2). The proportion of the foreign-born population ranges from 0.9% in Romania and 1.3% in Bulgaria to over 40% in Luxembourg and Liechtenstein. Overall, 10.3% of the total population and 11.4% of the adult population in the EU/EEA countries are foreign-born. Based on the above demographic data sources and the systematic reviews of hepatitis B virus (HBV) and HCV prevalence (at country level), it is estimated that 53% of the total foreign-born population in the EU/EEA is born in HBV-intermediate/high-endemic countries (those with a prevalence of 2% or higher) (Table 3). Around 79% of the foreign-born adult population is born in HCV high-endemic countries (those with a prevalence above 1%) (Table 8). Countries where the proportion of migrants from HBV-endemic countries exceeds 10% of the total population are Cyprus, Estonia, Latvia and Croatia. Countries where the proportion of migrants from HCV-endemic countries exceeds 15% of the total population are Liechtenstein, Luxembourg, Cyprus, Estonia and Latvia. The estimated prevalence of HBsAg among migrants from intermediate and high-endemic countries ranges from 3% in Estonia, Latvia, Lithuania and Poland to 9% in Portugal (Table 5). The estimated prevalence of viraemic

HCV infection among migrants from high-endemic countries ranges from 0.9% in Croatia, to 2.4% in Latvia (Table 9). These two findings reflect the composition of countries of origin for the migrant population in EU/EEA countries.

## Number of migrants with chronic hepatitis B and C infection

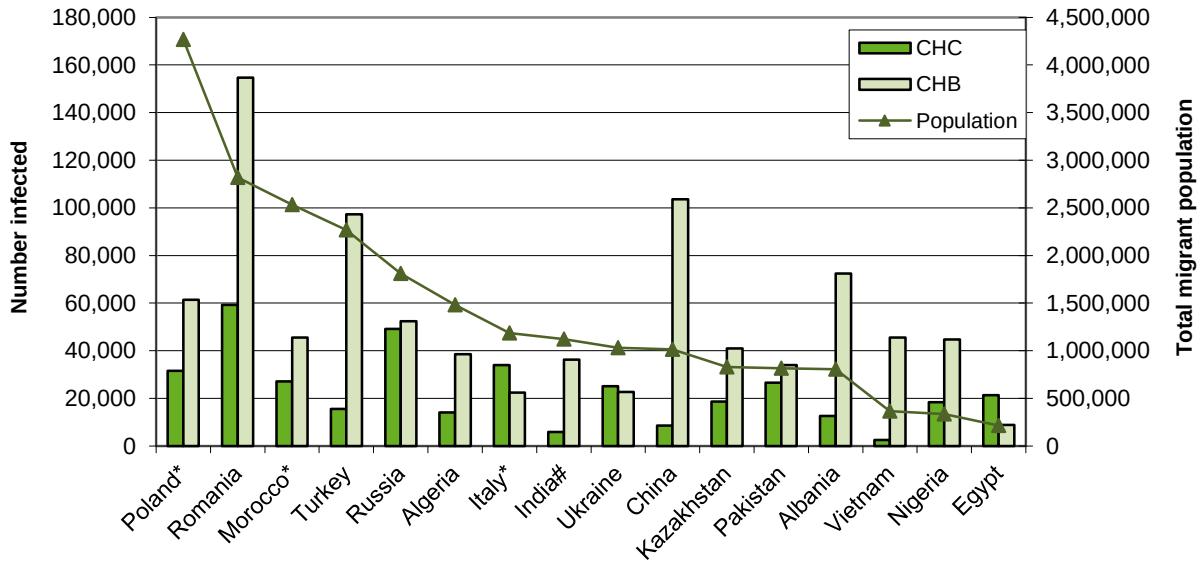
There are an estimated one to two million cases of chronic hepatitis B (CHB) (Table 5) and 300–900 000 cases of chronic hepatitis C (CHC) (Table 9) among migrants from intermediate/high-endemic countries. The estimated prevalence among migrants in the EU/EEA born in endemic countries is 6% for HBsAg and 2.3% for anti-HCV.

When analysing cumulatively the number of chronic HBV-infected people among the different migrant populations from intermediate and high-endemicity countries to the EU as a whole, over 50 000 CHB cases are estimated to originate from Romania, China, Turkey, Albania and Russia respectively. Migrants from Vietnam, Nigeria, Kazakhstan, Algeria and India (ranging from 36 000–46 000 cases respectively) also contribute substantially to the overall CHB burden in the EU/EEA countries of residence (Table 6). A sizeable number of CHB-affected migrants come from countries with low hepatitis B endemicity such as Poland (~61 000 cases), Morocco (~45 000 cases) and Italy (~22 000 cases).

When analysing cumulatively the CHC burden among the different migrant populations from high endemicity countries to the EU, 50,000-60 000 cases of CHC are estimated to be found among migrants from Romania and Russia. Between 25 000-35 000 cases are estimated to be found among migrants from Italy, Poland, Morocco, Pakistan and Ukraine. Around 20 000 cases are estimated to be found among migrants from Egypt, Kazakhstan and Nigeria.

In terms of absolute numbers, the overall estimated number of CHB cases by far exceeds the number of CHC cases (see Figure 1). The contribution of HBV and HCV to the total burden of chronic viral hepatitis differs for each migrant population. In migrants from China, Vietnam, Turkey, Albania and India, more than 80% of the chronic viral hepatitis infections are chronic hepatitis B infections. Migrants born in Ukraine, Russia and Pakistan contribute roughly equally to the HBV and HCV burden. Only in migrants from Egypt and Italy is the estimated number of CHC cases substantially higher than CHB cases. It is interesting that three migrant populations with relatively high numbers of both HBV and HCV cases are from EU/EEA countries – namely Italy, Poland and Romania.

**Figure 1. Estimated number of CHB and CHC cases among migrants in the EU/EEA and the size of the migrant population**




* low-endemic country for HBV (HBsAg prevalence <2%)
# low-endemic country for HCV (anti-HCV prevalence <1%)
§ data sources: demographic data on migrants –Table 1; estimated number of CHB and CHC cases – Annex 5.5 and 5.7.

## Migrants are disproportionally affected by chronic hepatitis B and C

In the EU/EEA as a whole, this study estimates the burden among migrants in relation to the overall number of infected cases to be around 25% for chronic hepatitis B, and 14% for chronic hepatitis C. This is much higher than the proportion of migrants in the total population, which is 5% for migrants from HBV endemic countries and 8% for migrants from HCV endemic countries. The burden among migrants in relation to the overall burden of both CHB and CHC is lowest in Romania, Bulgaria, Slovakia and Poland (<4%). These are all countries where the proportion of migrants from endemic countries in the total population is relatively low (<1.5%). In some countries (i.e. Ireland, the Netherlands and Sweden) the relative burden among migrants from intermediate and high-endemicity countries as a proportion of the overall chronic viral hepatitis B burden in the host country was estimated to be exceptionally high. A certain overestimation of the relative burden among migrants could be a consequence of an underestimation of the prevalence in the general population of the host country, or an overestimation of the prevalence among migrants (when basing this on the prevalence in the migrants' country of origin). To assess whether the in-country (country of origin) prevalence estimates used are overestimates we compared these estimates to the prevalence estimates found among migrants in the EU/EEA countries.

## Prevalence in migrants compared to prevalence in the country of origin

We extracted 103 country-specific estimates from studies among different populations of migrants and compared these with in-country estimates. There was considerable heterogeneity in the migrant populations from which prevalence estimates were derived. Our findings suggest a lower prevalence among residents (i.e. the general population), children and pregnant women than among those screened in healthcare settings and refugee camps.

The most valid comparison of whether the in-country prevalence reflects the prevalence in migrants is to look only at the samples in the general population and not in higher risk groups, such as refugees and patients. Of the 14 HBsAg prevalence estimates available for the general population of migrants, 57% were lower than the in-country estimate in the general population, 36% were comparable and only 7% (one study) was higher. For hepatitis C, 70% of the ten general migrant population estimates are comparable to the in-country prevalence, and 30% are lower.

# Conclusions and public health implications

The aim of this study was to estimate the chronic viral hepatitis burden in terms of infected cases among first-generation migrants in EU/EEA countries based on best available data sources and to identify those migrant groups with the largest number of cases who would benefit most from targeted screening programmes and early linkage to care. There are wide ranges around these estimates and the number of estimated cases should be interpreted with caution. Comparing prevalence data from studies in migrants with estimates for the in-country prevalence showed that the prevalence in migrant populations is often lower, especially for chronic hepatitis B, indicating that the estimates of the total number of migrants infected with chronic hepatitis B and C are possibly an overestimation. Therefore the actual number of infected migrants might be more towards the lower range of our estimates. Despite this uncertainty, the information on the size of the different migrant populations and the ranking of the populations with expected high numbers of chronic viral hepatitis infections provides valuable insight that countries can use to target prevention and screening efforts towards those migrant groups who would benefit most.

# 1 Background and objectives

## 1.1. Background

In the WHO European Region an estimated 13 million people have a chronic hepatitis B virus (HBV) infection, and another 15 million are chronically infected with hepatitis C virus (HCV) [1]. Childhood hepatitis B vaccination programmes and stringent screening of blood products as well as improved hospital hygiene and harm reduction programmes have led to a significant reduction in transmission in many European countries. While the number of acute HBV cases per 100 000 population is declining in EU/EEA countries, the number of chronic infections more than doubled between 2006 and 2012 [2]. As chronic hepatitis B is largely asymptomatic this increase probably reflects increased testing practices. Many chronic hepatitis B (CHB) infections in Europe are now diagnosed in people born in countries with intermediate and high hepatitis B/C endemicity. The ECDC surveillance report 'Hepatitis B and C surveillance in Europe 2012' showed that over 80% of chronic hepatitis B cases were classified as 'imported' in countries that had this information available [2]. The classification of cases as imported indicates that the infection was acquired abroad and as country of birth is usually not available this can be used as proxy for foreign-born cases. However, less than one third of EU/EEA countries provided data on the proportion 'imported', showing the limitation of the routine surveillance data in providing clear information around the extent of chronic viral hepatitis in migrants. In 2013, over 70 million migrants were living in the EU, a large proportion of whom come from countries where the CHB and CHC prevalence is over 2% [3].

Both diseases usually have an insidious onset and can remain undetected for many years. Hepatitis B and C are major causes of liver cirrhosis and hepatocellular carcinoma (HCC). As a result of advances in the treatment of chronic hepatitis B and C, remission of disease can be achieved in up to 90% of chronic hepatitis B patients [4,5] New antiviral drugs for hepatitis C show cure rates of over 90% [6]. Treatment of eligible patients can prevent hepatitis-related burden of disease and death.

The main bottleneck in providing treatment to eligible patients is case detection. It is estimated that up to 75% of patients are not aware that they are infected, on account of the mostly asymptomatic condition, and hence they do not seek treatment [7]. Case detection could be improved by targeted screening of risk groups, of which migrants are an important one. In order to inform policy making and healthcare planning, it is crucial to have a good understanding of the burden of hepatitis B and C infection among migrants. This will enable policy makers to prepare for targeted screening programmes and other prevention measures.

## 1.2 Objective

The objective of this project is to perform an epidemiological assessment of hepatitis B and C burden among foreign-born migrants (hereafter referred to as migrants) to countries within the 31 European Union/European Economic Area (EU/EEA) countries; to identify the migrant populations (i.e. those born outside the country of residence) that contribute substantially to the overall burden of chronic hepatitis B and C in the 31 EU/EEA countries. The work was divided in two parts. The first part deals with the quantitative estimation of the number of chronic hepatitis B and C virus infections among migrants in EU/EEA countries and the relative contribution of hepatitis among migrants to the overall burden of hepatitis B and C. The second part looks at differences in prevalence among migrant populations in EU/EEA countries, prevalence estimates in the countries of origin, and differences in prevalence between first and second-generation migrants.

### Definition of chronic viral hepatitis

| | |
|---|---|
| CHB | Chronic hepatitis B infection, referring to hepatitis B surface antigen (HBsAg) positivity |
| CHC | Chronic hepatitis C infection, referring to viraemic infection - i.e. HCV-RNA positivity - calculated as a proportion of 70% of anti-HCV positive cases which progress to chronicity (based on average viraemic prevalence estimated in a recent worldwide review study) [17]. |

### Definition of migrants

| | |
|---|---|
| FB | Foreign-born, referring to those born outside the country of residence |
| FGM | First-generation migrants, people who are foreign-born |
| SGM | Second-generation migrants, people considered migrants based on their ethnicity (e.g. self-reported or where one/both parents are foreign-born), but who themselves are born in the country of residence. |

### Definition of chronic viral hepatitis endemicity levels

| | HBsAg | anti-HVC |
|---|---|---|
| Low | <2% | <1% |
| Intermediate | <2–7% | n.a. |
| High | >=8% | >=1% |

# 2. Methods

## 2.1 Estimating the burden of chronic hepatitis B and C among migrants in the EU/EEA

### 2.1.1 General approach

To estimate the relative burden among migrants to the EU/EEA, we conducted two studies. First, we identified and extracted data on the country of origins of the migrant population in all 31 EU/EEA countries. Then we searched for systematic reviews of global prevalence of chronic hepatitis B and C to identify country of origin prevalence estimates (also referred to as in-country prevalence in this report).

The country-specific CHB/CHC prevalence estimates were then multiplied by the number of foreign-born residents from the specific country of origin living in the host EU/EEA country, to provide an indication of the potential number of CHB/CHC infections among migrants separately for each EU/EEA country. A detailed description of the individual steps is given below.

### 2.1.2 Demographic data extraction

Demographic data on the foreign-born population by county of birth for each of the 31 EU/EEA countries along with their age distribution (below/above 15 years) were obtained from European statistical databases or the national statistical institutes of the respective countries. Table 1 lists the size of the foreign-born population as available from different data sources, and the data source used for the analysis. If available, Eurostat 2013 was preferred as a data source, since information on both foreign-born migrants by country of birth and country-of-birth-specific age distribution was available for the most recent year (2013) [8]. This was the case for 21 countries (Table 1) (extracted from the Eurostat database on 3 November and 19 December 2014). Where Eurostat data by country of birth were missing (ten countries), the European Statistical System (ESS) website which provides demographic data from the 'EU 2011 – Housing and Population Census' was used (extracted from the European Statistical System on 27 March 2015) [9] Demographic data on the foreign-born population by country of birth as well as the age distribution (below/above 15 years) could be obtained from the ESS for seven countries. For Luxembourg and Greece, data on the foreign-born population by country of birth were obtained from the Organisation for Economic Co-operation and Development (OECD) from the OECD Stats website (extracted from the OECD database on 4 December 2014) [10]. However, since OECD Stats does not provide information on age distribution by country of birth, the proportion of the total foreign-born population <15 years of age was taken from Eurostat and applied equally to all countries of origin to estimate the adult migrant population. Detailed data on the foreign-born migrants resident in Lithuania could not be obtained from the three aforementioned data sources and data were obtained from the Lithuanian National Statistics Service for the year 2013 (data obtained on 24 October 2014) [11]. Here too the data on the proportion of the population <15 years were obtained from Eurostat and applied equally to all countries of origin.

**Table 1. Comparison of the total foreign-born population obtained from three different data sources**

| Country | Total foreign-born population by data source | | | | Demographic data source used |
|---|---|---|---|---|---|
| | Eurostat 2013 | European Statistical System (ESS) 2011 census | OECD | | |
| | | | OECD (most recent year) | OECD Year | |
| Austria | 1 362 185 | 1 312 688 | 1 364 771 | 2012 | Eurostat 2013 |
| Belgium | 1 747 641 | 1 517 608 | 1 690 000 | 2012 | Eurostat 2013 |
| Bulgaria | 96 113 | 78 643 | | | Eurostat 2013 |
| Croatia | 574 383 | 584 000 | | | ESS - 2011 census |
| Cyprus | 200 842 | 196 966 | | | ESS - 2011 census |
| Czech Republic | 387 337 | 693 959 | 669 000 | 2011 | Eurostat 2013 |
| Denmark | 548 411 | 501 911 | 442 000 | 2011 | Eurostat 2013 |
| Estonia | 198 411 | 197 356 | 210 842 | 2011 | Eurostat 2013 |
| Finland | 279 743 | 186 973 | 285 465 | 2012 | Eurostat 2013 |
| France | 7 537 795 | 7 321 237 | 7 358 218 | 2011 | ESS - 2011 census |
| Germany | 10 201 192 | 11 373 438 | 10 918 000 | 2012 | ESS - 2011 census |
| Greece | 1 235 426 | 1 286 067 | 729 926 | 2012 | OECD 2012/Eurostat 2013 age-distribution |
| Hungary | 423 317 | 383 142 | 424 000 | 2012 | Eurostat 2013 |
| Iceland | 35 319 | 32 501 | 35 000 | 2012 | Eurostat 2013 |
| Ireland | 736 375 | 766 640 | 752 000 | 2011 | Eurostat 2013 |
| Italy | 5 695 883 | 4 803 567 | 5 695 883 | 2012 | Eurostat 2013 |
| Latvia | 279 227 | 302 050 | 298 000 | 2011 | Eurostat 2013 |
| Liechtenstein | 23 109 | 14 649 | | | Eurostat 2013 |
| Lithuania | 140 221 | 179 563 | | | Euras.lt 2013/Eurostat 2013 age-distribution |
| Luxembourg | 227 461 | 201 578 | 205 162<br>226 100 | 2010<br>2012 | OECD 2010/Eurostat 2013 age-distribution |
| Malta | | 35 116 | | | ESS - 2011 census |
| Netherlands | 1 927 728 | 1 868 655 | 1 928 000 | 2012 | Eurostat 2013 |
| Norway | 662 526 | 611 283 | 664 000 | 2012 | Eurostat 2013 |
| Poland | 678 946 | 639 772 | 675 000 | 2011 | Eurostat 2013 |
| Portugal | 881 440 | 871 813 | 871 813 | 2011 | ESS - 2011 census |
| Romania | 182 939 | 150 564 | | | Eurostat 2013 |
| Slovakia | 158 164 | 149 662 | 158 178 | 2012 | Eurostat 2013 |
| Slovenia | 232 703 | 228 588 | 300 000 | 2012 | Eurostat 2013 |
| Spain | 6 174 740 | 5 648 995 | 6 618 000 | 2012 | Eurostat 2013 |
| Sweden | 1 472 353 | 1 338 010 | 1 473 000 | 2012 | Eurostat 2013 |
| United Kingdom | 7 828 164 | 7 985 585 | 7 588 000 | 2012 | ESS - 2011 census |

Demographic data on the countries of origin of foreign-born migrants were arranged by the number of adult migrants in descending order. The fifty countries of origin with the highest number of migrants were selected for estimating the CHB and CHC burden among migrants from each of these countries.

### 2.1.3 Systematic literature search to estimate prevalence in foreign-born migrants' countries of origin

On 21 January 2015, a search was performed of Medline, Embase, the Cochrane library, Web of Science, Scopus, PubMed publisher and Google Scholar for reviews, systematic reviews and meta analyses concerning the prevalence of hepatitis B/C in the general population worldwide at country level. The search terms used consisted of a combination of disease-related (hepatitis B/C), outcome-related (prevalence), population-related (general population, worldwide), and study design-related (reviews) terms. As the aim was to identify recent reviews, we searched for papers published in English between 2009 and 2014. Records were exported into Endnote to review for relevancy. Inclusion and exclusion criteria were established and applied to the list of retrieved articles. Key exclusion criteria included:

- Studies dealing with hepatitis other than type B or C
- Studies focusing on natural history, clinical features or complications of hepatitis
- Studies dealing with medical treatment
- Studies focusing on high-risk groups such as injecting drug users, sex workers, HIV patients, etc.
- Single case studies, cost-effectiveness-analyses.

The titles and abstracts of retrieved articles were assessed for relevancy by one reviewer. Full text articles were retrieved for all studies included based on title/abstract and reviewed for further inclusion or exclusion. Decisions to exclude were recorded and a PRISMA flowchart prepared to document these stages (Annex 5.1). Any uncertainty about specific articles was referred to a second reviewer for a second opinion. A description of the search terms used and the exact search in each database is available in Annex 5.2.

From the included reviews the country-level HBsAg and anti-HCV prevalence estimates and confidence intervals (CI) were extracted and entered into an Excel database of all countries of origin for migrants to EU-EEA countries. Where a country-specific estimate was not available for a country of origin, the relevant Global Burden of Disease (GBD) region estimate was added, if available. If a meta-analysis reported a statistically significant time trend the prevalence estimate from the most recent period was selected. If multiple estimates for a country were available from different reviews we assessed the scope and quality of the included studies to determine which estimate could be considered most robust or relevant (for example, by including grey/unpublished literature, or searching in a variety of languages or in national databases). Decisions were made jointly by two reviewers with the rationale recorded for each decision concerning a preferred estimate.

### 2.1.4 Estimating chronic hepatitis B (CHB) burden among foreign-born migrants for each EU/EEA country

To quantify the number of CHB cases among each of the first fifty countries of origin of foreign-born migrants residing in each of the 31 EU/EEA countries, the HBsAg prevalence estimates for the in-country general population (all ages) were multiplied with the total number of migrants (children and adults) from each respective country of origin (for the 50 countries of origin with the highest number of migrants) per EU/EEA country. Following this the countries of origin of foreign-born migrants were sorted by CHB prevalence in descending order, with the aim of identifying all intermediate and high-endemicity countries (i.e. countries with a HBsAg prevalence of 2% or more). The total number of foreign-born migrants originating from intermediate and high-hepatitis B endemicity countries was added up to determine their percentage contribution to the overall number of foreign-born migrants residing in the host country. We also determined the ten migrant groups with the highest number of infected individuals originating from intermediate and high endemicity countries, together with the corresponding CHB prevalence and the number of CHB cases, residing in each of the 31 EU/EEA countries.

### 2.1.5 Estimating chronic hepatitis C (CHC) burden among foreign-born migrants for each EU/EEA country

To quantify the number of hepatitis C cases among the first fifty countries of origin for foreign-born migrants residing in each of the 31 EU/EEA countries, the anti-HCV prevalence estimates for the adult in-country general population were multiplied with the number of adult migrants (15 years of age and above) from each respective country of origin (for the 50 largest) per EU/EEA country. According to the review by Gower et al. the general viraemic (chronic hepatitis C) prevalence is estimated to be 70% of the anti-HCV prevalence. We therefore multiplied the number of anti-HCV positive cases by 0.7 to obtain the number of CHC cases for each country of origin. The countries of origin of foreign-born migrants were then sorted by anti-HCV prevalence in descending order, with the aim of identifying all high-endemicity countries (i.e. countries with anti-HCV prevalence of 1% or more.) The total number of foreign-born migrants originating from high-endemicity hepatitis C countries was calculated to determine their contribution to the overall number of adult foreign-born migrants residing in the host country. We also determined the ten migrant groups with the highest number of infected individuals originating from intermediate and high-endemicity countries, together with the corresponding anti-HCV prevalence and the number of CHC cases, residing in each of the 31 EU/EEA countries.

### 2.1.6 Relative burden of CHB and CHC among migrants

To calculate the relative burden among migrants from intermediate and high-endemic countries as a proportion of the overall number of people infected with chronic hepatitis B or C, the estimated number of infected cases among migrants was divided by the total number of infected persons, based on the general population prevalence estimate and the total population. For hepatitis C the total number infected was taken for the adult population.

For the lower range the extreme lower limit was calculated by dividing the low estimate of the number of infected cases among migrants, with the high estimate for the total number of infected cases. In so doing we obtained an estimate for the minimum burden among migrants in proportion to the overall burden. For the high estimate we divided the high estimate of the number of infected migrants by the low overall number estimated to be infected in the host country.

# 2.2 Prevalence in migrant populations

## 2.2.1 General approach

We conducted a systematic literature search for studies estimating the HBsAg and/or anti-HCV prevalence among migrant populations in Europe. Prevalence estimates among similar populations were pooled, where possible, and compared to in-country estimates retrieved from the first part of the report. We also compared estimated prevalence among first- and second-generation migrants, where possible.

## 2.2.2 Systematic literature research

On 25 November 2014, we searched Medline, Embase, the Cochrane library, Web of Science, Scopus, PubMed publisher and Google Scholar for studies that estimate the prevalence of hepatitis B/C in migrants for any of the 31 EU/EEA Member States. The search terms used consisted of a combination of disease-related (hepatitis B/C), outcome-related (prevalence), population-related (migrants) and geographical area (EU/EEA countries) terms. We searched for papers published in English between 2000 and 2014 and, to avoid duplicating work done on the same articles, we excluded 172 records that were identified and screened in a 2009 literature review of the hepatitis B and C prevalence in several population groups, including migrants [12]. This previous search included a final total of 15 articles, all of which were added to the final list of full text articles. Records were exported into Endnote to be reviewed for relevancy.

Inclusion and exclusion criteria were established and applied to the list of retrieved articles. Articles were first reviewed based on the title and/or abstract and were included if the article was expected to report data on HBsAg or anti-HCV prevalence in migrant populations. Exclusion criteria included:

- Studies dealing with viral hepatitis other than type B or C
- Studies focusing on natural history, clinical features or complications of hepatitis
- Studies dealing with medical treatment
- Studies focusing on high-risk groups such as people who inject drugs, sex workers, HIV co-infected patients etc.
- Studies of migrants to countries outside Europe
- Studies in Roma populations
- Guidelines, position papers or commentary pieces without original prevalence data
- Modelling studies with no new measured prevalence estimates
- Single case studies, cost-effectiveness-analyses.

Studies in migrant pregnant women, children and adolescents were included.

## 2.2.3 Review of retrieved articles

The titles and abstracts of retrieved articles were assessed for relevancy by one reviewer, and to ensure consistent application and accuracy of this selection, a random sample of 10% of these were independently reviewed by a second reviewer. As very few disagreements were found (4%), we concluded that a second independent review of the whole sample would not be required. Where there was any doubt, a decision was made after consulting the second reviewer. Full text articles were retrieved for all studies included based on title/abstract and reviewed for further inclusion or exclusion by three reviewers (each working concurrently on a third of the sample). Decisions to exclude were recorded and a PRISMA flowchart prepared to document these stages (Annex 5.3). A description of the search terms and the exact search in each database is available in Annex 5.4.

## 2.2.4 Data extraction

A data extraction form was prepared including fields related to study design, population, external validity, and HBsAg, HBV DNA, anti-HCV and HCV RNA prevalence. Data were extracted by three reviewers into a Microsoft Excel spreadsheet. We extracted prevalence estimates in first or second-generation migrants for comparison, where available. Unless data were standardised, we (re)calculated 95% confidence limits using the Exact method in MS Excel. For studies reporting only region of origin data in more than 500 subjects, we contacted authors directly to request country-level data.

## 2.2.5 Data summary, pooling and comparison with in-country estimates

Summaries of all country- and regional-level estimates for migrants to Europe from six regions were prepared: Eastern Europe (including most of the former Soviet states, such as Kazakhstan and Uzbekistan); Africa; the European Mediterranean Region (including the Middle East and North Africa); South Asia (including Afghanistan); South East Asia and Latin America (including the Caribbean). Estimates based on a screened number of 10 or less per country were excluded. Pooled estimates for countries of origin were produced by combining the numbers tested and numbers of cases reported in studies with a comparable population.

Both pooled and large single-study estimates were compared with the in-country estimates extracted in the first part of the report. When the point estimate fell within the CI or uncertainty range the estimate was considered to be comparable to the in-country estimate, and when it was below the lower limit or higher than the upper limit the estimate was considered to be lower or higher. For hepatitis B we also used supplementary data comparing migrant to in-country estimates and change in prevalence over time where available [13].

# 3. Results

## 3.1 Demographic data

Table 2 shows the size of the population and the foreign-born population per country both for the total and for the adult (>15 years of age) population. As the prevalence estimates for anti-HCV are based on the adult population, this population is shown separately since it is used for the calculation of the numbers infected. Overall, 10.3% of the total population and 11.4% of the adult population in EU/EEA are foreign-born. The foreign-born proportion of the population ranges from 0.9% in Romania and 1.3% in Bulgaria to more than 40% in Luxembourg and Liechtenstein.

**Table 2. Total population and total and proportion foreign-born population in EU/EEA countries***

| Country | Total population | Foreign-born population | Proportion foreign-born | Total adult population | Foreign-born adult population | Proportion foreign-born adult population |
|---|---|---|---|---|---|---|
| Austria | 8 451 149 | 1 362 185 | 16.1% | 7 232 026 | 1 287 385 | 17.8% |
| Belgium | 11 161 642 | 1 747 641 | 15.7% | 9 263 570 | 1 609 042 | 17.4% |
| Bulgaria | 7 284 552 | 96 113 | 1.3% | 6 294 563 | 74 367 | 1.2% |
| Croatia | 4 284 889 | 584 000 | 13.6% | 3 632 461 | 565 090 | 15.6% |
| Cyprus | 840 407 | 202 283 | 24.1% | 705 459 | 187 040 | 26.5% |
| Czech Republic | 10 516 125 | 387 337 | 3.7% | 8 955 829 | 372 708 | 4.2% |
| Denmark | 5 602 628 | 548 411 | 9.8% | 4 625 032 | 509 149 | 11.0% |
| Estonia | 1 320 174 | 198 411 | 15.0% | 1 113 355 | 194 851 | 17.5% |
| Finland | 5 426 674 | 279 743 | 5.2% | 4 535 282 | 253 305 | 5.6% |
| France | 64 932 339 | 7 325 037 | 11.3% | 52 901 411 | 6 920 201 | 13.1% |
| Germany | 80 219 695 | 10 906 250 | 13.6% | 69 414 404 | 10 594 890 | 15.3% |
| Greece | 11 090 000 | 729 926 | 6.6% | 9 464 000 | 661 021 | 7.0% |
| Hungary | 9 908 798 | 423 317 | 4.3% | 8 477 933 | 391 887 | 4.6% |
| Iceland | 321 857 | 35 319 | 11.0% | 255 391 | 30 402 | 11.9% |
| Ireland | 4 591 087 | 736 375 | 16.0% | 3 586 829 | 643 083 | 17.9% |
| Italy | 59 685 227 | 5 695 883 | 9.5% | 51 336 889 | 5 345 646 | 10.4% |
| Latvia | 2 023 825 | 279 227 | 13.8% | 1 731 509 | 275 201 | 15.9% |
| Liechtenstein | 36 838 | 23 109 | 62.7% | 31 142 | 20 576 | 66.1% |
| Lithuania | 2 971 905 | 140 221 | 4.7% | 2 535 329 | 133 350 | 5.3% |
| Luxembourg | 506 953 | 205 162 | 40.5% | 417 377 | 189 365 | 45.4% |
| Malta | 417 432 | 35 116 | 8.4% | 355 704 | 32 803 | 9.2% |
| Netherlands | 16 779 575 | 1 927 728 | 11.5% | 13 901 653 | 1 825 747 | 13.1% |
| Norway | 5 049 223 | 662 526 | 13.1% | 4 122 334 | 598 257 | 14.5% |
| Poland | 38 533 299 | 678 946 | 1.8% | 32 736 685 | 575 241 | 1.8% |
| Portugal | 10 562 178 | 871 813 | 8.3% | 8 989 849 | 806 551 | 9.0% |
| Romania | 20 020 074 | 182 939 | 0.9% | 16 880 465 | 121 215 | 0.7% |
| Slovakia | 5 410 836 | 158 164 | 2.9% | 4 580 260 | 137 905 | 3.0% |
| Slovenia | 2 058 821 | 232 703 | 11.3% | 1 760 726 | 222 704 | 12.6% |
| Spain | 46 727 890 | 6 174 740 | 13.2% | 39 637 891 | 5 731 642 | 14.5% |
| Sweden | 9 555 893 | 1 472 353 | 15.4% | 7 944 034 | 1 369 521 | 17.2% |
| UK | 63 182 180 | 7 985 585 | 12.6% | 52 082 285 | 7 401 565 | 14.2% |
| **EU/EEA** | **509 474 165** | **52 288 563** | **10.3%** | **429 501 677** | **49 081 710** | **11.4%** |

** Data sources used are listed in Table 1*

## 3.2 Prevalence estimates in EU/EEA and migrant countries of origin

The systematic search for reviews yielded 802 studies published after 2009, of which 18 full texts were finally included (Annex 5.1).

### Hepatitis B

The most comprehensive review for the global country-specific prevalence of chronic hepatitis B in the general population was a review by Kowdley et al. published in 2012 [13]. This review included studies published between 1980 and July 2010. Studies included were population-based surveys and studies of groups, such as pregnant women, school children, military recruits, and healthy controls from cohort studies [13]. Blood donor studies and

studies in populations with increased hepatitis B risk were excluded. Most included studies reported data on the general populations of migrants' countries of origin (1 797 surveys in 98 countries, including >17 million persons) but 256 surveys in emigrants from 52 countries (including 689 078 people) were also included. Kowdley et al. used meta-analytic methods to determine the country-specific pooled HBsAg seroprevalence and corresponding 95% CI, as well as regional estimates.

The Kowdley study did not include a prevalence estimate for the US. We took the prevalence for the US from a nationally-representative survey published in 2011 [14]. For the following 11 countries Kowdley reported a significant decrease in prevalence over time: China, Egypt, Ethiopia, Greece, Italy, Romania, Saudi Arabia, South Korea, Spain, Thailand and Turkey. For this reason the estimate was taken from the period after 2000. Kowdley's regional and some in-country estimates were replaced with in-country estimates from other studies considered more robust or relevant for 11 countries: Albania, Algeria, Belgium, Cyprus, Finland, Ireland, Libya, Morocco, the Netherlands, Sweden and Tunisia [1,15,16]. The table showing the selected prevalence estimates per country appears in Annex 5.5. The countries for which estimates other than Kowdley were available, along with an explanation on the decision taken, are listed in Annex 5.6.

## Hepatitis C

The most comprehensive review with country-specific estimates for the anti-HCV and viraemic HCV prevalence was published in 2014 by Gower et al [17]. This review includes studies published after the year 2000, and provides estimates for 87 countries, with further estimates calculated for each of the 21 countries in the GBD region. Studies in non-representative (high-risk) populations, studies with a small sample size (<1000) and studies published prior to 2000 were excluded from the analysis. Studies were given a quality score in which the representativeness for the general population, sample size and year of the study (with recent studies scoring higher) were taken into account. The estimates from the studies with the highest scores were selected as the in-country general population prevalence estimate, with the exception of China, Nigeria and India for which estimates were calculated based on a meta-analysis from multiple studies. Since most studies reported the prevalence in adults, the prevalence estimates from Gower are applicable to the adult population, defined as 15 years and above. Where studies reported the prevalence for the total population this was recalculated to a prevalence in adults. The country-level estimates from Gower do not have 95% CIs but a lower and upper 'uncertainty' range. The lower range is reportedly based on studies among blood donors, for example, as representatives of 'healthy adults' however it is unclear from the methodology how the upper limit was derived.

For nine countries Gower's regional or in-country estimate could be replaced with more robust estimates from other systematic reviews: Albania, Egypt, France, Germany, Italy, Pakistan, Poland, Sweden and Turkey [18-23]. The table with the selected prevalence estimates per country appears in Annex 5.7. The countries for which other estimates than Gower are available, with an explanation on the decision taken, are listed in Annex 5.8.

## 3.2.1 Estimated chronic hepatitis B prevalence and number of infected cases in the general population of EU/EEA countries

The general population HBsAg prevalence estimates retrieved from the systematic reviews, and the corresponding estimated number of people infected are listed in Table 3 for the EU/EEA countries. The chronic hepatitis B prevalence estimates in the general population ranges from 0.1% in Ireland and the Netherlands, to 5.5% in Romania.

In terms of absolute numbers the EU/EEA countries with highest absolute number of estimated CHB cases are Italy and Romania (both over one million cases), Poland, Germany, France, UK, Bulgaria and Spain (range 550 000–300 000 cases) and Greece, Portugal and Hungary (range 260 000–100 00 cases). In the EU/EEA as a whole, the HBV prevalence is estimated at 1.12%, and between 4 and 7.5 million people are estimated to have a chronic HBV infection.

**Table 3. Chronic hepatitis B prevalence in the general population and estimated number of CHB infected cases**

| Country | Total Population | HBsAg prevalence | | | Estimated no. of CHB cases | | |
|---|---|---|---|---|---|---|---|
| | | % | Low 95% CI | High 95% CI | Central estimate | Lower estimate | Upper estimate |
| Austria | 8 451 149 | 0.55 | 0.34 | 0.71 | 46 481 | 28 734 | 60 003 |
| Belgium | 11 161 642 | 0.7 | 0.4 | 1.2 | 78 131 | 44 647 | 133 940 |
| Bulgaria | 7 284 552 | 4.25 | 2.80 | 5.70 | 309 593 | 203 967 | 415 219 |
| Croatia | 4 284 889 | 1.47 | 0.84 | 2.10 | 62 988 | 35 993 | 89 983 |
| Cyprus | 840 407 | 0.9 | 0.3 | 2 | 7 564 | 2 521 | 16 808 |
| Czech Republic | 10 516 125 | 0.70 | 0.43 | 0.98 | 73 613 | 45 219 | 103 058 |
| Denmark | 5 602 628 | 0.55 | 0.34 | 0.71 | 30 814 | 19 049 | 39 779 |
| Estonia | 1 320 174 | 0.58 | 0.42 | 0.74 | 7 657 | 5 545 | 9 769 |
| Finland | 5 426 674 | 0.2 | 0.1 | 0.4 | 10 853 | 5 427 | 21 707 |
| France | 64 932 339 | 0.68 | 0.44 | 1.05 | 441 540 | 285 702 | 681 790 |
| Germany | 80 219 695 | 0.6 | 0.4 | 0.8 | 481 318 | 320 879 | 641 758 |
| Greece | 11 090 000 | 2.33 | 1.54 | 3.11 | 258 397 | 170 786 | 344 899 |
| Hungary | 9 908 798 | 1.08 | 0.04 | 2.11 | 107 015 | 3 964 | 209 076 |
| Iceland | 321 857 | 0.55 | 0.34 | 0.71 | 1 770 | 1 094 | 2 285 |
| Ireland | 4 591 087 | 0.1 | 0 | 0.3 | 4 591 | 0 | 13 773 |
| Italy | 59 685 227 | 1.89 | 1.26 | 2.52 | 1 128 051 | 752 034 | 1 504 068 |
| Latvia | 2 023 825 | 1.39 | 1.10 | 1.67 | 28 131 | 22 262 | 33 798 |
| Liechtenstein | 36 838 | 0.55 | 0.34 | 0.71 | 203 | 125 | 262 |
| Lithuania | 2 971 905 | 2.03 | 1.37 | 2.69 | 60 330 | 40 715 | 79 944 |
| Luxembourg | 506 953 | 0.55 | 0.34 | 0.71 | 2 788 | 1 724 | 3 599 |
| Malta | 417 432 | 0.55 | 0.34 | 0.71 | 2 296 | 1 419 | 2 964 |
| Netherlands | 16 779 575 | 0.1 | 0 | 0.2 | 16 780 | 0 | 33 559 |
| Norway | 5 049 223 | 0.55 | 0.34 | 0.71 | 27 771 | 17 167 | 35 849 |
| Poland | 38 533 299 | 1.44 | 1.16 | 1.72 | 554 880 | 446 986 | 662 773 |
| Portugal | 10 562 178 | 1.35 | 0.66 | 2.04 | 142 589 | 69 710 | 215 468 |
| Romania | 20 020 074 | 5.49 | 5.24 | 5.73 | 1 099 102 | 1 049 052 | 1 147 150 |
| Slovakia | 5 410 836 | 0.70 | 0.43 | 0.98 | 37 876 | 23 267 | 53 026 |
| Slovenia | 2 058 821 | 3.29 | 2.33 | 4.24 | 67 735 | 47 971 | 87 294 |
| Spain | 46 727 890 | 0.66 | 0.34 | 0.97 | 308 404 | 158 875 | 453 261 |
| Sweden | 9 555 893 | 0.2 | 0.1 | 0.4 | 19 112 | 9 556 | 38 224 |
| United Kingdom | 63 182 180 | 0.54 | 0.30 | 0.60 | 341 184 | 189 547 | 379 093 |
| **EU/EEA** | **509 474 165** | **1.12** | **0.79** | **1.47** | **5 705 260** | **4 003 937** | **7 514 179** |

## 3.2.2 Foreign-born population by HBV endemicity level in EU/EEA countries

Table 4 shows the total population and the total foreign-born population residing in each of the 31 EU/EEA countries, along with the proportion of the total foreign-born population. With the prevalence estimates for the migrants' countries of origin, the foreign-born population in the EU/EEA countries can be further classified according to the endemicity level. Hence Table 4 also quantifies the population born in endemic countries, defined as those with an HBsAg prevalence of 2% or higher. The proportion of the foreign-born population born in endemic countries is also included. In this analysis the first 50 foreign-born populations are included in terms of population size, therefore the total number of foreign-born is slightly lower than the figures in Table 2 which cover the entire foreign-born population. For the whole of the EU/EEA, 53% of the foreign-born population was born in HBV-endemic countries. The highest proportion of migrants from HBV-endemic countries (>10%) is seen in Cyprus, Estonia, Latvia and Croatia.

**Table 4. Total foreign-born population and foreign-born population from countries with intermediate and high HBV prevalence, for the 50 largest migrant groups**

| Country | Total population | Foreign-born population | Proportion foreign-born | Foreign-born population from endemic countries | Proportion foreign-born from endemic countries | Proportion from endemic countries of total foreign-born |
|---|---|---|---|---|---|---|
| Austria | 8 451 149 | 1 298 945 | 15.4% | 768 773 | 9.1% | 59% |
| Belgium | 11 161 642 | 1 596 848 | 14.3% | 622 206 | 5.6% | 36% |
| Bulgaria | 7 284 552 | 90 990 | 1.2% | 62 755 | 0.9% | 65% |
| Croatia | 4 284 889 | 582 271 | 13.6% | 523 470 | 12.2% | 90% |
| Cyprus | 840 407 | 190 568 | 22.7% | 139 689 | 16.6% | 69% |
| Czech Republic | 10 516 125 | 374 296 | 3.6% | 234 291 | 2.2% | 60% |
| Denmark | 5 602 628 | 484 139 | 8.6% | 224 384 | 4.0% | 41% |
| Estonia | 1 320 174 | 197 744 | 15.0% | 184 642 | 14.0% | 93% |
| Finland | 5 426 674 | 257 044 | 4.7% | 141 953 | 2.6% | 51% |
| France | 64 932 339 | 6 775 948 | 10.4% | 3 591 002 | 5.5% | 49% |
| Germany | 80 219 695 | 10 426 860 | 13.0% | 5 398 700 | 6.7% | 50% |
| Greece | 11 090 000 | 713 471 | 6.4% | 615 986 | 5.6% | 84% |
| Hungary | 9 908 798 | 411 403 | 4.2% | 302 781 | 3.1% | 72% |
| Iceland | 321 857 | 32 910 | 10.2% | 7 857 | 2.4% | 22% |
| Ireland | 4 591 087 | 687 462 | 15.0% | 205 071 | 4.5% | 28% |
| Italy | 59 685 227 | 5 319 754 | 8.9% | 3 443 409 | 5.8% | 60% |
| Latvia | 2 023 825 | 278 243 | 13.7% | 267 617 | 13.2% | 96% |
| Liechtenstein | 36 838 | 22 806 | 61.9% | 2 140 | 5.8% | 9% |
| Lithuania | 2 971 905 | 139 712 | 4.7% | 121 992 | 4.1% | 87% |
| Luxembourg | 506 953 | 189 858 | 37.5% | 28 085 | 5.5% | 14% |
| Malta | 417 432 | 33 301 | 8.0% | 9 629 | 2.3% | 27% |
| Netherlands | 16 779 575 | 1 772 756 | 10.6% | 1 052 695 | 6.3% | 55% |
| Norway | 5 049 223 | 597 316 | 11.8% | 277 047 | 5.5% | 42% |
| Poland | 38 533 299 | 659 657 | 1.7% | 438 446 | 1.1% | 65% |
| Portugal | 10 562 178 | 854 830 | 8.1% | 475 155 | 4.5% | 55% |
| Romania | 20 020 074 | 166 973 | 0.8% | 103 740 | 0.5% | 57% |
| Slovakia | 5 410 836 | 155 346 | 2.9% | 25 170 | 0.5% | 16% |
| Slovenia | 2 058 821 | 231 276 | 11.2% | 160 220 | 7.8% | 69% |
| Spain | 46 727 890 | 5 930 170 | 12.7% | 1 909 343 | 4.1% | 31% |
| Sweden | 9 555 893 | 1 304 130 | 13.6% | 596 303 | 6.2% | 41% |
| United Kingdom | 63 182 180 | 6 845 805 | 10.8% | 3 976 870 | 6.3% | 50% |
| **EU/EEA** | **509 474 165** | **48 622 832** | **9.5%** | **25 911 421** | **5.1%** | **53%** |

**Figure 2. Foreign-born population (%) and proportion from HBV-endemic countries**

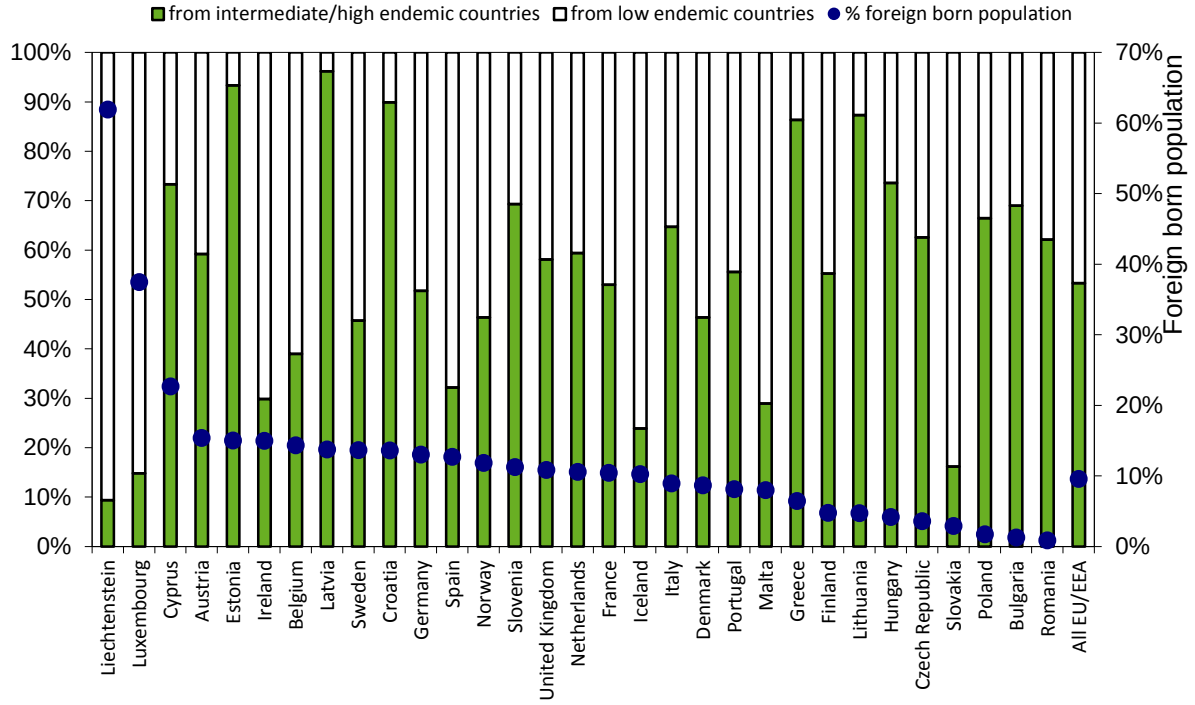



Figure 2 provides a graphical representation of the distribution of foreign-born population by endemicity level of the country of origin. EU/EEA countries are sorted by the overall proportion of foreign-born population (dots, right y-axis).

## 3.2.3 Estimated chronic hepatitis B prevalence and number of infected cases in migrants in EU/EEA countries

The total number of infected CHB cases among the first 50 migrant populations from intermediate/high-endemic countries in each EU/EEA countries is listed in Table 5. The average CHB (HBsAg) prevalence was calculated based on the total foreign-born population from endemic countries. The estimated HBsAg prevalence among migrants from intermediate/high endemic countries ranges from 3% in Estonia, Latvia, Lithuania and Poland to 9% in Portugal. These differences reflect the composition of resident migrant population's countries of origin. In the EU/EEA as a whole, the HBsAg prevalence among migrants from endemic countries is estimated at 6%, and between 1 and 1.9 million migrants born in endemic countries are estimated to have a chronic HBV infection.

**Table 5. Estimated number of CHB cases among migrants from endemic countries**

| Country | Foreign-born pop. from endemic countries | CHB infected cases | | | Average CHB prevalence |
|---|---|---|---|---|---|
| | | Central estimate | Lower estimate | Higher estimate | |
| Austria | 768 773 | 33 456 | 25 757 | 41 040 | 4.4% |
| Belgium | 622 206 | 42 530 | 32 218 | 54 309 | 6.8% |
| Bulgaria | 62 755 | 2 436 | 1 860 | 3 039 | 3.9% |
| Croatia | 523 470 | 18 673 | 11 966 | 25 376 | 3.6% |
| Cyprus | 139 689 | 6 770 | 5 141 | 8 445 | 4.8% |
| Czech Republic | 234 291 | 12 185 | 9 637 | 14 752 | 5.2% |
| Denmark | 224 384 | 12 352 | 9 605 | 15 152 | 5.5% |
| Estonia | 184 642 | 5 432 | 3 822 | 7 038 | 2.9% |
| Finland | 141 953 | 8 136 | 6 206 | 10 067 | 5.7% |
| France | 3 591 002 | 212 538 | 131 238 | 380 923 | 5.9% |
| Germany | 5 398 700 | 234 792 | 180 867 | 288 066 | 4.3% |
| Greece | 615 986 | 43 163 | 36 636 | 49 346 | 7.0% |
| Hungary | 302 781 | 15 286 | 13 649 | 16 940 | 5.0% |
| Iceland | 7 857 | 421 | 349 | 494 | 5.4% |
| Ireland | 205 071 | 13 196 | 10 935 | 15 574 | 6.4% |
| Italy | 3 443 409 | 213 063 | 174 632 | 251 539 | 6.2% |
| Latvia | 267 617 | 7 866 | 5 269 | 10 454 | 2.9% |
| Liechtenstein | 2 140 | 97 | 74 | 119 | 4.5% |
| Lithuania | 121 992 | 3 765 | 2 469 | 5 057 | 3.1% |
| Luxembourg | 28 085 | 1 450 | 913 | 2 019 | 5.2% |
| Malta | 9 629 | 637 | 429 | 860 | 6.6% |
| Netherlands | 1 052 695 | 56 650 | 40 335 | 73 016 | 5.4% |
| Norway | 277 047 | 17 021 | 12 125 | 21 979 | 6.1% |
| Poland | 438 446 | 11 679 | 7 018 | 16 342 | 2.7% |
| Portugal | 475 155 | 42 688 | 29 595 | 55 795 | 9.0% |
| Romania | 103 740 | 7 531 | 5 453 | 9 581 | 7.3% |
| Slovakia | 25 170 | 1 073 | 846 | 1 301 | 4.3% |
| Slovenia | 160 220 | 5 713 | 3 756 | 7 663 | 3.6% |
| Spain | 1 909 343 | 118 316 | 92 282 | 148 318 | 6.2% |
| Sweden | 596 303 | 33 850 | 23 728 | 44 011 | 5.7% |
| United Kingdom | 3 976 870 | 244 409 | 195 342 | 294 417 | 6.1% |
| **EU/EEA** | **25 911 421** | **1 427 174** | **1 074 152** | **1 873 032** | **5.5%** |

When cumulatively analysing the number of CHB cases among different migrants from intermediate/high-endemicity countries to the EU, migrants from Albania, China, Romania, Russia and Turkey are estimated to include over 50 000 CHB cases each. Migrants from Algeria, Kazakhstan, India, Nigeria and Vietnam (all between 36 000 and 46 000 cases) also contribute substantially to the overall number of CHB cases in the EU/EEA. Table 6 lists the ten migrant groups with the highest estimated number of CHB cases, as well as the host countries with the largest populations of migrants born in these countries.

When analysing the list of the 50 largest countries of origin in each EU/EEA country, sorted in descending order by the estimated number of CHB cases, a sizeable number of CHB cases are found among migrants from low-prevalence countries (with an HBsAg prevalence in the general population of <2%) such as Poland (~61 000 cases), Morocco (~45 000 cases) and Italy (~22 000 cases). Low hepatitis B endemicity countries are, however, excluded. Tables per EU/EEA country with estimates for all 50 migrant groups can be found in Annex 5.11.

**Table 6. Ten migrant groups (from intermediate/high-endemicity countries) with the highest estimated number of CHB cases (rounded) and the main host EU/EEA countries**

| Migrant group | Total population | HBsAg prevalence | CHB cases | Host countries (first six with largest populations)* |
|---|---|---|---|---|
| Romania | 2 817 458 | 5.5 | 155 000 | Italy, Spain, Germany, Hungary, UK, Austria |
| China | 1 012 550 | 10.2 | 104 000 | UK, Italy, Spain, France, Germany, Netherlands |
| Turkey | 2 266 977 | 4.3 | 97 000 | Germany, France, Netherlands, Austria, Belgium, UK |
| Albania | 804 570 | 9.0 | 72 000 | Italy, Greece, Belgium, Austria, Bulgaria |
| Russia | 1 810 197 | 2.9 | 52 000 | Germany, Latvia, Estonia, Italy, Spain, Lithuania |
| Vietnam | 365 048 | 12.5 | 46 000 | France, Germany, Czech Republic, UK, Sweden, Norway |
| Nigeria | 336 155 | 13.3 | 45 000 | UK, Italy, Spain, Ireland, Netherlands, Austria |
| Kazakhstan | 828 526 | 5.0 | 41 000 | Germany, Latvia, Czech Republic, Poland, Lithuania, Estonia |
| Algeria | 1 482 465 | 2.6 | 39 000 | France, Spain, Belgium, Italy, Ireland |
| India | 1 120 352 | 3.2 | 36 000 | UK, Italy, Germany, France, Spain, Ireland |

Migrants from China are represented in the list of first ten migrant populations (from intermediate/high-endemicity countries) with the highest number of estimates cases in 28 of the 31 EU/EEA countries. This is also the case in 19 of the 31 EU/EEA countries for migrants from Romania and for 18 of 31 EU/EEA countries for migrants from Russia (Table 6a).

**Table 6a. Countries of origin of first-generation migrants with CHB found in five or more of the 31 EU/EEA countries***

| Country of origin of migrants | No. of EU/EEA countries (of 31) | EU/EEA Countries |
|---|---|---|
| China | 28 | AUT, BEL, BLG, HR, CZ, DK, DE, FIN, FR, EE, HU, IRL, ISL, IT, LIE, LT, LUX, MT, NL, NO, PL, PT, RO, SK, SI, ES, SE, UK |
| Romania | 19 | AUT, BEL, BLG, HR, CY, CZ, DK, DE, GRC, HU, IRL, ISL, IT, LUX, MT, PL, PT, SK, ES |
| Russia | 18 | AT, BLG, HR, CY, CZ, DE, FIN, EE, GRC, HU, ISL, LT, LV, MT, PL, RO, SK, SI |
| Ukraine | 14 | BLG, HR, CZ, DE, EE, HU, IT, LT, LV, PL, PT, RO, SK, SI |
| Vietnam | 14 | BLG, CY, CZ, DK, DE, FIN, FR, HU, ISL, NL, NO, PL, SK, SE |
| Turkey | 12 | AUT, BEL, BLG, DK, DE, FIN, FR, GRC, LIE, NL, RO, SE |
| Moldova | 11 | BLG, CY, CZ, EE, IRL, IT, LT, LV, PT, RO, SI |
| Philippines | 11 | AUT, CY, DK, GRC, IRL, ISL, IT, MT, NO, ES, UK |
| Afghanistan | 10 | AUT, BEL, DK, DE, FIN, HU, NL, NO, SK, SE |
| Bosnia and Herzegovina | 10 | AUT, HR, DK, DE, LIE, LUX, NO, PL, SI, SE |
| Serbia | 10 | AUT, HR, HU, ISL, LIE, LUX, RO, SK, SI |
| Nigeria | 8 | AUT, FIN, HU, IRL, IT, MT, ES, UK |
| Somalia | 7 | DK, FIN, MT, NL, NO, SE, UK |
| Kazakhstan | 6 | CZ, DE, EE, LT, LV, PL |
| Lithuania | 6 | EE, IRL, ISL, LV, NO, PL |
| Pakistan | 6 | DK, GRC, IRL, NO, ES, UK |
| Thailand | 6 | DK, FIN, ISL, LIE, NO, SE |
| Georgia | 5 | CY, EE, GRC, LT, LV |
| Former Yugoslavia (bf. '92) | 5 | BEL, DE, FIN, NL, SE |

*selected from the ten largest CHB-affected migrant groups from intermediate/high-endemicity countries within the EU/EEA.

Annex 5.9 lists the ten migrant populations with the highest number of HBsAg infected cases in each of the 31 EU/EEA countries. It lists the HBsAg prevalence in the migrant's country of origin and the estimated number of infected cases among the specific migrant population in the host EU/EEA country.

Migrants born in south-east or east Asian counties, including China, Vietnam and the Philippines and to a lesser extent Thailand, are among the top ten migrant groups with the highest number of infected cases. At least three of these countries are among the ten countries of origin with the highest number of infected cases in the Czech Republic, Denmark, Finland, Hungary, Iceland, Liechtenstein, Norway, the Netherlands and Sweden.

People born either in Yugoslavia (before 1992) or in one of the former Yugoslav Republics feature among three or more of the top ten migrant groups with the highest number of infected cases in Austria, Liechtenstein and Luxembourg, as well as in Croatia and Slovenia. People born either in the former Soviet Union (before 1991) or in one of the former Soviet Republics are represented among three or more of the ten main migrant populations (in terms of estimated number of cases) in Bulgaria, Cyprus, Czech Republic, Germany, Hungary, Poland, Romania and Slovenia, as well as in Estonia, Lithuania and Latvia.

In the United Kingdom, migrants from India, Pakistan and Bangladesh are among the top ten migrant groups with the highest number of infected cases. Migrants from Maghreb countries such as Algeria and Tunisia are represented in the top ten list for France. There is considerable variation with regard to the African countries from which migrants to the EU/EEA originate. In Belgium, France, Luxembourg, Malta, Portugal and the United Kingdom four or more of the ten largest migrant populations in terms of number of CHB cases come from African countries. African countries of origin that contribute a large number of estimated cases include Eritrea, Ghana, Nigeria, Senegal, Somalia and South Africa.

### 3.2.4 Estimated anti-HCV prevalence and number of chronic hepatitis C cases in the general population of EU/EEA countries

The anti-HCV prevalence estimates in the general adult population retrieved from the systematic reviews for each EU/EEA country are listed in Table 7. The anti-HCV prevalence estimates in the general population range from 0.2% in the Netherlands to 4.4% in Italy. As an average of 70% of HCV infections are viraemic (chronic), Table 7 lists the estimated number of chronic hepatitis C (viraemic) cases with a central, a lower and an upper estimate. In

terms of absolute numbers, the EU/EEA country with the highest absolute number of estimated CHC cases among adults is Italy with ~1.6 million cases. Other EU/EEA countries with a high absolute number of CHC cases are Romania (~380 000) and Spain (~470 000).

**Table 7. Anti-HCV prevalence in the general population and estimated number of viraemic cases**

| Country | Total adult population (15+) | Anti-HCV prevalence estimate | | | Estimated no. of viraemic cases | | |
|---|---|---|---|---|---|---|---|
| | | % | Low | High | Central estimate | Lower estimate | Upper estimate |
| Austria | 7 232 026 | 0.5 | 0.1 | 0.7 | 25 312 | 5 062 | 35 437 |
| Belgium | 9 263 570 | 0.9 | 0.1 | 1.2 | 58 360 | 6 484 | 77 814 |
| Bulgaria | 6 294 563 | 1.1 | 0.3 | 2.4 | 48 468 | 13 219 | 105 749 |
| Croatia | 3 632 461 | 1.3 | 1.1 | 1.6 | 33 055 | 27 970 | 40 684 |
| Cyprus | 705 459 | 0.6 | 0.5 | 1.9 | 2.963 | 2.469 | 9.383 |
| Czech Republic | 8 955 829 | 0.7 | 0.2 | 0.7 | 43 884 | 12 538 | 43 884 |
| Denmark | 4 625 032 | 0.7 | 0.5 | 0.7 | 22 663 | 16 188 | 22 663 |
| Estonia | 1 113 355 | 3.3 | 1.6 | 4.5 | 25 719 | 12 470 | 35 071 |
| Finland | 4 535 282 | 0.7 | 0.6 | 0.9 | 22 223 | 19 048 | 28 572 |
| France | 52 901 411 | 0.7 | 0.5 | 0.8 | 259 217 | 185 155 | 296 248 |
| Germany | 69 414 404 | 0.5 | 0.3 | 0.9 | 242 950 | 145 770 | 437 311 |
| Greece | 9 464 000 | 1.9 | 0.5 | 2.6 | 125 871 | 33 124 | 172 245 |
| Hungary | 8 477 933 | 0.8 | 0.4 | 2.7 | 47 476 | 23 738 | 160 233 |
| Iceland | 255 391 | 0.9 | 0.7 | 1.5 | 1 609 | 1 251 | 2 682 |
| Ireland | 3 586 829 | 1.1 | 0.7 | 1.6 | 27 619 | 17 575 | 40 172 |
| Italy | 51 336 889 | 4.4 | 1.6 | 7.3 | 1 581 176 | 574 973 | 2 623 315 |
| Latvia | 1 731 509 | 2.4 | 1.7 | 3.3 | 29 089 | 20 605 | 39 998 |
| Liechtenstein | 31 142 | 0.9 | 0.7 | 1.5 | 196 | 153 | 327 |
| Lithuania | 2 535 329 | 2.9 | 0.7 | 3 | 51 467 | 12 423 | 53 242 |
| Luxembourg | 417 377 | 0.9 | 0.6 | 0.9 | 2 629 | 1 753 | 2 629 |
| Malta | 355 704 | 0.9 | 0.7 | 1.5 | 2 241 | 1 743 | 3 735 |
| Netherlands | 13 901 653 | 0.2 | 0.1 | 0.4 | 19 462 | 9 731 | 38 925 |
| Norway | 4 122 334 | 0.7 | 0.6 | 0.9 | 20 199 | 17 314 | 25 971 |
| Poland | 32 736 685 | 1.1 | 0.6 | 1.9 | 252 072 | 137 494 | 435 398 |
| Portugal | 8 989 849 | 1.8 | 0.5 | 2.9 | 113 272 | 31 464 | 182 494 |
| Romania | 16 880 465 | 3.2 | 2.9 | 3.6 | 378 122 | 342 673 | 425 388 |
| Slovakia | 4 580 260 | 1.4 | 0.9 | 2 | 44 887 | 28 856 | 64 124 |
| Slovenia | 1 760 726 | 1.3 | 1.1 | 1.6 | 16 023 | 13 558 | 19 720 |
| Spain | 39 637 891 | 1.7 | 0.4 | 2.6 | 471 691 | 110 986 | 721 410 |
| Sweden | 7 944 034 | 0.6 | 0.5 | 0.7 | 33 365 | 27 804 | 38 926 |
| United Kingdom | 52 082 285 | 0.6 | 0.4 | 1.2 | 218 746 | 145 830 | 437 491 |
| **EU/EEA** | **429 501 677** | **1.0** | **0.5** | **1.5** | **4 222 026** | **1 999 421** | **6 621 241** |

## 3.2.5 Foreign-born population by HCV endemicity level in EU/EEA countries

Table 8 shows the total adult population (>15 years), the total adult foreign-born population residing in EU/EEA countries and the proportion of the total foreign-born population. Anti-HCV prevalence estimates for countries of origin have been used to further classify the foreign-born population according to endemicity level, and here 'endemic' is defined as an anti-HCV prevalence of 1% or higher. The total size and proportion of the foreign-born population born in endemic countries is also included. As this analysis is restricted to the 50 largest (in absolute numbers) foreign-born adult populations, the total number of foreign-born persons in Table 8 is lower than that shown in Table 2 which includes the entire foreign-born population. For the EU/EEA, 79% of the foreign-born population is born in HCV-endemic countries. The highest proportion of migrants from HCV-endemic countries (>15%) is seen in Liechtenstein, Luxembourg, Cyprus, Estonia and Latvia.

**Table 8. Total adult foreign-born population and foreign-born population from endemic (>=1%) countries***

| Country | Total adult population | Foreign-born adult population | Proportion foreign-born | Foreign-born adult pop. from HCV endemic countries | Proportion foreign-born from HCV endemic countries | Proportion from endemic countries of total foreign-born |
|---|---|---|---|---|---|---|
| Austria | 7 232 026 | 1 230 059 | 17.0% | 883 345 | 12.2% | 72% |
| Belgium | 9 263 570 | 1 486 598 | 16.0% | 1 054 155 | 11.4% | 71% |
| Bulgaria | 6 294 563 | 71 105 | 1.1% | 62 941 | 1.0% | 89% |
| Croatia | 3 632 461 | 563 593 | 15.5% | 524 609 | 14.4% | 93% |
| Cyprus | 705 459 | 176 703 | 25.0% | 128 712 | 18.2% | 73% |
| Czech Republic | 8 955 829 | 360 170 | 4.0% | 331 840 | 3.7% | 92% |
| Denmark | 4 625 032 | 451 434 | 9.8% | 278 041 | 6.0% | 62% |
| Estonia | 1 113 355 | 194 286 | 17.5% | 189 495 | 17.0% | 98% |
| Finland | 4 535 282 | 233 644 | 5.2% | 176 980 | 3.9% | 76% |
| France | 52 901 411 | 6 429 368 | 12.2% | 5 714 076 | 10.8% | 89% |
| Germany | 69 414 404 | 10 157 980 | 14.6% | 8 888 710 | 12.8% | 88% |
| Greece | 9 464 000 | 646 119 | 6.8% | 588 275 | 6.2% | 91% |
| Hungary | 8 477 933 | 382 082 | 4.5% | 336 360 | 4.0% | 88% |
| Iceland | 255 391 | 28 221 | 11.1% | 18 311 | 7.2% | 65% |
| Ireland | 3 586 829 | 601 317 | 16.8% | 321 771 | 9.0% | 54% |
| Italy | 51 336 889 | 4 996 331 | 9.7% | 4 118 015 | 8.0% | 82% |
| Latvia | 1 731 509 | 274 856 | 15.9% | 271 468 | 15.7% | 99% |
| Liechtenstein | 31 142 | 20 298 | 65.2% | 14 672 | 47.1% | 72% |
| Lithuania | 2 535 329 | 132 866 | 5.2% | 127 711 | 5.0% | 96% |
| Luxembourg | 417 377 | 175 239 | 42.0% | 104 495 | 25.0% | 60% |
| Malta | 355 704 | 31 151 | 8.8% | 17 833 | 5.0% | 57% |
| Netherlands | 13 901 653 | 1 686 927 | 12.1% | 978 698 | 7.0% | 58% |
| Norway | 4 122 334 | 540 527 | 13.1% | 357 877 | 8.7% | 66% |
| Poland | 32 736 685 | 566 257 | 1.7% | 453 723 | 1.4% | 80% |
| Portugal | 8 989 849 | 791 848 | 8.8% | 642 212 | 7.1% | 81% |
| Romania | 16 880 465 | 113 002 | 0.7% | 102 854 | 0.6% | 91% |
| Slovakia | 4 580 260 | 135 759 | 3.0% | 31 460 | 0.7% | 23% |
| Slovenia | 1 760 726 | 221 479 | 12.6% | 208 026 | 11.8% | 94% |
| Spain | 39 637 891 | 5 507 896 | 13.9% | 3 748 924 | 9.5% | 68% |
| Sweden | 7 944 034 | 1 219 021 | 15.3% | 773 085 | 9.7% | 63% |
| United Kingdom | 52 082 285 | 6 351 825 | 12.2% | 4 706 765 | 9.0% | 74% |
| **EU/EEA** | **429 501 677** | **45 777 961** | **10.7%** | **36 155 438** | **8.4%** | **79%** |

*For the 50 largest (i.e. absolute size) migrant groups

**Figure 3. Foreign-born population (%) and proportion from HCV-endemic countries**

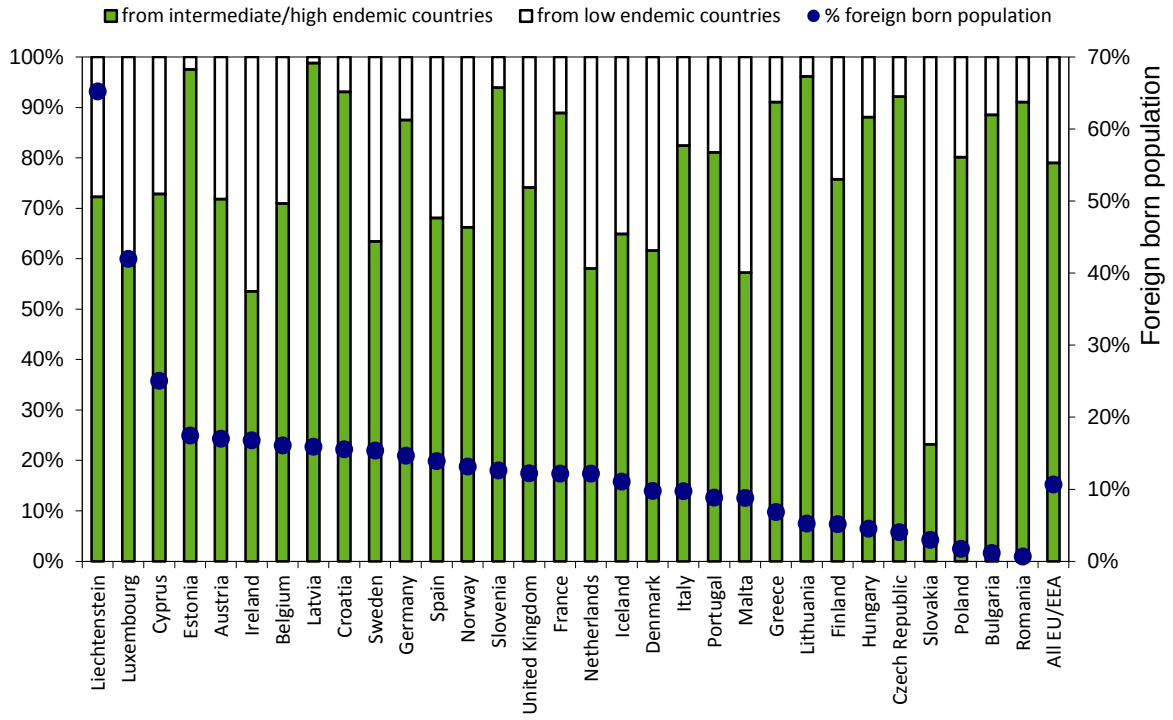



Figure 3 represents the distribution of the adult foreign-born population by country-of-origin endemicity level. The EU/EEA countries are sorted by the overall proportion of foreign-born population (dots, right y-axis).

## 3.2.6 Estimated chronic hepatitis C prevalence and number of infected cases among migrants in EU/EEA countries

The total number of infected (viraemic) CHC cases from the 50 largest migrant population groups born in endemic countries residing in EU/EEA countries is listed in Table 9. The average CHC prevalence was calculated using the total foreign-born adult population from endemic countries. The estimated prevalence of HCV infection among migrants from endemic countries ranges from 0.9% in Croatia to 2.4% in Latvia. Tables for each EU/EEA country with estimates for all 50 migrant groups can be found in Annex 5.12. In the EU/EEA as a whole, the CHC prevalence among migrants from endemic countries is estimated at 1.6%, corresponding to an anti-HCV prevalence of 2.3%, and an estimated 300 000–900 000 CHC infections among migrants born in endemic countries.

**Table 9. Estimated number of CHC cases and prevalence among migrants from endemic countries**

| Country | Foreign-born pop. from endemic countries | CHC infected cases | | | Average CHC prevalence |
|---|---|---|---|---|---|
| | | Central estimate | Lower estimate | Upper Estimate | |
| Austria | 883 345 | 11 753 | 8 243 | 15 117 | 1.3% |
| Belgium | 1 054 155 | 18 607 | 9 729 | 32 764 | 1.8% |
| Bulgaria | 62 941 | 1 366 | 605 | 1 836 | 2.2% |
| Croatia | 524 609 | 4 901 | 4 058 | 6 081 | 0.9% |
| Cyprus | 128 712 | 2 740 | 1 821 | 3 567 | 2.1% |
| Czech Republic | 331 840 | 5 937 | 2 596 | 8 219 | 1.8% |
| Denmark | 278 041 | 3 894 | 2 244 | 5 194 | 1.4% |
| Estonia | 189 495 | 5 090 | 1 625 | 7 033 | 2.7% |
| Finland | 176 980 | 3 383 | 1 682 | 4 826 | 1.9% |
| France | 5 714 076 | 88 799 | 37 816 | 154 348 | 1.6% |
| Germany | 8 888 710 | 128 809 | 61 796 | 193 947 | 1.4% |
| Greece | 588 275 | 12 959 | 9 854 | 15 519 | 2.2% |
| Hungary | 336 360 | 6 548 | 4 980 | 7 889 | 1.9% |
| Iceland | 18 311 | 206 | 111 | 307 | 1.1% |
| Ireland | 321 771 | 5 485 | 2 934 | 8 188 | 1.7% |
| Italy | 4 118 015 | 78 501 | 52 730 | 101 393 | 1.9% |
| Latvia | 271 468 | 6 532 | 2 168 | 9 209 | 2.4% |
| Liechtenstein | 14 672 | 172 | 82 | 223 | 1.2% |
| Lithuania | 127 711 | 2 795 | 1 046 | 4 142 | 2.2% |
| Luxembourg | 104 495 | 1 682 | 659 | 2 710 | 1.6% |
| Malta | 17 833 | 295 | 182 | 438 | 1.7% |
| Netherlands | 978 698 | 13 262 | 7 278 | 18 376 | 1.4% |
| Norway | 357 877 | 4 822 | 2 601 | 6 907 | 1.3% |
| Poland | 453 723 | 9 633 | 3 080 | 12 877 | 2.1% |
| Portugal | 642 212 | 13 505 | 7 474 | 24 179 | 2.1% |
| Romania | 102 854 | 2 090 | 912 | 2 923 | 2.0% |
| Slovakia | 31 460 | 588 | 281 | 782 | 1.9% |
| Slovenia | 208 026 | 2 030 | 1 607 | 2 563 | 1.0% |
| Spain | 3 748 924 | 55 164 | 31 440 | 75 323 | 1.5% |
| Sweden | 773 085 | 10 579 | 5 352 | 14 452 | 1.4% |
| United Kingdom | 4 706 765 | 76 535 | 45 555 | 118 608 | 1.6% |
| **EU/EEA** | **36 155 438** | **578 663** | **312 539** | **859 941** | **1.6%** |

When cumulatively analysing the CHC burden on the EU among the different migrant populations from endemic countries, migrants from Romania, Russia, Italy and Poland contribute substantially to the overall number of CHC cases in the EU/EEA countries of residence. Table 10 lists the ten migrant groups with the highest estimated number of CHC cases, as well as the host countries with the largest populations of migrants born in these countries.

**Table 10. Ten migrant groups with the highest estimated number of CHC cases in the EU/EEA (rounded) and main host countries**

| Migrant group | Total adult migrant population | HCV preva-lence | CHB cases | Host countries (first six with largest populations)* |
|---|---|---|---|---|
| Romania | 2 646 392 | 3.2 | 59 000 | Italy, Spain, Germany, Hungary, UK, Austria |
| Russia | 1 713 636 | 4.1 | 49 000 | Germany, Latvia, Estonia, Italy, Lithuania, Spain |
| Italy | 1 114 683 | 4.4 | 34 000 | France, Germany, UK, Belgium, Spain, Netherlands |
| Poland | 4 103 409 | 1.1 | 32 000 | Germany, UK, Italy, France, Ireland, Netherlands |
| Morocco | 2 418 072 | 1.6 | 27 000 | France, Spain, Italy, Belgium, Netherlands, Germany |
| Pakistan | 756 170 | 5.0 | 27 000 | UK, Italy, Spain, Germany, Greece, France |
| Ukraine | 993 459 | 3.6 | 25 000 | Poland, Germany, Italy, Czech Republic, Spain, Latvia |
| Egypt | 194 852 | 15.7 | 21 000 | Italy, UK, France, Netherlands, Austria, Greece |
| Kazakhstan | 807 781 | 3.3 | 19 000 | Germany, Latvia, Czech Republic, Poland, Lithuania, Estonia |
| Nigeria | 313 212 | 8.4 | 18 000 | UK, Italy, Spain, Ireland, Austria, Netherlands |

*if migrant population is at least 1 000

There are an estimated 50 000–60 000 cases of CHC among migrants from Romania and Russia. There are between 25 000 and 35 000 estimated cases among migrants from Italy, Poland, Morocco, Pakistan and Ukraine. There are around 20 000 estimated cases among migrants from Egypt, Kazakhstan and Nigeria. Adult migrants

from Russia, a high CHC prevalence country (2.9% viraemic prevalence) are among the ten migrant populations (from endemic countries) with the largest number of cases in 25 of 31 EU/EEA countries. This is the case for migrants from Romania and Italy in 20 EU/EEA countries. Although small in terms of population size, migrants from Egypt are among the ten largest CHC-infected migrant populations in 16 of the 31 EU/EEA countries due to the very high anti-HCV prevalence (~14–17.5%) in Egypt (Table 10a).

**Table 10a. Countries of origin of CHC-infected first-generation migrants represented in >5 EU/EEA countries**

| Representation of chronic hepatitis-C-infected migrant origin countries in the EU/EEA | | |
|---|---|---|
| **Migrants' country of origin** | **Number of EU/EEA countries (out of 31)** | **EU/EEA countries** |
| Russia | 25 | AUT, BLG, HR, CY, CZ, EE, FIN, DE, GRC, HU, ISL, IRL, IT, LV, LIE, LT, LUX, MT, NO, PL, RO, SK, SI, ES, SE |
| Italy | 20 | AUT, BEL, HR, DK, FIN, FR, DE, HU, ISL, IRL, LIE, LUX, MT, NL, PL, RO, SK, SI, ES, UK |
| Romania | 20 | AUT, BEL, BLG, CY, CZ, DK, DE, GRC, HU, ISL, IRL, IT, LUX, MT, NO, PL, PT, SK, ES, SE |
| Ukraine | 18 | BLG, CY, CZ, EE, DE, GRC, HU, ISL, IT, LV, LT, MT, PL, PT, RO, SK, SI, ES |
| Egypt | 16 | AUT, HR, CY, FIN, FR, GRC, HU, IRL, IT, LIE, MT, NL, PL, SK, SI, UK |
| Poland | 12 | AUT, BEL, CZ, DK, DE, ISL, IRL, NL, NO, SK, SE, UK |
| Pakistan | 9 | CY, DK, GRC, IRL, IT, NO, ES, SE, UK |
| Lithuania | 8 | DK, EE, ISL, IRL, LV, NO, PL, UK |
| Nigeria | 8 | AUT, FIN, HU, IRL, IT, MT, ES, UK |
| Turkey | 8 | AUT, BEL, BLG, DK, DE, LIE, NL, RO |
| Bosnia and Herzegovina | 7 | AUT, HR, DK, LIE, LUX, SI, SE |
| Iraq | 7 | DK, FIN, DE, NL, NO, RO, SE |
| Kazakhstan | 6 | CZ, EE, DE, LV, LT, PL |
| Moldova | 6 | BLG, CZ, IT, LV, PT, RO |
| United States | 6 | ISL, IRL, MT, NO, PL, SK |
| Uzbekistan | 6 | BLG, CZ, EE, DE, LV, LT |
| Armenia | 5 | BLG, EE, GRC, LT, PL |
| China | 5 | FIN, HU, NL, RO, UK |
| Georgia | 5 | CY, EE, GRC, LV, LT |
| Latvia | 5 | EE, ISL, IRL, LT, NO |
| Morocco | 5 | BEL, FR, IT, NL, ES |
| Serbia | 5 | AUT, HR, HU, SK, SI |
| Syria | 5 | BLG, CY, GRC, RO, SE |
| Thailand | 5 | DK, FIN, ISL, NO, SE |

*Selected from among the top ten migrant groups from intermediate and high-endemicity countries with the highest number of estimated CHC cases in the EU/EEA.

Migrants from the Maghreb countries Algeria, Morocco and Tunisia are represented among the largest ten migrant groups by CHC case number in France. Pakistan is the most common south-Asian country of origin in the list of ten with the highest number of cases and features on the top ten list for nine EU/EEA countries.

People born either in the former Soviet Union (before 1991) or in one of the former Soviet Republics constitute three or more of the ten migrant groups with the highest estimated number of CHC cases in 16 of 31 EU/EEA countries. In Estonia, Lithuania and Latvia the entire list of ten is comprised of former Soviet Republics. In Bulgaria, the Czech Republic and Poland five to six of the ten migrant groups with the highest number of infected cases originate from one of the former Soviet Republics. This is also the case for three to four of the top ten in Cyprus, Finland, Germany, Greece, Hungary, Iceland, Ireland, Italy, Norway and Romania.

EU/EEA countries with three to five African countries represented among the ten migrant groups with the highest estimated number of CHC cases are Belgium, France, Luxembourg, Portugal and the UK.

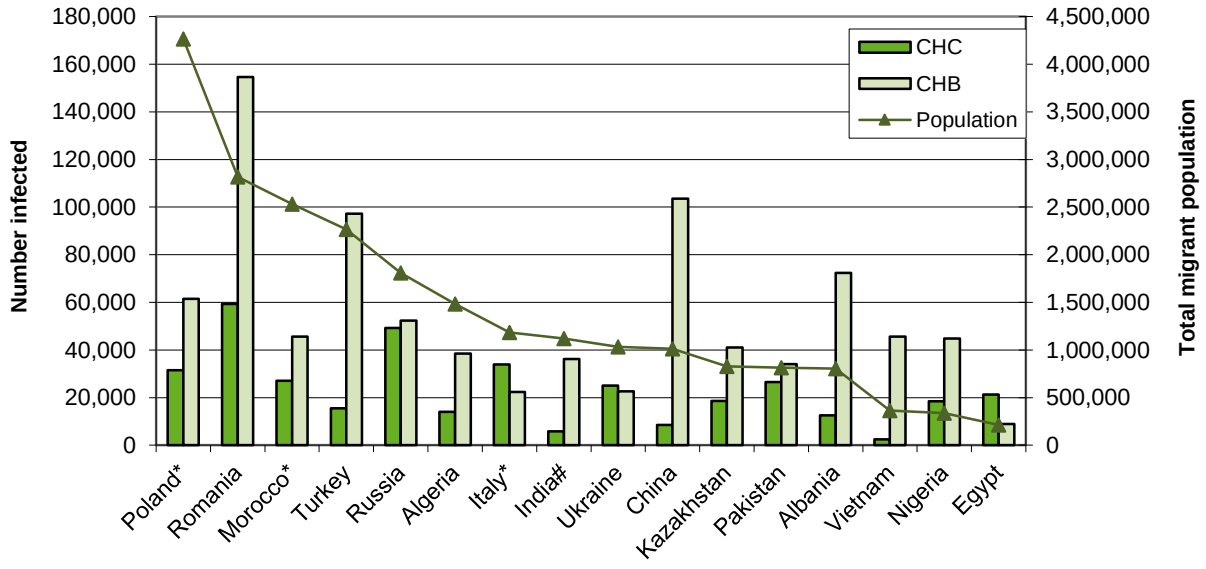
People born either in the former Yugoslavia (before 1992) or in one of the former Yugoslav Republics are represented in six of the ten migrant groups with the largest of number of CHC cases in Croatia and Slovenia (countries making up the former Yugoslavia) and among three of the top ten groups in Austria. Annex 5.10 lists the ten migrant populations with the highest number of anti-HCV infected cases, the anti-HCV prevalence and the estimated number of infected viraemic cases (70% of anti-HCV) in these countries of origin for each of the EU/EEA countries.

### 3.2.7 Cumulative burden of chronic hepatitis B and C among migrants

To identify the ten migrant populations with the largest number of CHB and CHC cases in the EU/EEA as a whole, the total number of chronic hepatitis B and C cases per migrant group were estimated from the top ten migrant groups from endemic countries. As four countries were in the top ten for both CHB and CHC, the total list includes 16 migrant populations. Figure 3 shows that migrants from Poland form the largest migrant group with almost 4.3 million migrants in EU/EEA countries and an estimated 60 000 CHB and 30 000 CHC cases. More than 10% of the one million migrants from China are estimated to have a chronic HBV infection, while less than 10 000 (1%) are estimated to have a chronic HCV infection.

The contribution of HBV and HCV to the total burden of chronic viral hepatitis differs for each migrant population. In migrants from China, Vietnam, Turkey, Albania and India, more than 80% of the chronic viral hepatitis infections are chronic hepatitis B infections. In migrants born in Ukraine, Russia and Pakistan, HBV and HCV contribute almost equally. Only in migrants from Egypt and Italy is the estimated number of CHC cases substantially higher than CHB cases.

**Figure 4. Estimated number of CHB and CHC cases among migrants in the EU/EEA and size of the migrant population**




* low-endemic country for HBV (HBsAg prevalence <2%)
# low-endemic country for HCV (anti-HCV prevalence <1%)

## 3.3 Relative contribution of migrant populations

### 3.3.1 Relative contribution of foreign-born migrants (all ages) from endemic countries to the overall CHB burden in EU/EEA countries

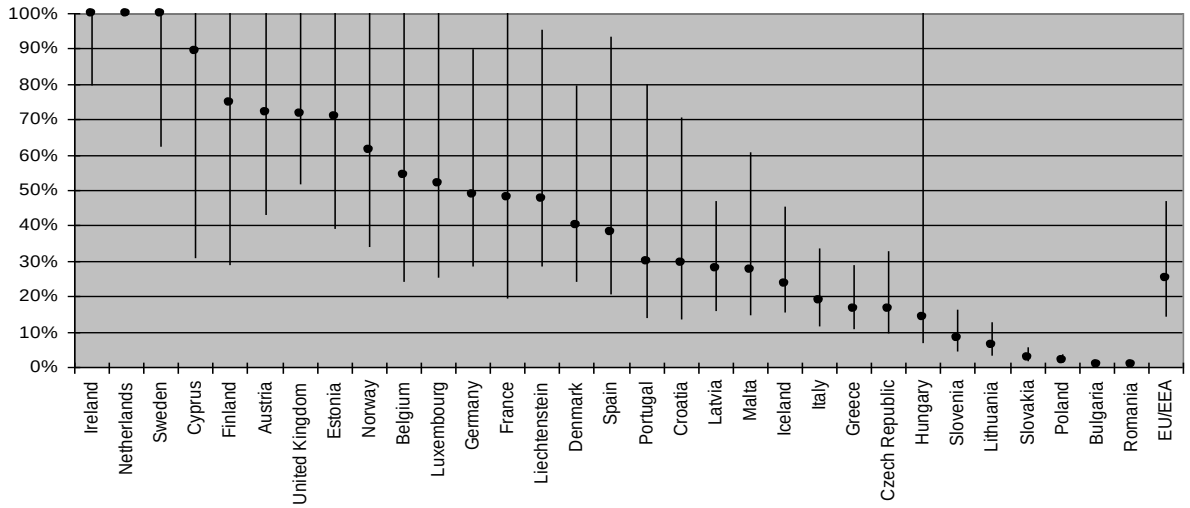
To estimate the relative proportion of affected migrants from intermediate and high-endemic countries to the overall number of people infected with chronic hepatitis B, the estimated number of infected cases among migrants was divided by the total number of infected persons, based on the general population prevalence estimate and the total population.

The relative contribution of first-generation migrants from intermediate and high-endemicity countries to the overall CHB case burden varies across countries from 1% to >100% (Table 11 and Figure 4). The relative burden among migrants in proportion to the overall CHB burden in Cyprus, Iceland, the Netherlands and Sweden is estimated to be very high (ranges from 90% to >100%), while it is relatively low (1–3%) in the eastern European countries of Bulgaria, Poland, Romania and Slovakia.

**Table 11. Relative contribution of CHB cases among migrants from endemic countries to the total number of CHB cases in EU/EEA host countries**

| Country | Sum total population of migrants from endemic countries* | Contribution of migrants from endemic countries to total population in host country | Estimated number of CHB cases among migrants from 50 endemic countries* | | | Relative contribution (%) of CHB cases among migrants from endemic countries to total number of CHB cases in host country# | | |
|---|---|---|---|---|---|---|---|---|
| | | % | CHB cases | Lower estimate | Upper estimate | % | Lower range | Upper range |
| Austria | 768 773 | 9.1% | 33 456 | 25 757 | 41 040 | 72% | 43% | >100% |
| Belgium | 622 206 | 5.6% | 42 530 | 32 218 | 54 309 | 54% | 24% | >100% |
| Bulgaria | 62 755 | 0.9% | 2 436 | 1 860 | 3 039 | 1% | 0% | 1% |
| Croatia | 523 470 | 12.2% | 18 673 | 11 966 | 25 376 | 30% | 13% | 71% |
| Cyprus | 139 689 | 16.6% | 6 770 | 5 141 | 8 445 | 90% | 31% | >100% |
| Czech Republic | 234 291 | 2.2% | 12 185 | 9 637 | 14 752 | 17% | 9% | 33% |
| Denmark | 224 384 | 4.0% | 12 352 | 9 605 | 15 152 | 40% | 24% | 80% |
| Estonia | 184 642 | 14.0% | 5 432 | 3 822 | 7 038 | 71% | 39% | >100% |
| Finland | 141 953 | 2.6% | 8 136 | 6 206 | 10 067 | 75% | 29% | >100% |
| France | 3 591 002 | 5.5% | 212 538 | 131 238 | 380 923 | 48% | 19% | >100% |
| Germany | 5 398 700 | 6.7% | 234 792 | 180 867 | 288 066 | 49% | 28% | 90% |
| Greece | 615 986 | 5.6% | 43 163 | 36 636 | 49 346 | 17% | 11% | 29% |
| Hungary | 302 781 | 3.1% | 15 286 | 13 649 | 16 940 | 14% | 7% | >100% |
| Iceland | 7 857 | 2.4% | 421 | 349 | 494 | 24% | 15% | 45% |
| Ireland | 205 071 | 4.5% | 13 196 | 10 935 | 15 574 | >100% | 79% | >100% |
| Italy | 3 443 409 | 5.8% | 213 063 | 174 632 | 251 539 | 19% | 12% | 33% |
| Latvia | 267 617 | 13.2% | 7 866 | 5 269 | 10 454 | 28% | 16% | 47% |
| Liechtenstein | 2 140 | 5.8% | 97 | 74 | 119 | 48% | 28% | 95% |
| Lithuania | 121 992 | 4.1% | 3 765 | 2 469 | 5 057 | 6% | 3% | 12% |
| Luxembourg | 28 085 | 5.5% | 1 450 | 913 | 2 019 | 52% | 25% | >100% |
| Malta | 9 629 | 2.3% | 637 | 429 | 860 | 28% | 14% | 61% |
| Netherlands | 1 052 695 | 6.3% | 56 650 | 40 335 | 73 016 | >100% | >100% | >100% |
| Norway | 277 047 | 5.5% | 17 021 | 12 125 | 21 979 | 61% | 34% | >100% |
| Poland | 438 446 | 1.1% | 11 679 | 7 018 | 16 342 | 2% | 1% | 4% |
| Portugal | 475 155 | 4.5% | 42 688 | 29 595 | 55 795 | 30% | 14% | 80% |
| Romania | 103 740 | 0.5% | 7 531 | 5 453 | 9 581 | 1% | 0% | 1% |
| Slovakia | 25 170 | 0.5% | 1 073 | 846 | 1 301 | 3% | 2% | 6% |
| Slovenia | 160 220 | 7.8% | 5 713 | 3 756 | 7 663 | 8% | 4% | 16% |
| Spain | 1 909 343 | 4.1% | 118 316 | 92 282 | 148 318 | 38% | 20% | 93% |
| Sweden | 596 303 | 6.2% | 33 850 | 23 728 | 44 011 | >100% | 62% | >100% |
| UK | 3 976 870 | 6.3% | 244 409 | 195 342 | 294 417 | 72% | 52% | >100% |
| **EU/EEA** | **25 178 155** | **5.1%** | **1 427 174** | **1 074 152** | **1 873 032** | **25%** | **14%** | **47%** |

**Figure 5. Relative burden among migrants in proportion to the total number of HB cases per country**



## 3.3.2 Relative burden among migrants from endemic countries in proportion to the overall CHC burden among adults in EU/EEA countries

The relative proportion of infected migrants from intermediate/high-endemicity countries to the overall CHC burden in the EU/EEA countries, along with the lowest and highest estimate of infected cases, is shown in Table 12 and Figure 5. This relative contribution is low in the eastern EU/EEA countries of Bulgaria, Poland, Romania and Slovakia (ranging from 1–4%), while it is estimated to be relatively high in Cyprus, Liechtenstein, the Netherlands and Luxembourg (ranging from 92–64%, in descending order).

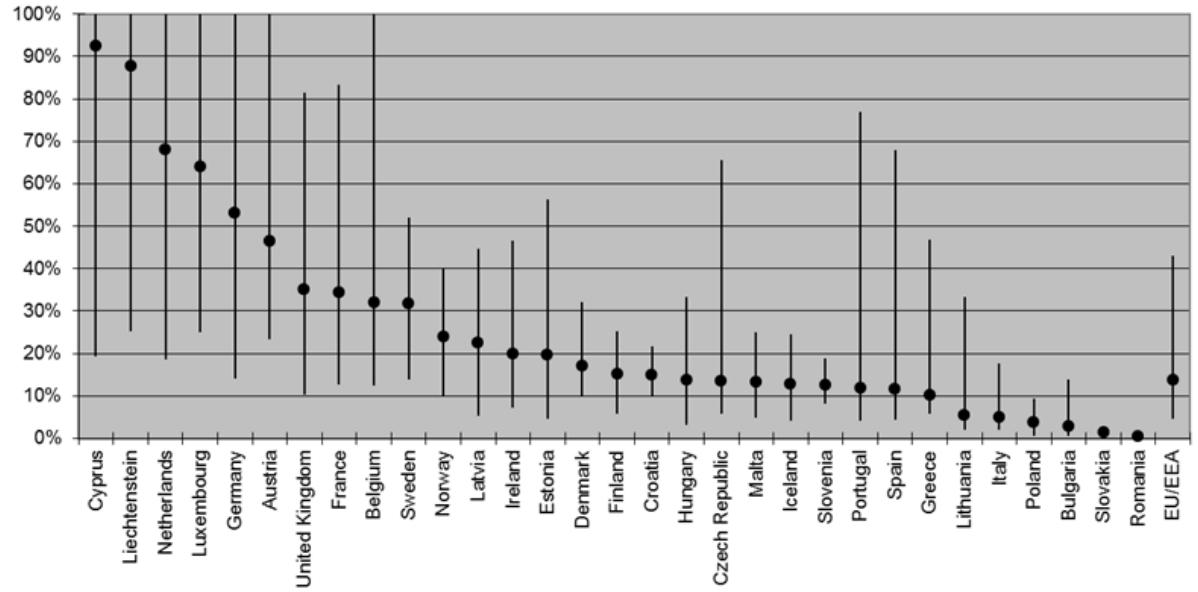
**Table 12. Relative contribution of CHC cases among migrants from endemic countries to the total number of CHC cases in EU/EEA host countries**

| Country | Sum total population of adult migrants from endemic countries* | Contribution (%) of adult migrants from endemic countries to total adult population in host country | Estimated number of CHC (viraemic) cases among adult migrants from endemic countries selected from the 50 most populous migrant countries | | | Relative contribution (%) of CHC cases among adult migrants from endemic countries to total number of CHC cases in host country# | | |
|---|---|---|---|---|---|---|---|---|
| | | % | CHC cases | Lower estimate | Upper estimate | % | Lowest estimate | Highest estimate |
| Austria | 883 345 | 12.2% | 11 753 | 8 243 | 15 117 | 46% | 23% | >100% |
| Belgium | 1 054 155 | 11.4% | 18 607 | 9 729 | 32 764 | 32% | 13% | >100% |
| Bulgaria | 62 941 | 1.0% | 1 366 | 605 | 1 836 | 3% | 1% | 14% |
| Croatia | 524 609 | 14.4% | 4 901 | 4 058 | 6 081 | 15% | 10% | 22% |
| Cyprus | 128 712 | 18.2% | 2 740 | 1 821 | 3 567 | 92% | 19% | >100% |
| Czech Republic | 331 840 | 3.7% | 5 937 | 2 596 | 8 219 | 14% | 6% | 66% |
| Denmark | 278 041 | 6.0% | 3 894 | 2 244 | 5 194 | 17% | 10% | 32% |
| Estonia | 189 495 | 17.0% | 5 090 | 1 625 | 7 033 | 20% | 5% | 56% |
| Finland | 176 980 | 3.9% | 3 383 | 1 682 | 4 826 | 15% | 6% | 25% |
| France | 5 714 076 | 10.8% | 88 799 | 37 816 | 154 348 | 34% | 13% | 83% |
| Germany | 8 888 710 | 12.8% | 128 809 | 61 796 | 193 947 | 53% | 14% | >100% |
| Greece | 588 275 | 6.2% | 12 959 | 9 854 | 15 519 | 10% | 6% | 47% |
| Hungary | 336 360 | 4.0% | 6 548 | 4 980 | 7 889 | 14% | 3% | 33% |
| Iceland | 18 311 | 7.2% | 206 | 111 | 307 | 13% | 4% | 25% |
| Ireland | 321 771 | 9.0% | 5 485 | 2 934 | 8 188 | 20% | 7% | 47% |
| Italy | 4 118 015 | 8.0% | 78 501 | 52 730 | 101 393 | 5% | 2% | 18% |
| Latvia | 271 468 | 15.7% | 6 532 | 2 168 | 9 209 | 22% | 5% | 45% |
| Liechtenstein | 14 672 | 47.1% | 172 | 82 | 223 | 88% | 25% | >100% |
| Lithuania | 127 711 | 5.0% | 2 795 | 1 046 | 4 142 | 5% | 2% | 33% |
| Luxembourg | 104 495 | 25.0% | 1 682 | 659 | 2 710 | 64% | 25% | >100% |
| Malta | 17 833 | 5.0% | 295 | 182 | 438 | 13% | 5% | 25% |
| Netherlands | 978 698 | 7.0% | 13 262 | 7 278 | 18 376 | 68% | 19% | >100% |
| Norway | 357 877 | 8.7% | 4 822 | 2 601 | 6 907 | 24% | 10% | 40% |
| Poland | 453 723 | 1.4% | 9 633 | 3 080 | 12 877 | 4% | 1% | 9% |
| Portugal | 642 212 | 7.1% | 13 505 | 7 474 | 24 179 | 12% | 4% | 77% |
| Romania | 102 854 | 0.6% | 2 090 | 912 | 2 923 | 1% | 0% | 1% |
| Slovakia | 31 460 | 0.7% | 588 | 281 | 782 | 1% | 0% | 3% |
| Slovenia | 208 026 | 11.8% | 2 030 | 1 607 | 2 563 | 13% | 8% | 19% |
| Spain | 3 748 924 | 9.5% | 55 164 | 31 440 | 75 323 | 12% | 4% | 68% |
| Sweden | 773 085 | 9.7% | 10 579 | 5 352 | 14 452 | 32% | 14% | 52% |
| UK | 4 706 765 | 9.0% | 76 535 | 45 555 | 118 608 | 35% | 10% | 81% |
| **EU/EEA** | **36 155 438** | **8.4%** | **578 663** | **312 539** | **859 941** | **14%** | **5%** | **43%** |

* Anti-HCV prevalence >=1%, selected from the 50 largest migrant groups in the respective EU/EEA country

# >100% is the result when the estimated number of cases among migrants is higher than the estimated number of cases in the total population of the host country.

**Figure 6. Relative burden among migrants in proportion to the total number of CHC cases per country**




# 3.4 The prevalence of HBsAg/anti-HCV among migrants

## 3.4.1 Summary of included articles

From the final selection of 54 articles, we extracted around 335 prevalence estimates among first-generation, second or subsequent generation migrants. Migrant status was measured by country or region of birth or by self-reported ethnicity. Populations included blood donors, adult residents (i.e. the general population), health service users (mostly GP attendees, those visiting clinics for sexually transmitted infections (STI), and international health, tropical medicine or public health clinic attendees), unspecified patients, asylum seekers and refugees (often defined as residence in a refugee camp), international adoptees, pregnant women, and school-age children. In the summary tables below, we report the HBsAg and anti-HCV prevalence among migrants (where the number screened from a specific country of origin is >10), compare these findings to pooled country of origin (in-country) estimates from systematic reviews, and describe any data available that compares first with second (or subsequent) generation migrants.

## 3.4.2 HBsAg prevalence among migrants from the Eastern Mediterranean Region

### *3.4.2.1 Summary of prevalence estimates*

Estimates of HBsAg prevalence from larger studies among various migrant populations from Egypt, Iraq, Iran, Morocco and Turkey were available from the Eastern Mediterranean Region (EMR) (Table 13). Three pooled estimates were derived – from health service users and the general population of migrants from Turkey, and from a general population estimate among migrants from Morocco. Larger samples were compared with the Kowdley-derived country of origin estimates (Table 14). Three estimates (among international health clinic attendees and outpatients) for the North African/Middle Eastern region were available and these were pooled into an estimate for comparison with the regional estimate from Kowdley, which does however include Sudan [24-26]. Differences between first generation migrants (FGM) and second generation migrants (SGM) are also explained.

**Table 13. HBsAg prevalence extracted/pooled from studies among migrants from the EMR**

| Country of birth | Study country | Study period | Generation | Age groups | Population | N | HBsAg prevalence (%) | Comments | Ref. no |
|---|---|---|---|---|---|---|---|---|---|
| Egypt | NL | 2004 | FGM | Adults | Residents | 465 | 1.1 | | 27 |
| Iraq | Italy | 2000 | FGM | Children | Refugees | 146 | 1.4 | Kurdish | 28 |
| Iraq | Italy | 2000 | FGM | Adults | Refugees | 487 | 2.5 | Kurdish | 28 |
| Iraq | NL | 2011 | FGM | Adults | Residents | 290 | 0.7 | | 29 |
| Iran | NL | 2011 | FGM | Adults | Residents | 153 | 0.7 | | 29 |
| Morocco | NL | 2004 | FGM | Adults | Residents | 44 | 0 | | 30 |
| Morocco | NL | 2004 | FGM | Adults | Residents | 261 | 0.4 | | 31 |
| **Morocco** | **NL** | **2004** | **FGM** | **Adults** | **Residents** | **305** | **0.3 (0–1.8)** | **Pooled** | **30,31** |
| Morocco | Spain | 2001-2005 | FGM | Adults | Public health clinic attendees | 54 | 5.6 | | 32 |
| Morocco | NL | 2004 | SGM | Adults | Residents | 12 | 0 | | 31 |
| Turkey | Germany | N.R | N.R | Adults | Clinic attendees | 1285 | 4.9 | Multi-centre (five city) study | 33 |
| Turkey | Germany | 2010-2012 | FGM | Adults | GP attendees | 606 | 4.8 | | 34 |
| **Turkey** | **Germany** | **N.R** | **FGM** | **Adults** | **Health service users** | **1891** | **4.9 (4.0–6.0)** | **Pooled** | **33,34** |
| Turkey | Italy | 2000 | FGM | Children | Refugees | 123 | 3.3 | Kurdish | 28 |
| Turkey | Italy | 2000 | FGM | Adults | Refugees | 245 | 8.6 | Kurdish | 28 |
| Turkey | NL | 2004 | FGM | Adults | Residents | 54 | 0 | | 30 |
| Turkey | NL | 2004 | FGM | Adults | Residents | 304 | 4.9 | | 31 |
| Turkey | NL | 2008–09 | FGM | Adults | Residents | 544 | 3.1 | | 29 |
| **Turkey** | **NL** | **2004/ 2011** | **FGM** | **Adults** | **Residents** | **902** | **3.7 (2.5–5.1)** | **Pooled** | **29-31** |
| Turkey | NL | 2008-09 | SGM | Adults | Residents | 103 | 1.0 | | 29 |

## *Comparing HBsAg prevalence estimates among migrants from the EMR (in host EU/EEA countries) with EMR country of origin (in-country) estimates*

**Egypt**

Just one estimate was available among migrants from Egypt. The prevalence found among adult residents was lower than the estimate by Kowdley and the two CIs did not overlap. Similarly, Kowdley found that in-country estimates are significantly higher than those found among migrants.

**Iraq**

Two estimates were available among adult migrants from Iraq – one among adult residents and the other among (Kurdish) refugees. The prevalence among both groups of migrants was comparable to that found by Kowdley and there was a significant overlap in the CIs. Interestingly, no in-country studies were retrieved by Kowdley and the estimate is based on two studies (n=1 867) among migrant populations.

**Iran**

Just one estimate was retrieved for migrants from Iran. The prevalence among adult residents was lower than the estimate by Kowdley and the two CIs did not overlap. Similarly, Kowdley found a significantly higher in-country estimate than among migrants.

**Morocco**

Two estimates were available – a pooled estimate among residents and one among public health clinic attendees - for comparison with the in-country estimate. The estimate among residents (i.e. the general population) was lower whereas the estimate among public health clinic attendees was comparable. Interestingly, Kowdley found the estimate derived from migrants was significantly higher than the in-country prevalence (1.5% vs. 4.5% $p<0.001$).

**Turkey**

Four estimates were available among migrants from Turkey – among adult residents, among health service users, and among both adult and child refugees. The prevalence in adult resident migrants was comparable to the in-country estimate. Conversely, the prevalence among adult (Kurdish) refugees was higher whereas the prevalence among child refugees was lower than the in-country estimate. For all groups except adult refugees the CIs overlap with Kowdley. Kowdley found that the prevalence among migrants from Turkey did not differ significantly from the in-country prevalence.

**Table14. Comparison of HBsAg estimates from studies among EMR migrants with in-country prevalence from systematic reviews**

| Country | Migrants | | | In-country | | | | Comparison |
|---|---|---|---|---|---|---|---|---|
| | Population | Prevalence | 95% CI | Population | Prevalence | 95% CI | Ref. | |
| Egypt | Residents | 1.1 | 0.4–2.5 | Pooled | 4.2[#] | 1.9–6.5 | 13 | Lower |
| Iraq | Residents | 0.7 | 0–3.6 | Pooled | 1.3 | 0–2.9 | 13 | Comparable |
| Iraq | Refugees | 2.2 | 1.2–3.6 | Pooled | 1.3 | 0–2.9 | 13 | Comparable |
| Iran | Residents | 0.7 | 0.1–2.5 | Pooled | 3.1 | 2.7–3.5 | 13 | Lower |
| Morocco | Residents | 0.3 | 0–1.8 | Pooled | 1.8 | 1.5–5.9 | 13,16 | Lower |
| Morocco | PHC attendees | 5.6 | 1.2–15.4 | Pooled | 1.8 | 1.5–5.9 | 13,16 | Comparable |
| Turkey | Residents | 3.7 | 2.5–5.1 | Pooled | 4.3[#] | 3.7–4.9 | 13 | Comparable |
| Turkey | Health service users | 4.9 | 4.0–6.0 | Pooled | 4.3[#] | 3.7–4.9 | 13 | Comparable |
| Turkey | Adult refugees | 8.6 | 5.4–12.8 | Pooled | 4.3[#] | 3.7–4.9 | 13 | Higher |
| Turkey | Child refugees | 3.3 | 0.9–8.1 | Pooled | 4.3[#] | 3.7–4.9 | 13 | Lower |
| North Africa/ Middle East | Health service users | 3.7 | 1.4–7.8 | Pooled | 6.6* | 4.6–3.8 | 13 | Lower |

[#] Kowdley >2000 estimate
*Kowdley regional estimate includes Sudan

### *First- and second-generation migrants*

Information about first- compared to second- and subsequent generations was only available for migrants from Morocco and Turkey. The prevalence in the second-generation (SGM) was lower than that found among the first-generation (FGM) for both groups and there was an overlap in CIs (Turkey: FGM 3.7% (95% CI: 2.5–5.1) vs. SGM: 1.0% (95% CI: 0–5.3); Morocco: FGM 0.3% (95% CI: 0–1.8) vs. SGM 0% (95% CI: 0–26.5).

## 3.4.3 Anti-HCV prevalence among migrants from the Eastern Mediterranean Region

Estimates of anti-HCV prevalence from larger samples among various migrant populations from Egypt, Morocco, Iraq, Iran and Turkey were available (Table 15). These were compared with the samples extracted from Lehman (for Egypt), Gower (for Iraq, Iran and Morocco) and Bruggman (for Turkey) (Table 16). Differences observed between first and subsequent generations are also explained.

**Table 15. Anti-HCV prevalence estimates extracted/pooled from studies among migrants from the EMR**

| Country of birth | Study country | Study period | Generation | Age groups | Population | N | Anti-HCV prevalence (%) | Comments | Ref. No |
|---|---|---|---|---|---|---|---|---|---|
| Egypt | NL | 2004 | FGM | Adults | Residents | 465 | 2.4 | | 27 |
| Iraq | NL | 2011 | FGM | Adults | Residents | 290 | 0.3 | | 29 |
| Iraq | Italy | 2000 | FGM | All | Refugees | 637 | 0.2 | | 28 |
| Iran | NL | 2011 | FGM | Adults | Residents | 153 | 0.7 | | 29 |
| Morocco | NL | 2003-2009 | FGM | Adults | STI clinic attendees | 37 | 0 | | 35 |
| Morocco | Spain | 2001-2005 | FGM | Adults | PHC attendees | 66 | 3.0 | | 32 |
| **Morocco** | **Various** | **2001-2009** | **FGM** | **Adults** | **Clinic attendees** | **103** | **1.9 (0.2 – 6.8)** | **Pooled** | **32,35** |
| Morocco | NL | 2003-2009 | FGM | Adults | Pregnant women | 482 | 0 | | 35 |
| Morocco | NL | 2003-2009 | FGM | Adults | Health survey respondents | 255 | 0.4 | | 35 |
| Morocco | NL | 2003-2009 | FGM | Adults | Gen. population | 36 | 2.8 | | 35 |
| Morocco | NL | 2004 | FGM | Adults | Residents | 40 | 2.5 | | 30 |
| **Morocco** | **NL** | **2003-2009** | **FGM** | **Adults** | **Gen. Population** | **331** | **0.9 (0.2 – 2.6)** | **Pooled** | **30,35** |
| Morocco | NL | 2003-2009 | SGM | Adults | Pregnant women | 67 | 0 | | 35 |
| Morocco | NL | 2003-2009 | SGM | Adults | Health survey respondents | 12 | 0 | | 35 |
| Morocco | NL | 2003-2009 | SGM | Adults | Gen. population | 7 | 0 | | 35 |
| **Morocco** | **NL** | **2003-2009** | **SGM** | **Adults** | **Gen. population** | **19** | **0 (0 – 17.7)** | **Pooled** | **35** |
| Turkey | NL | 2003-2009 | FGM | Adults | STI clinic attendees | 14 | 0 | | 35 |
| Turkey | Germany | 2010-2012 | FGM | Adults | GP attendees | 606 | 0.8 | | 34 |
| **Turkey** | **Various** | **2003-2012** | **FGM** | **Adults** | **Health service users** | **620** | **0.8 (0.3 -1.9)** | **Pooled** | **34,35** |
| Turkey | NL | 2003-2009 | FGM | Adults | Pregnant women | 218 | 0.5 | | 35 |
| Turkey | NL | 2003-2009 | FGM | Adults | Health survey respondents | 309 | 0 | | 35 |
| Turkey | NL | 2003-2009 | FGM | Adults | Gen. population | 65 | 0 | | 35 |
| Turkey | NL | 2008-2009 | FGM | Adults | Residents | 544 | 0.4 | | 29 |
| Turkey | NL | 2004 | FGM | Adults | Residents | 47 | 0 | | 30 |

| Country of birth | Study country | Study period | Generation | Age groups | Population | N | Anti-HCV prevalence (%) | Comments | Ref. No |
|---|---|---|---|---|---|---|---|---|---|
| **Turkey** | **NL** | **2003-2011** | **FGM** | **Adults** | **Gen. population** | **965** | **0.2 (0 – 0.8)** | **Pooled** | **29,30, 35** |
| Turkey | Italy | 2000 | FGM | All | Refugees | 368 | 0 | | 28 |
| Turkey | NL | 2008-2009 | SGM | Adults | Residents | 103 | 0 | | 29 |
| Turkey | NL | 2003-2009 | SGM | Adults | Health survey respondents | 13 | 0 | | 35 |
| Turkey | NL | 2003-2009 | SGM | Adults | Gen. population | 15 | 0 | | 35 |
| **Turkey** | **NL** | **2003-2011** | **SGM** | **Adults** | **Gen. population** | **131** | **0 0 – 2.8)** | **Pooled** | **29,35** |
| Turkey | NL | 2003-2009 | SGM | Adults | STI clinic attendees | 28 | 0 | | 35 |
| Turkey | NL | 2003-2009 | SGM | Adults | Pregnant women | 33 | 0 | | 35 |

## *Comparing anti-HCV prevalence estimates among migrants from the EMR (in host EU/EEA countries) with country of origin (in-country) estimates*

**Egypt**

The prevalence derived from a general population sample of migrants from Egypt was considerably lower than the in-country estimate by Lehman.

**Iraq**

The two estimates among migrants from Iraq – one among refugees and one among the general population – were very similar (0.2% vs. 0.3%) although only the estimate among residents falls within the Gower uncertainty range. As there is significant comparability in the two estimates, it is likely that the prevalence among migrants is lower than the in-country prevalence.

**Iran**

The one estimate among adult resident migrants from Iran was comparable with the in-country estimate.

**Morocco**

Estimates were derived for three different migrant populations from Morocco – a general population sample, a sample of pregnant women and a pooled estimate from health service users. The prevalence among pregnant women was lower than the in-country estimate whereas the prevalence among health service users was higher. The general population estimate was comparable to the in-country estimate.

**Turkey**

The prevalence in three Turkish migrant populations – from a general population sample, pregnant women and refugees – was lower than the in-country estimate. The estimate among health service users was comparable.

**Table 16. Comparison of anti-HCV estimates from studies among EMR migrants to in-country prevalence**

| Country | Migrants | | | In-country | | | | Comparison |
|---|---|---|---|---|---|---|---|---|
| | Population | Prevalence | 95% CI | Population | Prevalence | 95% CI | Ref. | |
| Egypt | Residents | 2.4 | 1.2–4.2 | Pooled | 15.7 | 13.9–17.5 | 21 | Lower |
| Iraq | Residents | 0.3 | 0–1.9 | Pooled | 3.2 | 0.3–3.2* | 17 | Comparable |
| Iraq | Refugees | 0.2 | 0–0.9 | Pooled | 3.2 | 0.3–3.2* | 17 | Lower |
| Iran | Residents | 0.7 | 0–3.6 | Pooled | 0.5 | 0.2–1* | 17 | Comparable |
| Morocco | Gen. population | 0.9 | 0.2–2.6 | Pooled | 1.6 | 0.6–1.9* | 17 | Comparable |
| Morocco | Pregnant women | 0 | 0–0.8 | Pooled | 1.6 | 0.6–1.9* | 17 | Lower |
| Morocco | Health service users | 3.3 | 0.7–9.3 | Pooled | 1.6 | 0.6–1.9* | 17 | Higher |
| Turkey | Gen. population | 0.2 | 0–0.8 | Pooled | 1.0 | 0.7–1.1 | 18 | Lower |
| Turkey | Pregnant women | 0.5 | 0–2.5 | Pooled | 1.0 | 0.7–1.1 | 18 | Lower |
| Turkey | Health service users | 0.8 | 0.3–1.0 | Pooled | 1.0 | 0.7–1.1 | 18 | Comparable |
| Turkey | Refugees | 0 | 0–1.0 | Pooled | 1.0 | 0.7–1.1 | 18 | Lower |

*Not a 95% CI but an uncertainty range (see methods)

### *First- and second generation migrants*

Country-level prevalence among FGM and SGM were available for Morocco and Turkey. No cases were found among the small sample sizes although the CIs from the pooled general population SGM estimates do overlap with the lower limit of the FGM estimates.

## 3.4.4. HBsAg prevalence among migrants from South Asia

### *Summary of prevalence estimates*

HBsAg prevalence estimates from larger studies were available among various migrant populations from Afghanistan, Bangladesh, India and Pakistan (Table 17). The estimates were compared with those extracted from Kowdley (Table 18). Differences observed between first and subsequent generations are also explained.

**Table 17. HBsAg prevalence estimates extracted/pooled from studies among migrants from South Asia**

| Country of birth/ethnicity | Study country | Study period | Generation | Age groups | Population | N | HBsAg prevalence (%) | Comments | Ref. No. |
|---|---|---|---|---|---|---|---|---|---|
| Afghanistan | NL | 2011 | FGM | Adults | Residents | 293 | 2.1 | | 29 |
| Afghanistan | Italy | 2009 | FGM | All | Refugees | 11 | 0 | | 36 |
| Bangladesh | UK | N.R | FGM | Adults | Residents | 726 | 1.5 | >16 years | 37 |
| Bangladesh | UK | N.R | FGM | Adults | Residents | 208 | 3.2 | | 38 |
| **Bangladesh** | **UK** | **N.R** | **FGM** | **Adults** | **Residents** | **934** | **1.3 (0.7-2.2)** | **Pooled** | **37,38** |
| Bangladesh | Spain | 2001-05 | FGM | Adults | PHC attendees | 40 | 5.0 | | 32 |
| Bangladesh | UK | 2001-05 | FGM | Children | School children | 59 | 1.7 | 7–11 years | 39 |
| Bangladesh | UK | 2001-05 | SGM | Children | School children | 484 | 0.2 | 7–11 years | 39 |
| India | Italy | 2005 | FGM | Adults | Refugees | 23 | 0 | >15 years | 40 |
| India | Spain | 2001-05 | FGM | Adults | PHC attendees | 17 | 0 | | 32 |
| India | UK | 2001-05 | FGM | Children | School children | 36 | 0 | 7–11 years | 39 |
| India | UK | 2001-05 | SGM | Children | School children | 591 | 0 | 7–11 years | 39 |
| India | UK | N.R | FGM | Adults | Residents | 1197 | 0.1 | >16 years | 37 |
| Pakistan | Norway | 2007-09 | FGM | Adults | Pregnant women | 206 | 0.5 | | 41 |
| Pakistan | UK | 2009-10 | FGM | Adults | Residents | 882 | 0.8 | | 42 |
| Pakistan | Norway | 2009 | FGM | Adults | Residents | 224 | 1.3 | | 43 |
| Pakistan | UK | N.R | FGM | Adults | Residents | 2458 | 1.8 | >16 years | 37 |
| Pakistan | UK | N.R | FGM | Adults | Residents | 222 | 3.2 | | 38 |
| **Pakistan** | **UK** | **N.R** | **FGM** | **Adults** | **Residents** | **3786** | **1.6 (1.2-2.1)** | **Pooled** | **37,38, 42,43** |
| Pakistan | UK | 2009–10 | SGM | Adults | Residents | 148 | 0.7 | | 42 |
| Pakistan | Spain | 2001-05 | FGM | Adults | PHC attendees | 218 | 4.1 | | 32 |
| Pakistan | Italy | 2009 | FGM | All | Refugees | 14 | 0 | 7–52 years | 36 |
| Pakistan | Italy | 2005 | FGM | Adults | Refugees | 41 | 12.2 | | 40 |
| Pakistan | Italy | 2003-09 | FGM | All | Refugees | 143 | 14.7 | 1–56 years | 44 |
| **Pakistan** | **UK** | **N.R** | **FGM** | **All** | **Refugees** | **198** | **13.3 (8.8 – 18.7)** | **Pooled** | **36, 40,44** |
| Pakistan | UK | 2001-05 | FGM | Children | School children | 85 | 0 | 7–11 years | 39 |
| Pakistan | UK | 2001-05 | SGM | Children | School children | 1047 | 0 | 7–11 years | 39 |

N.R. – not reported

**Afghanistan**

The one estimate available among (adult resident) migrants from Afghanistan was considerably lower than the in-country estimate and there was no overlap in the CIs. Interestingly, Kowdley found that the prevalence among migrants from Afghanistan was considerably higher than the in-country prevalence.

**Bangladesh**
Three estimates were available among migrants from Bangladesh – among adult residents, school-age children and attendees of a public health clinic. The prevalence among resident and school-age migrants was lower than the in-country estimate, although the CI from the estimate in school-age children overlaps with the in-country estimate by Kowdley. The prevalence found among attendees of a public health clinic was comparable to the in-country prevalence. Kowdley found no significant difference between the in-country prevalence and the prevalence in migrants.

**India**
Four estimates were available among migrants from India - among adult residents, school-age children, attendees of a public health centre and refugees. Estimates for all groups of migrants from India were lower than the in-country estimate, although the upper limit of the migrant CI only came outside the lower limit of the Kowdley estimate for adult residents. This mirrors the findings of Kowdley: a significantly higher in-country prevalence when comparing the migrant and in-country prevalence for India.

**Pakistan**
Five estimates were available among migrants from Pakistan - among school-age children, pregnant women, adult residents, attendees of a public health clinic and refugees. As no cases were found among 85 school-age migrant children, the zero prevalence was lower than Kowdley's estimate and the CI. The prevalence among pregnant women was lower than the in-country estimate. The prevalence among resident migrants was also lower than the Kowdley estimate. The prevalence among attendees of a public health clinic was comparable to the in-country estimate. The prevalence found among refugees was considerably higher than the in-country estimates and there was no overlap in the two CIs. Kowdley found that the prevalence in migrants was significantly lower than the in-country prevalence, which is in line with our results for the general adult population (pregnant women and residents) but the opposite of what we observed for more vulnerable migrant groups, such as refugees and public health clinic attendees.

**Table 18. Comparison of HBsAg estimates from studies among southern Asian migrants with in-country prevalence from Kowdley**

| Country | Migrants | | | In-country | | | Comparison |
|---|---|---|---|---|---|---|---|
| | Population | Prevalence | 95% CI | Population | Prevalence | 95% CI | |
| Afghanistan | Residents | 2.1 | 0.8–4.4 | Pooled | 10.46 | 5.9–15.1 | Lower |
| Bangladesh | Residents | 1.3 | 0.7–2.2 | Pooled | 4.8 | 4.0–5.6 | Lower |
| Bangladesh | School children | 1.7 | 0–9.1 | Pooled | 4.8 | 4.0–5.6 | Lower |
| Bangladesh | PHC attendees | 5.0 | 0.6–16.9 | Pooled | 4.8 | 4.0–5.6 | Comparable |
| India | Residents | 0.1 | 0–0.5 | Pooled | 3.2 | 2.9–3.6 | Lower |
| India | School children | 0 | 0–9.7 | Pooled | 3.2 | 2.9–3.6 | Lower |
| India | Refugees | 0 | 0–14.8 | Pooled | 3.2 | 2.9–3.6 | Lower |
| India | PHC attendees | 0 | 0–19.1 | Pooled | 3.2 | 2.9–3.6 | Lower |
| Pakistan | School children | 0 | 0–4.25 | Pooled | 4.2 | 3.6–4.8 | Lower |
| Pakistan | Pregnant women | 0.5 | 0–2.7 | Pooled | 4.2 | 3.6–4.8 | Lower |
| Pakistan | Residents | 1.9 | 1.4–2.4 | Pooled | 4.2 | 3.6–4.8 | Lower |
| Pakistan | PHC attendees | 4.1 | 1.9–7.7 | Pooled | 4.2 | 3.6–4.8 | Comparable |
| Pakistan | Refugees | 13.3 | 8.8–18.7 | Pooled | 4.2 | 3.6–4.8 | Higher |

### *First and second generation migrants*

Country-level information comparing first and second-generation migrants was only available for school-age children from Bangladesh, India and Pakistan. These data suggest a comparable prevalence in the two generations for India and Pakistan, but that the prevalence among children born in Bangladesh is higher than that among Bangladeshi children. Regional estimates for South Asia among first and second/third-generation resident migrants were available and suggest a 10-fold increase in prevalence when comparing first with subsequent generations (2.0% vs. 0.2%) [38].

## 3.4.5 Anti-HCV prevalence among migrants from South Asia

Estimates of anti-HCV prevalence from larger samples among various migrant populations from Afghanistan, Bangladesh, India and Pakistan were available (Table 19). These were compared with estimates from Gower (for Afghanistan, Bangladesh and India) and Waheed (for Pakistan) (Table 20). Differences observed between first- and subsequent generations are also explained.

**Table 19. Anti-HCV prevalence estimates extracted/pooled from studies among migrants from South Asia**

| Country of birth/ethnicity | Study country | Study period | Generation | Age groups | Population | N | Anti-HCV prevalence (%) | Comments | Ref. No |
|---|---|---|---|---|---|---|---|---|---|
| Afghanistan | NL | 2011 | FGM | Adults | Residents | 293 | 1 | | 29 |
| Afghanistan | Italy | 2009 | FGM | All | Refugees | 11 | 9.1 | | 36 |
| Bangladesh | Spain | 2001-05 | FGM | Adults | PHC attendees | 45 | 0 | | 32 |
| Bangladesh | UK | N.R | FGM | Adults | Residents | 208 | 0 | | 37 |
| Bangladesh | UK | N.R | FGM | Adults | Residents | 726 | 0.6 | | 38 |
| **Bangladesh** | **UK** | **N.R** | **FGM** | **Adults** | **Residents** | **934** | **0.4 (0.1-1.1)** | **Pooled** | **37,38** |
| India | UK | 2009-10 | FGM | Adults | Residents | 137 | 2.9 | | 42 |
| India | UK | N.R | FGM | Adults | Residents | 1197 | 0.2 | | 37 |
| **India** | **UK** | **N.R** | **FGM** | **Adults** | **Residents** | **1334** | **0.4 (0.2 – 1.0)** | **Pooled** | **37,38** |
| India | Spain | 2001-05 | FGM | Adults | PHC attendees | 20 | 0 | | 32 |
| Pakistan | Spain | 2001-04 | FGM | Adults | Health service users | 136 | 8.1 | | 24 |
| Pakistan | Spain | 2001-05 | FGM | Adults | PHC attendees | 260 | 9.6 | | 32 |
| **Pakistan** | **Spain** | **2001-05** | **FGM** | **Adults** | **Health service users** | **396** | **9.1 (6.5-12.4)** | **Pooled** | **24,32** |
| Pakistan | Italy | 2009 | FGM | All | Refugees | 14 | 0 | 7 – 52 years | 36 |
| Pakistan | UK | 2009 | FGM/SGM | Adults | Residents | 170 | 4.1 | | 45 |
| Pakistan | UK | N.R | FGM | Adults | Residents | 222 | 1.8 | | 38 |
| Pakistan | UK | 2009-10 | FGM | Adults | Residents | 882 | 3.1 | | 42 |
| Pakistan | UK | N.R | FGM | Adults | Residents | 2458 | 2.7 | | 37 |
| **Pakistan** | **UK** | **N.R** | **FGM** | **Adults** | **Residents** | **3562** | **2.8 (2.3-3.4)** | **Pooled** | **37,38,42** |
| Pakistan | UK | 2009-10 | SGM | Adults | Residents | 148 | 0.7 | | 42 |

N.R. – Not reported

## *Comparing anti-HCV prevalence estimates among migrants from South Asian countries (in host EU/EEA countries) with country of origin (in-country) estimates*

**Afghanistan**

The one estimate available among (adult resident) migrants from Afghanistan was comparable to the in-country estimate.

**Bangladesh**

Two estimates were available among migrants from Bangladesh – for adult residents and attendees of a public health clinic. No cases were found among public health clinic attendees and the corresponding zero prevalence was lower than the in-country estimate. The estimate among residents was comparable with the in-country estimate.

**India**

Two estimates were available among migrants from India – for adult residents and attendees of a public health clinic. Although the estimate for public health clinic attendees was lower than the in-country estimate, the estimate for residents was comparable to the in-country estimate.

**Pakistan**

Two estimates were available among migrants from Pakistan – for adult residents and health service users. The prevalence among resident migrants from Pakistan was lower than the in-country estimate [23] The prevalence among health service users was higher than the in-country prevalence reported by Waheed [23].

**Table 20. Comparison of anti-HCV estimates from studies among South Asian migrants with in-country prevalence**

| Country | Migrants | | | In-country | | | Comparison |
|---|---|---|---|---|---|---|---|
| | Population | Prevalence | 95% CI | Prevalence | Limits | Ref. | |
| Afghanistan | Residents | 1.0 | 0.2–3.0 | 1.1 | 0.6–1.9 | 17 | Comparable |
| Bangladesh | Residents | 0.4 | 0.1–1.1 | 1.3 | 0.2–2.2 | 17 | Comparable |
| Bangladesh | PHC attendees | 0 | 0–1.8 | 1.3 | 0.2–2.2 | 17 | Lower |
| India | Residents | 0.4 | 0.2–1.0 | 0.8 | 0.4–1.0 | 17 | Comparable |
| India | PHC attendees | 0 | 0–16.9 | 0.8 | 0.4–1.0 | 17 | Lower (<25 screened) |
| Pakistan | Residents | 2.8 | 2.3–3.4 | 5.5 | 4.4–5.5 | 23 | Lower |
| Pakistan | Health Service Users | 9.1 | 6.5–12.4 | 5.5 | 4.4–5.5 | 23 | Higher |

### *First and second-generation migrants*

Estimates among adult resident FGM and SGM from Pakistan were available and show a lower prevalence among SGM (0.7%, 95% CI: 0–3.7) than that found among FGM (2.8%, 95% CI: 2.3–3.4). There is slight overlap in the CI although this is probably explained by differences in sample size, given the small SGM sample size and consequent wide CI compared to the larger pooled FGM sample size (n=148 vs. n=3562).

## 3.4.6 HBsAg prevalence among migrants from South East Asia

Estimates among various migrant populations from China, Hong Kong, Vietnam and the Philippines were available (Table 21). These were compared with the estimates reported in Kowdley (Table 22). Differences observed between first and subsequent generations are also explained.

**Table 21. HBsAG prevalence estimates extracted/pooled from studies among South East Asian migrants**

| Country of birth/ethnicity | Study country | Study period | Generation | Age groups | Population | N | HBsAg prevalence (%) | Comments | Ref. No |
|---|---|---|---|---|---|---|---|---|---|
| China | UK | N.R | FGM | Adults | Residents | 163 | 11.0 | | 38 |
| Hong Kong | UK | N.R | FGM | Adults | Residents | 307 | 7.8 | | 38 |
| China & HK | NL | 2009 | FGM | All | Residents | 849 | 9.7 | 11–89 years | 46 |
| **China & HK** | **UK & NL** | **N.R** | **FGM** | **Adults** | **Residents** | **1319** | **9.4 (7.9-11.1)** | **Pooled** | **38,46** |
| China | Italy | 2003-09 | FGM | All | Refugees | 52 | 57.7 | | 44 |
| China | UK | 2001-05 | SGM | Children | School children | 27 | 0 | 7–11 years | 39 |
| China and HK | NL | 2009 | SGM | All | Residents | 111 | 2.7 | | 46 |
| British Chinese | UK | N.R | SGM | Adults | Residents | 75 | 6.7 | All cases >28 years | 38 |
| **China & HK** | **UK & NL** | **N.R** | **SGM** | **Adults** | **Residents** | **186** | **4.3 (1.9-8.3)** | **Pooled** | **46,38** |
| Chinese | UK | 2009-12 | FGM/SGM | Adults | Residents | 229 | 8.7 | | 47 |
| Chinese | UK | 1996-08 | N.R | Adults | Blood donors | 39263 | 0.3 | | 48 |
| Chinese | UK | 2010-13 | N.R | Adults | Pregnant women | 93 | 4.3 | | 49 |
| Philippines | Spain | 2001-05 | FGM | All | PHC attendees | 150 | 3.3 | | 32 |
| Vietnam | UK | N.R | FGM | Adults | Residents | 23 | 17.4 | | 38 |
| Vietnam | NL | 2011 | FGM | Adults | Residents | 126 | 9.5 | | 29 |
| **Vietnam** | **Various** | **N.R** | **FGM** | **Adults** | **Residents** | **149** | **10.7 (6.3–16.9)** | **Pooled** | **38,29** |
| Vietnam | France | 2009-11 | FGM | Children | International adoptees | 10 | 20.0 | | 50# |

# Screened negative on arrival in France.

### *Comparing HBsAg prevalence estimates among migrants from South East Asia with country of origin (in-country) estimates by Kowdley*

**China and Hong Kong**

The pooled prevalence among residents born in China and Hong Kong was comparable to the prevalence in China, whereas the prevalence in pregnant women (first and subsequent generations) is lower. Kowdley found no significant difference between in-country prevalence in China (including Taiwan and Hong Kong) and that derived from studies among migrants.

**Philippines**

The prevalence in attendees of a public health centre was lower than the estimated in-country prevalence. Conversely, Kowdley found that the in-country prevalence derived from migrants was higher than the estimate.

**Vietnam**

The pooled prevalence in resident migrants from Vietnam was very high (>10%) but lower than the in-country prevalence whereas Kowdley found no significant difference between in-country and migrant-derived estimates.

**Table 22. Comparison of HBsAg estimates from studies among South East Asian migrants with in-country prevalence from Kowdley**

| Country | Migrants | | | In-country | | Comparison |
|---|---|---|---|---|---|---|
| | Population | Prevalence | 95% CI | Prevalence | 95% CI | |
| China & Hong Kong | Residents | 9.4 | 7.9–11.1 | 10.2[#] | 9.4–11.2 | Comparable |
| China | Pregnant women | 4.3 | 1.2–10.7 | 10.2[#] | 9.4–11.2 | Lower |
| Philippines | PHC attendees | 3.3 | 1.1–7.6 | 7.4 | 6.3–8.4 | Lower |
| Vietnam | Residents | 10.7 | 6.3–16.9 | 12.5 | 11.5–13.5 | Lower |

[#] Kowdley >2000 estimate

### *First- and second-generation migrants*

Two prevalence estimates for FGM and SGM from China and Hong Kong were available [38,46]. The pooled data from these studies indicate that the prevalence in SGM (4.3%, 95% CI 1.9–8.3)) was lower than in FGM (9.4%, 95% CI 7.9–11.1). All SGM that were found to be HBsAg positive were born after the introduction of the hepatitis B antenatal screening programme. No HBsAg cases were found among 27 SGM Chinese school children in the UK.

## 3.4.7 Anti-HCV prevalence among migrants from South East Asia

Estimates among migrants from the Philippines attending a public health centre and adult resident migrants from Vietnam were available (Table 23). These were compared with the estimates reported in Gower (Table 24). No country- or regional-level information was retrieved on the anti-HCV prevalence among SGM.

**Table 23. Anti-HCV prevalence estimates from studies among South-East Asian migrants**

| Country of birth | Study country | Study period | Generation | Age groups | Population | N | Anti-HCV prevalence (%) | Ref. No |
|---|---|---|---|---|---|---|---|---|
| Philippines | Spain | 2001-2005 | FGM | All | PHC attendees | 156 | 0.6 | 32 |
| Vietnam | NL | 2011 | FGM | Adults | Residents | 126 | 1.6 | 29 |

### *Comparing anti-HCV prevalence estimates among migrants from South-East Asia with country of origin (in-country) estimates by Gower*

Both the estimates for migrants from Vietnam and the Philippines were comparable with the in-country estimates (Table 24).

**Table 24. Comparison of anti-HCV estimates from studies among South-East Asian migrants with in-country prevalence from Gower**

| Country | Migrants | | | In-country | | Comparison |
|---|---|---|---|---|---|---|
| | Population | Prevalence | 95% CI | Prevalence | Limits | |
| Vietnam | Residents | 1.6 | 0.2-5.6 | 1.0 | 0.8-1.8 | Comparable |
| Philippines | PHC attendees | 0.6 | 0.02-3.5 | 0.9 | 0.3-2.0 | Comparable |

## 3.4.8 HBsAg prevalence among migrants from eastern Europe

Estimates of HBsAg prevalence among various migrant populations from Albania, the former USSR, Kazakhstan, Kosovo, Romania, Russia and Poland were available (Table 25). These were compared with the in-country estimate derived from two studies (Table 26). No information was retrieved to compare FGM with SGM.

**Table 25. HBsAg prevalence estimates extracted/pooled from studies among eastern European migrants**

| Country of birth | Study country | Study period | Generation | Age groups | Population | N | HBsAg prevalence (%) | Comments | Ref. no |
|---|---|---|---|---|---|---|---|---|---|
| Albania | Greece | 2000-09 | FGM | All | Residents | 504 | 11.7 | 10-23 years | 51 |
| Albania | Italy | 1997 | FGM | Children | Refugees | 331 | 8.8 | | 52 |
| Albania | Italy | 1997 | FGM | Adults | Refugees | 405 | 15.6 | | 52 |
| Albania | Greece | N.R | FGM | Adults | Refugees | 76 | 22.4 | | 53 |
| Albania | Italy | 2005 | FGM | Adults | Refugees | 62 | 12.9 | >15 years | 40 |
| Albania | Italy | 2003-09 | FGM | All | Refugees | 32 | 53.1 | | 44 |
| **Albania** | **Various** | **1997-2009** | **FGM** | **Adults** | **Refugees** | **575** | **18.3 (15.2-21.7)** | **Pooled** | **40,44, 52,53** |
| Albania | Greece | 2009-11 | FGM | Adults | Pregnant women | 148 | 5.4 | Antenatal screening attendees | 52 |
| Albania | Greece | 2009-11 | FGM | Adults | Pregnant women | 417 | 7.4 | Antenatal screening non-attendees | 54 |
| **Albania** | **Greece** | **2009-2011** | **FGM** | **Adults** | **Pregnant women** | **565** | **6.9 (5.0–9.3)** | **Pooled** | **54** |
| Former USSR | NL | 2011 | FGM | Adults | Residents | 65 | 0 | | 29 |
| Former USSR | Greece | 1992-94 | FGM | Adults | Residents | 610 | 5.3 | | 55 |
| **Former USSR** | **Various** | **1992-94, 2001** | **FGM** | **Adults** | **Residents** | **675** | **4.7 (3.3–6.6)** | **Pooled** | **29,55** |
| Former USSR | Greece | 1992-94 | FGM | Children | Residents | 363 | 1.1 | | 55 |
| Kazakhstan | Germany | 2010-12 | FGM | Adults | GP attendees | 43 | 7.0 | | 34 |
| Kosovo | Italy | 1999 | FGM | Children | Refugees | 370 | 1.6 | 2-20 years | 56 |
| Kosovo | Italy | 1999 | FGM | Adults | Refugees | 156 | 5.8 | | 56 |
| Romania | Italy | 2003-09 | FGM | All | Refugees | 62 | 30.7 | | 44 |
| Russia | France | 2009-11 | FGM | Children | Adoptees | 12 | 0 | | 50 |
| Russia | Germany | 2010-12 | FGM | Adults | GP attendees | 29 | 10.3 | | 34 |
| Poland | Germany | 2010-12 | FGM | Adults | GP attendees | 14 | 0% | | 34 |

## 3.4.9 Comparing HBsAg prevalence estimates among migrants from eastern European countries with country of origin (in-country) estimates

**Albania**
The prevalence in pregnant women was lower than the in-country prevalence. In contrast, the prevalence in both residents and refugees from Albania was higher than the in-country estimate. Kowdley also compared the in-country estimate and the estimate derived from migrant studies, but found no significant difference.

**Former USSR**
The pooled prevalence in residents from the former USSR was comparable to the in-country estimate. Kowdley also found no significant difference when comparing the in-country with migrant-derived estimates.

**Kazakhstan**
The prevalence in migrants from Kazakhstan screened via general practitioners (GPs) in Germany was higher than the in-country estimate. There is no data available from Kowdley to compare migrant with in-country estimates.

**Kosovo**
The prevalence in adult refugees from Kosovo was higher than the regional estimate for eastern Europe whereas the prevalence among child refugees was lower.

**Poland**
The only available estimate is among 14 people screened in a doctor's practice in Germany where no CHB was found, while the in-country prevalence is 1.4%.

**Romania**
The prevalence among refugees from Romania in Italy was much higher than the in-country estimate, and the lower limit of the migrant estimate was higher than the upper limit of the in-country estimate. Kowdley found no significant difference when comparing in-country estimates to those derived from migrant studies.

**Russia**
The prevalence in FGM from Russia was higher than the in-country estimate, although there is some overlap in CIs, mainly due to the small sample size for the migrant-derived estimate. Kowdley found no significant difference between in-country and migrant prevalence.

**Table 26. Comparison of HBsAg estimates from studies among eastern European migrants with in-country prevalence from systematic reviews/meta analyses**

| Country | Migrants | | | In-country | | | Comparison | Remarks |
|---|---|---|---|---|---|---|---|---|
| | Population | Prevalence | 95% CI | Prevalence | 95% CI | Ref. | | |
| Albania | Pregnant women | 6.9 | 5.0–9.3 | 9.0 | 8.1–9.8 | 1 | Lower | |
| Albania | Residents | 11.7 | 9.0–14.8 | 9.0 | 8.1–9.8 | 1 | Higher | |
| Albania | Refugees | 18.3 | 15.2–21.7 | 9.0 | 8.1–9.8 | 1 | Higher | |
| Former USSR | Residents | 4.7 | 3.3–6.6 | 3.8 | 2.7–4.9 | 13 | Comparable | |
| Kosovo | Adult refugees | 5.8 | 2.7–10.7 | 3.3* | 2.3–4.2 | 13 | Higher | |
| Kosovo | Child refugees | 1.6 | 0.6–3.5 | 3.3* | 2.3–4.2 | 13 | Lower | |
| Poland | GP attendees | 0.0 | 0.0–23.2 | 1.4 | 1.2–1.7 | 13 | Lower | <25 screened |
| Romania | Refugees | 31 | 20–44 | 5.5# | 5.2–5.7 | 13 | Higher | |
| Russia | GP attendees | 10.3 | 2.2–27.4 | 2.9 | 2.2–3.6 | 13 | Higher | |
| Kazakhstan | GP attendees | 7.0 | 1.5–19.1 | 5.0 | 3.3–6.6 | 13 | Higher | |

*Regional estimate for eastern Europe
# Kowdley >2000 estimate

## 3.4.10 Anti-HCV prevalence among migrants from eastern Europe

Estimates among various migrant populations from Albania, the former USSR, Kazakhstan, Kosovo, Poland and Russia were available (Table 27). These were compared with the in-country estimate derived from systematic reviews/meta analyses [17, 22] (Table 28). No information was retrieved about the anti-HCV prevalence among FGM compared to SGM.

**Table 27. Anti-HCV prevalence estimates from studies among eastern European migrants**

| Country of birth | Study country | Study period | Generation | Age groups | Population | N | Anti-HCV prevalence (%) | Comments | Ref. No |
|---|---|---|---|---|---|---|---|---|---|
| Albania | Italy | 1997 | FGM | All | Refugees | 670 | 0.2 | 50% children | 52 |
| Albania | Greece | N.R | FGM | Adults | Refugees | 76 | 1.3 | | 53 |
| Former USSR | NL | 2011 | FGM | Adults | Residents | 65 | 3.1 | | 29 |
| Kosovo | Italy | 1999 | FGM | All | Refugees | 526 | 0.6 | 70% children | 52 |
| Poland | Germany | 2010-12 | FGM | Adults | GP attendees | 14 | 7.1 | | 34 |
| Russia | Germany | 2010-12 | FGM | Adults | GP attendees | 29 | 6.9 | | 34 |
| Kazakhstan | Germany | 2010-12 | FGM | Adults | GP attendees | 42 | 9.3 | | 34 |

### *Comparing anti-HCV prevalence estimates among eastern European migrants with country of origin (in-country) estimates*

**Albania**
The prevalence in Albanian refugees in Greece is lower than the in-country estimate [22].

**Former USSR**
The prevalence in resident adult migrants from the former USSR in the Netherlands is comparable to the in-country estimate.

**Poland, Russia, Kazakhstan**
Prevalence estimates for GP attendees among migrants from these countries were available from a study in Germany but the numbers per country are small (n=14–42) [34]. The prevalence found in migrants from both Poland and Russia was higher than the prevalence in the country of origin.

**Table 28. Comparison of anti-HCV estimates from studies among eastern European migrants with in-country prevalence from systematic reviews/meta analyses**

| Country | Migrants | | | In-country | | | Comparison | Remarks |
|---|---|---|---|---|---|---|---|---|
| | Population | Prevalence | 95% CI | Prevalence | 95% CI | Ref. | | |
| Albania | Refugees | 1.3 | 0.0–7.1 | 2.4* | 2.0–2.8 | 22 | Lower | |
| Former USSR | Residents | 3.1 | 0.4–10.7 | 3.3* | 1.6–4.5 | 17 | Comparable | |
| Poland | GP attendees | 7.1 | 0.2–33.9 | 1.1 | 0.6–1.9 | 34 | Higher | <25 screened |
| Russia | GP attendees | 6.9 | 0.9–22.8 | 4.1 | 1.2–5.6 | 17 | Higher | |
| Kazakhstan | GP attendees | 9.3 | 2.2–22 1 | 3.3 | 1.0–6.7 | 17 | higher | |

*Regional estimate from Global Burden of Disease eastern European region
#Regional estimate from Global Burden of Disease central European region

## 3.4.11 HBsAg prevalence among migrants from Latin America

Estimates were available for various migrant populations from Argentina, Bolivia, Brazil, Chile, Colombia, Dominican Republic, Dutch Antilles, Haiti, Ecuador, Paraguay, Peru and Suriname (Table 29). None of these 15 estimates could be pooled due to heterogeneity in the populations. Each estimate was compared to the in-country estimate from Kowdley (Table 30). No country-level data on SGM from Latin America was available, although it was possible to make some comparisons of FGM and SGM from the Caribbean.

**Table 29. HBsAg prevalence estimates from studies among Latin American migrants**

| Country of birth | Study country | Study period | Generation | Age groups | Population | N | HBsAg prevalence (%) | Ref. No |
|---|---|---|---|---|---|---|---|---|
| Argentina | Spain | 2001-2005 | FGM | Adults | PHC attendees | 18 | 5.6 | 32 |
| Bolivia | Spain | 2001-2005 | FGM | Adults | PHC attendees | 50 | 0 | 32 |
| Brazil | Italy | 2005-2006 | FGM | Adults | Refugees | 80 | 15.0 | 57 |
| Brazil | Spain | 2001-2005 | FGM | Adults | PHC attendees | 13 | 0 | 32 |
| Chile | Spain | 2001-2005 | FGM | Adults | PHC attendees | 13 | 0 | 32 |
| Colombia | Italy | 2005-2006 | FGM | Adults | Refugees | 23 | 0 | 57 |
| Colombia | Spain | 2001-2005 | FGM | Adults | PHC attendees | 55 | 0 | 32 |
| Colombia | France | 2009-2011 | FGM | Children | International adoptees | 18 | 0 | 50 |
| Dominican Republic | Spain | 2001-2005 | FGM | Adults | PHC attendees | 35 | 0 | 32 |
| Dutch Antilles | NL | 2004 | FGM | Adults | Residents | 38 | 2.6 | 30 |
| Ecuador | Spain | 2001-2005 | FGM | Adults | PHC attendees | 294 | 0 | 32 |
| Haiti | France | 2009-2011 | FGM | Children | International adoptees | 40 | 0 | 50 |
| Paraguay | Spain | 2001-2005 | FGM | Adults | PHC attendees | 17 | 0 | 32 |
| Peru | Italy | 2005-2006 | FGM | Adults | Refugees | 14 | 0 | 57 |
| Peru | Spain | 2001-2005 | FGM | Adults | PHC attendees | 29 | 0 | 32 |
| Suriname | NL | 2004 | FGM | Adults | Residents | 56 | 0 | 30 |

## *Comparing HBsAg prevalence estimates among Latin American migrants (in the EU/EEA) with country of origin (in-country) estimates*

**Bolivia**
The estimate for public health centre attendees from Bolivia was lower than the estimate derived by Kowdley, although there is some overlap in the CIs of the two estimates.

**Brazil**
The estimate among refugees from Brazil is considerably higher than the Kowdley in-country estimate and there is no overlap between the two CIs. There were no migrant-specific estimates from Kowdley with which to compare this finding.

**Colombia**
We compared the largest of the three estimates among migrants from Colombia with the in-country estimate. This estimate, among public health centre attendees, was lower than the Kowdley estimate. Kowdley however found no significant difference in prevalence between in-country and migrant-derived studies.

**Dominican Republic**
The prevalence among migrants from the Dominican Republic was much lower than the in-country estimate. Most of the studies used to calculate the prevalence in Kowdley were published before 1990, and no studies published after 1999 were available. As there is a large but statistically non-significant decline in prevalence from pre-1990 to 1990–1999 (12.5 vs. 5.2 p=0.13) and a significantly lower prevalence (4.8% vs. 12.6%) comparing the prevalence in migrants with in-country derived estimates, it is likely that the Kowdley in-country estimate is an over-estimate of the current prevalence in migrants from the Dominican Republic.

**Dutch Antilles and Suriname**
Two estimates, among residents, were retrieved for migrants from the Dutch Antilles and Suriname and compared to a regional estimate for the Caribbean region. The estimate from Suriname was lower than the regional estimate, whereas the estimate from the Dutch Antilles was comparable to the regional estimate. However, of the 36 studies included in the assessment that focused on the Caribbean region, 16 were published before 1990, and only eight were from 2000 onwards. Since analysis of pre-1999 compared with 2000 onwards shows a significant decline over time for all countries in the region where estimates are available, it is likely that the regional estimate (dominated by older studies reporting a higher prevalence) is an over-estimate.

**Ecuador**
No cases were detected among almost 300 public health centre attendees from Ecuador, corresponding to a lower prevalence than reported in Kowdley. There were no studies among migrants retrieved by the Kowdley study with which to compare this finding.

**Haiti**
No cases were detected among 40 international adoptees from Haiti living in France. This was lower than the estimated in-country prevalence in Kowdley. There was, however, no significant difference when comparing in-country with migrant-derived estimates, although there was a significant decline in prevalence over time. Since the estimate for migrants is among children (under 10 years), it is likely that the in-country estimate is an over-estimate.

**Peru**
The prevalence derived from estimates among migrants from Peru was lower than the estimate from Kowdley. There were no studies retrieved by Kowdley estimating the prevalence in migrants with which to compare this finding, although Kowdley did find a significant decline in prevalence over time (pre 1999 versus post 2000). Is therefore likely that the prevalence in migrants is comparable to the more recent estimates.

**Table 30. Comparison of HBsAg estimates from studies among Latin American migrants with in-country prevalence from Kowdley**

| Country | Migrants | | | In-country | | | Comparison |
|---|---|---|---|---|---|---|---|
| | Population | Prevalence | 95% CI | Population | Prevalence | 95% CI | |
| Bolivia | PHC attendees | 0 | 0–7.1 | Pooled | 3.3 | 0.1–6.0 | Lower |
| Brazil | Refugees | 15.0 | 8.0–27.7 | Pooled | 1.8 | 1.5–2 | Higher |
| Colombia | PHC attendees | 0 | 0–6.5 | Pooled | 1.2 | 0.3–2.1 | Lower |
| Dominican Republic | PHC attendees | 0 | 0–10.0 | Pooled | 10.8 | 5.9–15.5 | Lower |
| Dutch Antilles | Residents | 2.6 | 0.1–13.8 | Pooled | 4.5* | 2.5–6.6 | Comparable |
| Ecuador | PHC attendees | 0 | 0–1.3 | Pooled | 0.5 | 0.4–0.5 | Lower |
| Haiti | International adoptees | 0 | 0–8.8 | Pooled | 4.8 | 3.9–5.7 | Lower |
| Peru | PHC attendees | 0 | 0–11.9 | Pooled | 1.9 | 1.3–2.4 | Lower |
| Suriname | Residents | 0 | 0–6.4 | Pooled | 4.5* | 2.5–6.6 | Lower |

* Caribbean regional estimate

### *First- and second-generation migrants*

Just one study was retrieved reporting a prevalence estimate for FGM and SGM among Caribbean children aged 7-11 years [39]. As this study found no HBsAg cases of in either group, there is little we can infer about differences in prevalence between FGM and SGM.

## 3.4.12 Anti-HCV prevalence among migrants from Latin America

Estimates among various migrant populations from Argentina, Bolivia, Brazil, Chile, Colombia, Cuba, Dominican Republic, Dutch Antilles, Ecuador, Paraguay, Peru and Suriname were available (Table 31). Three estimates among migrants from Suriname were pooled into a resident (i.e. general population) estimate. These estimates were compared with in-country estimates (Table 32) retrieved from Gower, although for many countries there was no country-specific estimate available and the relevant GBD regional estimate was used. Country-level data comparing FGM with SGM was only available for migrants from Suriname – among residents, STI clinic attendees and pregnant women [35].

**Table 31. Anti-HCV prevalence estimates from studies among Latin American migrants**

| Study Country | Study period | Country of birth | Generation | Age groups | Population | N | Anti-HCV prevalence (%) | Comments | Ref. No |
|---|---|---|---|---|---|---|---|---|---|
| Spain | 2001-2005 | Argentina | FGM | Adults | PHC attendees | 52 | 0 | | 32 |
| Spain | 2001-2005 | Bolivia | FGM | Adults | PHC attendees | 57 | 0 | | 32 |
| Spain | 2001-2005 | Brazil | FGM | Adults | PHC attendees | 13 | 0 | | 32 |
| Spain | 2001-2005 | Chile | FGM | Adults | PHC attendees | 13 | 0 | | 32 |
| Spain | 2001-2005 | Colombia | FGM | Adults | PHC attendees | 66 | 1.5 | | 32 |
| Spain | 2001-2005 | Cuba | FGM | Adults | PHC attendees | 10 | 10.0 | | 32 |
| Spain | 2001-2005 | Dominican Republic | FGM | Adults | PHC attendees | 39 | 0 | | 32 |
| NL | 2004 | Dutch Antilles | FGM | Adults | Residents | 38 | 2.6 | | 30 |
| Spain | 2001-2005 | Ecuador | FGM | Adults | PHC attendees | 323 | 1.2 | | 32 |
| Spain | 2001-2005 | Paraguay | FGM | Adults | PHC attendees | 18 | 0 | | 32 |
| Spain | 2001-2005 | Peru | FGM | Adults | PHC attendees | 33 | 0 | | 32 |
| NL | 2004 | Suriname | FGM | Adults | Residents | 57 | 1.8 | | 30 |
| NL | 2011 | Suriname | FGM | Adults | Health survey respondents | 66 | 3.0 | | 35 |
| NL | 2011 | Suriname | FGM | Adults | Residents | 102 | 1.7 | | 35 |
| NL | 2004; 2011 | Suriname | FGM | Adults | Residents | 225 | 2.2 (0.7- 5.1) | Pooled | 30,35 |
| NL | 2011 | Suriname | SGM | Adults | Residents | 24 | 0 | | 35 |
| NL | 2011 | Suriname | FGM | Adults | STI clinic attendees | 177 | 0 | | 35 |
| NL | 2011 | Suriname | SGM | Adults | STI clinic attendees | 355 | 0 | | 35 |
| NL | 2011 | Suriname | FGM | Adults | Pregnant women | 281 | 0 | | 35 |
| NL | 2011 | Suriname | SGM | Adults | Pregnant women | 131 | 0 | | 35 |

### *Comparing anti-HCV prevalence estimates among Latin American migrants (in the EU/EEA) with country of origin (in-country) estimates*

**Argentina**

No cases were found among the 52 public health clinic attendees from Argentina in Spain. This prevalence was lower than the 1.5% in-country estimate.

**Bolivia**

No cases were found among the 57 migrants from Bolivia. This was lower than the only available estimate of 0.9% in the GBD region of Andean Latin America.

**Colombia**

The estimate of 1.5% anti-HCV prevalence among migrants from Colombia was higher than the Central Latin America GBD region estimate (the only figure available for comparison from Gower).

**Dominican Republic**

No cases of anti-HCV were detected among 39 public health centre attendees from the Dominican Republic in Spain and this figure was lower than the Caribbean GBD region estimate of 0.8%.

**Dutch Antilles**
A higher prevalence was found among resident migrants from the Dutch Antilles than the prevalence for the GBD region of the Caribbean.

**Ecuador**
A comparable prevalence was found among a large (>300) sample of migrants from Ecuador to that for the Andean Latin America GBD region.

**Peru**
No cases of anti-HCV were detected among 33 migrants to Spain from Peru, a lower prevalence than the reported in-country prevalence.

**Suriname**
Three estimates were available for migrants from Suriname – a pooled estimate for the general population, an estimate among pregnant women and an estimate for STI clinic attendees. Cases of anti-HCV were only found among the general population; the 2.4% prevalence is higher than the Caribbean GBD regional estimate, whereas the other two estimates among migrants were lower. Being older seems to be significant as the age range is wider and the median age is higher in the general population than in the other two estimates (49 years versus 31 years in pregnant women and 25 years in STI clinic attendees).

**Table 32. Comparison of anti-HCV estimates from studies among Latin American migrants with in-country prevalence from Gower**

| Country | Migrants | | | In-country | | Comparison |
|---|---|---|---|---|---|---|
| | Population | Prevalence | 95% CI | Prevalence | Limits | |
| Argentina | PHC attendees | 0 | 0–6.9 | 1.5 | 0.5–2.5 | Lower |
| Bolivia | PHC attendees | 0 | 0–6.3 | 0.9* | 0.4–1.3 | Lower |
| Colombia | PHC attendees | 1.5 | 0–8.2 | 1.0# | 0.8–1.4 | Higher |
| Dominican Republic | PHC attendees | 0 | 0–9.0 | 0.8$ | 0.2–1.3 | Lower |
| Dutch Antilles | Residents | 2.6 | 0.1–13.8 | 0.8$ | 0.2–1.3 | Higher |
| Ecuador | PHC attendees | 1.2 | 0.3–3.1 | 0.9* | 0.4–1.3 | Comparable |
| Peru | PHC attendees | 0 | 0–10.6 | 1.2 | 0.4–1.6 | Lower |
| Suriname | Residents | 2.4 | 0.5–7.0 | 0.8$ | 0.2–1.3 | Higher |
| Suriname | Pregnant women | 0 | 0–1.3 | 0.8$ | 0.2–1.3 | Lower |
| Suriname | STI clinic attendees | 0 | 0–2.1 | 0.8$ | 0.2–1.3 | Lower |

* Andean Latin America GBD regional estimate
# Central Latin America GBD regional estimate
$ Caribbean GBD regional estimate

### *First- and second-generation migrants*
Data to compare the prevalence in FGM to SGM were only available for migrants from Suriname [35]. In the general population, the prevalence among FGM was 2.4% compared to 0% among SGM, although the sample sizes did vary considerably (123 FGM versus 24 SGM), reducing the potential to detect cases in a low prevalence population. There was no difference in the prevalence among FGM or SGM pregnant women and STI clinic attendees and no cases were found in either population.

## 3.4.13 HBsAg prevalence among migrants from Africa

Estimates were available among diverse migrant populations from Africa including the general population, refugees, health service users and adoptees. Countries of origin included Burkina Faso, Cape Verde, Equatorial Guinea, Eritrea, Ethiopia, Ghana, Ivory Coast, Liberia, Mali, Nigeria, Senegal, Sierra Leone, Somalia and Sudan (see Table 33). Three pooled estimates were possible – among refugees from Eritrea, Liberia and Somalia. Estimates from larger studies were compared with in-country and migrant-derived estimates from Kowdley, although for some countries only a regional estimate was available for comparison purposes (Table 34).

**Table 33. HBsAg prevalence estimates extracted/pooled from studies among migrants from Africa**

| Study Country | Study period | Country of birth/ethnicity | Generation | Age groups | Population | N | HBsAg prevalence (%) | Comments | Ref. No |
|---|---|---|---|---|---|---|---|---|---|
| Italy | 2009 | Burkina Faso | FGM | All | Refugees | 19 | 15.8 | 7–52 years | 36 |
| NL | 2004 | Cape Verde | FGM | Adults | Residents | 13 | 0 | | 30 |
| Spain | 2002-08 | Equatorial Guinea | FGM | N.R | Tropical Medicine Unit patients | 1220 | 7.9 | | 24 |
| Italy | 2009 | Eritrea | FGM | All | Refugees | 30 | 3.3 | 7–52 years | 36 |
| Italy | 2005 | Eritrea | FGM | Adults | Refugees | 197 | 5.1 | >15 years | 40 |
| Italy | 2003-09 | Eritrea | FGM | All | Refugees | 665 | 6.3 | | 44 |
| **Italy** | **2003-09** | **Eritrea** | **FGM** | **All** | **Refugees** | **892** | **5.9 (5.4 – 7.7)** | **Pooled** | **36,40, 44** |
| France | 2009-11 | Ethiopia | FGM | Children | International adoptees | 40 | 0 | | 50 |
| Italy | 2005 | Ethiopia | FGM | Adults | Refugees | 38 | 13.2 | >15 years | 40 |
| Spain | 2001-04 | Ghana | FGM | All | International health clinic attendees | 92 | 16.3 | | 24 |
| Italy | 2009 | Ghana | FGM | All | Refugees | 30 | 26.7 | 7–52 years | 36 |
| Italy | 2009 | Ivory Coast | FGM | All | Refugees | 17 | 11.8 | 7–52 years | 36 |
| Italy | 2005 | Liberia | FGM | Adults | Refugees | 83 | 18.1 | | 40 |
| Italy | 2003-09 | Liberia | FGM | All | Refugees | 114 | 26.3 | | 44 |
| **Italy** | **2003-09** | **Liberia** | **FGM** | **All** | **Refugees** | **197** | **22.8 (17.2 – 29.4)** | **Pooled** | **40,44** |
| Italy | 2009 | Mali | FGM | All | Refugees | 15 | 13.3 | 7–52 years | 36 |
| Italy | 2009 | Nigeria | FGM | All | Refugees | 165 | 8.5 | 7–52 years | 36 |
| Spain | 2001-04 | Senegal | FGM | All | International health clinic attendees | 81 | 22.2 | | 24 |
| Spain | 2001-04 | Sierra Leone | FGM | All | International health clinic attendees | 133 | 15.8 | | 24 |
| Italy | 2009 | Somalia | FGM | All | Refugees | 187 | 15.8 | 7–52 years | 36 |
| Malta | 2010-11 | Somalia | FGM | Adults | Refugees | 416 | 6.3 | | 58 |
| Italy | 2003-09 | Somalia | FGM | All | Refugees | 568 | 4.2 | | 44 |
| **Various** | **2003-11** | **Somalia** | **FGM** | **All** | **Refugees** | **1171** | **5.4 (3.4 – 5.9)** | **Pooled** | **36,44 58** |
| UK | 2000 | Somalia | FGM | All | Residents | 317 | 7.3 | | 59 |
| UK | 2000 | Somalia | FGM/SGM | Women | Residents | 112 | 6.3 | 15–44 years | 59 |
| UK | 2000 | Somalia | FGM/SGM | Children | Residents | 194 | 3.6 | | 59 |
| UK | 2000 | Somalia | FGM/SGM | Adults | Residents | 245 | 7.6 | | 59 |
| UK | 2000 | Somalia | SGM | All | Residents | 122 | 1.6 | | 59 |
| Italy | 2005 | Sudan | FGM | Adults | Refugees | 53 | 22.7 | >15 years | 40 |

## *Comparing HBsAg prevalence estimates among migrants from Africa (in the EU/EEA) with country of origin (in-country) estimates*

**Equatorial Guinea**

The prevalence among Tropical Medicine Unit patients from Equatorial Guinea was lower than the regional prevalence for Middle Africa in Kowdley. However, as the Middle Africa estimate only includes in-country estimates from Cameroon published before 2000, the comparability of this estimate with one specifically for migrants from Equatorial Guinea is questionable.

**Eritrea**

The prevalence among refugees from Eritrea was much lower than the Kowdley estimate, although the latter estimate was based on just two studies of 171 subjects and published before 1999. The estimate among refugees was derived by pooling three studies from Italy, comprising nearly 900 subjects and carried out between 2003 and 2009. The estimate among refugees could indeed be a more accurate reflection of the current prevalence of CHB in Eritrea.

**Ethiopia**
Both samples from Ethiopia were small (n=38–40) and produced heterogeneous estimates; no cases of CHB were found among 40 international adoptees, whereas a prevalence of 13.2% was found among refugees. The latter estimate was much higher than the Kowdley estimate. Kowdley also found that the prevalence among migrants was higher than in-country prevalence estimates.

**Ghana**
The prevalence among refugees from Ghana was more than 10 percentage points higher than the prevalence found among international health clinic attendees. The former was higher than the in-country estimate whereas the health service estimate is comparable to the in-country prevalence. Kowdley found no significant difference when comparing prevalence in migrants to in-county derived estimates.

**Liberia**
The estimate derived from Liberian refugees was higher than the Kowdley estimate. Kowdley however, found no significant difference when comparing migrant-derived estimates with in-country estimates.

**Nigeria**
The prevalence among refugees from Nigeria was lower than the in-country whereas Kowdley found no studies in emigrants to compare with the in-country estimate.

**Senegal**
A higher prevalence among health service users was found among migrants from Senegal compared to the in-country estimate. Kowdley also compared the prevalence in migrants (which, incidentally, is the same estimate as listed here [24]) to the pooled in-country prevalence and also found it to be significantly higher (22.2% versus 12.3% p=0.04).

**Sierra Leone**
The estimate among health service users was comparable to that found in Sierra Leone; Kowdley also found no significant difference when comparing the migrant-derived estimate with the in-country estimate.

**Somalia**
Two estimates were available for migrants from Somalia – a pooled prevalence estimate among refugees and a single study among adult residents. Interestingly, the prevalence was higher among adult residents than among refugees (7.3% compared to 5.3%) although the CIs of the two estimates do overlap. Both estimates are lower than the in-country prevalence. Kowdley also found a significantly higher in-country prevalence than among migrants (7.3% versus 14.5%).

**Sudan**
One estimate, among refugees, was available for migrants from Sudan, and although this estimate is ten percentage points higher than the prevalence reported by Kowdley, it is comparable. Kowdley found no studies among migrants from Sudan.

**Table 34. Comparison of HBsAg estimates from studies among migrants from Africa to in-country prevalence from Kowdley**

| Country | Migrants | | | In-country | | Comparison |
|---|---|---|---|---|---|---|
| | Population | Prevalence | 95% CI | Prevalence | 95% CI | |
| Equatorial Guinea | Tropical Medicine Unit patients | 7.9 | 6.4–9.5 | 11.4* | 8.5–14.4 | Lower |
| Eritrea | Refugees | 5.9 | 5.4–7.7 | 15.5 | 2.0–29.0 | Lower |
| Ethiopia | International adoptees | 0 | 0–8.8 | 5.5# | 2.6–8.4 | Lower |
| Ethiopia | Refugees | 13.2 | 4.4–18.1 | 5.5# | 2.6–8.4 | Higher |
| Ghana | International health clinic attendees | 16.3 | 9.4–25.5 | 13.4 | 10.5–16.4 | Comparable |
| Ghana | Refugees | 26.7 | 12.3–45.9 | 13.4 | 10.5–16.4 | Higher |
| Liberia | Refugees | 22.8 | 17.2–29.4 | 16.5 | 11.5–21.5 | Higher |
| Nigeria | Refugees | 8.5 | 4.7–18.8 | 13.3 | 11.6–15.1 | Lower |
| Senegal | International health clinic attendees | 22.2 | 13.7–32.8 | 12.7 | 10.1–15.2 | Higher |
| Sierra Leone | International health clinic attendees | 15.8 | 10.1–23.1 | 11.9 | 6.5–17.3 | Comparable |
| Somalia | Refugees | 5.4 | 3.4–5.9 | 12.4 | 8.9–15.9 | Lower |
| Somalia | Residents | 7.3 | 4.6–10.7 | 12.4 | 8.9–15.9 | Lower |
| Sudan | Refugees | 22.6 | 12.3–36.2 | 18.6 | 14.2–23.0 | Comparable |

*Regional estimate for Middle Africa
# Studies >2000 due to significant decrease in prevalence over time

### *First- and second-generation migrants*

Comparison of a general population estimate for FGM and SGM migrants from Somalia was possible [59]. A higher prevalence was found among FGM than SGM (7.3% (CI: 4.7–10.7) versus 1.6% (CI: 0.2–5.8)).

## 3.4.14 Anti-HCV prevalence among migrants from Africa

Estimates were available from two groups of migrants (international/Tropical Medicine Unit patients and refugees) from Burkina Faso, Cameroon, Cape Verde, Equatorial Guinea, Eritrea, Ghana, Ivory Coast, Mali, Nigeria and Somalia (Table 35). Pooled estimates were available for two groups – health service users from Equatorial Guinea and refugees from Somalia. Estimates were compared with in-country estimates from Gower (Table 36), although only the GBD region estimate was available for Equatorial Guinea, Eritrea and Ghana. No data on SGM were available.

**Table 35. Anti-HCV prevalence estimates extracted/pooled from studies among African migrants**

| Study country | Study period | Country of birth | Generation | Age groups | Population | N | Anti-HCV prevalence (%) | Comments | Ref. No |
|---|---|---|---|---|---|---|---|---|---|
| Italy | 2009 | Burkina Faso | FGM | All | Refugees | 19 | 10.5 | | 36 |
| Spain | 2001-04 | Cameroon | FGM | All | Residents | 97 | 4.1 | | 24 |
| Netherlands | 2004 | Cape Verde | FGM | Adults | Residents | 13 | 0 | | 30 |
| Spain | 2001-04 | Equatorial Guinea | FGM | All | Health service users | 307 | 9.8 | | 24 |
| Spain | 2002-08 | Equatorial Guinea | FGM | N.R | Tropical Medicine Unit patients | 1220 | 19.2 | | 60 |
| **Spain** | **2001-2008** | **Equatorial Guinea** | **FGM** | **N.R** | **Patients** | **1527** | **17. (15.4–19.3)** | **Pooled** | **24, 60** |
| Italy | 2009 | Eritrea | FGM | All | Refugees | 30 | 3.3 | | 36 |
| Italy | 2009 | Ghana | FGM | All | Refugees | 30 | 3.3 | | 36 |
| Italy | 2009 | Ivory Coast | FGM | All | Refugees | 17 | 5.9 | | 36 |
| Italy | 2009 | Mali | FGM | All | Refugees | 15 | 26.7 | | 36 |
| Italy | 2009 | Nigeria | FGM | All | Refugees | 165 | 6.1 | | 36 |
| Italy | 2009 | Somalia | FGM | All | Refugees | 187 | 0 | | 36 |
| Malta | 2010-11 | Somalia | FGM | Adults | Refugees | 416 | 0.2 | | 58 |
| **Various** | **2009-11** | **Somalia** | **FGM** | **Adults** | **Refugees** | **603** | **0.2 (0–0.9)** | **Pooled** | **36, 58** |

## 3.4.15 Comparing anti-HCV prevalence estimates among migrants from Africa (in the EU/EEA) with country of origin (in-country) estimates

**Equatorial Guinea**

The prevalence among Tropical Medicine Unit patients from Equatorial Guinea was higher than the prevalence for the Central Sub-Saharan Africa GBD region. Interestingly, the only data source for Equatorial Guinea in the Gower study cites this same study. The GBD regional estimate is based on studies in the Democratic Republic of Congo (DRC) and Gabon that report higher upper limits than the regional upper range of 9.2% (13.7% for the DRC and 20.7R in Gabon). These upper limits are closer to the migrant-derived estimate for Equatorial Guinea, suggesting the GBD regional estimate is an under-estimation for Equatorial Guinea.

**Eritrea**

The prevalence among refugees from Eritrea was higher than the Eastern Sub-Saharan Africa GBD regional estimate, although the sample among refugees is small (n=30).

**Ghana**

The prevalence among refugees from Ghana was comparable with the West Sub-Saharan GBD regional estimate.

**Nigeria**

The prevalence among refugees from Nigeria was comparable with the in-country estimate, which interestingly is a meta-analysed estimate of three studies among healthy patients, antenatal attendees and accident and emergency attendees.

**Somalia**

Two studies were pooled into an estimate for refugees from Somalia and this estimate is lower than the Eastern Sub-Saharan Africa GBD regional estimate. There was also little overlap in the ranges and the Gower estimate came outside the upper limit of the prevalence estimate derived from studies among refugees.

**Table 36. Comparison of anti-HCV estimates from studies among African migrants with in-country prevalence from Gower**

| Country | Migrants | | | In-country | | | Comparison |
|---|---|---|---|---|---|---|---|
| | Population | Prevalence | 95% CI | Population | Prevalence | Limits | |
| Equatorial Guinea | International/Tropical Medicine Unit patients | 17.3 | 15.4–19.3 | Pooled | 4.2* | 2.4–9.2 | Higher |
| Eritrea | Refugees | 3.3 | 0.1–17.2 | Pooled | 1.0# | 0.6–3.1 | Higher |
| Ghana | Refugees | 3.3 | 0.1–17.2 | Pooled | 5.3$ | 2.9–9.1 | Comparable |
| Nigeria | Refugees | 6.1 | 2.9–10.9 | Pooled | 8.4 | 3.9–12.8 | Comparable |
| Somalia | Refugees | 0.2 | 0–0.9 | Pooled | 1.0† | 0.6–3.1 | Lower |

* Central Sub-Saharan Africa GBD regional estimate
# Eastern Sub-Saharan African GBD regional estimate
$ West Sub-Saharan Africa GBD regional estimate

## 3.4.16 Comparing HBsAg prevalence from migrant studies (in the EU/EEA) with country of origin (in-country) estimates for different types of population

We were able to compare 61 estimates of HBsAg prevalence among migrant populations (residing in the EU/EEA) with country of origin (or regional) estimates. We found that 34 estimates were lower, that 13 were higher and that 13 were comparable to the HBsAg prevalence in the migrants' country of origin. We found considerable heterogeneity in the migrant populations from which these estimates were obtained; 19 were studies among health service users/patients (including public health or tropical medicine clinics, GPs, STI clinics and clinics in general); 17 were studies among refugee populations; 16 were among the general population (i.e. residents); three were studies of school-age children; three were among pregnant women; and two studies were among international adoptees.

### *Patients*

Of the 19 studies among patients, 14 were from public health clinic, tropical medicine unit or international health clinic attendees, three were from GPs, and two were pooled estimates among outpatients. Among the 14 studies from clinic attendees, five were from Latin America, four were from Africa, three from South Asia, and one each from the EMR and South East Asia. Of these 14 estimates, five were comparable with than the in-country estimates, one was higher (among migrants from Senegal) and eight were lower. Among the three studies from GPs, all of which were from eastern Europe, two were higher (among migrants from Kazakhstan and Russia) and one was lower (among migrants from Poland). The two pooled estimates are both from the EMR. The pooled estimate among out-patients from North Africa/Middle East was lower, whereas the other estimate, from Turkish migrants, was comparable with the in-country estimate.

### *Refugees*

Of the 17 studies among refugees, seven studies related to refugees from African countries of origin, four from eastern European countries of origin, three from the EMR, two from South Asian and one from Latin American countries of origin. While six were lower and two were comparable with the in-country estimates, nine were higher than the estimated prevalence in the refugees' country of origin.

### *General population*

Among the 16 studies in the general migrant population, five were among migrants from the EMR, four were from South Asia, two each were from eastern European countries, Latin America and South East Asia, and one was for migrants from Africa. Two of these (migrants from Suriname and the Dutch Antilles) could only be compared with a regional estimate but among the remaining 14 general population estimates, nine were lower than the in-country estimate. Although lower than the in-country estimate, four of these migrant groups reported >2% prevalence (among migrants from Vietnam, Pakistan (1.9%), Afghanistan and Somalia). Four estimates were comparable with the in-country/regional estimate, three of which (among migrants from Turkey, the former USSR and China) still had an intermediate (3.7% in Turkey; 4.7% in the former USSR) or high (9.4% in China) prevalence. One estimate, among migrants from Albania, was higher than the reported in-country prevalence.

# 1. Background and objectives

## 1.1. Background

In the WHO European Region an estimated 13 million people have a chronic hepatitis B virus (HBV) infection, and another 15 million are chronically infected with hepatitis C virus (HCV) [1]. Childhood hepatitis B vaccination programmes and stringent screening of blood products as well as improved hospital hygiene and harm reduction programmes have led to a significant reduction in transmission in many European countries. While the number of acute HBV cases per 100 000 population is declining in EU/EEA countries, the number of chronic infections more than doubled between 2006 and 2012 [2]. As chronic hepatitis B is largely asymptomatic this increase probably reflects increased testing practices. Many chronic hepatitis B (CHB) infections in Europe are now diagnosed in people born in countries with intermediate and high hepatitis B/C endemicity. The ECDC surveillance report 'Hepatitis B and C surveillance in Europe 2012' showed that over 80% of chronic hepatitis B cases were classified as 'imported' in countries that had this information available [2]. The classification of cases as imported indicates that the infection was acquired abroad and as country of birth is usually not available this can be used as proxy for foreign-born cases. However, less than one third of EU/EEA countries provided data on the proportion 'imported', showing the limitation of the routine surveillance data in providing clear information around the extent of chronic viral hepatitis in migrants. In 2013, over 70 million migrants were living in the EU, a large proportion of whom come from countries where the CHB and CHC prevalence is over 2% [3].

Both diseases usually have an insidious onset and can remain undetected for many years. Hepatitis B and C are major causes of liver cirrhosis and hepatocellular carcinoma (HCC). As a result of advances in the treatment of chronic hepatitis B and C, remission of disease can be achieved in up to 90% of chronic hepatitis B patients [4,5] New antiviral drugs for hepatitis C show cure rates of over 90% [6]. Treatment of eligible patients can prevent hepatitis-related burden of disease and death.

The main bottleneck in providing treatment to eligible patients is case detection. It is estimated that up to 75% of patients are not aware that they are infected, on account of the mostly asymptomatic condition, and hence they do not seek treatment [7]. Case detection could be improved by targeted screening of risk groups, of which migrants are an important one. In order to inform policy making and healthcare planning, it is crucial to have a good understanding of the burden of hepatitis B and C infection among migrants. This will enable policy makers to prepare for targeted screening programmes and other prevention measures.

## 1.2 Objective

The objective of this project is to perform an epidemiological assessment of hepatitis B and C burden among foreign-born migrants (hereafter referred to as migrants) to countries within the 31 European Union/European Economic Area (EU/EEA) countries; to identify the migrant populations (i.e. those born outside the country of residence) that contribute substantially to the overall burden of chronic hepatitis B and C in the 31 EU/EEA countries. The work was divided in two parts. The first part deals with the quantitative estimation of the number of chronic hepatitis B and C virus infections among migrants in EU/EEA countries and the relative contribution of hepatitis among migrants to the overall burden of hepatitis B and C. The second part looks at differences in prevalence among migrant populations in EU/EEA countries, prevalence estimates in the countries of origin, and differences in prevalence between first and second-generation migrants.

### Definition of chronic viral hepatitis

| | |
|---|---|
| CHB | Chronic hepatitis B infection, referring to hepatitis B surface antigen (HBsAg) positivity |
| CHC | Chronic hepatitis C infection, referring to viraemic infection - i.e. HCV-RNA positivity - calculated as a proportion of 70% of anti-HCV positive cases which progress to chronicity (based on average viraemic prevalence estimated in a recent worldwide review study) [17]. |

### Definition of migrants

| | |
|---|---|
| FB | Foreign-born, referring to those born outside the country of residence |
| FGM | First-generation migrants, people who are foreign-born |
| SGM | Second-generation migrants, people considered migrants based on their ethnicity (e.g. self-reported or where one/both parents are foreign-born), but who themselves are born in the country of residence. |

### Definition of chronic viral hepatitis endemicity levels

| | HBsAg | anti-HVC |
|---|---|---|
| Low | <2% | <1% |
| Intermediate | <2–7% | n.a. |
| High | >=8% | >=1% |

sample (migrants from Kosovo). Ten of the samples were obtained by screening attendees of international/public health or tropical medicine clinics. Two of these samples (migrants from Equatorial Guinea and Colombia) had a higher prevalence than the regional prevalence estimate, three were comparable and five were lower than the in-country/regional prevalence. Three samples were among health service users (pooled from outpatient estimates or unspecified clinics), two of which were higher than in-country prevalence (migrants from Morocco and Pakistan), whereas one (migrants from Turkey) was comparable with the in-country estimate. The sample from STI clinic attendees was lower than the reported in-region estimate (among migrants from Suriname).

### *General population*

Although two of the 13 samples for the general population (among migrants from the former Dutch Antilles and Suriname) were higher than comparator prevalence, this was actually a region-only estimate for the Caribbean GBD region, and is itself a defined prevalence based on data from Latin America and Oceania. The data for migrants sampled from the general population suggest that it is not a reliable estimate for countries in this region and is perhaps an underestimate. One other sample, among migrants from the former USSR, could not be compared with a specific in-country anti-HCV prevalence. Of the ten other samples, seven were comparable with the in-country estimate (and within the uncertainty range or CI). Three of these seven suggest high prevalence among migrants, including people from Vietnam, Afghanistan and Morocco. Three general population estimates for migrant groups were lower than the in-country prevalence and, interestingly enough, this included Egypt and Pakistan. A high in-country prevalence is reported for Egypt (15.7%) and Pakistan (5.5%), whereas the estimates retrieved from our search are much lower (2.4% for Egypt and 2.8% for Pakistan). A lower prevalence was found among migrants from Turkey than the in-country estimate, although there is some overlap in the two CIs.

### *Refugees*

Of the nine samples from refugees, three were comparable to, five were lower than and one was higher than the in-country (or regional) estimate.

### *Pregnant women*

All three samples among pregnant women were lower than the in-country prevalence estimates, in fact cases were only found among migrants from Turkey.

### *Migrant study estimates that are lower than in-country estimates*

In 11 of the samples where the migrant-derived estimate was lower than the reported in-country anti-HCV prevalence, no cases of anti-HCV were detected. This is comparable with in-country estimates of between 0.8–1.5% in these 11 countries of origin.

### *Countries of origin with more than one population sample estimate*

For some migrants more than one population sub-group was available – specifically for Afghanistan, Bangladesh, India, Morocco, Pakistan, Suriname and Turkey. The estimates were only comparable for migrants from Suriname, and in this case both were lower than the regional prevalence estimate available from Gower. In the other six countries, there was heterogeneity in the different sub-population estimates, and thus in the comparison with the in-country ranges. Among three populations of migrants from Morocco; there were no cases among pregnant women although the prevalence rose to 0.9% in the general population and to 3.3% among health service users.

# 4. Discussion

The incidence of new HBV and HCV infections is decreasing in many EU countries. However due to the slow disease progression and ageing of the population, the number of cases with hepatitis C-related advanced liver disease, including decompensated cirrhosis and hepatocellular carcinoma (HCC), is expected to rise in many European countries [61,62]. Early identification, with linkage to care and antiviral treatment can reduce the burden of viral-hepatitis-related advanced liver disease, but in most EU/EEA countries a majority of asymptomatic cases remain undiagnosed and it is likely that this number is higher in the eastern European countries. According to the EU surveillance report of 2012, the highest number of acute HBV cases is reported from eastern European countries which, however, stands in contrast to the lowest number of CHB and CHC cases being reported from this region. This is also contrary to results of prevalence surveys. Conversely, the highest number of CHB and CHC cases is reported from northern and western European countries. Differences in the frequency of organised screening practices are the most likely explanation for this observed difference [2]. Recent modelling studies show that the maximum reduction of CHC-associated morbidity and mortality can be achieved when increasing both the diagnosis and treatment rate using high efficacy anti-viral drugs, and suggest that a treatment rate of 10% with newer anti-viral drugs and a 3–5 fold increase in diagnosis rate could reduce HCV infections by more than 90% by the year 2030 [63,64].

Screening increases the diagnosis rate and, when followed by effective linkage to care and antiviral treatment, could result in a decrease in the morbidity and mortality of advanced liver disease. To optimise the cost-effectiveness of screening, the groups most at risk of chronic viral hepatitis infection (i.e. those with the highest prevalence) should be targeted. Migrants from intermediate and high-endemicity countries (=>2% for HBsAg and =>1% for anti-HCV) (whether from within or outside the EU/EEA) are recognised as one of the key populations for hepatitis B and C prevention and care in many countries within the region. Enhanced screening among this group also has the potential to decrease in-equalities and disparities in health among the migrant and host-country populations.

Although migrants have a high burden of chronic viral hepatitis infections and are therefore an important group to consider for testing and care, the risk of onward transmission of infection seems low. According to the EU surveillance report of 2012, there was a decline in the number of acute Hepatitis B cases during the period 2006–2012 which is most likely a reflection of the successful implementation of HBV vaccination programmes. On the other hand, there was a steady rise in the number of chronic hepatitis B cases reported between 2006 and 2012. Given the steady to slightly-increasing population of foreign-born migrants in the EU/EEA, a high risk of migrant-associated transmission would likely have resulted in an increasing number of acute cases being reported than has been the case.

Routine surveillance data do not give enough information to provide insight into the prevalence of chronic infection among migrants. Furthermore, hepatitis B and C cases among vulnerable groups, particularly migrants, are sometimes under-detected or under-reported in routine surveillance due to the difficulties that some migrants have in accessing health services as a result of legal barriers, stigma and cultural/language differences [65]. To estimate the burden of chronic hepatitis B and C we therefore used existing data from prevalence studies rather than notification data.

## 4.1 Migrant populations in the EU/EEA

Our calculations suggest that 53% of the total foreign-born population in the EU/EEA is born in HBV-endemic countries (Table 3), and 79% of the foreign-born adult population is born in HCV-endemic countries (Table 8). An explanation for this difference may be the lower cut-off value for HCV endemicity (anti-HCV prevalence of 1% and above) compared to HBV endemicity (HBsAg prevalence of 2% and above).

Countries where the proportion of migrants from HBV-endemic countries exceeds 10% of the total population are Cyprus, Estonia, Latvia and Croatia. Countries where the proportion of migrants from HCV endemic countries exceeds 15% of the total population are Liechtenstein, Luxembourg, Cyprus, Estonia and Latvia. In the former Soviet Baltic states of Estonia and Latvia, a large proportion of first-generation migrants originate from Russia, Belarus, Lithuania and Kazakhstan, all of which are intermediate/high hepatitis B and C endemicity countries. Around 40% of first-generation migrants in Cyprus originate from just five intermediate/high hepatitis B and C endemicity countries (Romania, Bulgaria, Greece, Georgia and Russia). More than 85% of first-generation migrants in Croatia originate from one of the former Yugoslav Republics of Bosnia & Herzegovina, Serbia, Kosovo, Slovenia, Macedonia and Montenegro, all of which are intermediate/high hepatitis B and C endemicity countries, explaining the high representation in these countries. Both Liechtenstein and Luxembourg have an exceptionally high proportion of migrants.

The estimated prevalence of HBsAg among migrants from intermediate and high endemic countries ranges from 3% in Estonia, Latvia, Lithuania and Poland, to 9% in Portugal (Table 5). This reflects the composition of migrant population countries of origin. In the four eastern European countries, migrants from other countries in eastern Europe form a large part of the migrant population, and the HBsAg prevalence in these countries is often

intermediate (between 2–4%). In Portugal however, migrants from Angola and Mozambique are among the top five migrant groups in terms of population size and the estimated HBsAg prevalence in these countries is around 10%, which probably explains the difference in the average HBsAg prevalence among foreign-born migrants in the EU/EEA countries.

The estimated prevalence of viraemic HCV infection among migrants from high endemic countries ranges from 0.9% in Croatia, to 2.4% in Latvia (Table 9). This reflects the composition of the migrant populations' countries of origin. As mentioned above, in Croatia 85% of migrants originate from one of the former Yugoslav Republics where the viraemic prevalence is 0.9%. In contrast, more than half of all the migrants in Latvia were born in Russia, which has an estimated viraemic prevalence of 2.9%. This probably explains the diversity in the prevalence ranges among foreign-born migrants in the EU/EEA countries.

## 4.2 The burden of chronic viral hepatitis B and C among migrants

When analysing cumulatively the number of chronic HBV infected people among the different migrant populations from intermediate and high-endemicity countries to the EU, migrants from Romania, China, Turkey, Albania and Russia are estimated to represent over 50 000 CHB cases each. Migrants from Vietnam, Nigeria, Kazakhstan, Algeria and India (each representing between 36 000 and 46 000 cases) also carry a relatively high burden and contribute substantially to the overall CHB burden in the EU/EEA countries of residence (Table 6). When looking at the distribution of CHB cases in the EU/EEA countries, migrants born in China are found among the ten main CHB-affected migrant populations (from intermediate/high endemicity countries) in 28 of the 31 EU/EEA countries, this is the case in 19 of the 31 EU/EEA countries for migrants from Romania. Migrants born in Russia are found among the ten main CHB-affected migrant populations in 18 of the 31 EU/EEA countries, while this is the case in only three EU/EEA countries for people born in Albania. A sizeable number of CHB-affected migrants come from low hepatitis B endemicity countries such as Poland (~61 000 cases), Morocco (~45 000 cases) and Italy (~22 000 cases). Being low-endemicity countries, with a HBsAg prevalence below 2% in the general population, these countries are not included in the list of the ten largest CHB contributing migrant groups from intermediate or high endemicity countries (Annex 5.9) nor in Table 6 and 6a.

The only study with which to compare these results to is by Rossi et al. [66] This study took a similar approach to estimating the number of infected migrants but instead of taking estimates for the in-country prevalence they meta-analysed prevalence studies in migrants and derived regional, pooled seroprevalence estimates. These prevalence estimates were combined with the number of migrants from each of five World Bank regions (excluding high-income countries) to calculate estimates of the number of infected migrants. The findings are difficult to compare due to the regional approach and the fact that the number of migrants from the five World Bank regions differs from the numbers we applied, which were based on the selection of individual intermediate and high-endemic countries. For example, for Spain Rossi reported almost 3.5 million migrants, while our total was almost two million migrants from intermediate and high-endemic countries. This difference is likely explained by our exclusion of migrants from Latin America, based on a low estimated prevalence, while they are included in the Rossi estimate. Despite the different approach, it is interesting to note that the overall chronic HBV prevalence estimate among migrants in the 16 countries included in both Rossi's and our study was similar (5.7% in our study; 5.4% in Rossi), and the total number of CHB-infected cases was estimated at around 1.3 million in both studies.

In terms of absolute numbers, migrants born in Romania, Russia, Italy, Poland, Morocco, Pakistan and Ukraine contribute substantially to the overall number of CHC cases in the EU/EEA countries of residence. When analysing the distribution of CHC cases in the EU/EEA countries, adult migrants from Russia, a high CHC-prevalence country (2.9% viraemic prevalence), are represented among the ten main CHC-affected migrant populations (from high endemicity countries) in 25 of 31 EU/EEA countries. This is the case in 20 EU/EEA countries for migrants from Romania and Italy. Despite the relatively small number of migrants from Egypt, they are found among the ten largest CHC-infected migrant populations in 16 of the 31 EU/EEA countries due the very high anti-HCV prevalence (~14–17.5%) in Egypt.

In terms of absolute numbers the overall estimated number of CHB cases by far exceeds the number of CHC cases. The contribution of HBV and HCV to the total burden of chronic viral hepatitis differs for each migrant population. In migrants from China, Vietnam, Turkey, Albania and India, more than 80% of the chronic viral hepatitis infections are chronic hepatitis B infections. Migrants born in Ukraine, Russia and Pakistan contribute roughly equally to the HBV and HCV burden. Only in migrants from Egypt and Italy is the estimated number of CHC cases higher than CHB cases, the reason being that the anti-HCV prevalence in both countries is higher than the HBsAg prevalence. It is interesting that three countries with relatively high numbers of both HBV and HCV cases are EU/EEA countries – namely Italy, Poland and Romania. Migrants from these three EU countries contribute substantially to the CHB/CHC burden in other EU/EEA countries.

Knowledge of the countries of origin of migrants who carry a high CHB and/or CHC burden due to a higher exposure risk in their countries of origin, as well as information about the distribution of these migrant groups among the population of each EU/EEA country will enable Member States to focus screening efforts on a selected group of people with a higher risk.

The burden of chronic viral hepatitis B and C is defined as the number of cases with a chronic hepatitis B virus infection (i.e. HBsAg positive) or with viraemic hepatitis C virus infection (i.e. HCV RNA positive). It must be noted that while patients with viraemic HCV infection are eligible for antiviral treatment, this is only the case for a selection of patients with chronic HBV infection, namely those with so-called active infection. To assess treatment eligibility the level of HBV DNA is taken into account, along with the severity of liver inflammation based on elevated liver function testing (e.g. ALT) [4]. For HCV, reliable estimates are available for the proportion HCV RNA positive cases but for HBV, there is no additional data to estimate the number with active infection. As a result, the number of patients with active HBV infection that would require antiviral treatment is lower than the number of CHB cases estimated in our analysis.

## 4.3 The relative burden chronic viral hepatitis among migrants

In the EU/EEA as a whole, the burden among migrants in relation to the overall number of chronically-infected cases was estimated to be around 25% for chronic hepatitis B, and 14% for chronic hepatitis C. There was wide variation in the different countries but a general trend emerging from the data is that in the western and northern European countries the relative burden among migrants from intermediate and high hepatitis B or C endemicity countries to the overall burden of chronic viral hepatitis in the respective country is higher than that in southern and eastern European countries (Table 11). The relative burden of both CHB and CHC among migrants as a proportion of the overall burden is lowest in Romania, Bulgaria, Slovakia and Poland (<4%). These are all countries where the proportion of migrants from endemic countries in the total population is relatively low (<1.5%). In some countries (i.e. Ireland, the Netherlands and Sweden) the relative burden among migrants from intermediate and high-endemicity countries to the overall chronic viral hepatitis B burden in the host country was estimated to be exceptionally high (>100%).

The relative burden among migrants may be overestimated for a number of different reasons. The prevalence in the general population of the host country might be underestimated, leading to an underestimation of the denominator, in this case the total number of hepatitis B/C infected cases in the country. This underestimation could be due to under-representation of migrants and other high-risk groups in the general population samples in seroprevalence studies.

The relative burden among migrants could also be overestimated if the numerator, in this case the number of chronic viral hepatitis infections among migrants, is overestimated. This would happen when the hepatitis B or C prevalence estimates for the migrants' countries of origin are an overestimate of the actual prevalence among migrants. The so-called healthy migrant effect may play a role (i.e. migrants may be inherently different from the source population in the country of origin). The socio-economic status, a possibly higher level of hepatitis B vaccination among this group or even a short duration of stay in their country of origin (i.e. migration at an early age) may reduce the risk of infection and result in lower CHB/CHC rates among migrants compared to the population in the migrants' country of origin. One way of exploring this would be to use the notifications of chronic hepatitis B cases to ECDC where data are available on the proportion of cases reported as 'imported' [2]. This can be used as a proxy for the proportion of cases in foreign-born patients, and could be used as a validation of the estimated relative burden among migrants in our study. However, this information was only available for a substantial number of cases (>500) from three countries reporting in 2011. In these countries the 'imported' proportion is 87% in the Netherlands, and 96% in Norway and Sweden. Although this is not as high as 100%, it does suggest that the relative burden of chronic hepatitis B among migrants is extremely high in these low-prevalence countries. Another method would be to compare the in-country prevalence to that found among migrants, as discussed in the following section.

For the general population prevalence estimates in the EU/EEA countries we used reviews focussing on country-specific prevalence at a regional or global level. ECDC is currently collecting updated prevalence data for the general population in the EU/EEA countries. As the prevalence of chronic viral hepatitis is expected to decline over time, more recent data will probably show an even lower prevalence in the general population of EU/EEA countries. Given the declining prevalence over time we do not think that the estimates we used are likely to underestimate the general population prevalence in the EU/EEA.

## 4.4 Comparing in-country prevalence estimates with prevalence in migrant populations

In this study, the calculations of the numbers infected are based on estimates in the migrants' countries of origin. We set out to determine how valid it was to apply these in-country prevalence estimates as a proxy for the prevalence among migrants. We extracted 103 country-specific estimates from studies among different populations of migrants and compared these with in-country estimates. There was considerable heterogeneity in the migrant populations from which prevalence estimates are derived. Our findings suggest a lower prevalence among residents (i.e. the general population), children and pregnant women compared to populations screened in healthcare settings and refugee camps. Similarly, both reviews by Kowdley and Rossi found the prevalence of

chronic HBV to be higher among refugees and asylum seekers than resident migrants. A recent study from the UK also reported the chronic HBV prevalence among migrant pregnant women to be lower than the in-country estimate [67].

An interesting example of how heterogeneity in population samples for a specific migrant group can result in heterogeneity in prevalence estimates was seen for Albania (Table 26). Estimates were derived from pregnant women, the general population and refugees. The prevalence in pregnant women was the lowest of these estimates and the prevalence among refugees highest. Interestingly, the prevalence in the general population of migrants was higher than the in-country prevalence.

The most valid comparison of whether the in-country prevalence reflects the prevalence in migrants is to look only at the samples in the general population and not in higher risk groups, such as refugees and patients. Of the 14 HBsAg prevalence estimates available for the general population of migrants, 57% were lower than the country of origin estimates in the general population, 36% were comparable and 7% (one study) was higher. China, Turkey and Romania are the three migrant populations that have the highest estimated numbers of CHB infections in the EU/EEA. Estimates from the general population were available for China and Turkey for comparison only. The pooled prevalence from several studies among resident migrants born in China, often participants in community based screening programmes, was 9.4% which is comparable with the prevalence in China. The pooled prevalence among Turkish resident migrants was 3.7% which is also comparable with the in-country estimate. For hepatitis C, 70% of the ten general migrant population estimates are comparable to the country of origin prevalence, and 30% are lower. The three migrant populations that have the highest estimated numbers of CHC infections in the EU/EEA were born in Romania, Russia, and Italy. No HCV prevalence estimates in migrant populations were available from any of these countries for comparison.

We expected that the prevalence in adult migrants would reflect the prevalence in the country of birth since chronic hepatitis B virus infection is often acquired at birth or in early childhood in countries where HBV is endemic. Although antenatal screening programmes and/or universal infant vaccination have been in place for about 30 years in high-income countries, introduction and implementation in low-income/high-endemic countries has only begun in the past 15 years [68]. Based on the epidemiological features of HBV, it is therefore surprising that in more than half of those countries where a CHB prevalence estimate among resident migrants is available, this was lower than the prevalence in the country of origin. One explanation for the observed lower HBV prevalence in migrants compared to in-country estimates could be that the estimates of the in-country prevalence include older estimates (studies published as long ago as the 1980s), while the majority of studies concerning migrant populations in EU/EEA countries were conducted in the 21st century. A recent study estimating the global hepatitis B prevalence by region showed a decrease in the prevalence of chronic HBV infection from 1990 to 2005 in most regions [69]. This decline in prevalence over time suggests that Kowdley's results may be over-estimated. Differences in prevalence can also occur due to differing age structure (migrants are often younger) and the healthy migrant effect [65].

In endemic countries, hepatitis C is, however, often acquired at a later age, mostly through exposure in healthcare settings with poor infection control practices. After migration to a low endemic country, the risk of infection is expected to decrease, which would result in a lower prevalence among migrants compared to the prevalence in the country of origin. In contrast to this assumption, the HCV prevalence in resident migrants was comparable to the country of origin estimate in more than two-thirds of the countries with estimates available. For hepatitis C, the majority of estimates from migrant studies were comparable to the estimates from Gower et al., who only included prevalence estimates from 2000 onwards. Another explanation for the comparability of HCV prevalence estimates is the wide uncertainty range around the Gower estimate, the lower range of which was taken from low-risk populations such as blood donors. The prevalence in resident migrant samples was often higher than the lower range, which is an extreme low and not a lower calculated confidence limit, and thus considered comparable. It must be noted that even though the prevalence in migrants might be lower than the prevalence in the country of birth, in absolute terms the prevalence in many migrant groups is often intermediate to high endemic, and much higher than the general population prevalence in many of the EU/EEA countries.

Where available, we also looked at differences between first and subsequent generations of migrants and only found data for HBV infections. We consistently found that the prevalence among first-generation migrants was much higher than in second- and subsequent generations. We also found that where cases were detected among second-generation migrants, these were in populations born before the introduction of antenatal screening in host countries.

The studies among populations considered to be the general population of migrants may not be representative due to study design. Most studies providing information on the prevalence in residents migrants were not designed as seroprevalence studies but were often opportunistic or outreach-based screening campaigns offering voluntary testing and access to treatment. This is likely to result in selection biases with varying implications. One implication of such a study design could be that people who know they have a chronic infection do not participate in screening, leading to an underestimation of the prevalence. Alternatively, expanded access to treatment may encourage people with a known chronic infection, but with limited access to healthcare (such as undocumented migrants) to participate, leading to a higher estimate. The latter has been observed in screening campaigns within the Chinese community [46,47].

## 4.5 Strengths and limitations

We used official statistics at the European level for the number of foreign-born migrants per country in the EU/EEA countries. These sources collect data in a comparable manner across the EU/EEA, but one limitation is that undocumented migrants are not included in the estimates. This will have resulted in an underestimation of the number of foreign-born migrants, and therefore an underestimation of the number of migrants with chronic viral hepatitis and the relative burden among migrants in proportion to the overall burden.

It was beyond the scope of this project to do a systematic literature review to identify prevalence estimates for all individual countries of origin for migrants. Hence a literature review was conducted with the aim of identifying (systematic) reviews, meta-analyses and other data sources providing estimates of chronic hepatitis B and C prevalence in the countries of origin of first-generation migrants in Europe. Two large worldwide reviews providing country specific HBsAg and anti-HCV estimates were identified, published in 2012 and 2014. These reviews, from Kowdley and Gower, are comprehensive studies, which were considered to be of good quality and provided the most recent collation of data on prevalence. We considered the estimates from these reviews as the best available estimates and, when there were other estimates available, they were comparable in the majority of cases. Estimates were only adjusted for a few countries.

A key strength of this work is the systematic search for all articles reporting on HBsAg/anti-HCV prevalence among migrants to Europe. Over 1 200 articles were reviewed to obtain over 330 estimates of prevalence among migrant populations. It is likely that we successfully captured all literature published in English and relevant to this research question. We were also careful not to pool estimates among heterogeneous populations. Where possible, we made inferences across sub-populations where numerous estimates exist for migrants from one country of origin. We also pooled cases and denominator data, rather than prevalence estimates themselves, thus giving weight to the larger studies in pooled estimates. The re-calculation of the CIs using the conservative Exact method standardised the data across estimates and improved transparency of calculation. We also retrieved additional unpublished data from authors of studies screening >500 subjects, which was largely successful although there were some studies for which more detailed country of origin data were not available. We were also cautious not to use data from small samples; data on 10 or fewer subjects were excluded and we only used samples of over 25 subjects per country of origin to compare with country of origin data.

The restriction of the search to English language only may have reduced the range of data captured by the search. Similarly, the restriction to migrants within the EU/EEA will have filtered out studies among migrants to other parts of the world such as migrants to the US or Australia. Our research question was focused on the prevalence among migrants to Europe but there may have been interesting and potentially comparable data among migrants to other countries.

The assessment of comparability with in-country estimates was based on the inclusion of the migrant-derived prevalence estimate within the in-country CI. However, although the studies of HBsAg prevalence and all studies other than Gower report a 95% CI (and show which estimates contributed to this range), the Gower study developed an 'uncertainty range' and it was unclear how the upper limit of the uncertainty range was derived. As the lower limit was usually taken from a healthy blood donor population, we assume that the upper range was in contrast to this – i.e. a higher risk population. Although this lack of transparency could have been transferred into our comparator assessments, we searched exhaustively for better sources of in-country prevalence and the Gower estimates were selected in nearly all cases as the most reliable. This is therefore the best available global prevalence data for comparison.

## 4.6 Conclusions and public health implications

With an estimated 4–7.5 million chronic hepatitis B infected people, and 2–6.6 million chronic hepatitis C cases, the burden of these chronic liver infections (6–14 million cases) in the EU/EEA is substantial. The estimated prevalence of both HBsAg and anti-HCV is around 1% in the EU/EEA as a whole, while the estimated prevalence among migrants in the EU/EEA born in intermediate/high-endemic countries is 6% for HBsAg and 2.3% for anti-HCV. The higher prevalence among migrants results in a relatively high burden among migrants to the overall number of infected cases of around 25% for chronic hepatitis B, and 14% for chronic hepatitis C. This is much higher than the overall proportion of migrants in the total population, which is 5% for migrants from HBV-endemic countries and 8% for migrants from HCV-endemic countries.

The aim of this study was to estimate the chronic viral hepatitis burden in terms of infected cases among first-generation migrants in EU/EEA countries based on best available data sources and to thereby identify those migrant groups which carry a relatively high burden and would benefit most from targeted screening programmes and early detection.

There are wide ranges around these estimates and the number of estimated cases should be interpreted with caution. Comparing prevalence data from studies in migrants with estimates for the prevalence in the country of origin showed that the prevalence in migrant populations in EU/EEA countries is often lower, especially for HBsAg prevalence, indicating that the estimates of the total number of migrants infected with chronic hepatitis B and C are possibly an overestimation. Therefore the actual number of infected migrants might be more towards the lower

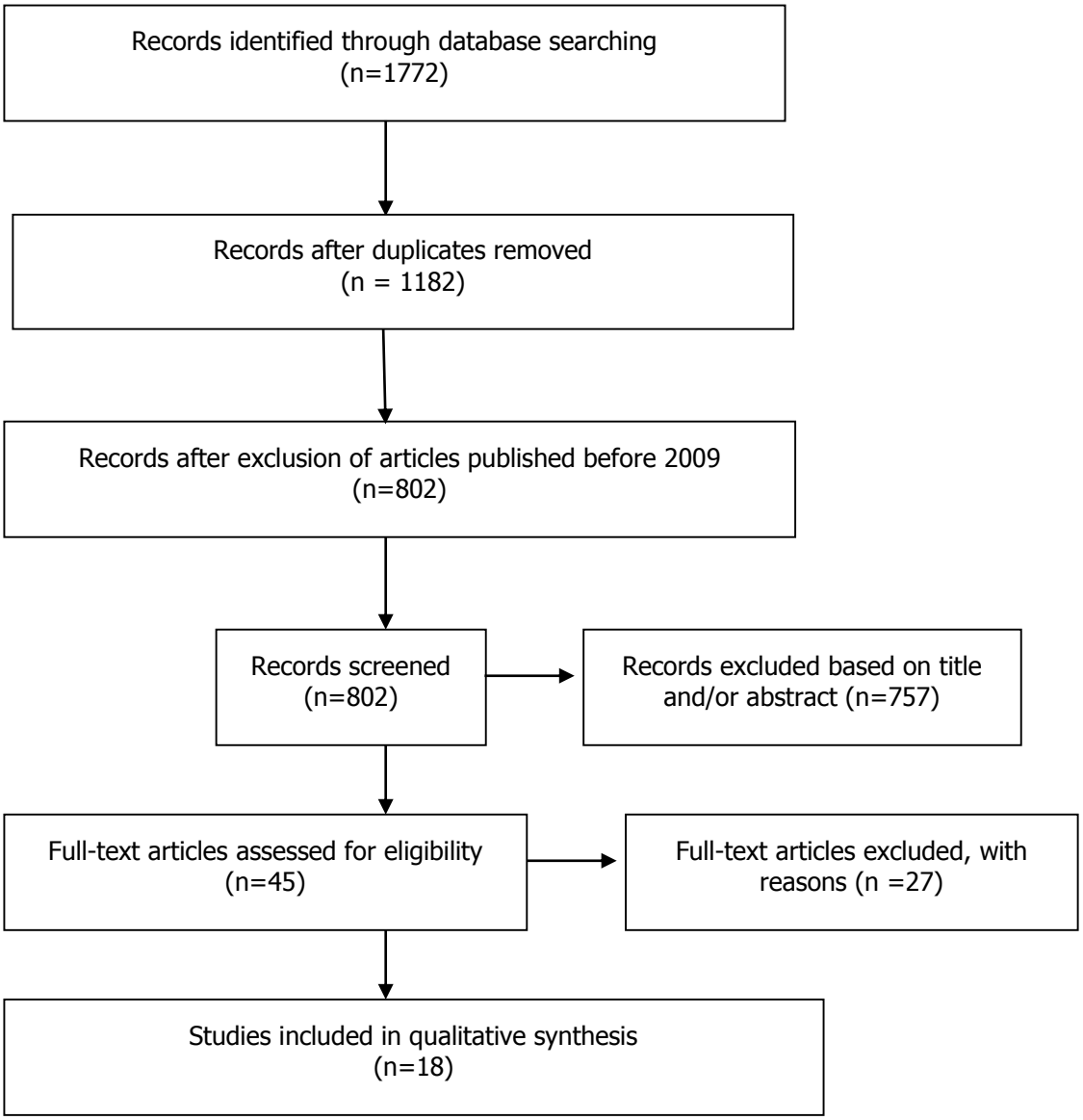
range of our estimates. Conversely, it is not clear whether the Eurostat data on migrant population size includes refugees and undocumented migrants, both of which are sizeable groups with an expected higher prevalence due to vulnerability during migration as well as social and economic vulnerability in host countries [3,70]. As the population size may be underestimated, and higher prevalence migrant groups are not included, the estimated number of cases could therefore also be an underestimate.

Despite this uncertainty, the information on the size of the different migrant populations and the ranking of the populations with expected high numbers of chronic viral hepatitis infections does provide valuable insight. Countries will be able to use this to target prevention and screening efforts towards those migrant groups that can be expected to benefit most. Screening programmes targeted to migrant communities will also further improve understanding of the prevalence of infection. Most of the studies we retrieved that provide information about the prevalence in migrant communities were designed as screening rather than seroprevalence studies and much can be learned from the methods and results from these studies. Previously-tested options for reaching migrant groups include invitation-based models using municipal or patient registers that record country of birth, community outreach via cultural or civic institutions; opportunistic screening in healthcare services and extension of existing screening targeting migrant groups, such as tuberculosis screening. The focus of published examples of screening has mostly been on resident migrants, although some of these models could also be used to reach newly-arriving migrants via refugee or receiving centres. Furthermore, the data comparing first- and second-generation migrants suggest that screening should focus on first-generation migrants using country of birth rather than ethnicity-related characteristics to define the population at risk. More about the different models of screening and how to implement these successfully can be found on the HEP screen Toolkit website (www.hepscreen.eu).

Studies assessing the cost effectiveness of viral hepatitis screening in migrants from intermediate/high-prevalence countries have revealed favourable outcomes and strengthen the case for screening as a form of secondary prevention [15]. Screening in low-prevalence populations, including migrants from low-prevalence countries, is not considered cost-effective, as a relatively large number of people would have to be reached with a targeted screening programme in order to identify CHB cases. Combining screening for both hepatitis B and C, and targeting populations using a model based on predicted chronic viral hepatitis prevalence, could increase the cost effectiveness and yield from these prevention efforts. For example, a sizeable number of CHB-affected migrants come from low hepatitis B endemicity countries, the largest of which include Poland, Morocco and Italy. However, these three countries all have an HCV prevalence of above 1%, and screening for HCV and HBV together will increase the cost effectiveness. Studies that evaluate the cost effectiveness of combined screening are lacking and much needed.

# 5. Annexes

## 5.1 PRISMA flow diagram of systematic search for global HBsAg and anti-HCV seroprevalence



## 5.2 Description of the search strategy and retrievals for systematic reviews and meta-analyses of global prevalence studies

The search was structured to include terms from four topic areas, i.e. the infection, the outcome, the population and the study design. Separate search terms are included, as well as controlled vocabulary search terms (EMTree, comparable to MeSH terms in Medline). The search terms included per topic area in the EMBASE search are described below. The full search strategy for systematic reviews in each database is also presented below.

The infection: hepatitis B or C
in abstract or title:
hepatitis B, hepatitis B virus, hepatitis C, hepatitis C virus [EMtree]
hbv, hcv

The outcome: prevalence
in abstract or title:
prevalence, seroprevalence;
serology [EMTree]; prevalen*, seroprevalen*, serolog*, marker*, seroepidemiol*
hepatitis rapid test, hepatitis B rapid test, hepatitis C rapid test [EMTree]
hepatitis B antibody [EMTree]
hepatitis B antigen, hepatitis B surface antigen, HBsAg, HBs-Ag, HB-s-Ag
hepatitis C antigen [EMTree]
hepatitis C antibody [EMTree]

The population: general population worldwide/global:
in abstract or title:
Health survey [EMTree]; 'residual sera', survey*, surveillan*,
Population, Population group, Population research [EMTree]; population*, communit*,
Geographic names, Geographic distribution [EMTree]; geograph*, worldwide, world-wide, global, europe*, asia*, america*, africa*, australia*, countr*
Population and population related phenomena [EMTree];

Study design
in abstract or title:
Systematic review [EMTree]; 'systematic* AND review*',
comprehensiv*, exhaustiv* NEAR/3 literature*
Meta analysis [EMTree]; meta NEXT/1 analy*

### 5.2.1 Full search strategy: Reviews, systematic review and meta analyses on hepatitis B and hepatitis C prevalence worldwide at country level

Run by Erasmus MC Medical Library on 21 January 2015

Embase.com 872

((('hepatitis B'/exp OR 'Hepatitis B virus'/exp OR 'hepatitis C'/exp OR 'Hepatitis C virus'/exp OR ((hepatitis NEXT/3 (B OR C)) OR hbv OR hcv):ab,ti) AND (prevalence/de OR seroprevalence/de OR serology/exp OR epidemiology/exp OR (seroprevalen* OR prevalen* OR serolog* OR seroepidemiol* OR epidemiolog*):ab,ti)) OR ('hepatitis rapid test'/exp OR 'hepatitis B rapid test'/exp OR 'hepatitis C rapid test'/exp OR 'hepatitis B antigen'/de OR 'hepatitis C antigen'/exp OR 'hepatitis C antibody'/exp OR 'hepatitis B antibody'/exp OR 'hepatitis B surface antigen'/de OR (HBsAg OR HBs-Ag OR HB-s-Ag OR (('Hepatitis b' OR 'Hepatitis c' OR hbv OR hcv) NEAR/3 ( 'surface antigen' OR 'surface antigens' OR antibod*))):ab,ti)) AND ('health survey'/de OR population/de OR 'population group'/exp OR 'geographic names'/exp OR 'population research'/exp OR 'geographic distribution'/exp OR 'population and population related phenomena'/exp OR (population* OR communit* OR 'residual sera' OR survey* OR surveillan* OR geograph* OR worldwide OR world-wide OR global OR europe* OR asia* OR america* OR africa* OR australia* OR countr*):ab,ti) AND ('systematic review'/exp OR 'meta analysis'/exp OR ((systematic* AND review*) OR ((comprehensiv* OR exhaustiv*) NEAR/3 literature*) OR (meta NEXT/1 analy*)):ab,ti)

Medline (OvidSP) 326

(((exp hepatitis B/ OR Hepatitis B virus/ OR hepatitis C/ OR Hepacivirus/ OR ((hepatitis ADJ3 (B OR C)) OR hbv OR hcv).ab,ti.) AND (prevalence/ OR Seroepidemiologic Studies/ OR serology/ OR Serologic Tests/ OR (seroprevalen* OR prevalen* OR serolog* OR seroepidemiol* OR epidemiolog*).ab,ti.)) OR (exp hepatitis B antigen/ OR hepatitis C antigen/ OR hepatitis C antibodies/ OR hepatitis B antibodies/ OR (HBsAg OR HBs-Ag OR HB-s-Ag OR ((Hepatitis b OR Hepatitis c OR hbv OR hcv) ADJ3 ( surface antigen OR surface antigens OR antibod*))).ab,ti.)) AND (exp Health Surveys/ OR exp Population Groups/ OR exp Population/ OR exp Geographic Locations/ OR (population* OR communit* OR residual sera OR survey* OR surveillan* OR geograph* OR worldwide OR world-wide OR global OR europe* OR asia* OR america* OR africa* OR australia* OR countr*).ab,ti.) AND (Meta-Analysis.pt. OR ((systematic* AND review*) OR ((comprehensiv* OR exhaustiv*) ADJ3 literature*) OR (meta ADJ analy*)).ab,ti.)

Cochrane DARE 0

(((((hepatitis NEXT/3 (B OR C)) OR hbv OR hcv):ab,ti) AND ((seroprevalen* OR prevalen* OR serolog* OR seroepidemiol* OR epidemiolog*):ab,ti)) OR ((HBsAg OR HBs-Ag OR HB-s-Ag OR (('Hepatitis b' OR 'Hepatitis c' OR hbv OR hcv) NEAR/3 ( 'surface antigen' OR 'surface antigens' OR antibod*))):ab,ti)) AND ((population* OR communit* OR 'residual sera' OR survey* OR surveillan* OR geograph* OR worldwide OR world-wide OR global OR europe* OR asia* OR america* OR africa* OR australia* OR countr*):ab,ti)

Web-of-science 366

TS=((((((hepatitis NEAR/3 (B OR C)) OR hbv OR hcv)) AND ((seroprevalen* OR prevalen* OR serolog* OR seroepidemiol* OR epidemiolog*))) OR ((HBsAg OR HBs-Ag OR HB-s-Ag OR (("Hepatitis b" OR "Hepatitis c" OR hbv OR hcv) NEAR/3 ( "surface antigen" OR "surface antigens" OR antibod*))))) AND ((population* OR communit* OR "residual sera" OR survey* OR surveillan* OR geograph* OR worldwide OR world-wide OR global OR europe* OR asia* OR america* OR africa* OR australia* OR countr*)) AND (((systematic* AND review*) OR ((comprehensiv* OR exhaustiv*) NEAR/3 literature*) OR (meta NEAR/1 analy*))))

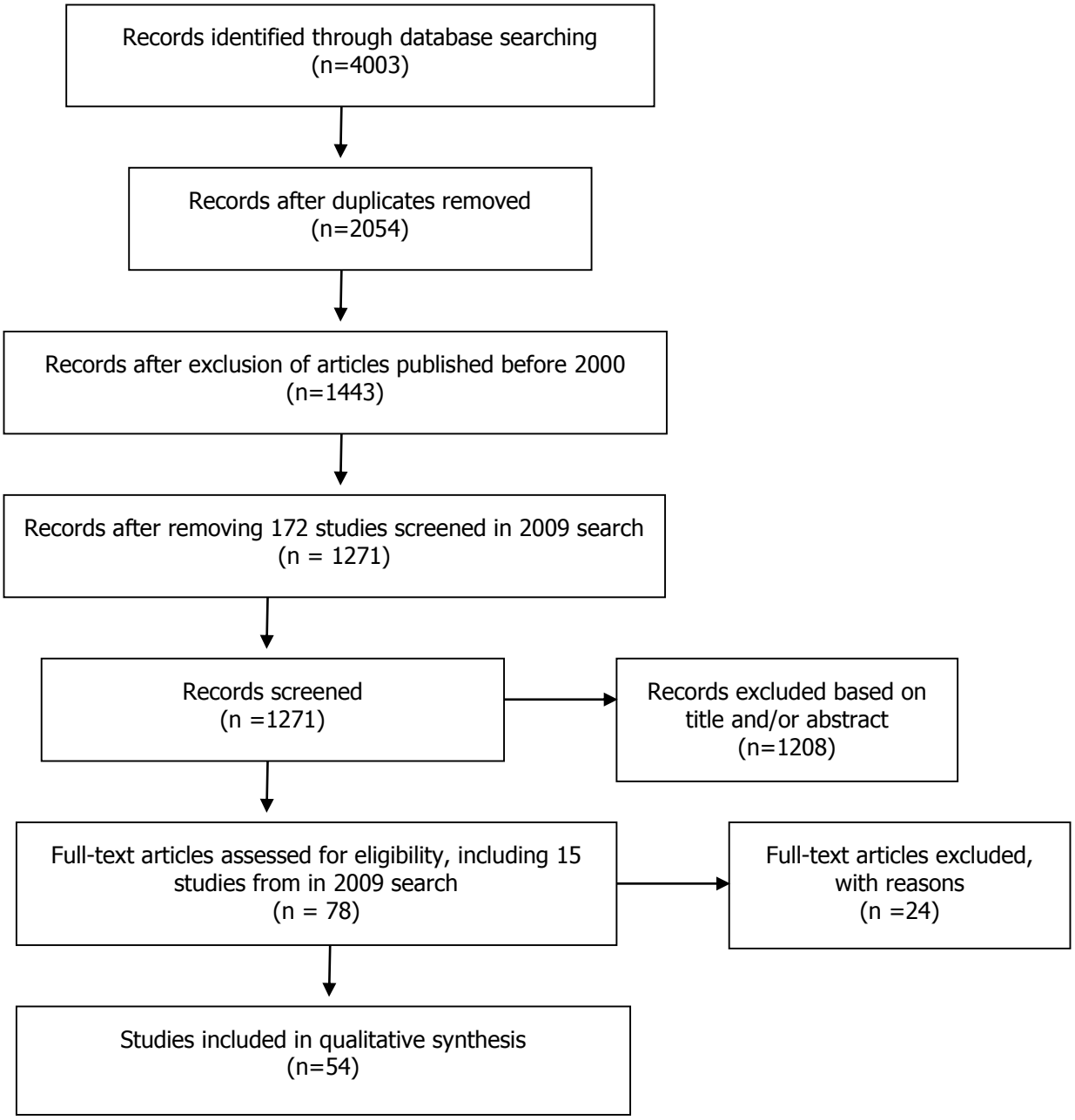
PubMed publisher 8

(((hepatitis B[mh] OR Hepatitis B virus[mh] OR hepatitis C[mh] OR Hepacivirus[mh] OR ((hepatitis AND (B OR C)) OR hbv OR hcv)) AND (prevalence[mh] OR Seroepidemiologic Studies[mh] OR serology[mh] OR Serologic Tests[mh] OR (seroprevalen*[tiab] OR prevalen*[tiab] OR serolog*[tiab] OR seroepidemiol*[tiab] OR epidemiolog*[tiab]))) OR (hepatitis B antigen[mh] OR hepatitis C antigen[mh] OR hepatitis C antibodies[mh] OR hepatitis B antibodies[mh] OR (HBsAg OR HBs-Ag OR HB-s-Ag OR ((Hepatitis b OR Hepatitis c OR hbv OR hcv) AND ( surface antigen OR surface antigens OR antibod*[tiab])))) AND (Health Surveys[mh] OR Population Groups[mh] OR Population[mh] OR Geographic Locations[mh] OR (population*[tiab] OR communit*[tiab] OR residual sera OR survey*[tiab] OR surveillan*[tiab] OR geograph*[tiab] OR worldwide OR world-wide OR global OR europe*[tiab] OR asia*[tiab] OR america*[tiab] OR africa*[tiab] OR australia*[tiab] OR countr*[tiab])) AND (Meta-Analysis[pt] OR ((systematic*[tiab] AND review*[tiab]) OR ((comprehensiv*[tiab] OR exhaustiv*[tiab]) AND literature*[tiab]) OR (meta analy*[tiab]))) AND publisher

Google Scholar

"hepatitis B|C"|hbv|hcv seroprevalence|prevalence|serology|seroepidemioly|epidemiology population|community|geography|worldwide|"world wide"|global|europe|asia|america|africa|australia|country|countries "systematic review|"meta analysis"

## 5.3 PRISMA flow diagram of systematic search for HBsAg and anti-HCV seroprevalence in migrants in Europe



## 5.4 Description of the search strategy and retrievals for prevalence studies among migrants

The search was structured to include terms from four topic areas, i.e. the infection, the outcome, the population and geographical area. Separate search terms are included, as well as controlled vocabulary search terms (EMTree, comparable to MeSH terms in Medline). The search terms included per topic area in the EMBASE search are described below. The full search strategy for migrants studies in each database is also presented below.

The infection: hepatitis B or C
in abstract or title:
hepatitis B, Hepatitis B virus, hepatitis C, hepatitis C virus [EMtree]
hbv, hcv

The outcome: prevalence
in abstract or title:
prevalence, seroprevalence;
serology [EMTree]; prevalen*, seroprevalen*, serolog*, marker*, seroepidemiol*
hepatitis rapid test, hepatitis B rapid test, hepatitis C rapid test [EMTree]
hepatitis B antibody [EMTree]
hepatitis B antigen, hepatitis B surface antigen, HBsAg, HBs-Ag, HB-s-Ag
hepatitis C antigen [EMTree]
hepatitis C antibody [EMTree]

The population: migrants:
in abstract or title:
migrant, migration, minority group, ethnic group, ethnicity [EMTree]
migrant*, emigrant*, immigrant*, migrat*, emigrat*, immigrat*, asylum seeker*, refugee*, minorit*, ethnic* (countr*, africa*, asia*, racial*, eastern europe, endemic areas, endemic area, foreign*) NEAR (origin*, born*, nationalit*)

Geographical area: EU/EEA countries
in abstract or title or journal title or country of journal or country of author or author address:
Europe, European [EMTree]
European Union, europ*, eu
Austria*, Belgium, belgian, Bulgaria*, Croatia*, Cyprus, cypriot*, Czech*, Denmark, danish, Estonia*, Finland, finnish, finn, France, french*, German*, Greece, greek, Hungar*, Ireland, irish, Italy, italian*, Latvia*, Lithuania*, Luxemburg*, Malta, maltese, Netherlands, dutch, Poland, polish*, Portug*, Romania*, Slovak*, Slovenia*, Spain, spanish, spaniard*, Sweden, swedish, "united kingdom", "great britain", uk, british*, England, english, Scotland, scottish, Wales, welsh, Norway, norweg*, Iceland*

### 5.4.1 Full search strategy: hepatitis B and hepatitis C among migrants in the EU

Run by Erasmus MC Medical Library on 17 November 2014

Embase.com 1210 (1204 unique records)

((('hepatitis B'/exp OR 'Hepatitis B virus'/exp OR 'hepatitis C'/exp OR 'Hepatitis C virus'/exp OR ((hepatitis NEAR/3 (B OR C)) OR hbv OR hcv):ab,ti) AND (prevalence/de OR seroprevalence/de OR serology/exp OR (seroprevalen* OR prevalen* OR marker* OR serolog* OR seroepidemiol*):ab,ti)) OR ('hepatitis rapid test'/exp OR 'hepatitis B rapid test'/exp OR 'hepatitis C rapid test'/exp OR 'hepatitis B antigen'/de OR 'hepatitis C antigen'/exp OR 'hepatitis C antibody'/exp OR 'hepatitis B antibody'/exp OR 'hepatitis B surface antigen'/de OR (HBsAg OR HBs-Ag OR HB-s-Ag OR (('Hepatitis b' OR 'Hepatitis c' OR hbv OR hcv) NEAR/3 ( 'surface antigen' OR 'surface antigens' OR antibod*))):ab,ti)) AND (migrant/exp OR migration/exp OR 'minority group'/exp OR 'ethnic group'/exp OR ethnicity/exp OR (migrant* OR emigrant* OR immigrant* OR migrat* OR emigrat* OR immigrat* OR (asylum NEXT/1 seeker*) OR refugee* OR minorit* OR ethnic* OR ((countr* OR africa* OR asia* OR racial* OR 'eastern europe' OR 'endemic areas' OR 'endemic area' OR foreign* ) NEAR/3 (origin* OR born* OR nationalit*))):ab,ti) AND (europe/exp OR European/exp OR 'European Union'/de OR (europ* OR eu OR iceland* OR norway OR norweg* OR sweden OR swedish OR finland OR finnish OR finn OR denmark OR danish OR "great britain" OR "united kingdom" OR uk OR british* OR England OR english OR Scotland OR scottish OR Wales OR welsh OR Ireland OR irish OR Netherlands OR dutch OR Belgium OR belgian OR France OR french* OR Luxemburg* OR Spain OR spanish OR spaniard* OR Portug* OR Italy OR italian* OR Switzerland OR swiss* OR Austria* OR German* OR Poland OR polish* OR Hungar* OR Czech* OR Croatia* OR Slovak* OR Slovenia* OR Romania* OR Bulgaria* OR Lithuania* OR Latvia* OR Estonia* OR Greece OR greek OR Turkey OR turkish OR Macedonia* OR Cyprus OR cypriot* OR Malta OR maltese):ab,ti,ca,ta,cy,ad) AND [english]/lim NOT ([Conference Abstract]/lim OR [Letter]/lim OR [Note]/lim OR [Conference Paper]/lim OR [Editorial]/lim)

Medline (OvidSP) 989 (191 unique records)

(((exp hepatitis B/ OR Hepatitis B virus/ OR hepatitis C/ OR Hepacivirus/ OR ((hepatitis ADJ3 (B OR C)) OR hbv OR hcv).ab,ti.) AND (prevalence/ OR Seroepidemiologic Studies/ OR serology/ OR Serologic Tests/ OR (seroprevalen* OR prevalen* OR marker* OR serolog* OR seroepidemiol*).ab,ti.)) OR (exp hepatitis B antigen/ OR hepatitis C antigen/ OR hepatitis C antibodies/ OR hepatitis B antibodies/ OR (HBsAg OR HBs-Ag OR HB-s-Ag OR ((Hepatitis b OR Hepatitis c OR hbv OR hcv) ADJ3 (surface antigen* OR antibod*))).ab,ti.)) AND (Transients and Migrants/ OR Human Migration/ OR minority group/ OR ethnic group/ OR Emigrants and Immigrants/ OR Emigration and Immigration/ OR (migrant* OR emigrant* OR immigrant* OR migrat* OR emigrat* OR immigrat* OR asylum seeker* OR refugee* OR minorit* OR ethnic* OR ((countr* OR africa* OR asia* OR racial* OR eastern europe OR endemic areas OR endemic area OR foreign* ) ADJ3 (origin* OR born* OR nationalit*))).ab,ti.) AND (exp europe/ OR (europ* OR eu OR iceland* OR norway OR norweg* OR sweden OR swedish OR finland OR finnish OR finn OR denmark OR danish OR "great britain" OR "united kingdom" OR uk OR british* OR England OR english OR Scotland OR scottish OR Wales OR welsh OR Ireland OR irish OR Netherlands OR dutch OR Belgium OR belgian OR France OR french* OR Luxemburg* OR Spain OR spanish OR spaniard* OR Portug* OR Italy OR italian* OR Switzerland OR swiss* OR Austria* OR German* OR Poland OR polish* OR Hungar* OR Czech* OR Croatia* OR Slovak* OR Slovenia* OR Romania* OR Bulgaria* OR Lithuania* OR Latvia* OR Estonia* OR Greece OR greek OR Turkey OR turkish OR Macedonia* OR Cyprus OR cypriot* OR Malta OR maltese).ab,ti,jn,cp,in.) AND english.la. NOT (letter OR news OR comment OR editorial OR congresses OR abstracts).pt.

Cochrane 8 (3 unique records)

(((((hepatitis NEAR/3 (B OR C)) OR hbv OR hcv):ab,ti) AND ((seroprevalen* OR prevalen* OR marker* OR serolog* OR seroepidemiol*):ab,ti)) OR ((HBsAg OR HBs-Ag OR HB-s-Ag OR (('Hepatitis b' OR 'Hepatitis c' OR hbv OR hcv) NEAR/3 ( 'surface antigen' OR 'surface antigens' OR antibod*))):ab,ti)) AND ((migrant* OR emigrant* OR immigrant* OR migrat* OR emigrat* OR immigrat* OR (asylum NEXT/1 seeker*) OR refugee* OR minorit* OR ethnic* OR ((countr* OR africa* OR asia* OR racial* OR 'eastern europe' OR 'endemic areas' OR 'endemic area' OR foreign* ) NEAR/3 (origin* OR born* OR nationalit*))):ab,ti) AND ((europ* OR eu OR iceland* OR norway OR norweg* OR sweden OR swedish OR finland OR finnish OR finn OR denmark OR danish OR "great britain" OR "united kingdom" OR uk OR british* OR England OR english OR Scotland OR scottish OR Wales OR welsh OR Ireland OR irish OR Netherlands OR dutch OR Belgium OR belgian OR France OR french* OR Luxemburg* OR Spain OR spanish OR spaniard* OR Portug* OR Italy OR italian* OR Switzerland OR swiss* OR Austria* OR German* OR Poland OR polish* OR Hungar* OR Czech* OR Croatia* OR Slovak* OR Slovenia* OR Romania* OR Bulgaria* OR Lithuania* OR Latvia* OR Estonia* OR Greece OR greek OR Turkey OR turkish OR Macedonia* OR Cyprus OR cypriot* OR Malta OR maltese):ab,ti)

Web-of-science 547 (170 unique records)

TS=((((((hepatitis NEAR/3 (B OR C)) OR hbv OR hcv)) AND ((seroprevalen* OR prevalen* OR marker* OR serolog* OR seroepidemiol*))) OR ((HBsAg OR HBs-Ag OR HB-s-Ag OR (("Hepatitis b" OR "Hepatitis c" OR hbv OR hcv) NEAR/3 ( "surface antigen" OR "surface antigens" OR antibod*))))) AND ((migrant* OR emigrant* OR immigrant* OR migrat* OR emigrat* OR immigrat* OR (asylum NEAR/1 seeker*) OR refugee* OR minorit* OR ethnic* OR ((countr* OR africa* OR asia* OR racial* OR "eastern europe" OR "endemic areas" OR "endemic area" OR foreign* ) NEAR/3 (origin* OR born* OR nationalit*)))) AND ((europ* OR eu OR iceland* OR norway OR norweg* OR sweden OR swedish OR finland OR finnish OR finn OR denmark OR danish OR "great britain" OR "united kingdom" OR uk OR british* OR England OR english OR Scotland OR scottish OR Wales OR welsh OR Ireland OR irish OR Netherlands OR dutch OR Belgium OR belgian OR France OR french* OR Luxemburg* OR Spain OR spanish OR spaniard* OR Portug* OR Italy OR italian* OR Switzerland OR swiss* OR Austria* OR German* OR Poland OR polish* OR Hungar* OR Czech* OR Croatia* OR Slovak* OR Slovenia* OR Romania* OR Bulgaria* OR Lithuania* OR Latvia* OR Estonia* OR Greece OR greek OR Turkey OR turkish OR Macedonia* OR Cyprus OR cypriot* OR Malta OR maltese)) )

Scopus 1012 (304 unique records)

TITLE-ABS-KEY((((((hepatitis W/3 (B OR C)) OR hbv OR hcv)) AND ((seroprevalen* OR prevalen* OR marker* OR serolog* OR seroepidemiol*))) OR ((HBsAg OR HBs-Ag OR HB-s-Ag OR (("Hepatitis b" OR "Hepatitis c" OR hbv OR hcv) W/3 ( "surface antigen" OR "surface antigens" OR antibod*))))) AND ((migrant* OR emigrant* OR immigrant* OR migrat* OR emigrat* OR immigrat* OR (asylum W/1 seeker*) OR refugee* OR minorit* OR ethnic* OR ((countr* OR africa* OR asia* OR racial* OR "eastern europe" OR "endemic areas" OR "endemic area" OR foreign* ) W/3 (origin* OR born* OR nationalit*)))) AND ((europ* OR eu OR iceland* OR norway OR norweg* OR sweden OR swedish OR finland OR finnish OR finn OR denmark OR danish OR "great britain" OR "united kingdom" OR uk OR british* OR England OR english OR Scotland OR scottish OR Wales OR welsh OR Ireland OR irish OR Netherlands OR dutch OR Belgium OR belgian OR France OR french* OR Luxemburg* OR Spain OR spanish OR spaniard* OR Portug* OR Italy OR italian* OR Switzerland OR swiss* OR Austria* OR German* OR Poland OR polish* OR Hungar* OR Czech* OR Croatia* OR Slovak* OR Slovenia* OR Romania* OR Bulgaria* OR Lithuania* OR Latvia* OR Estonia* OR Greece OR greek OR Turkey OR turkish OR Macedonia* OR Cyprus OR cypriot* OR Malta OR maltese)) )

PubMed publisher 37 (27 unique records)

(((hepatitis B*[tiab] OR hepatitis C*[tiab] OR hbv[tiab] OR hcv[tiab]) AND ((seroprevalen*[tiab] OR prevalen*[tiab] OR marker*[tiab] OR serolog*[tiab] OR seroepidemiol*[tiab] OR surface antigen*[tiab] OR antibod*[tiab])))) OR ((HBsAg[tiab] OR HBs-Ag[tiab] OR HB-s-Ag[tiab] ))) AND ((migrant*[tiab] OR emigrant*[tiab] OR immigrant*[tiab] OR migrat*[tiab] OR emigrat*[tiab] OR immigrat*[tiab] OR asylum seeker*[tiab] OR refugee*[tiab] OR minorit*[tiab] OR ethnic*[tiab] OR ((countr*[tiab] OR africa*[tiab] OR asia*[tiab] OR racial*[tiab] OR eastern europe*[tiab] OR endemic area*[tiab] OR foreign*[tiab] ) AND (origin*[tiab] OR born*[tiab] OR nationalit*[tiab])))) AND (europ* OR eu OR iceland* OR norway OR norweg* OR sweden OR swedish OR finland OR finnish OR finn OR denmark OR danish OR "great britain" OR "united kingdom" OR uk OR british* OR England OR english OR Scotland OR scottish OR Wales OR welsh OR Ireland OR irish OR Netherlands OR dutch OR Belgium OR belgian OR France OR french* OR Luxemburg* OR Spain OR spanish OR spaniard* OR Portug* OR Italy OR italian* OR Switzerland OR swiss* OR Austria* OR German* OR Poland OR polish* OR Hungar* OR Czech* OR Croatia* OR Slovak* OR Slovenia* OR Romania* OR Bulgaria* OR Lithuania* OR Latvia* OR Estonia* OR Greece OR greek OR Turkey OR turkish OR Macedonia* OR Cyprus OR cypriot* OR Malta OR maltese) AND english[la] AND publisher

Google Scholar 200 (155 unique records)

"hepatitis B|C" prevalence|seroprevalence|antigen|antibody|antigens|antibodies migrant|migrants|minority|minorities|ethnic|ethnicity|immigrants|immigrant|foreigners europe|European

## 5.5 HBsAg prevalence estimates from systematic reviews

The HBsAg prevalence estimates selected for each country are presented below. Where the prevalence estimate was taken from studies published after 2000, this is because Kowdley observed a significant decline in the meta regression analysis.

| Country | CHB prevalence | Lower 95% CI | Upper 95% CI | Endemicity level | Country or regional data | GBD region | Data source |
|---|---|---|---|---|---|---|---|
| Afghanistan | 10.46 | 5.85 | 15.07 | int-high | Country | South Asia | Kowdley et al. |
| Albania | 9.0 | 8.1 | 9.8 | int-high | Country | Central Europe | Hope, 2014 |
| Algeria | 2.6 | 0.0 | 12.19 | int-high | Country | North Africa/Middle East | Ezzikouri, 2013 |
| Angola | 11.44 | 8.46 | 14.43 | int-high | Regional | Middle Africa | Kowdley et al. |
| Argentina | 1.0 | 0.39 | 1.62 | low | Country | Southern Latin America | Kowdley et al. |
| Armenia | 0.57 | 0.19 | 0.94 | low | Country | Central Asia | Kowdley et al. |
| Australia | 0.87 | 0.39 | 1.35 | low | Country | Australasia | Kowdley et al. |
| Austria | 0.55 | 0.34 | 0.71 | low | Regional | Western Europe | Kowdley et al. |
| Azerbaijan | 3.11 | 1.39 | 4.84 | int-high | Country | Central Asia | Kowdley et al. |
| Bangladesh | 4.83 | 4.02 | 5.64 | int-high | Country | South Asia | Kowdley et al. |
| Barbados | 0.41 | 0.15 | 0.67 | low | Country | Caribbean | Kowdley et al. |
| Belarus | 3.19 | 1.72 | 4.65 | int-high | Country | Eastern Europe | Kowdley et al. |
| Belgium | 0.7 | 0.4 | 1.2 | low | Country | Western Europe | Hahné et al, 2010 |
| Belize | 1.28 | 0.72 | 1.83 | low | Country | Caribbean | Kowdley et al. |
| Benin | 13,17 | 10,18 | 16,17 | high | Regional | West Sub-Saharan Africa | Kowdley et al. |
| Bolivia | 3.03 | 0.08 | 5.98 | int-high | Country | Andean Latin America | Kowdley et al. |
| Bosnia and Herzegovina | 3.63 | 2.26 | 5.0 | int-high | Country | Central Europe | Kowdley et al. |
| Brazil | 1.78 | 1.54 | 2.02 | low | Country | Tropical Latin America | Kowdley et al. |
| Bulgaria | 4.25 | 2.8 | 5.7 | int-high | Country | Central Europe | Kowdley et al. |
| Burundi | 9.66 | 7.06 | 12.26 | int-high | Regional | Eastern Sub-Saharan Africa | Kowdley et al. |
| Cambodia | 10.27 | 7.01 | 13.53 | int-high | Country | Southeast Asia | Kowdley et al. |
| Cameroon | 11.44 | 8.46 | 14.43 | int-high | Country | West Africa | Kowdley et al. |
| Canada | 0.7 | 0.6 | 0.9 | low | Country | High Income North America | Kowdley et al. |
| Cape Verde | 5.65 | 0.16 | 11.14 | int-high | Country | West Africa | Kowdley et al. |

| Country | CHB prevalence | Lower 95% CI | Upper 95% CI | Endemicity level | Country or regional data | GBD region | Data source |
|---|---|---|---|---|---|---|---|
| Chad | 11.44 | 8.46 | 14.43 | int-high | Regional | Middle Africa | Kowdley et al. |
| Chile | 0.4 | 0.11 | 0.69 | low | Country | Southern Latin America | Kowdley et al. |
| China | 10.23 | 9.35 | 11.11 | int-high | Country, >2000 | East Asia | Kowdley et al. |
| Colombia | 1.2 | 0.27 | 2.13 | low | Country | Central Latin America | Kowdley et al. |
| Comoros | 9.66 | 7.06 | 12.26 | int-high | Regional | Eastern Africa | Kowdley et al. |
| Congo | 11.44 | 8.46 | 14.43 | int-high | Regional | Middle Africa | Kowdley et al. |
| Costa Rica | 0.57 | 0.0 | 1.2 | low | Country | Central Latin America | Kowdley et al. |
| Croatia | 1.47 | 0.84 | 2.1 | low | Country | Central Europe | Kowdley et al. |
| Cuba | 0.86 | 0.58 | 1.14 | low | Country | Caribbean | Kowdley et al. |
| Cyprus | 0.9 | 0.3 | 2.0 | low | Country | Western Europe | Hahné et al, 2010 |
| Czech Republic | 0.7 | 0.43 | 0.98 | low | Country | Central Europe | Kowdley et al. |
| Czech Republic and Slovakia | 0.7 | 0.43 | 0.98 | low | Country | Central Europe | Kowdley et al. |
| Democratic Republic of Congo | 11.44 | 8.46 | 14.43 | int-high | Regional | Middle Africa | Kowdley et al. |
| Denmark | 0.55 | 0.34 | 0.71 | low | Regional | Western Europe | Kowdley et al. |
| Dominican Republic | 10.68 | 5.89 | 15.46 | int-high | Country | Caribbean | Kowdley et al. |
| Ecuador | 0.47 | 0.42 | 0.51 | low | Country | Andean Latin America | Kowdley et al. |
| Egypt | 4.18 | 1.85 | 6.51 | int-high | Country, >2000 | North Africa/Middle East | Kowdley et al. |
| El Salvador | 0.39 | 0.33 | 0.55 | low | Country | Central Latin America | Kowdley et al. |
| Equatorial Guinea | 11.44 | 8.46 | 14.43 | int-high | Regional | Middle Africa | Kowdley et al. |
| Eritrea | 15.52 | 2.02 | 29.02 | int-high | Country | Eastern Sub-Saharan Africa | Kowdley et al. |
| Estonia | 0.58 | 0.42 | 0.74 | low | Country | Eastern Europe | Kowdley et al. |
| Ethiopia | 5.47 | 2.55 | 8.39 | int-high | Country, >2000 | Eastern Sub-Saharan Africa | Kowdley et al. |
| Faeroe Islands (DK) | 0.55 | 0.34 | 0.71 | low | Regional | Western Europe | Kowdley et al. |
| Fiji | 5.78 | 3.68 | 7.87 | int-high | Country | Oceania | Kowdley et al. |
| Finland | 0.2 | 0.1 | 0.4 | low | Country | Western Europe | Hahné et al, 2010 |
| Former Netherlands Antilles | 4.52 | 2.47 | 6.57 | int-high | Regional | Caribbean | Kowdley et al. |
| Former Serbia and Montenegro | 3.29 | 2.33 | 4.24 | int-high | Regional | Eastern Europe | Kowdley et al. |
| Former USSR | 3.83 | 2.74 | 4.91 | int-high | Country | Eastern Europe | Kowdley et al. |
| France | 0.68 | 0.44 | 1.05 | low | Country | Western Europe | Kowdley et al. |
| Gabon | 11,44 | 8,46 | 14,43 | high | Regional | Central Sub-Saharan Africa | Kowdley et al. |
| Gambia | 3.41 | 2.4 | 4.46 | int-high | Regional | West Africa | Kowdley et al. |
| Georgia | 3.89 | 1.25 | 6.54 | int-high | Country | Central Asia | Kowdley et al. |
| Germany | 0.6 | 0.4 | 0.8 | low | Country | Western Europe | Kowdley et al. |
| Ghana | 13.44 | 10.5 | 16.38 | int-high | Country | West Africa | Kowdley et al. |
| Greece | 2.33 | 1.54 | 3.11 | int-high | Country, >2000 | Western Europe | Kowdley et al. |
| Greenland (DK) | 0.55 | 0.34 | 0.71 | low | Regional | Western Europe | Kowdley et al. |
| Guatemala | 3.72 | 1.38 | 6.07 | int-high | Country | Central Latin America | Kowdley et al. |

| Country | CHB prevalence | Lower 95% CI | Upper 95% CI | Endemicity level | Country or regional data | GBD region | Data source |
|---|---|---|---|---|---|---|---|
| Guinea | 16.33 | 14.61 | 18.05 | int-high | Country | West Africa | Kowdley et al. |
| Guinea-Bissau | 13.17 | 10.18 | 16.17 | int-high | Regional | Western Africa | Kowdley et al. |
| Guyana | 1.31 | 0.72 | 1.91 | low | Country | Caribbean | Kowdley et al. |
| Haiti | 4.81 | 3.93 | 5.68 | int-high | Country | Caribbean | Kowdley et al. |
| Honduras | 0.56 | 0.41 | 0.72 | low | Country | Central Latin America | Kowdley et al. |
| Hungary | 1.08 | 0.04 | 2.11 | low | Country | Central Europe | Kowdley et al. |
| Iceland | 0.55 | 0.34 | 0.71 | low | Regional | Western Europe | Kowdley et al. |
| India | 3.23 | 2.92 | 3.55 | int-high | Country | South Asia | Kowdley et al. |
| Indonesia | 3.93 | 3.08 | 4.77 | int-high | Country | Southeast Asia | Kowdley et al. |
| Iran | 3.1 | 2.69 | 3.5 | int-high | Country | North Africa/Middle East | Kowdley et al. |
| Iraq | 1.31 | 0.0 | 2.87 | low | Country | North Africa/Middle East | Kowdley et al. |
| Ireland | 0.1 | 0.0 | 0.3 | low | Country | Western Europe | Hahné et al, 2010 |
| Israel | 1.26 | 0.97 | 1.55 | low | Country | Western Europe | Kowdley et al. |
| Italy | 1.89 | 1.26 | 2.52 | low | Country, >2000 | Western Europe | Kowdley et al. |
| Ivory Coast | 13.17 | 10.18 | 16.17 | int-high | Regional | Western Africa | Kowdley et al. |
| Jamaica | 3.94 | 0.81 | 7.07 | int-high | Country | Caribbean | Kowdley et al. |
| Japan | 0.63 | 0.6 | 0.7 | low | Country | Asia Pacific High Income | Kowdley et al. |
| Jordan | 6.36 | 3.72 | 9.0 | int-high | Country | North Africa/Middle East | Kowdley et al. |
| Kazakhstan | 4.95 | 3.34 | 6.56 | int-high | Country | Central Asia | Kowdley et al. |
| Kenya | 5.7 | 4.21 | 7.2 | int-high | Country | Eastern Sub-Saharan Africa | Kowdley et al. |
| Kosovo | 3.29 | 2.33 | 4.24 | int-high | Regional | Central Europe | Kowdley et al. |
| Kuwait | 3.85 | 1.99 | 5.71 | int-high | Country | North Africa/Middle East | Kowdley et al. |
| Kyrgyzstan | 3.61 | 3.05 | 4.19 | int-high | Regional | South Central Asia | Kowdley et al. |
| Laos | 13.61 | 11.58 | 15.64 | int-high | Country | Southeast Asia | Kowdley et al. |
| Latvia | 1.39 | 1.1 | 1.67 | low | Country | Eastern Europe | Kowdley et al. |
| Lebanon | 1.66 | 0.86 | 2.46 | low | Country | North Africa/Middle East | Kowdley et al. |
| Liberia | 16.54 | 11.55 | 21.53 | int-high | Country | West Africa | Kowdley et al. |
| Libya | 2.2 | 1.51 | 5.89 | int-high | Country | Northern Africa | Ezzikouri, 2013 |
| Liechtenstein | 0.55 | 0.34 | 0.71 | low | Regional | Western Europe | Kowdley et al. |
| Lithuania | 2.03 | 1.37 | 2.69 | int-high | Country | Eastern Europe | Kowdley et al. |
| Luxembourg | 0.55 | 0.34 | 0.71 | low | Regional | Western Europe | Kowdley et al. |
| Macedonia | 3.29 | 2.33 | 4.24 | int-high | Country | Central Europe | Kowdley et al. |
| Madagascar | 9.66 | 7.06 | 12.26 | int-high | Regional | Eastern Africa | Kowdley et al. |
| Malaysia | 5.58 | 4.27 | 6.88 | int-high | Country | Southeast Asia | Kowdley et al. |
| Mali | 13.17 | 10.18 | 16.17 | int-high | Regional | Western Africa | Kowdley et al. |
| Malta | 0.55 | 0.34 | 0.71 | low | Regional | Western Europe | Kowdley et al. |
| Mauritania | 13.17 | 10.18 | 16.17 | int-high | Regional | West Africa | Kowdley et al. |
| Mauritius | 9.32 | 8.15 | 10.48 | int-high | Regional | Southeast Asia | Kowdley et al. |
| Mexico | 0.49 | 0.34 | 0.65 | low | Country | Central Latin America | Kowdley et al. |
| Micronesia | 15.11 | 11.22 | 19.01 | int-high | Country | Oceania | Kowdley et al. |
| Moldova | 9.61 | 6.92 | 12.29 | int-high | Country | Eastern Europe | Kowdley et al. |
| Monaco | 0.55 | 0.34 | 0.71 | low | Regional | Western Europe | Kowdley et al. |
| Mongolia | 8.97 | 8.47 | 9.48 | int-high | Regional | East Asia | Kowdley et al. |

| Country | CHB prevalence | Lower 95% CI | Upper 95% CI | Endemicity level | Country or regional data | GBD region | Data source |
|---|---|---|---|---|---|---|---|
| Montenegro | 3.29 | 2.33 | 4.24 | int-high | Regional | Eastern Europe | Kowdley et al. |
| Morocco | 1.8 | 1.51 | 5.89 | low | Country | North Africa/Middle East | Ezzikouri, 2013 |
| Mozambique | 9.66 | 7.06 | 12.26 | int-high | Regional | Eastern Africa | Kowdley et al. |
| Myanmar | 11.63 | 9.53 | 13.73 | int-high | Country | Southeast Asia | Kowdley et al. |
| Nepal | 2.32 | 1.71 | 2.93 | int-high | Country | South Asia | Kowdley et al. |
| Netherlands | 0.1 | 0.0 | 0.2 | low | Country | Western Europe | Hahné et al, 2010 |
| New Zealand | 0.5 | 0.42 | 0.56 | low | Country | Australasia | Kowdley et al. |
| Nicaragua | 0.68 | 0.0 | 1.78 | low | Country | Central Latin America | Kowdley et al. |
| Nigeria | 13.31 | 11.57 | 15.06 | int-high | Country | West Africa | Kowdley et al. |
| Northern America | 0.7 | 0.59 | 0.9 | low | Country | High Income North America | Kowdley et al. |
| Norway | 0.55 | 0.34 | 0.71 | low | Regional | Western Europe | Kowdley et al. |
| Pakistan | 4.17 | 3.59 | 4.75 | int-high | Country | South Asia | Kowdley et al. |
| Palestine | 6.62 | 4.6 | 8.64 | int-high | Regional | Northern Africa | Kowdley et al. |
| Panama | 0.87 | 0.48 | 1.26 | low | Country | Central Latin America | Kowdley et al. |
| Paraguay | 0.78 | 0.52 | 1.05 | low | Country | Tropical Latin America | Kowdley et al. |
| Peru | 1.85 | 1.29 | 2.42 | low | Country | Andean Latin America | Kowdley et al. |
| Philippines | 7.36 | 6.32 | 8.39 | int-high | Country | Southeast Asia | Kowdley et al. |
| Poland | 1.44 | 1.16 | 1.72 | low | Country | Central Europe | Kowdley et al. |
| Portugal | 1.35 | 0.66 | 2.04 | low | Country | Western Europe | Kowdley et al. |
| Republic of Korea | 4.33 | 3.94 | 4.73 | int-high | Country, >2000 | East Asia and Asia Pacific High Income | Kowdley et al. |
| Romania | 5.49 | 5.24 | 5.73 | int-high | Country, >2000 | Central Europe | Kowdley et al. |
| Russia | 2.89 | 2.16 | 3.62 | int-high | Country | Eastern Europe | Kowdley et al. |
| Rwanda | 9.66 | 7.06 | 12.26 | int-high | Regional | Eastern Africa | Kowdley et al. |
| Samoa | 4.28 | 2.46 | 6.1 | int-high | Country | Oceania | Kowdley et al. |
| Sao Tome and Principe | 13.17 | 10.18 | 16.17 | int-high | Regional | Western Africa | Kowdley et al. |
| Saudi Arabia | 5.34 | 3.78 | 6.91 | int-high | Country, >2000 | North Africa/Middle East | Kowdley et al. |
| Senegal | 12.66 | 10.14 | 15.18 | int-high | Country | West Africa | Kowdley et al. |
| Serbia | 3.29 | 2.33 | 4.24 | int-high | Regional | Eastern Europe | Kowdley et al. |
| Sierra Leone | 11.89 | 6.5 | 17.28 | int-high | Country | West Africa | Kowdley et al. |
| Singapore | 6.02 | 5.03 | 7.01 | int-high | Country | Asia Pacific High Income | Kowdley et al. |
| Slovakia | 0.7 | 0.43 | 0.98 | low | Country | Central Europe | Kowdley et al. |
| Slovenia | 3.29 | 2.33 | 4.24 | int-high | Regional | Eastern Europe | Kowdley et al. |
| Somalia | 12.4 | 8.89 | 15.92 | int-high | Country | Eastern Sub-Saharan Africa | Kowdley et al. |
| South Africa | 6.2 | 4.68 | 7.71 | int-high | Country | Southern Sub-Saharan Africa | Kowdley et al. |
| South Korea | 4.33 | 3.94 | 4.73 | int-high | Country, >2000 | East Asia and Asia Pacific High Income | Kowdley et al. |
| Spain | 0.66 | 0.34 | 0.97 | low | Country, >2000 | Western Europe | Kowdley et al. |
| Sri Lanka | 2.41 | 0.0 | 5.53 | int-high | Country | Southeast Asia | Kowdley et al. |
| Sudan | 18.59 | 14.22 | 22.96 | int-high | Country | Eastern Sub-Saharan Africa | Kowdley et al. |
| Suriname | 4.52 | 2.47 | 6.57 | int-high | Regional | Caribbean | Kowdley et al. |
| Sweden | 0.2 | 0.1 | 0.4 | low | Country | Western Europe | Hahné et al, 2010 |
| Switzerland | 0.55 | 0.34 | 0.71 | low | Regional | Western Europe | Kowdley et al. |

| Country | CHB prevalence | Lower 95% CI | Upper 95% CI | Endemicity level | Country or regional data | GBD region | Data source |
|---|---|---|---|---|---|---|---|
| Syria | 5.62 | 4.82 | 6.42 | int-high | Country | North Africa/Middle East | Kowdley et al. |
| Taiwan | 10.23 | 9.35 | 11.11 | int-high | Country, >2000 (China) | East Asia | Kowdley et al. |
| Tajikistan | 3.61 | 3.05 | 4.19 | int-high | Regional | South Central Asia | Kowdley et al. |
| Tanzania | 5.65 | 4.43 | 6.86 | int-high | Country | Eastern Sub-Saharan Africa | Kowdley et al. |
| Thailand | 5.54 | 4.64 | 6.43 | int-high | Country, >2000 | Southeast Asia | Kowdley et al. |
| Timor-Leste | 3.93 | 3.08 | 4.77 | int-high | Country (Indonesia ) | Southeast Asia | Kowdley et al. |
| Togo | 13.17 | 10.18 | 16.17 | int-high | Regional | West Africa | |
| Tonga | 12.99 | 7.61 | 18.38 | int-high | Country | Oceania | Kowdley et al. |
| Trinidad and Tobago | 0.71 | 0.49 | 0.94 | low | Country | Caribbean | Kowdley et al. |
| Tunisia | 4.9 | 1.51 | 5.89 | int-high | Country | Northern Africa | Ezzikouri, 2013 |
| Turkey | 4.29 | 3.7 | 4.88 | int-high | Country, >2000 | North Africa/Middle East | Kowdley et al. |
| Turkmenistan | 3.61 | 3.05 | 4.19 | int-high | Regional | South Central Asia | Kowdley et al. |
| Uganda | 10.27 | 8.54 | 11.99 | int-high | Country | Eastern Sub-Saharan Africa | Kowdley et al. |
| Ukraine | 2.2 | 1.15 | 3.24 | int-high | Country | Eastern Europe | Kowdley et al. |
| United Kingdom | 0.54 | 0.3 | 0.6 | low | Country | Western Europe | Kowdley et al. |
| United States | 0.27 | 0.2 | 0.34 | low | Country | High Income North America | Ioannou, Ann Int Med, 2011 |
| Uruguay | 0.38 | 0.3 | 0.46 | low | Country | Southern Latin America | Kowdley et al. |
| Uzbekistan | 6.34 | 4.22 | 8.46 | int-high | Country | Central Asia | Kowdley et al. |
| Venezuela | 1.93 | 1.13 | 2.73 | low | Country | Central Latin America | Kowdley et al. |
| Vietnam | 12.48 | 11.46 | 13.5 | int-high | Country | Southeast Asia | Kowdley et al. |
| Yemen | 13.23 | 10.35 | 16.11 | int-high | Country | North Africa/Middle East | Kowdley et al. |
| Yugoslavia | 3.98 | 1.32 | 6.64 | int-high | Country | Central Europe | Kowdley et al. |
| Zambia | 9.66 | 7.06 | 12.26 | int-high | Regional | Eastern Africa | Kowdley et al. |
| Zimbabwe | 13.91 | 10.7 | 17.11 | int-high | Country | Southern Sub-Saharan Africa | Kowdley et al. |

## 5.6 Comparison of HBsAg estimates from SRs/Mas

Where Kowdley reports a regional estimate for a country we checked if other reviews providing country estimates are available and whether the reported estimates from other studies are considered more reliable.

The countries for which other estimates than Kowdley are available are listed below with an explanation on the decision made.

Albania

Hope – three studies (two national and one city specific) - 9.0% HBsAg (95% CI 8.1 – 9.8). CI for Hope estimate calculated from reported sample size and prevalence. Kowdley – eight general population and 10 immigrant studies 12.39% (95% CI 9.75–5.03). Studies in immigrants dominated by refugees, therefore we feel that the Hope estimate is a more accurate estimate.

Maghreb region (Tunisia, Algeria, Libya, Morocco, Mauritania)

Estimates from Ezzikouri (2013) are generally lower than Kowdley (where they are available). These estimates include studies in French and unpublished national report data. We therefore think they are a more accurate estimate of HBsAg prevalence. However, a CI is not provided. As there are no estimates in Kowdley for Tunisia and Libya, we would have to use the regional estimate from North Africa which includes Sudan and is therefore an overestimate for these countries.

For Algeria and Morocco we took Ezzikouri's point estimate and kept Kowdley's CI.

For Libya and Tunisia we took Ezzikouri's point estimate and the CI for Morocco as we felt this CI was more representative of these countries than the regional CI for North Africa, which includes Sudan.

The Ezzikouri estimate for Mauritania is higher (18,5%) than the Kowdley regional estimate (13,2%). As the Ezzikouri point estimate falls outside the regional CI we kept the regional estimate for West Africa from Kowdley.

Egypt

One study (Lehman) is based on 12 studies, all pre-2007, in populations including voluntary blood donors, antenatal screening and military recruits. This is not considered a better estimate than the Kowdley study estimate from studies after 2000 (estimated prevalence of 4.2% compared to 8% in Lehman).

Germany

ECDC review reports the same prevalence as Kowdley. No difference so we kept Kowdley.

Greece

The estimate from the ECDC review (2.1%) was based on one survey and is comparable to the recent Kowdley estimate (2.3%). As the recent Kowdley estimate was based on nine surveys we did not think the ECDC estimate was better.

India

One study (Batham) is based on 54 studies, all pre-2009, in populations including voluntary and replacement blood donors. This was not a better estimate than the Kowdley study which included 74 in country estimates. The estimates were not too different (3.2% in Kowdley compared to 3.1% in Batham).

Ireland

Kowdley 0.35%, based on a study in 16 000 pregnant women in Dublin 1998–2000. ECDC estimate 0.1% based on one study of 2 500 residual sera collected in 2003. This latter study was nationwide so we preferred this estimate over Kowdley.

Italy

ECDC review did not report an overall country estimate but estimates for Italian regions. We kept the recent Kowdley estimate.

Kazakhstan

Kowdley 4.95%, Hope 3.8%. Keep Kowdley as this was based on four studies while Hope was based on one study only.

Netherlands

Kowdley 0.41%, based on a study from Amsterdam in 2004. ECDC 0.1% based on a nationwide study in 1995–1996. This last study was nationwide so we preferred this estimate over Kowdley.

Pakistan

Two studies (Ali, 2009 and Ali, 2011) estimated prevalence in Pakistan. Ali 2009 included 13 publications estimating the prevalence in the general (non-blood donor) population to arrive at 3.8% (95% CI 1.4 -11). Ali 2011 included 17 studies. Kowdley included 32 in country estimates, most of which (24) were published after 2000. Kowdley was therefore a more reliable estimate.

Romania

Kowdley 5.5%. ECDC 5.6%. Similar estimates and ECDC based on one study only so kept recent Kowdley estimate.

Russia

Kowdley 2.89%, Hope 1.5%. Hope based on one conference paper from 2008. Kowdley based on 19 estimates, we felt Hope estimate was not more reliable than Kowdley.

Spain

Recent Kowdley estimate 0.66%, based on eight surveys. ECDC 1.0% but based on one study from Catalonia only.

Turkey

Hope and Toy estimate the prevalence in Turkey. Hope included nine studies and estimated a prevalence of 3.4%. Toy included 30 studies from 1999–2009 and estimated 4.8%. Kowdley included 69 in country studies with an overall estimate of 5.3%. As the Toy estimate excludes the many studies published during the period 1990–1999 (35 studies), and there was a statistically significant decrease in prevalence over this time period, we favoured the Kowdley estimate.

Ukraine

Kowdley 2.2%, Hope 1.3%. Both based on three surveys but Hope includes two surveys in pregnant women so we did not consider this a better estimate than Kowdley.

Uzbekistan

Kowdley 6.34%, based on 10 studies. Hope 13%, based on one study. We did not consider this a better estimate than Kowdley.

# 5.7 Anti-HCV prevalence estimates from systematic reviews

The anti-HCV prevalence estimates selected for each country are presented below.

| Country | Adult anti-HCV prevalence | Lower limit | Upper limit | Endemicity (<1%) | Country or regional data | Data source | GBD Region |
|---|---|---|---|---|---|---|---|
| Afghanistan | 1.1 | 0.6 | 1.9 | high | Country | Gower et.al. | South Asia |
| Albania | 2.4 | 2.0 | 2.8 | high | Regional | Mohd Hanafiah | Central Europe |
| Algeria | 1.4 | 0.2 | 2.5 | high | Country | Gower et.al. | North Africa / Middle East |
| Angola | 4.2 | 2.4 | 9.2 | high | Regional | Gower et.al. | Central Sub-Saharan Africa |
| Anguilla | 0.8 | 0.2 | 1.3 | low | Regional | Gower et.al. | Caribbean |
| Antigua and Barbuda | 0.8 | 0.2 | 1.3 | low | Regional | Gower et.al. | Caribbean |
| Argentina | 1.5 | 0.5 | 2.5 | high | Country | Gower et.al. | Southern Latin America |
| Armenia | 5.4 | 3.5 | 6.8 | high | Regional | Gower et.al. | Central Asia |
| Aruba | 0.8 | 0.2 | 1.3 | low | Regional | Gower et.al. | Caribbean |
| Australia | 1.7 | 1.2 | 2.3 | high | Country | Gower et.al. | Australasia |
| Austria | 0.5 | 0.1 | 0.7 | low | Country | Gower et.al. | Western Europe |
| Azerbaijan | 3.1 | 1.0 | 6.7 | high | Country | Gower et.al. | Central Asia |
| Bahamas | 0.8 | 0.2 | 1.3 | low | Regional | Gower et.al. | Caribbean |
| Bahrain | 3.1 | 2.5 | 3.9 | high | Regional | Gower et.al. | North Africa / Middle East |
| Bangladesh | 1.3 | 0.2 | 2.2 | high | Country | Gower et.al. | South Asia |
| Barbados | 0.8 | 0.2 | 1.3 | low | Regional | Gower et.al. | Caribbean |
| Belarus | 1.3 | 0.9 | 2.9 | high | Country | Gower et.al. | Eastern Europe |
| Belgium | 0.9 | 0.1 | 1.2 | low | Country | Gower et.al. | Western Europe |
| Belize | 0.8 | 0.2 | 1.3 | low | Regional | Gower et.al. | Caribbean |
| Benin | 3.6 | 3.6 | 12.8 | high | Country | Gower et.al. | West Sub-Saharan Africa |
| Bermuda | 0.8 | 0.2 | 1.3 | low | Regional | Gower et.al. | Caribbean |
| Bhutan | 1.1 | 0.7 | 1.5 | high | Regional | Gower et.al. | South Asia |
| Bolivia | 0.9 | 0.4 | 1.3 | low | Regional | Gower et.al. | Andean Latin America |
| Bosnia and Herzegovina | 1.3 | 1.1 | 1.6 | high | Regional | Gower et.al. | Central Europe |
| Botswana | 1.3 | 0.8 | 2.5 | high | Regional | Gower et.al. | South Sub-Saharan Africa |
| Brazil | 1.6 | 1.1 | 1.6 | high | Country | Gower et.al. | Tropical Latin America |
| British Virgin Islands | 0.8 | 0.2 | 1.3 | low | Regional | Gower et.al. | Caribbean |
| Brunei Darussalam | 1.1 | 0.5 | 1.7 | high | Regional | Gower et.al. | High-Income Asia Pacific |
| Bulgaria | 1.1 | 0.3 | 2.4 | high | Country | Gower et.al. | Central Europe |
| Burkina Faso | 5.3 | 2.9 | 9.1 | high | Regional | Gower et.al. | West Sub-Saharan Africa |
| Burundi | 1.0 | 0.6 | 3.1 | high | Regional | Gower et.al. | East Sub-Saharan Africa |
| Cambodia | 2.3 | 2.3 | 14.7 | high | Country | Gower et.al. | Southeast Asia |
| Cameroon | 11.6 | 4.3 | 29.7 | high | Country | Gower et.al. | West Sub-Saharan Africa |
| Canada | 1.1 | 0.6 | 1.3 | high | Country | Gower et.al. | High-income North America |
| Cape Verde | 5.3 | 2.9 | 9.1 | high | Regional | Gower et.al. | West Sub-Saharan Africa |
| Cayman Islands | 0.8 | 0.2 | 1.3 | low | Regional | Gower et.al. | Caribbean |
| Cent African Rep | 4.2 | 2.4 | 9.2 | high | Regional | Gower et.al. | Central Sub-Saharan Africa |
| Chad | 5.3 | 2.9 | 9.1 | high | Regional | Gower et.al. | West Sub-Saharan Africa |
| Chile | 1.2 | 0.5 | 2.1 | high | Regional | Gower et.al. | Southern Latin America |

| Country | Adult anti-HCV prevalence | Lower limit | Upper limit | Endemicity (<1%) | Country or regional data | Data source | GBD Region |
|---|---|---|---|---|---|---|---|
| China | 1.3 | 0.4 | 2.0 | high | Country | Gower et.al. | East Asia |
| Colombia | 1.0 | 0.8 | 1.4 | high | Regional | Gower et.al. | Central Latin America |
| Comoros | 1.0 | 0.6 | 3.1 | high | Regional | Gower et.al. | East Sub-Saharan Africa |
| Congo | 4.2 | 2.4 | 9.2 | high | Regional | Gower et.al. | Central Sub-Saharan Africa |
| Cook Islands | 0.1 | 0.1 | 0.6 | low | Regional | Gower et.al. | Oceania |
| Costa Rica | 1.0 | 0.8 | 1.4 | high | Regional | Gower et.al. | Central Latin America |
| Cote d'Ivoire | 3.3 | 0.8 | 12.8 | high | Country | Gower et.al. | West Sub-Saharan Africa |
| Croatia | 1.3 | 1.1 | 1.6 | high | Regional | Gower et.al. | Central Europe |
| Cuba | 0.8 | 0.2 | 1.3 | low | Regional | Gower et.al. | Caribbean |
| Cyprus | 0.6 | 0.5 | 1.9 | low | Country | Gower et.al. | Western Europe |
| Czech Republic | 0.7 | 0.2 | 0.7 | low | Country | Gower et.al. | Central Europe |
| Czech Republic and Slovakia | 1.3 | 1.1 | 1.6 | high | Regional | Gower et.al. | Central Europe |
| Democratic Republic of the Congo | 4.3 | 3.2 | 13.7 | high | Country | Gower et.al. | Central Sub-Saharan Africa |
| Denmark | 0.7 | 0.5 | 0.7 | low | Country | Gower et.al. | Western Europe |
| Djibouti | 1.0 | 0.6 | 3.1 | high | Regional | Gower et.al. | East Sub-Saharan Africa |
| Dominica | 0.8 | 0.2 | 1.3 | low | Regional | Gower et.al. | Caribbean |
| Dominican Republic | 0.8 | 0.2 | 1.3 | low | Regional | Gower et.al. | Caribbean |
| Ecuador | 0.9 | 0.4 | 1.3 | low | Regional | Gower et.al. | Andean Latin America |
| Egypt | 15.7 | 13.9 | 17.5 | high | Country | Lehman, 2008 | North Africa / Middle East |
| El Salvador | 1.0 | 0.8 | 1.4 | high | Regional | Gower et.al. | Central Latin America |
| Equatorial Guinea | 4.2 | 2.4 | 9.2 | high | Regional | Gower et.al. | Central Sub-Saharan Africa |
| Eritrea | 1.0 | 0.6 | 3.1 | high | Regional | Gower et.al. | East Sub-Saharan Africa |
| Estonia | 3.3 | 1.6 | 4.5 | high | Regional | Gower et.al. | Eastern Europe |
| Ethiopia | 1.3 | 0.7 | 5.8 | high | Country | Gower et.al. | East Sub-Saharan Africa |
| Faeroe Islands (DK) | 0.9 | 0.7 | 1.5 | low | Regional | Gower et.al. | Western Europe |
| Fiji | 0.1 | 0.1 | 0.6 | low | Regional | Gower et.al. | Oceania |
| Finland | 0.7 | 0.6 | 0.9 | low | Country | Gower et.al. | Western Europe |
| Former Netherlands Antilles | 0.8 | 0.2 | 1.3 | low | Regional | Gower et.al. | Caribbean |
| Former Serbia and Montenegro | 1.3 | 1.1 | 1.6 | high | Regional | Gower et.al. | Central Europe |
| Former USSR | 3.3 | 1.6 | 4.5 | high | Regional | Gower et.al. | Eastern Europe |
| France | 0.7 | 0.5 | 0.8 | low | Country | Bruggman, 2014 | Western Europe |
| French Guiana | 0.8 | 0.2 | 1.3 | low | Regional | Gower et.al. | Caribbean |
| Gabon | 11.2 | 2.1 | 20.7 | high | Country | Gower et.al. | Central Sub-Saharan Africa |
| Gambia | 2.1 | 1.4 | 2.9 | high | Country | Gower et.al. | West Sub-Saharan Africa |
| Georgia | 6.7 | 5.6 | 7.3 | high | Country | Gower et.al. | Central Asia |
| Germany | 0.5 | 0.3 | 0.9 | low | Country | Bruggman, 2014 | Western Europe |
| Ghana | 5.3 | 2.9 | 9.1 | high | Regional | Gower et.al. | West Sub-Saharan Africa |

| Country | Adult anti-HCV prevalence | Lower limit | Upper limit | Endemicity (<1%) | Country or regional data | Data source | GBD Region |
|---|---|---|---|---|---|---|---|
| Gibraltar | 0.9 | 0.7 | 1.5 | low | Regional | Gower et.al. | Western Europe |
| Greece | 1.9 | 0.5 | 2.6 | high | Country | Gower et.al. | Western Europe |
| Greenland (DK) | 0.9 | 0.7 | 1.5 | low | Regional | Gower et.al. | Western Europe |
| Grenada | 0.8 | 0.2 | 1.3 | low | Regional | Gower et.al. | Caribbean |
| Guatemala | 1.0 | 0.8 | 1.4 | high | Regional | Gower et.al. | Central Latin America |
| Guinea | 5.3 | 2.9 | 9.1 | high | Regional | Gower et.al. | West Sub-Saharan Africa |
| Guinea-Bissau | 5.3 | 2.9 | 9.1 | high | Regional | Gower et.al. | West Sub-Saharan Africa |
| Guyana | 0.8 | 0.2 | 1.3 | low | Regional | Gower et.al. | Caribbean |
| Haiti | 0.8 | 0.2 | 1.3 | low | Regional | Gower et.al. | Caribbean |
| Holy See | 0.9 | 0.7 | 1.5 | low | Regional | Gower et.al. | Western Europe |
| Honduras | 1.0 | 0.8 | 1.4 | high | Regional | Gower et.al. | Central Latin America |
| Hong Kong | 1.2 | 0.4 | 1.8 | high | Regional | Gower et.al. | East Asia |
| Hungary | 0.8 | 0.4 | 2.7 | low | Country | Gower et.al. | Central Europe |
| Iceland | 0.9 | 0.7 | 1.5 | low | Regional | Gower et.al. | Western Europe |
| India | 0.8 | 0.4 | 1.0 | low | Country | Gower et.al. | South Asia |
| Indonesia | 0.8 | 0.4 | 2.0 | low | Country | Gower et.al. | Southeast Asia |
| Iran | 0.5 | 0.2 | 1.0 | low | Country | Gower et.al. | North Africa / Middle East |
| Iraq | 3.2 | 0.3 | 3.2 | high | Country | Gower et.al. | North Africa / Middle East |
| Ireland | 1.1 | 0.7 | 1.6 | high | Country | Gower et.al. | Western Europe |
| Isle of Man | 0.9 | 0.7 | 1.5 | low | Regional | Gower et.al. | Western Europe |
| Israel | 2.0 | 0.9 | 2.0 | high | Country | Gower et.al. | Western Europe |
| Italy | 4.4 | 1.6 | 7.3 | high | Country | Cornberg, 2011 | Western Europe |
| Ivory Coast | 5.3 | 2.9 | 9.1 | high | Regional | Gower et.al. | West Sub-Saharan Africa |
| Jamaica | 0.8 | 0.2 | 1.3 | low | Regional | Gower et.al. | Caribbean |
| Japan | 1.5 | 0.5 | 2.2 | high | Country | Gower et.al. | High-Income Asia Pacific |
| Jordan | 3.1 | 2.5 | 3.9 | high | Regional | Gower et.al. | North Africa / Middle East |
| Kazakhstan | 3.3 | 1.0 | 6.7 | high | Country | Gower et.al. | Central Asia |
| Kenya | 1.0 | 0.6 | 3.1 | high | Regional | Gower et.al. | East Sub-Saharan Africa |
| Kiribati | 0.1 | 0.1 | 0.6 | low | Regional | Gower et.al. | Oceania |
| Kosovo | 1.3 | 1.1 | 1.6 | high | Regional | Gower et.al. | Central Europe |
| Kuwait | 3.1 | 2.5 | 3.9 | high | Regional | Gower et.al. | North Africa / Middle East |
| Kyrgyzstan | 2.5 | 1.6 | 6.7 | high | Country | Gower et.al. | Central Asia |
| Laos | 1.0 | 0.8 | 1.8 | high | Regional | Gower et.al. | Southeast Asia |
| Latvia | 2.4 | 1.7 | 3.3 | high | Country | Gower et.al. | Eastern Europe |
| Lebanon | 3.1 | 2.5 | 3.9 | high | Regional | Gower et.al. | North Africa / Middle East |
| Lesotho | 1.3 | 0.8 | 2.5 | high | Regional | Gower et.al. | South Sub-Saharan Africa |
| Liberia | 5.3 | 2.9 | 9.1 | high | Regional | Gower et.al. | West Sub-Saharan Africa |
| Libya | 1.2 | 1.2 | 2.3 | high | Country | Gower et.al. | North Africa / Middle East |
| Liechtenstein | 0.9 | 0.7 | 1.5 | low | Regional | Gower et.al. | Western Europe |
| Lithuania | 2.9 | 0.7 | 3.0 | high | Country | Gower et.al. | Eastern Europe |
| Luxembourg | 0.9 | 0.6 | 0.9 | low | Country | Gower et.al. | Western Europe |

| Country | Adult anti-HCV prevalence | Lower limit | Upper limit | Endemicity (<1%) | Country or regional data | Data source | GBD Region |
|---|---|---|---|---|---|---|---|
| Macao, China | 1.2 | 0.4 | 1.8 | high | Regional | Gower et.al. | East Asia |
| Macedonia | 1.3 | 1.1 | 1.6 | high | Regional | Gower et.al. | Central Europe |
| Madagascar | 1.2 | 0.8 | 1.7 | high | Country | Gower et.al. | East Sub-Saharan Africa |
| Malawi | 1.0 | 0.6 | 3.1 | high | Regional | Gower et.al. | East Sub-Saharan Africa |
| Malaysia | 1.5 | 0.3 | 7.7 | high | Country | Gower et.al. | Southeast Asia |
| Maldives | 1.0 | 0.8 | 1.8 | high | Regional | Gower et.al. | Southeast Asia |
| Mali | 5.3 | 2.9 | 9.1 | high | Regional | Gower et.al. | West Sub-Saharan Africa |
| Malta | 0.9 | 0.7 | 1.5 | low | Regional | Gower et.al. | Western Europe |
| Marshall Islands | 0.1 | 0.1 | 0.6 | low | Regional | Gower et.al. | Oceania |
| Mauritania | 1.9 | 1.1 | 10.7 | high | Country | Gower et.al. | West Sub-Saharan Africa |
| Mauritius | 1.0 | 0.8 | 1.8 | high | Regional | Gower et.al. | Southeast Asia |
| Mexico | 1.4 | 1.1 | 1.6 | high | Country | Gower et.al. | Central Latin America |
| Micronesia (Federated States of) | 0.1 | 0.1 | 0.6 | low | Regional | Gower et.al. | Oceania |
| Moldova | 3.3 | 1.6 | 4.5 | high | Regional | Gower et.al. | Eastern Europe |
| Monaco | 0.9 | 0.7 | 1.5 | low | Regional | Gower et.al. | Western Europe |
| Mongolia | 10.8 | 8.7 | 15.6 | high | Country | Gower et.al. | Central Asia |
| Montenegro | 1.3 | 1.1 | 1.6 | high | Regional | Gower et.al. | Central Europe |
| Montserrat | 0.8 | 0.2 | 1.3 | low | Regional | Gower et.al. | Caribbean |
| Morocco | 1.6 | 0.6 | 1.9 | high | Country | Gower et.al. | North Africa / Middle East |
| Mozambique | 1.0 | 0.6 | 3.1 | high | Regional | Gower et.al. | East Sub-Saharan Africa |
| Myanmar | 1.7 | 1.0 | 2.7 | high | Country | Gower et.al. | Southeast Asia |
| Namibia | 1.3 | 0.8 | 2.5 | high | Regional | Gower et.al. | South Sub-Saharan Africa |
| Nauru | 0.1 | 0.1 | 0.6 | low | Regional | Gower et.al. | Oceania |
| Nepal | 1.1 | 0.7 | 1.5 | high | Regional | Gower et.al. | South Asia |
| Netherlands | 0.2 | 0.1 | 0.4 | low | Country | Gower et.al. | Western Europe |
| New Zealand | 1.9 | 0.8 | 2.2 | high | Country | Gower et.al. | Australasia |
| Nicaragua | 1.0 | 0.8 | 1.4 | high | Regional | Gower et.al. | Central Latin America |
| Niger | 5.3 | 2.9 | 9.1 | high | Regional | Gower et.al. | West Sub-Saharan Africa |
| Nigeria | 8.4 | 3.9 | 12.8 | high | Country | Gower et.al. | West Sub-Saharan Africa |
| Niue | 0.1 | 0.1 | 0.6 | low | Regional | Gower et.al. | Oceania |
| Norway | 0.7 | 0.6 | 0.9 | low | Country | Gower et.al. | Western Europe |
| Oman | 3.1 | 2.5 | 3.9 | high | Regional | Gower et.al. | North Africa / Middle East |
| Pakistan | 5.0 | 4.4 | 5.5 | high | Country | Waheed, 2009 | South Asia |
| Palau | 0.1 | 0.1 | 0.6 | low | Regional | Gower et.al. | Oceania |
| Palestine | 3.1 | 2.5 | 3.9 | high | Regional | Gower et.al. | North Africa / Middle East |
| Panama | 1.0 | 0.8 | 1.4 | high | Regional | Gower et.al. | Central Latin America |
| Papua New Guinea | 0.1 | 0.1 | 0.6 | low | Regional | Gower et.al. | Oceania |
| Paraguay | 1.2 | 0.9 | 1.2 | high | Regional | Gower et.al. | Tropical Latin America |
| People's Republic of Korea | 1.2 | 0.4 | 1.8 | high | Regional | Gower et.al. | East Asia |
| Peru | 1.2 | 0.4 | 1.6 | high | Country | Gower et.al. | Andean Latin America |
| Philippines | 0.9 | 0.3 | 2.0 | low | Country | Gower et.al. | Southeast Asia |

| Country | Adult anti-HCV prevalence | Lower limit | Upper limit | Endemicity (<1%) | Country or regional data | Data source | GBD Region |
|---|---|---|---|---|---|---|---|
| Poland | 1.1 | 0.6 | 1.9 | high | Country | Godzik, 2012 | Central Europe |
| Portugal | 1.8 | 0.5 | 2.9 | high | Country | Gower et.al. | Western Europe |
| Puerto Rico | 2.3 | 1.3 | 4.2 | high | Country | Gower et.al. | Caribbean |
| Qatar | 0.9 | 0.5 | 1.5 | low | Country | Gower et.al. | North Africa / Middle East |
| Rep, of Moldova | 4.5 | 2.3 | 4.5 | high | Country | Gower et.al. | Eastern Europe |
| Republic of Korea | 0.8 | 0.2 | 2.1 | high | Country | Gower et.al. | High-Income Asia Pacific |
| Romania | 3.2 | 2.9 | 3.6 | high | Country | Gower et.al. | Central Europe |
| Russia | 4.1 | 1.2 | 5.6 | high | Country | Gower et.al. | Eastern Europe |
| Rwanda | 1.0 | 0.6 | 3.1 | high | Regional | Gower et.al. | East Sub-Saharan Africa |
| Saint Kitts and Nevis | 0.8 | 0.2 | 1.3 | low | Regional | Gower et.al. | Caribbean |
| Saint Lucia | 0.8 | 0.2 | 1.3 | low | Regional | Gower et.al. | Caribbean |
| Saint Vincent and the Grenadines | 0.8 | 0.2 | 1.3 | low | Regional | Gower et.al. | Caribbean |
| Samoa | 0.2 | 0.2 | 0.9 | low | Country | Gower et.al. | Oceania |
| San Marino | 0.9 | 0.7 | 1.5 | low | Regional | Gower et.al. | Western Europe |
| Sao Tome and Principe | 5.3 | 2.9 | 9.1 | high | Regional | Gower et.al. | West Sub-Saharan Africa |
| Saudi Arabia | 1.5 | 0.6 | 7.3 | high | Country | Gower et.al. | North Africa / Middle East |
| Senegal | 5.3 | 2.9 | 9.1 | high | Regional | Gower et.al. | West Sub-Saharan Africa |
| Serbia | 1.3 | 1.1 | 1.6 | high | Regional | Gower et.al. | Central Europe |
| Seychelles | 1.0 | 0.8 | 1.8 | high | Regional | Gower et.al. | Southeast Asia |
| Sierra Leone | 5.3 | 2.9 | 9.1 | high | Regional | Gower et.al. | West Sub-Saharan Africa |
| Singapore | 1.1 | 0.5 | 1.7 | high | Regional | Gower et.al. | High-Income Asia Pacific |
| Slovakia | 1.4 | 0.9 | 2.0 | high | Country | Gower et.al. | Central Europe |
| Slovenia | 1.3 | 1.1 | 1.6 | high | Regional | Gower et.al. | Central Europe |
| Solomon Islands | 0.1 | 0.1 | 0.6 | low | Regional | Gower et.al. | Oceania |
| Somalia | 1.0 | 0.6 | 3.1 | high | Regional | Gower et.al. | East Sub-Saharan Africa |
| South Africa | 1.7 | 1.0 | 2.5 | high | Country | Gower et.al. | South Sub-Saharan Africa |
| South Korea | 0.8 | 0.2 | 2.1 | low | Country | Gower et.al. | High-Income Asia Pacific |
| South Sudan | 1.0 | 0.6 | 3.1 | high | Regional | Gower et.al. | |
| Spain | 1.7 | 0.4 | 2.6 | high | Country | Gower et.al. | Western Europe |
| Sri Lanka | 1.0 | 0.8 | 1.8 | high | Regional | Gower et.al. | Southeast Asia |
| Sudan | 1.0 | 0.6 | 3.1 | high | Regional | Gower et.al. | East Sub-Saharan Africa |
| Suriname | 0.8 | 0.2 | 1.3 | low | Regional | Gower et.al. | Caribbean |
| Swaziland | 1.3 | 0.8 | 2.5 | high | Regional | Gower et.al. | South Sub-Saharan Africa |
| Sweden | 0.6 | 0.5 | 0.7 | low | Country | Bruggman, 2014 | Western Europe |
| Switzerland | 1.5 | 0.7 | 1.8 | high | Country | Gower et.al. | Western Europe |
| Syria | 3.1 | 2.5 | 3.9 | high | Regional | Gower et.al. | North Africa / Middle East |
| Taiwan | 4.4 | 2.5 | 6.3 | high | Country | Gower et.al. | East Asia |
| Tajikistan | 3.1 | 1.1 | 6.7 | high | Country | Gower et.al. | Central Asia |
| Tanzania | 1.0 | 0.6 | 3.1 | high | Regional | Gower et.al. | East Sub-Saharan Africa |
| Thailand | 2.7 | 1.8 | 3.7 | high | Country | Gower et.al. | Southeast Asia |
| Timor-Leste | 1.0 | 0.8 | 1.8 | high | Regional | Gower et.al. | Southeast Asia |

| Country | Adult anti-HCV prevalence | Lower limit | Upper limit | Endemicity (<1%) | Country or regional data | Data source | GBD Region |
|---|---|---|---|---|---|---|---|
| Togo | 5.3 | 2.9 | 9.1 | high | Regional | Gower et.al. | West Sub-Saharan Africa |
| Tokelau | 0.1 | 0.1 | 0.6 | low | Regional | Gower et.al. | Oceania |
| Tonga | 0.1 | 0.1 | 0.6 | low | Regional | Gower et.al. | Oceania |
| Trinidad and Tobago | 0.8 | 0.2 | 1.3 | low | Regional | Gower et.al. | Caribbean |
| Tunisia | 1.3 | 0.3 | 2.5 | high | Country | Gower et.al. | North Africa / Middle East |
| Turkey | 1.0 | 0.7 | 1.1 | high | Country | Bruggman, 2014 | North Africa / Middle East |
| Turkmenistan | 5.6 | 1.1 | 6.7 | high | Country | Gower et.al. | Central Asia |
| Turks and Caicos Islands | 0.8 | 0.2 | 1.3 | low | Regional | Gower et.al. | Caribbean |
| Tuvalu | 0.1 | 0.1 | 0.6 | low | Regional | Gower et.al. | Oceania |
| Uganda | 1.0 | 0.6 | 3.1 | high | Regional | Gower et.al. | East Sub-Saharan Africa |
| Ukraine | 3.6 | 0.9 | 4.5 | high | Country | Gower et.al. | Eastern Europe |
| United Arab Emirates | 3.1 | 2.5 | 3.9 | high | Regional | Gower et.al. | North Africa / Middle East |
| United Kingdom | 0.6 | 0.4 | 1.2 | low | Country | Gower et.al. | Western Europe |
| United States | 1.3 | 1.2 | 2.4 | high | Country | Gower et.al. | High-income North America |
| Uruguay | 1.2 | 0.5 | 2.1 | high | Regional | Gower et.al. | Southern Latin America |
| US Virgin Islands | 0.8 | 0.2 | 1.3 | low | Regional | Gower et.al. | Caribbean |
| Uzbekistan | 11.3 | 6.4 | 13.1 | high | Country | Gower et.al. | Central Asia |
| Vanuatu | 0.1 | 0.1 | 0.6 | low | Regional | Gower et.al. | Oceania |
| Venezuela | 1.5 | 0.3 | 2.6 | high | Country | Gower et.al. | Central Latin America |
| Vietnam | 1.0 | 0.8 | 1.8 | high | Regional | Gower et.al. | Southeast Asia |
| Western Sahara | 3.1 | 2.5 | 3.9 | high | Regional | Gower et.al. | North Africa / Middle East |
| Yemen | 2.2 | 1.1 | 3.5 | high | Country | Gower et.al. | North Africa / Middle East |
| Yugoslavia | 1.3 | 1.1 | 1.6 | high | Regional | Gower et.al. | Central Europe |
| Zambia | 1.0 | 0.6 | 3.1 | high | Regional | Gower et.al. | East Sub-Saharan Africa |
| Zimbabwe | 1.6 | 1.0 | 9.1 | high | Country | Gower et.al. | South Sub-Saharan Africa |

## 5.8 Comparison of anti-HCV estimates from SRs/Mas

Comparison of anti-HCV estimates from SR/MAs to Gower: summary of decisions

The Gower study includes studies published post-2000 and gives more weight to more recent studies through a quality weighting.

Algeria

Ezzikouri provided a prevalence estimate of 1.4, which is the same as the country estimate in Gower. We therefore selected the Gower estimate as we did have a 95% CI, whereas there was no CI for the Ezzikouri estimate.

Albania

No in-country estimates were available and as Mohd Hanafiah meta-analysed more than one study (compared to Gower's selection of the most recent and highest quality), we selected the former estimate for Central Europe.

Argentina

Comparable estimate but as only a range was reported with no point estimate, we selected Gower.

Belgium

Hope provided an estimate of 0.6 although the source was unclear. The Gower estimate was the same as the Bruggman estimate (0.9), we therefore took the Gower estimate.

Bulgaria

Comparable estimate, we therefore took Gower.

Brazil

Seemed lower but as only a range was reported with no point estimate, we selected Gower.

Egypt

Comparable estimate, although the Lehman study included many more studies than Gower. We therefore selected Lehman.

France

All estimates were derived from the same original data. Cornberg reported the prevalence in the original study. Bruggman modelled the original data by age to arrive at a lower estimate (of 0.7 compared to 0.84 in the original study). The Gower estimate used Bruggman and the original data alongside an expert panel to revise it down further (0.58). We therefore selected the Bruggman estimate as it accounted for the change in age distribution over the period 2004–2014. We also selected the Bruggman CI.

Libya

Comparable estimate, we therefore took Gower.

Georgia

Comparable estimate, we therefore took Gower.

Germany

The Bruggman study was based on seven single study estimates, and was the basis of the Gower estimates. We therefore selected the Bruggman estimate and the CI.

Greece

There were no precise estimates available from the other review (Bruggman). We therefore selected Gower.

Italy

There was quite a large difference between the estimates from Gower and Cornberg (2 to 5.2). The source of the original data for the point estimate in Gower was unclear, although the low and high estimate ranges came from the same original study as that preferred by Cornberg (Ansaldi et al). The summary of data sources listed in Cornberg suggested that there were large age and region-specific differences and that the studies took place over the last 20–30 years. The age-adjusted estimate reported in Cornberg of 4.4 (and from Ansaldi) seemed to be most reliable, with the CI limit to account for the regional variation 1.6 (north) – 7.3 (south) (as reported in Gower).

Kazakhstan

The Hope estimate of 1.0 was from a study among pregnant women, a likely under-estimation. The Gower estimate seemed a more reasonable estimate, and we therefore kept that although the data source for the point estimate was unclear.

Kyrgyzstan

The Hope estimate of 1.6 was from a study among pregnant women, a likely under-estimation. The Gower estimate seemed more reasonable, and we therefore kept that although the data source for the point estimate was unclear.

Mauritania

Comparable estimate, we therefore took Gower.

Morocco

Comparable estimate, we therefore took Gower.

Mexico

Comparable estimate, we therefore took Gower.

The Netherlands

The estimate that was used to generate the prevalence in Gower was from a large population-based study published recently, whereas the Hope review was based on older estimates. We therefore took Gower.

Pakistan

Two estimates were available. The confidence limit in the Ali study was (2009) unreasonably wide. The Waheed review included 10 studies and produced a narrow CI range. The Gower estimate was based on one estimate and we therefore selected Waheed (2009).

Portugal

The estimate in the Bruggman study was from 1995 and was used within the Gower estimate. We preferred Gower.

Poland

There were a number of studies included in the description of data sources in Cornberg study whereas Gower repored estimates from a very recent study (from 2012) which reported an age-standardised estimate for the population 2010. There was quite a difference: 0.9 compared to 1.9 in Cornberg. In the original study preferred by Gower (in Polish), there were a number of different results reported (varying between 0.9–1.1) due to the ELISA/Western Blot confirmation variance in samples. If ELISA and Western blot are positive, the prevalence was 1.12. Four of the studies listed in Cornberg found a prevalence of 1.9, with other estimates of 1.4 and 2.1. We selected the most recent point estimate of 1.12, with the lower range as reported in Gower 0.59 and the upper range of 1.9 from Cornberg to account for this heterogeneity.

Romania

The Hope and Cornberg studies were very similar to Gower. We therefore selected the Gower estimate.

Russia

The Cornberg estimates were mostly derived from older estimates, before the break-up of the Soviet Union. Both the Hope and the Gower estimates were based on one study; we therefore selected the Gower estimate which was more recent.

Serbia

The estimate from Hope was based on one study (from Kosovo), mostly in blood donors. There were only regional estimates in Gower and Mohd Hanafiah – further decision needed on preference of regional estimate.

South Korea

There was no CI in Sievert and the Gower estimate was a very recent estimate from a peer-reviewed sample.

Spain

There were mostly old estimates used in the Cornberg estimates. The Bruggman study revised the estimates from these early studies down to 1.5 which was used as a reference in Gower, plus another study by the research team. We preferred Gower.

Sweden

Preferred Bruggman due to inclusion of notification and published data. The estimates were quite similar.

Syria

There was heterogeneity in the samples listed in Sievert, and the overall point estimate did not have a CI. Although the Gower estimate was for the region, it did have a CI. We preferred Gower.

Tajikistan

The estimates in blood donors and the general population from Hope were very different (5.9 compared to 0.5). The Gower estimates were between these two and were considered more relevant.

Turkey

The Hope study was based on multiple estimates although it was unclear how the 0.7 estimate was derived. The Bruggman study reported the regional variety in studies, which were the low and high ranges around the Gower estimate. The Bruggman review highlighted the nationally representative study used to derive the Gower estimate. We therefore selected the Bruggman estimate and CI as these derived from the nationally representative recent study.

Tunisia

Comparable estimate, we therefore took Gower.

Ukraine

The estimate used in Hope was from an unpublished national source. The estimate was also much higher than in Gower (12.0 versus 3.6) and it was also difficult to identify the original source of this. The estimate in Hope among blood donors (2.7) was so much lower than the general population. The Hope estimate was not therefore deemed more accurate and we selected Gower.

United Kingdom

The estimates in Gower and Bruggman were derived from the same source (Public Health England). However, the age distribution and the date ranges differed. The Bruggman estimate was also only for England and Wales. We therefore selected Gower, which included Scotland.

Uzbekistan

The Hope general population estimate appeared to be the higher limit in the Gower estimate and the blood donor limit was the lower Gower limit. We selected Gower, since they derived from the same study.

Vietnam

There was heterogeneity in the samples listed in Sievert, and the overall point estimate did not have a CI. Although the Gower estimate was for the region, it did have a CI. We preferred Gower.

Kershenobich

There was no supplementary data added for the countries reported – imputed estimates, selection bias and date range – in this review.

# 5.9 Chronic hepatitis B (CHB) burden in migrants: the ten migrant groups from intermediate and high endemic countries with the highest number of CHB cases and total number of cases in host EU/EEA countries

| | | Population | CHB prevalence % with 95% CI | | | Estimated number of chronic hepatitis B cases | | |
|---|---|---|---|---|---|---|---|---|
| | | | % | Lower | Upper | CHB cases | Lower range | Upper range |
| **Host Country** | **Austria** | **8,451,149** | **0.55** | **0.34** | **0.71** | **46,481** | **28,734** | **60,003** |
| **Country of origin of first generation migrants** | Turkey | 159,386 | 4.29 | 3.7 | 4.88 | 6,838 | 5,897 | 7,778 |
| | Bosnia and Herzegovina | 151,580 | 3.63 | 2.26 | 5 | 5,502 | 3,426 | 7,579 |
| | Serbia | 130,828 | 3.29 | 2.33 | 4.24 | 4,304 | 3,048 | 5,547 |
| | Romania | 74,110 | 5.49 | 5.24 | 5.73 | 4,069 | 3,883 | 4,247 |
| | China | 14,347 | 10.23 | 9.35 | 11.11 | 1,468 | 1,341 | 1,594 |
| | Afghanistan | 13,150 | 10.46 | 5.85 | 15.07 | 1,375 | 769 | 1,982 |
| | Kosovo (UN SCR 1244/99) | 28,033 | 3.29 | 2.33 | 4.24 | 922 | 653 | 1,189 |
| | Nigeria | 6,800 | 13.31 | 11.57 | 15.06 | 905 | 787 | 1,024 |
| | Philippines | 12,255 | 7.36 | 6.32 | 8.39 | 902 | 775 | 1,028 |
| | Russia | 29,264 | 2.89 | 2.16 | 3.62 | 846 | 632 | 1,059 |
| **Host Country** | **Belgium** | **11,161,642** | **0.7** | **0.4** | **1.2** | **78,131** | **44,647** | **133,940** |
| **Country of origin of first generation migrants** | DRC of Congo | 84,278 | 11.44 | 8.46 | 14.43 | 9,641 | 7,130 | 12,161 |
| | Turkey | 99,011 | 4.29 | 3.7 | 4.88 | 4,248 | 3,663 | 4,832 |
| | Romania | 53,087 | 5.49 | 5.24 | 5.73 | 2,914 | 2,782 | 3,042 |
| | Former Soviet Union (before 1991) | 54,604 | 3.83 | 2.74 | 4.91 | 2,091 | 1,496 | 2,681 |
| | Guinea | 12,702 | 16.33 | 14.61 | 18.05 | 2,074 | 1,856 | 2,293 |
| | Former Yugoslavia (before 1992) | 47,923 | 3.98 | 1.32 | 6.64 | 1,907 | 633 | 3,182 |
| | China | 18,421 | 10.23 | 9.35 | 11.11 | 1,884 | 1,722 | 2,047 |
| | Cameroon | 14,760 | 11.44 | 8.46 | 14.43 | 1,689 | 1,249 | 2,130 |
| | Rwanda | 14,027 | 9.66 | 7.06 | 12.26 | 1,355 | 990 | 1,720 |
| | Afghanistan | 12,256 | 10.46 | 5.85 | 15.07 | 1,282 | 717 | 1,847 |
| **Host Country** | **Bulgaria** | **7,284,552** | **4.25** | **2.8** | **5.7** | **309,593** | **203,967** | **415,219** |
| **Country of origin of first generation migrants** | Russia | 19,533 | 2.89 | 2.16 | 3.62 | 565 | 422 | 707 |
| | Romania | 5,380 | 5.49 | 5.24 | 5.73 | 295 | 282 | 308 |
| | Turkey | 6,227 | 4.29 | 3.7 | 4.88 | 267 | 230 | 304 |
| | Moldova | 1,996 | 9.61 | 6.92 | 12.29 | 192 | 138 | 245 |
| | Greece | 7,377 | 2.33 | 1.54 | 3.11 | 172 | 114 | 229 |
| | Ukraine | 6,084 | 2.2 | 1.15 | 3.24 | 134 | 70 | 197 |
| | Albania | 1,078 | 9 | 8.1 | 9.8 | 97 | 87 | 106 |
| | China | 929 | 10.23 | 9.35 | 11.11 | 95 | 87 | 103 |
| | FYR Macedonia | 2,384 | 3.29 | 2.33 | 4.24 | 78 | 56 | 101 |
| | Vietnam | 596 | 12.48 | 11.46 | 13.5 | 74 | 68 | 80 |
| **Host Country** | **Croatia** | **4,284,889** | **1.47** | **0.84** | **2.1** | **62,988** | **35,993** | **89,983** |
| **Country of origin of first generation migrants** | Bosnia and Herzegovina | 409,357 | 3.63 | 2.26 | 5 | 14,860 | 9,251 | 20,468 |
| | Serbia | 52,763 | 3.29 | 2.33 | 4.24 | 1,736 | 1,229 | 2,237 |
| | Kosovo (UN SCR 1244/99) | 20,347 | 3.29 | 2.33 | 4.24 | 669 | 474 | 863 |
| | Slovenia | 19,803 | 3.29 | 2.33 | 4.24 | 652 | 461 | 840 |
| | FYR Macedonia | 10,167 | 3.29 | 2.33 | 4.24 | 334 | 237 | 431 |
| | Montenegro | 6,249 | 3.29 | 2.33 | 4.24 | 206 | 146 | 265 |
| | China | 451 | 10.23 | 9.35 | 11.11 | 46 | 42 | 50 |
| | Russian Federation | 1,326 | 2.89 | 2.16 | 3.62 | 38 | 29 | 48 |
| | Romania | 505 | 5.49 | 5.24 | 5.73 | 28 | 26 | 29 |
| | Ukraine | 766 | 2.2 | 1.15 | 3.24 | 17 | 9 | 25 |

| | | Population | CHB prevalence % with 95% CI | | | Estimated number of chronic hepatitis B cases | | |
|---|---|---|---|---|---|---|---|---|
| | | | % | Lower | Upper | CHB cases | Lower range | Upper range |
| **Host Country** | **Cyprus** | **840,407** | **0.9** | **0.3** | **2** | **7,564** | **2,521** | **16,808** |
| **Country of origin of first generation migrants** | Romania | 24,532 | 5.49 | 5.24 | 5.73 | 1,347 | 1,285 | 1,406 |
| | Vietnam | 7,016 | 12.48 | 11.46 | 13.5 | 876 | 804 | 947 |
| | Bulgaria | 19,284 | 4.25 | 2.8 | 5.7 | 820 | 540 | 1,099 |
| | Philippines | 10,009 | 7.36 | 6.32 | 8.39 | 737 | 633 | 840 |
| | Georgia | 11,814 | 3.89 | 1.25 | 6.54 | 460 | 148 | 773 |
| | Greece | 18,788 | 2.33 | 1.54 | 3.11 | 438 | 289 | 584 |
| | Russia | 10,520 | 2.89 | 2.16 | 3.62 | 304 | 227 | 381 |
| | Moldova | 2,348 | 9.61 | 6.92 | 12.29 | 226 | 162 | 289 |
| | Syria | 3,272 | 5.62 | 4.82 | 6.42 | 184 | 158 | 210 |
| | Sri Lanka | 7,327 | 2.41 | 0 | 5.53 | 177 | 0 | 405 |
| **Host Country** | **Czech Republic** | **10,516,125** | **0.7** | **0.43** | **0.98** | **73,613** | **45,219** | **103,058** |
| **Country of origin of first generation migrants** | Vietnam | 46,200 | 12.48 | 11.46 | 13.5 | 5,766 | 5,295 | 6,237 |
| | Ukraine | 99,835 | 2.2 | 1.15 | 3.24 | 2,196 | 1,148 | 3,235 |
| | Russia | 29,204 | 2.89 | 2.16 | 3.62 | 844 | 631 | 1,057 |
| | Moldova | 6,285 | 9.61 | 6.92 | 12.29 | 604 | 435 | 772 |
| | China | 4,512 | 10.23 | 9.35 | 11.11 | 462 | 422 | 501 |
| | Mongolia | 4,383 | 8.97 | 8.47 | 9.48 | 393 | 371 | 416 |
| | Bulgaria | 7,686 | 4.25 | 2.8 | 5.7 | 327 | 215 | 438 |
| | Kazakhstan | 5,652 | 4.95 | 3.34 | 6.56 | 280 | 189 | 371 |
| | Romania | 5,018 | 5.49 | 5.24 | 5.73 | 275 | 263 | 288 |
| | Uzbekistan | 1,983 | 6.34 | 4.22 | 8.46 | 126 | 84 | 168 |
| **Host Country** | **Denmark** | **5,602,628** | **0.55** | **0.34** | **0.71** | **30,814** | **19,049** | **39,779** |
| **Country of origin of first generation migrants** | Turkey | 32,066 | 4.29 | 3.7 | 4.88 | 1,376 | 1,186 | 1,565 |
| | Somalia | 9,963 | 12.4 | 8.89 | 15.92 | 1,235 | 886 | 1,586 |
| | Vietnam | 9,716 | 12.48 | 11.46 | 13.5 | 1,213 | 1,113 | 1,312 |
| | Afghanistan | 11,435 | 10.46 | 5.85 | 15.07 | 1,196 | 669 | 1,723 |
| | China | 10,877 | 10.23 | 9.35 | 11.11 | 1,113 | 1,017 | 1,208 |
| | Philippines | 10,151 | 7.36 | 6.32 | 8.39 | 747 | 642 | 852 |
| | Romania | 13,057 | 5.49 | 5.24 | 5.73 | 717 | 684 | 748 |
| | Thailand | 11,551 | 5.54 | 4.64 | 6.43 | 640 | 536 | 743 |
| | Bosnia and Herzegovina | 17,474 | 3.63 | 2.26 | 5 | 634 | 395 | 874 |
| | Pakistan | 12,166 | 4.17 | 3.59 | 4.75 | 507 | 437 | 578 |
| **Host Country** | **Germany** | **80,219,695** | **0.6** | **0.4** | **0.8** | **481,318** | **320,879** | **641,758** |
| **Country of origin of first generation migrants** | Turkey | 1,318,420 | 4.29 | 3.7 | 4.88 | 56,560 | 48,782 | 64,339 |
| | Kazakhstan | 800,500 | 4.95 | 3.34 | 6.56 | 39,625 | 26,737 | 52,513 |
| | Russian Federation | 975,500 | 2.89 | 2.16 | 3.62 | 28,192 | 21,071 | 35,313 |
| | Romania | 449,920 | 5.49 | 5.24 | 5.73 | 24,701 | 23,576 | 25,780 |
| | Vietnam | 85,430 | 12.48 | 11.46 | 13.5 | 10,662 | 9,790 | 11,533 |
| | China | 77,620 | 10.23 | 9.35 | 11.11 | 7,941 | 7,257 | 8,624 |
| | Afghanistan | 75,320 | 10.46 | 5.85 | 15.07 | 7,878 | 4,406 | 11,351 |
| | Former Yugo-slavia (bf. 92) | 175,260 | 3.98 | 1.32 | 6.64 | 6,975 | 2,313 | 11,637 |
| | Bosnia and Herzegovina | 159,380 | 3.63 | 2.26 | 5 | 5,785 | 3,602 | 7,969 |
| | Ukraine | 205,970 | 2.2 | 1.15 | 3.24 | 4,531 | 2,369 | 6,673 |
| **Host Country** | **Finland** | **5,426,674** | **0.2** | **0.1** | **0.4** | **10,853** | **5,427** | **21,707** |
| **Country of origin of first generation migrants** | Former Soviet Union (bf. 91) | 52,339 | 3.83 | 2.74 | 4.91 | 2,005 | 1,434 | 2,570 |
| | Somalia | 9,079 | 12.4 | 8.89 | 15.92 | 1,126 | 807 | 1,445 |
| | China | 8,272 | 10.23 | 9.35 | 11.11 | 846 | 773 | 919 |
| | Vietnam | 5,176 | 12.48 | 11.46 | 13.5 | 646 | 593 | 699 |
| | Thailand | 8,050 | 5.54 | 4.64 | 6.43 | 446 | 374 | 518 |
| | Afghanistan | 3,288 | 10.46 | 5.85 | 15.07 | 344 | 192 | 496 |
| | Russia | 10,020 | 2.89 | 2.16 | 3.62 | 290 | 216 | 363 |
| | Former Yugo-slavia (bf. 92) | 6,515 | 3.98 | 1.32 | 6.64 | 259 | 86 | 433 |
| | Turkey | 5,736 | 4.29 | 3.7 | 4.88 | 246 | 212 | 280 |
| | Nigeria | 1,759 | 13.31 | 11.57 | 15.06 | 234 | 204 | 265 |

| | | Population | CHB prevalence % with 95% CI | | | Estimated number of chronic hepatitis B cases | | |
|---|---|---|---|---|---|---|---|---|
| | | | % | Lower | Upper | CHB cases | Lower range | Upper range |
| **Host Country** | **France** | **64,932,339** | **0.68** | **0.44** | **1.05** | **441,540** | **285,702** | **681,790** |
| **Country of origin of first generation migrants** | Algeria | 1,370,617 | 2.6 | 0 | 12.19 | 35,636 | 0 | 167,078 |
| | Tunisia | 376,254 | 4.9 | 1.51 | 5.89 | 18,436 | 5,681 | 22,161 |
| | Vietnam | 119,606 | 12.48 | 11.46 | 13.5 | 14,927 | 13,707 | 16,147 |
| | Senegal | 114,405 | 12.66 | 10.14 | 15.18 | 14,484 | 11,601 | 17,367 |
| | Ivory Coast | 89,324 | 13.17 | 10.18 | 16.17 | 11,764 | 9,093 | 14,444 |
| | Madagascar | 116,405 | 9.66 | 7.06 | 12.26 | 11,245 | 8,218 | 14,271 |
| | Turkey | 256,409 | 4.29 | 3.7 | 4.88 | 11,000 | 9,487 | 12,513 |
| | China | 96,301 | 10.23 | 9.35 | 11.11 | 9,852 | 9,004 | 10,699 |
| | Cameroon | 79,587 | 11.44 | 8.46 | 14.43 | 9,105 | 6,733 | 11,484 |
| | Mali | 68,882 | 13.17 | 10.18 | 16.17 | 9,072 | 7,012 | 11,138 |
| **Host Country** | **Estonia** | **1,320,174** | **0.58** | **0.42** | **0.74** | **7,657** | **5,545** | **9,769** |
| **Country of origin of first generation migrants** | Russia | 138,501 | 2.89 | 2.16 | 3.62 | 4,003 | 2,992 | 5,014 |
| | Ukraine | 21,743 | 2.2 | 1.15 | 3.24 | 478 | 250 | 704 |
| | Belarus | 11,616 | 3.19 | 1.72 | 4.65 | 371 | 200 | 540 |
| | Kazakhstan | 3,802 | 4.95 | 3.34 | 6.56 | 188 | 127 | 249 |
| | Moldova | 842 | 9.61 | 6.92 | 12.29 | 81 | 58 | 103 |
| | Uzbekistan | 1,090 | 6.34 | 4.22 | 8.46 | 69 | 46 | 92 |
| | Georgia | 1,528 | 3.89 | 1.25 | 6.54 | 59 | 19 | 100 |
| | Azerbaijan | 1,501 | 3.11 | 1.39 | 4.84 | 47 | 21 | 73 |
| | Lithuania | 1,886 | 2.03 | 1.37 | 2.69 | 38 | 26 | 51 |
| | China | 228 | 10.23 | 9.35 | 11.11 | 23 | 21 | 25 |
| **Host Country** | **Greece** | **11,090,000** | **2.33** | **1.54** | **3.11** | **258,397** | **170,786** | **344,899** |
| **Country of origin of first generation migrants** | Albania | 357,103 | 9 | 8.1 | 9.8 | 32,139 | 28,925 | 34,996 |
| | Georgia | 54,192 | 3.89 | 1.25 | 6.54 | 2,108 | 677 | 3,544 |
| | Romania | 32,717 | 5.49 | 5.24 | 5.73 | 1,796 | 1,714 | 1,875 |
| | Bulgaria | 35,037 | 4.25 | 2.8 | 5.7 | 1,489 | 981 | 1,997 |
| | Russia | 37,762 | 2.89 | 2.16 | 3.62 | 1,091 | 816 | 1,367 |
| | Pakistan | 24,038 | 4.17 | 3.59 | 4.75 | 1,002 | 863 | 1,142 |
| | Syria | 10,036 | 5.62 | 4.82 | 6.42 | 564 | 484 | 644 |
| | Philippines | 6,603 | 7.36 | 6.32 | 8.39 | 486 | 417 | 554 |
| | Egypt | 11,378 | 4.18 | 1.85 | 6.51 | 476 | 210 | 741 |
| | Turkey | 9,388 | 4.29 | 3.7 | 4.88 | 403 | 347 | 458 |
| **Host Country** | **Hungary** | **9,908,798** | **1.08** | **0.04** | **2.11** | **107,015** | **3,964** | **209,076** |
| **Country of origin of first generation migrants** | Romania | 190,942 | 5.49 | 5.24 | 5.73 | 10,483 | 10,005 | 10,941 |
| | Serbia | 35,944 | 3.29 | 2.33 | 4.24 | 1,183 | 837 | 1,524 |
| | China | 9,890 | 10.23 | 9.35 | 11.11 | 1,012 | 925 | 1,099 |
| | Ukraine | 28,779 | 2.2 | 1.15 | 3.24 | 633 | 331 | 932 |
| | Former Soviet Union (bf. 91) | 14,070 | 3.83 | 2.74 | 4.91 | 539 | 386 | 691 |
| | Vietnam | 3,166 | 12.48 | 11.46 | 13.5 | 395 | 363 | 427 |
| | Nigeria | 1,302 | 13.31 | 11.57 | 15.06 | 173 | 151 | 196 |
| | Afghanistan | 1,152 | 10.46 | 5.85 | 15.07 | 120 | 67 | 174 |
| | Russia | 3,155 | 2.89 | 2.16 | 3.62 | 91 | 68 | 114 |
| | Mongolia | 1,010 | 8.97 | 8.47 | 9.48 | 91 | 86 | 96 |
| **Host Country** | **Ireland** | **4,591,087** | **0.1** | **0** | **0.3** | **4,591** | **0** | **13,773** |
| **Country of origin of first generation migrants** | Nigeria | 24,938 | 13.31 | 11.57 | 15.06 | 3,319 | 2,885 | 3,756 |
| | China | 13,798 | 10.23 | 9.35 | 11.11 | 1,412 | 1,290 | 1,533 |
| | Philippines | 17,800 | 7.36 | 6.32 | 8.39 | 1,310 | 1,125 | 1,493 |
| | Romania | 16,788 | 5.49 | 5.24 | 5.73 | 922 | 880 | 962 |
| | India | 22,222 | 3.23 | 2.92 | 3.55 | 718 | 649 | 789 |
| | Lithuania | 32,639 | 2.03 | 1.37 | 2.69 | 663 | 447 | 878 |
| | South Africa | 10,260 | 6.2 | 4.68 | 7.71 | 636 | 480 | 791 |
| | Zimbabwe | 3,510 | 13.91 | 10.7 | 17.11 | 488 | 376 | 601 |
| | Pakistan | 10,192 | 4.17 | 3.59 | 4.75 | 425 | 366 | 484 |
| | Moldova | 4,240 | 9.61 | 6.92 | 12.29 | 407 | 293 | 521 |

| | | Population | CHB prevalence % with 95% CI | | | Estimated number of chronic hepatitis B cases | | |
|---|---|---|---|---|---|---|---|---|
| | | | % | Lower | Upper | CHB cases | Lower range | Upper range |
| **Host Country** | **Iceland** | **321,857** | **0.55** | **0.34** | **0.71** | **1,770** | **1,094** | **2,285** |
| **Country of origin of first generation migrants** | Philippines | 1,487 | 7.36 | 6.32 | 8.39 | 109 | 94 | 125 |
| | Vietnam | 555 | 12.48 | 11.46 | 13.5 | 69 | 64 | 75 |
| | Thailand | 1,132 | 5.54 | 4.64 | 6.43 | 63 | 53 | 73 |
| | China | 548 | 10.23 | 9.35 | 11.11 | 56 | 51 | 61 |
| | Lithuania | 1,408 | 2.03 | 1.37 | 2.69 | 29 | 19 | 38 |
| | Romania | 273 | 5.49 | 5.24 | 5.73 | 15 | 14 | 16 |
| | Serbia | 325 | 3.29 | 2.33 | 4.24 | 11 | 8 | 14 |
| | Russia | 361 | 2.89 | 2.16 | 3.62 | 10 | 8 | 13 |
| | India | 295 | 3.23 | 2.92 | 3.55 | 10 | 9 | 10 |
| | Bulgaria | 151 | 4.25 | 2.8 | 5.7 | 6 | 4 | 9 |
| **Host Country** | **Italy** | **59,685,227** | **1.89** | **1.26** | **2.52** | **1,128,051** | **752,034** | **1,504,068** |
| **Country of origin of first generation migrants** | Romania | 1,000,111 | 5.49 | 5.24 | 5.73 | 54,906 | 52,406 | 57,306 |
| | Albania | 432,706 | 9 | 8.1 | 9.8 | 38,944 | 35,049 | 42,405 |
| | China | 191,272 | 10.23 | 9.35 | 11.11 | 19,567 | 17,884 | 21,250 |
| | Moldova | 157,145 | 9.61 | 6.92 | 12.29 | 15,102 | 10,874 | 19,313 |
| | Senegal | 79,193 | 12.66 | 10.14 | 15.18 | 10,026 | 8,030 | 12,021 |
| | Philippines | 135,364 | 7.36 | 6.32 | 8.39 | 9,963 | 8,555 | 11,357 |
| | Nigeria | 52,152 | 13.31 | 11.57 | 15.06 | 6,941 | 6,034 | 7,854 |
| | Ghana | 43,824 | 13.44 | 10.5 | 16.38 | 5,890 | 4,602 | 7,178 |
| | Tunisia | 110,706 | 4.9 | 1.51 | 5.89 | 5,425 | 1,672 | 6,521 |
| | Ukraine | 209,992 | 2.2 | 1.15 | 3.24 | 4,620 | 2,415 | 6,804 |
| **Host Country** | **Liechtenstein** | **36,838** | **0.55** | **0.34** | **0.71** | **203** | **125** | **262** |
| **Country of origin of first generation migrants** | Turkey | 602 | 4.29 | 3.7 | 4.88 | 26 | 22 | 29 |
| | Bosnia and Herzegovina | 301 | 3.63 | 2.26 | 5 | 11 | 7 | 15 |
| | Kosovo (UN SCR 1244/99) | 236 | 3.29 | 2.33 | 4.24 | 8 | 5 | 10 |
| | China | 73 | 10.23 | 9.35 | 11.11 | 7 | 7 | 8 |
| | Dominican Republic | 67 | 10.68 | 5.89 | 15.46 | 7 | 4 | 10 |
| | Laos | 35 | 13.61 | 11.58 | 15.64 | 5 | 4 | 5 |
| | Serbia | 138 | 3.29 | 2.33 | 4.24 | 5 | 3 | 6 |
| | Thailand | 79 | 5.54 | 4.64 | 6.43 | 4 | 4 | 5 |
| | Slovenia | 112 | 3.29 | 2.33 | 4.24 | 4 | 3 | 5 |
| | Former Serbia &Montenegro | 112 | 3.29 | 2.33 | 4.24 | 4 | 3 | 5 |
| **Host Country** | **Lithuania** | **2,971,905** | **2.03** | **1.37** | **2.69** | **60,330** | **40,715** | **79,944** |
| **Country of origin of first generation migrants** | Russia | 62,241 | 2.89 | 2.16 | 3.62 | 1,799 | 1,344 | 2,253 |
| | Belarus | 37,079 | 3.19 | 1.72 | 4.65 | 1,183 | 638 | 1,724 |
| | Ukraine | 13,035 | 2.2 | 1.15 | 3.24 | 287 | 150 | 422 |
| | Kazakhstan | 4,710 | 4.95 | 3.34 | 6.56 | 233 | 157 | 309 |
| | Uzbekistan | 1,021 | 6.34 | 4.22 | 8.46 | 65 | 43 | 86 |
| | Moldova | 637 | 9.61 | 6.92 | 12.29 | 61 | 44 | 78 |
| | Azerbaijan | 924 | 3.11 | 1.39 | 4.84 | 29 | 13 | 45 |
| | Georgia | 700 | 3.89 | 1.25 | 6.54 | 27 | 9 | 46 |
| | Kyrgyzstan | 405 | 3.61 | 3.05 | 4.19 | 15 | 12 | 17 |
| | China | 123 | 10.23 | 9.35 | 11.11 | 13 | 12 | 14 |
| **Host Country** | **Luxembourg** | **506,953** | **0.55** | **0.34** | **0.71** | **2,788** | **1,724** | **3,599** |
| **Country of origin of first generation migrants** | Cape Verde | 4,622 | 5.65 | 0.16 | 11.14 | 261 | 7 | 515 |
| | China (incl. Hong Kong) | 1,869 | 10.23 | 9.35 | 11.11 | 191 | 175 | 208 |
| | Romania | 1,927 | 5.49 | 5.24 | 5.73 | 106 | 101 | 110 |
| | Montenegro | 2,847 | 3.29 | 2.33 | 4.24 | 94 | 66 | 121 |
| | Bosnia and Herzegovina | 2,232 | 3.63 | 2.26 | 5 | 81 | 50 | 112 |
| | Angola | 689 | 11.44 | 8.46 | 14.43 | 79 | 58 | 99 |
| | Congo | 635 | 11.44 | 8.46 | 14.43 | 73 | 54 | 92 |
| | Guinea-Bissau | 439 | 13.17 | 10.18 | 16.17 | 58 | 45 | 71 |
| | Serbia | 1,754 | 3.29 | 2.33 | 4.24 | 58 | 41 | 74 |
| | Cameroon | 481 | 11.44 | 8.46 | 14.43 | 55 | 41 | 69 |

| | | Population | CHB prevalence % with 95% CI | | | Estimated number of chronic hepatitis B cases | | |
|---|---|---|---|---|---|---|---|---|
| | | | % | Lower | Upper | CHB cases | Lower range | Upper range |
| **Host Country** | **Latvia** | **2,023,825** | **1.39** | **1.1** | **1.67** | **28,131** | **22,262** | **33,798** |
| **Country of origin of first generation migrants** | Russia | 146,280 | 2.89 | 2.16 | 3.62 | 4,227 | 3,160 | 5,295 |
| | Belarus | 51,500 | 3.19 | 1.72 | 4.65 | 1,643 | 886 | 2,395 |
| | Ukraine | 35,687 | 2.2 | 1.15 | 3.24 | 785 | 410 | 1,156 |
| | Lithuania | 17,854 | 2.03 | 1.37 | 2.69 | 362 | 245 | 480 |
| | Kazakhstan | 6,202 | 4.95 | 3.34 | 6.56 | 307 | 207 | 407 |
| | Moldova | 1,752 | 9.61 | 6.92 | 12.29 | 168 | 121 | 215 |
| | Uzbekistan | 2,018 | 6.34 | 4.22 | 8.46 | 128 | 85 | 171 |
| | Azerbaijan | 2,012 | 3.11 | 1.39 | 4.84 | 63 | 28 | 97 |
| | Georgia | 1,382 | 3.89 | 1.25 | 6.54 | 54 | 17 | 90 |
| | Kyrgyzstan | 866 | 3.61 | 3.05 | 4.19 | 31 | 26 | 36 |
| **Host Country** | **Malta** | **417,432** | **0.55** | **0.34** | **0.71** | **2,296** | **1,419** | **2,964** |
| **Country of origin of first generation migrants** | Somalia | 1,003 | 12.4 | 8.89 | 15.92 | 124 | 89 | 160 |
| | Eritrea | 507 | 15.52 | 2.02 | 29.02 | 79 | 10 | 147 |
| | Nigeria | 330 | 13.31 | 11.57 | 15.06 | 44 | 38 | 50 |
| | Sudan | 227 | 18.59 | 14.22 | 22.96 | 42 | 32 | 52 |
| | China | 377 | 10.23 | 9.35 | 11.11 | 39 | 35 | 42 |
| | Bulgaria | 875 | 4.25 | 2.8 | 5.7 | 37 | 25 | 50 |
| | Romania | 656 | 5.49 | 5.24 | 5.73 | 36 | 34 | 38 |
| | Philippines | 464 | 7.36 | 6.32 | 8.39 | 34 | 29 | 39 |
| | Russian Federation | 918 | 2.89 | 2.16 | 3.62 | 27 | 20 | 33 |
| | Egypt | 454 | 4.18 | 1.85 | 6.51 | 19 | 8 | 30 |
| **Host Country** | **Netherlands** | **16,779,575** | **0.1** | **0** | **0.2** | **16,780** | **0** | **33,559** |
| **Country of origin of first generation migrants** | Turkey | 196,536 | 4.29 | 3.7 | 4.88 | 8,431 | 7,272 | 9,591 |
| | Suriname | 184,098 | 4.52 | 2.47 | 6.57 | 8,321 | 4,547 | 12,095 |
| | China | 59,759 | 10.23 | 9.35 | 11.11 | 6,113 | 5,587 | 6,639 |
| | Indonesia | 132,044 | 3.93 | 3.08 | 4.77 | 5,189 | 4,067 | 6,298 |
| | Former Dutch Antilles | 86,371 | 4.52 | 2.47 | 6.57 | 3,904 | 2,133 | 5,675 |
| | Afghanistan | 32,832 | 10.46 | 5.85 | 15.07 | 3,434 | 1,921 | 4,948 |
| | Somalia | 24,605 | 12.4 | 8.89 | 15.92 | 3,051 | 2,187 | 3,917 |
| | Former Yugo-slavia (bf. 92) | 50,357 | 3.98 | 1.32 | 6.64 | 2,004 | 665 | 3,344 |
| | Ghana | 13,835 | 13.44 | 10.5 | 16.38 | 1,859 | 1,453 | 2,266 |
| | Vietnam | 12,441 | 12.48 | 11.46 | 13.5 | 1,553 | 1,426 | 1,680 |
| **Host Country** | **Norway** | **5,049,223** | **0.55** | **0.34** | **0.71** | **27,771** | **17,167** | **35,849** |
| **Country of origin of first generation migrants** | Somalia | 23,670 | 12.4 | 8.89 | 15.92 | 2,935 | 2,104 | 3,768 |
| | Vietnam | 13,481 | 12.48 | 11.46 | 13.5 | 1,682 | 1,545 | 1,820 |
| | Eritrea | 10,097 | 15.52 | 2.02 | 29.02 | 1,567 | 204 | 2,930 |
| | Philippines | 17,586 | 7.36 | 6.32 | 8.39 | 1,294 | 1,111 | 1,475 |
| | Afghanistan | 11,980 | 10.46 | 5.85 | 15.07 | 1,253 | 701 | 1,805 |
| | China | 11,450 | 10.23 | 9.35 | 11.11 | 1,171 | 1,071 | 1,272 |
| | Thailand | 16,322 | 5.54 | 4.64 | 6.43 | 904 | 757 | 1,050 |
| | Pakistan | 18,543 | 4.17 | 3.59 | 4.75 | 773 | 666 | 881 |
| | Lithuania | 28,610 | 2.03 | 1.37 | 2.69 | 581 | 392 | 770 |
| | Bosnia and Herzegovina | 13,110 | 3.63 | 2.26 | 5 | 476 | 296 | 656 |
| **Host Country** | **Poland** | **38,533,299** | **1.44** | **1.16** | **1.72** | **554,880** | **446,986** | **662,773** |
| **Country of origin of first generation migrants** | Ukraine | 227,995 | 2.2 | 1.15 | 3.24 | 5,016 | 2,622 | 7,387 |
| | Belarus | 83,842 | 3.19 | 1.72 | 4.65 | 2,675 | 1,442 | 3,899 |
| | Russia | 41,344 | 2.89 | 2.16 | 3.62 | 1,195 | 893 | 1,497 |
| | Lithuania | 55,592 | 2.03 | 1.37 | 2.69 | 1,129 | 762 | 1,495 |
| | Vietnam | 3,112 | 12.48 | 11.46 | 13.5 | 388 | 357 | 420 |
| | Kazakhstan | 5,128 | 4.95 | 3.34 | 6.56 | 254 | 171 | 336 |
| | Romania | 2,744 | 5.49 | 5.24 | 5.73 | 151 | 144 | 157 |
| | Bosnia and Herzegovina | 3,819 | 3.63 | 2.26 | 5 | 139 | 86 | 191 |
| | China | 1,273 | 10.23 | 9.35 | 11.11 | 130 | 119 | 141 |
| | Bulgaria | 1,921 | 4.25 | 2.8 | 5.7 | 82 | 54 | 109 |

| | | Population | CHB prevalence % with 95% CI | | | Estimated number of chronic hepatitis B cases | | |
|---|---|---|---|---|---|---|---|---|
| | | | % | Lower | Upper | CHB cases | Lower range | Upper range |
| **Host Country** | **Portugal** | **10,562,178** | **1.35** | **0.66** | **2.04** | **142,589** | **69,710** | **215,468** |
| **Country of origin of first generation migrants** | Angola | 162,604 | 11.44 | 8.46 | 14.43 | 18,602 | 13,756 | 23,464 |
| | Mozambique | 73,084 | 9.66 | 7.06 | 12.26 | 7,060 | 5,160 | 8,960 |
| | Guinea-Bissau | 29,578 | 13.17 | 10.18 | 16.17 | 3,895 | 3,011 | 4,783 |
| | Cape Verde | 61,953 | 5.65 | 0.16 | 11.14 | 3,500 | 99 | 6,902 |
| | Sao Tome and Principe | 18,645 | 13.17 | 10.18 | 16.17 | 2,456 | 1,898 | 3,015 |
| | Moldova | 14,324 | 9.61 | 6.92 | 12.29 | 1,377 | 991 | 1,760 |
| | Romania | 23,689 | 5.49 | 5.24 | 5.73 | 1,301 | 1,241 | 1,357 |
| | China | 10,887 | 10.23 | 9.35 | 11.11 | 1,114 | 1,018 | 1,210 |
| | Ukraine | 33,172 | 2.2 | 1.15 | 3.24 | 730 | 381 | 1,075 |
| | South Africa | 11,477 | 6.2 | 4.68 | 7.71 | 712 | 537 | 885 |
| **Host Country** | **Romania** | **20,020,074** | **5.49** | **5.24** | **5.73** | **1,099,102** | **1,049,052** | **1,147,150** |
| **Country of origin of first generation migrants** | Moldova | 59,670 | 9.61 | 6.92 | 12.29 | 5,734 | 4,129 | 7,333 |
| | Bulgaria | 11,163 | 4.25 | 2.8 | 5.7 | 474 | 313 | 636 |
| | China | 2,978 | 10.23 | 9.35 | 11.11 | 305 | 278 | 331 |
| | Turkey | 5,057 | 4.29 | 3.7 | 4.88 | 217 | 187 | 247 |
| | Ukraine | 8,743 | 2.2 | 1.15 | 3.24 | 192 | 101 | 283 |
| | Russia | 4,952 | 2.89 | 2.16 | 3.62 | 143 | 107 | 179 |
| | Syria | 2,295 | 5.62 | 4.82 | 6.42 | 129 | 111 | 147 |
| | Greece | 4,085 | 2.33 | 1.54 | 3.11 | 95 | 63 | 127 |
| | Tunisia | 1,034 | 4.9 | 1.51 | 5.89 | 51 | 16 | 61 |
| | Serbia | 1,529 | 3.29 | 2.33 | 4.24 | 50 | 36 | 65 |
| **Host Country** | **Slovakia** | **5,410,836** | **0.7** | **0.43** | **0.98** | **37,876** | **23,267** | **53,026** |
| **Country of origin of first generation migrants** | Romania | 5,301 | 5.49 | 5.24 | 5.73 | 291 | 278 | 304 |
| | Ukraine | 9,753 | 2.2 | 1.15 | 3.24 | 215 | 112 | 316 |
| | Vietnam | 1,596 | 12.48 | 11.46 | 13.5 | 199 | 183 | 215 |
| | Russia | 2,303 | 2.89 | 2.16 | 3.62 | 67 | 50 | 83 |
| | China | 611 | 10.23 | 9.35 | 11.11 | 63 | 57 | 68 |
| | Bulgaria | 1,303 | 4.25 | 2.8 | 5.7 | 55 | 36 | 74 |
| | Serbia | 1,581 | 3.29 | 2.33 | 4.24 | 52 | 37 | 67 |
| | Chad | 149 | 11.44 | 8.46 | 14.43 | 17 | 13 | 22 |
| | Afghanistan | 126 | 10.46 | 5.85 | 15.07 | 13 | 7 | 19 |
| | South Korea | 303 | 4.33 | 3.94 | 4.73 | 13 | 12 | 14 |
| **Host Country** | **Slovenia** | **2,058,821** | **3.29** | **2.33** | **4.24** | **67,735** | **47,971** | **87,294** |
| **Country of origin of first generation migrants** | Bosnia and Herzegovina | 98,527 | 3.63 | 2.26 | 5 | 3,577 | 2,227 | 4,926 |
| | Serbia | 26,742 | 3.29 | 2.33 | 4.24 | 880 | 623 | 1,134 |
| | FYR Macedonia | 14,730 | 3.29 | 2.33 | 4.24 | 485 | 343 | 625 |
| | Kosovo (UN SCR 1244/99) | 10,414 | 3.29 | 2.33 | 4.24 | 343 | 243 | 442 |
| | Montenegro | 2,834 | 3.29 | 2.33 | 4.24 | 93 | 66 | 120 |
| | China | 839 | 10.23 | 9.35 | 11.11 | 86 | 78 | 93 |
| | Bulgaria | 1,059 | 4.25 | 2.8 | 5.7 | 45 | 30 | 60 |
| | Russia | 1,413 | 2.89 | 2.16 | 3.62 | 41 | 31 | 51 |
| | Ukraine | 1,605 | 2.2 | 1.15 | 3.24 | 35 | 18 | 52 |
| | Moldova | 327 | 9.61 | 6.92 | 12.29 | 31 | 23 | 40 |
| **Host Country** | **Spain** | **46,727,890** | **0.66** | **0.34** | **0.97** | **308,404** | **158,875** | **453,261** |
| **Country of origin of first generation migrants** | Romania | 715,033 | 5.49 | 5.24 | 5.73 | 39,255 | 37,468 | 40,971 |
| | China | 160,460 | 10.23 | 9.35 | 11.11 | 16,415 | 15,003 | 17,827 |
| | Dominican Republic | 152,947 | 10.68 | 5.89 | 15.46 | 16,335 | 9,009 | 23,646 |
| | Senegal | 53,347 | 12.66 | 10.14 | 15.18 | 6,754 | 5,409 | 8,098 |
| | Bulgaria | 140,046 | 4.25 | 2.8 | 5.7 | 5,952 | 3,921 | 7,983 |
| | Bolivia | 174,288 | 3.03 | 0.08 | 5.98 | 5,281 | 139 | 10,422 |
| | Nigeria | 33,970 | 13.31 | 11.57 | 15.06 | 4,521 | 3,930 | 5,116 |
| | Philippines | 41,895 | 7.36 | 6.32 | 8.39 | 3,083 | 2,648 | 3,515 |
| | Pakistan | 63,946 | 4.17 | 3.59 | 4.75 | 2,667 | 2,296 | 3,037 |
| | Mali | 19,931 | 13.17 | 10.18 | 16.17 | 2,625 | 2,029 | 3,223 |

| | | Population | CHB prevalence % with 95% CI | | | Estimated number of chronic hepatitis B cases | | |
|---|---|---|---|---|---|---|---|---|
| | | | % | Lower | Upper | CHB cases | Lower range | Upper range |
| **Host Country** | **Sweden** | **9,555,893** | **0.2** | **0.1** | **0.4** | **19,112** | **9,556** | **38,224** |
| **Country of origin of first generation migrants** | Somalia | 43,966 | 12.4 | 8.89 | 15.92 | 5,452 | 3,909 | 6,999 |
| | China | 27,422 | 10.23 | 9.35 | 11.11 | 2,805 | 2,564 | 3,047 |
| | Former Yugoslavia (bf. 92) | 69,269 | 3.98 | 1.32 | 6.64 | 2,757 | 914 | 4,599 |
| | Afghanistan | 21,484 | 10.46 | 5.85 | 15.07 | 2,247 | 1,257 | 3,238 |
| | Eritrea | 13,735 | 15.52 | 2.02 | 29.02 | 2,132 | 277 | 3,986 |
| | Bosnia and Herzegovina | 56,595 | 3.63 | 2.26 | 5 | 2,054 | 1,279 | 2,830 |
| | Iran | 65,649 | 3.1 | 2.69 | 3.5 | 2,035 | 1,766 | 2,298 |
| | Thailand | 35,554 | 5.54 | 4.64 | 6.43 | 1,970 | 1,650 | 2,286 |
| | Vietnam | 15,677 | 12.48 | 11.46 | 13.5 | 1,956 | 1,797 | 2,116 |
| | Turkey | 45,085 | 4.29 | 3.7 | 4.88 | 1,934 | 1,668 | 2,200 |
| **Host Country** | **United Kingdom** | **63,182,180** | **0.54** | **0.3** | **0.6** | **341,184** | **189,547** | **379,093** |
| **Country of origin of first generation migrants** | China | 284,070 | 10.23 | 9.35 | 11.11 | 29,060 | 26,561 | 31,560 |
| | Nigeria | 201,185 | 13.31 | 11.57 | 15.06 | 26,778 | 23,277 | 30,298 |
| | India | 722,435 | 3.23 | 2.92 | 3.55 | 23,335 | 21,095 | 25,646 |
| | Pakistan | 502,795 | 4.17 | 3.59 | 4.75 | 20,967 | 18,050 | 23,883 |
| | Zimbabwe | 123,670 | 13.91 | 10.7 | 17.11 | 17,202 | 13,233 | 21,160 |
| | Ghana | 95,665 | 13.44 | 10.5 | 16.38 | 12,857 | 10,045 | 15,670 |
| | Somalia | 103,050 | 12.4 | 8.89 | 15.92 | 12,778 | 9,161 | 16,406 |
| | South Africa | 203,475 | 6.2 | 4.68 | 7.71 | 12,615 | 9,523 | 15,688 |
| | Bangladesh | 214,090 | 4.83 | 4.02 | 5.64 | 10,341 | 8,606 | 12,075 |
| | Philippines | 129,835 | 7.36 | 6.32 | 8.39 | 9,556 | 8,206 | 10,893 |

# 5.10 Chronic hepatitis C (CHC) burden in migrants: ten migrant groups from intermediate and high-endemic countries with the highest number of CHB cases and total cases in host EU/EEA countries

| | | Adult population 15+ | Anti-HCV prevalence estimate (%) | | | Estimated number of chronic hepatitis C cases (70% of anti-HCV) | | |
|---|---|---|---|---|---|---|---|---|
| | | | % | Lower limit | Upper limit | CHC cases | Lower range | Upper range |
| **Host Country** | **Austria** | **7,232,026** | **0.5** | **0.1** | **0.7** | **25,312** | **5,062** | **35,437** |
| **Country of origin of first generation migrants** | Romania | 69,506 | 3.2 | 2.9 | 3.6 | 1,557 | 1,411 | 1,752 |
| | Bosnia and Herzegovina | 149,265 | 1.3 | 1.1 | 1.6 | 1,358 | 1,149 | 1,672 |
| | Egypt | 11,612 | 15.7 | 13.9 | 17.5 | 1,276 | 1,130 | 1,422 |
| | Serbia | 126,453 | 1.3 | 1.1 | 1.6 | 1,151 | 974 | 1,416 |
| | Turkey | 154,707 | 1 | 0.7 | 1.1 | 1,083 | 758 | 1,191 |
| | Italy | 24,638 | 4.4 | 1.6 | 7.3 | 759 | 276 | 1,259 |
| | Russia | 24,206 | 4.1 | 1.2 | 5.6 | 695 | 203 | 949 |
| | Poland | 60,323 | 1.1 | 0.6 | 1.9 | 464 | 253 | 802 |
| | Nigeria | 6,476 | 8.4 | 3.9 | 12.8 | 381 | 177 | 580 |
| | Croatia | 38,305 | 1.3 | 1.1 | 1.6 | 349 | 295 | 429 |
| **Host Country** | **Belgium** | **9,263,570** | **0.9** | **0.1** | **1.2** | **58,360** | **6,484** | **77,814** |
| **Country of origin of first generation migrants** | Italy | 115,528 | 4.4 | 1.6 | 7.3 | 3,558 | 1,294 | 5,903 |
| | DR Congo | 81,383 | 4.3 | 3.2 | 13.7 | 2,450 | 1,823 | 7,805 |
| | Morocco | 197,472 | 1.6 | 0.6 | 1.9 | 2,212 | 829 | 2,626 |
| | Former Soviet Union (bf. 91) | 54,604 | 3.3 | 1.6 | 4.5 | 1,261 | 612 | 1,720 |
| | Cameroon | 13,519 | 11.6 | 4.3 | 29.7 | 1,098 | 407 | 2,811 |
| | Romania | 47,832 | 3.2 | 2.9 | 3.6 | 1,071 | 971 | 1,205 |
| | Turkey | 96,479 | 1 | 0.7 | 1.1 | 675 | 473 | 743 |
| | Poland | 62,233 | 1.1 | 0.6 | 1.9 | 479 | 261 | 828 |
| | Former Yugoslavia (bf. 92) | 47,892 | 1.3 | 1.1 | 1.6 | 436 | 369 | 536 |
| | Spain | 35,598 | 1.7 | 0.4 | 2.6 | 424 | 100 | 648 |
| **Host Country** | **Bulgaria** | **6,294,563** | **1.1** | **0.3** | **2.4** | **48,468** | **13,219** | **105,749** |
| **Country of origin of first generation migrants** | Russia | 18,929 | 4.1 | 1.2 | 5.6 | 543 | 159 | 742 |
| | Ukraine | 5,896 | 3.6 | 0.9 | 4.5 | 149 | 37 | 186 |
| | Romania | 5,308 | 3.2 | 2.9 | 3.6 | 119 | 108 | 134 |
| | Greece | 4,896 | 1.9 | 0.5 | 2.6 | 65 | 17 | 89 |
| | Uzbekistan | 712 | 11.3 | 6.4 | 13.1 | 56 | 32 | 65 |
| | Armenia | 1,373 | 5.4 | 3.5 | 6.8 | 52 | 34 | 65 |
| | Moldova | 1,849 | 3.3 | 1.6 | 4.5 | 43 | 21 | 58 |
| | Azerbaijan | 1,866 | 3.1 | 1 | 6.7 | 40 | 13 | 88 |
| | Turkey | 4,857 | 1 | 0.7 | 1.1 | 34 | 24 | 37 |
| | Syria | 1,191 | 3.1 | 2.5 | 3.9 | 26 | 21 | 33 |
| **Host Country** | **Croatia** | **3,632,461** | **1.3** | **1.1** | **1.6** | **33,055** | **27,970** | **40,684** |
| **Country of origin of first generation migrants** | Bosnia and Herzegovina | 403,576 | 1.3 | 1.1 | 1.6 | 3,673 | 3,108 | 4,520 |
| | Serbia | 51,169 | 1.3 | 1.1 | 1.6 | 466 | 394 | 573 |
| | Kosovo (UN SCR 1244/99) | 19,931 | 1.3 | 1.1 | 1.6 | 181 | 153 | 223 |
| | Slovenia | 19,276 | 1.3 | 1.1 | 1.6 | 175 | 148 | 216 |
| | FYR Macedonia | 9,887 | 1.3 | 1.1 | 1.6 | 90 | 76 | 111 |
| | Italy | 2,193 | 4.4 | 1.6 | 7.3 | 68 | 25 | 112 |
| | Montenegro | 6,188 | 1.3 | 1.1 | 1.6 | 56 | 48 | 69 |
| | Russian Federation | 1,219 | 4.1 | 1.2 | 5.6 | 35 | 10 | 48 |
| | Egypt | 244 | 15.7 | 13.9 | 17.5 | 27 | 24 | 30 |
| | Switzerland | 2,326 | 1.5 | 0.7 | 1.8 | 24 | 11 | 29 |
| **Host Country** | **Cyprus** | **705,459** | **0.6** | **0.5** | **1.9** | **2.963** | **2.469** | **9.383** |
| **Country of origin of first generation migrants** | Georgia | 11,511 | 6.7 | 5.6 | 7.3 | 540 | 451 | 588 |
| | Romania | 22,475 | 3.2 | 2.9 | 3.6 | 503 | 456 | 566 |
| | Egypt | 3,193 | 15.7 | 13.9 | 17.5 | 351 | 311 | 391 |
| | Russia | 9,255 | 4.1 | 1.2 | 5.6 | 266 | 78 | 363 |
| | Greece | 16,210 | 1.9 | 0.5 | 2.6 | 216 | 57 | 295 |
| | Bulgaria | 17,320 | 1.1 | 0.3 | 2.4 | 133 | 36 | 291 |
| | Ukraine | 3,484 | 3.6 | 0.9 | 4.5 | 88 | 22 | 110 |
| | Syria | 2,991 | 3.1 | 2.5 | 3.9 | 65 | 52 | 82 |
| | Pakistan | 1,520 | 5 | 4.4 | 5.5 | 53 | 47 | 59 |
| | Sri Lanka | 7,298 | 1 | 0.8 | 1.8 | 51 | 41 | 92 |

| | | Adult population 15+ | Anti-HCV prevalence estimate (%) | | | Estimated number of chronic hepatitis C cases (70% of anti-HCV) | | |
|---|---|---|---|---|---|---|---|---|
| | | | % | Lower limit | Upper limit | CHC cases | Lower range | Upper range |
| **Host Country** | **Czech Republic** | **8,955,829** | **0.7** | **0.2** | **0.7** | **43,884** | **12,538** | **43,884** |
| **Country of origin of first generation migrants** | Ukraine | 95,966 | 3.6 | 0.9 | 4.5 | 2,418 | 605 | 3,023 |
| | Russia | 26,943 | 4.1 | 1.2 | 5.6 | 773 | 226 | 1,056 |
| | Slovakia | 77,821 | 1.4 | 0.9 | 2 | 763 | 490 | 1,089 |
| | Vietnam | 45,167 | 1 | 0.8 | 1.8 | 316 | 253 | 569 |
| | Mongolia | 4,041 | 10.8 | 8.7 | 15.6 | 305 | 246 | 441 |
| | Uzbekistan | 1,908 | 11.3 | 6.4 | 13.1 | 151 | 85 | 175 |
| | Poland | 18,032 | 1.1 | 0.6 | 1.9 | 139 | 76 | 240 |
| | Moldova | 5,969 | 3.3 | 1.6 | 4.5 | 138 | 67 | 188 |
| | Kazakhstan | 5,416 | 3.3 | 1 | 6.7 | 125 | 38 | 254 |
| | Romania | 4,877 | 3.2 | 2.9 | 3.6 | 109 | 99 | 123 |
| **Host Country** | **Denmark** | **4,625,032** | **0.7** | **0.5** | **0.7** | **22,663** | **16,188** | **22,663** |
| **Country of origin of first generation migrants** | Iraq | 20,222 | 3.2 | 0.3 | 3.2 | 453 | 42 | 453 |
| | Pakistan | 11,658 | 5 | 4.4 | 5.5 | 408 | 359 | 449 |
| | Romania | 12,370 | 3.2 | 2.9 | 3.6 | 277 | 251 | 312 |
| | Lebanon | 11,975 | 3.1 | 2.5 | 3.9 | 260 | 210 | 327 |
| | Turkey | 31,611 | 1 | 0.7 | 1.1 | 221 | 155 | 243 |
| | Poland | 28,029 | 1.1 | 0.6 | 1.9 | 216 | 118 | 373 |
| | Thailand | 10,371 | 2.7 | 1.8 | 3.7 | 196 | 131 | 269 |
| | Italy | 5,580 | 4.4 | 1.6 | 7.3 | 172 | 62 | 285 |
| | Bosnia and Herzegovina | 17,358 | 1.3 | 1.1 | 1.6 | 158 | 134 | 194 |
| | Lithuania | 7,690 | 2.9 | 0.7 | 3 | 156 | 38 | 161 |
| **Host Country** | **Estonia** | **1,113,355** | **3.3** | **1.6** | **4.5** | **25,719** | **12,470** | **35,071** |
| **Country of origin of first generation migrants** | Russia | 137,646 | 4.1 | 1.2 | 5.6 | 3,950 | 1,156 | 5,396 |
| | Ukraine | 21,598 | 3.6 | 0.9 | 4.5 | 544 | 136 | 680 |
| | Belarus | 11,587 | 1.3 | 0.9 | 2.9 | 105 | 73 | 235 |
| | Kazakhstan | 3,790 | 3.3 | 1 | 6.7 | 88 | 27 | 178 |
| | Uzbekistan | 1,088 | 11.3 | 6.4 | 13.1 | 86 | 49 | 100 |
| | Georgia | 1,515 | 6.7 | 5.6 | 7.3 | 71 | 59 | 77 |
| | Latvia | 3,971 | 2.4 | 1.7 | 3.3 | 67 | 47 | 92 |
| | Lithuania | 1,844 | 2.9 | 0.7 | 3 | 37 | 9 | 39 |
| | Azerbaijan | 1,494 | 3.1 | 1 | 6.7 | 32 | 10 | 70 |
| | Armenia | 658 | 5.4 | 3.5 | 6.8 | 25 | 16 | 31 |
| **Host Country** | **Finland** | **4,535,282** | **0.7** | **0.6** | **0.9** | **22,223** | **19,048** | **28,572** |
| **Country of origin of first generation migrants** | Former Soviet Union (bf. 91) | 52,318 | 3.3 | 1.6 | 4.5 | 1,209 | 586 | 1,648 |
| | Estonia | 30,299 | 3.3 | 1.6 | 4.5 | 700 | 339 | 954 |
| | Russia | 6,562 | 4.1 | 1.2 | 5.6 | 188 | 55 | 257 |
| | Iraq | 7,759 | 3.2 | 0.3 | 3.2 | 174 | 16 | 174 |
| | Thailand | 6,434 | 2.7 | 1.8 | 3.7 | 122 | 81 | 167 |
| | Nigeria | 1,727 | 8.4 | 3.9 | 12.8 | 102 | 47 | 155 |
| | Egypt | 814 | 15.7 | 13.9 | 17.5 | 89 | 79 | 100 |
| | China | 7,174 | 1.3 | 0.4 | 2 | 65 | 20 | 100 |
| | Former Yugoslavia (bf. 92) | 6,481 | 1.3 | 1.1 | 1.6 | 59 | 50 | 73 |
| | Italy | 1,877 | 4.4 | 1.6 | 7.3 | 58 | 21 | 96 |
| **Host Country** | **France** | **52,901,411** | **0.7** | **0.5** | **0.8** | **259,217** | **185,155** | **296,248** |
| **Country of origin of first generation migrants** | Algeria | 1,331,679 | 1.4 | 0.2 | 2.5 | 13,050 | 1,864 | 23,304 |
| | Italy | 337,920 | 4.4 | 1.6 | 7.3 | 10,408 | 3,785 | 17,268 |
| | Morocco | 869,903 | 1.6 | 0.6 | 1.9 | 9,743 | 3,654 | 11,570 |
| | Portugal | 595,315 | 1.8 | 0.5 | 2.9 | 7,501 | 2,084 | 12,085 |
| | Cameroon | 73,384 | 11.6 | 4.3 | 29.7 | 5,959 | 2,209 | 15,257 |
| | Senegal | 108,409 | 5.3 | 2.9 | 9.1 | 4,022 | 2,201 | 6,906 |
| | Tunisia | 367,692 | 1.3 | 0.3 | 2.5 | 3,346 | 772 | 6,435 |
| | Spain | 279,269 | 1.7 | 0.4 | 2.6 | 3,323 | 782 | 5,083 |
| | Egypt | 28,413 | 15.7 | 13.9 | 17.5 | 3,123 | 2,765 | 3,481 |
| | Ivory Coast | 83,132 | 5.3 | 2.9 | 9.1 | 3,084 | 1,688 | 5,296 |

| | | Adult Population 15+ | Anti-HCV prevalence estimate (%) | | | Estimated number of chronic hepatitis C cases (70% of anti-HCV) | | |
|---|---|---|---|---|---|---|---|---|
| | | | % | Lower limit | Upper limit | CHC cases | Lower range | Upper range |
| **Host Country** | **Germany** | **69,414,404** | **0.5** | **0.3** | **0.9** | **242,950** | **145,770** | **437,311** |
| **Country of origin of first generation migrants** | Russia | 943,240 | 4.1 | 1.2 | 5.6 | 27,071 | 7,923 | 36,975 |
| | Poland | 2,721,070 | 1.1 | 0.6 | 1.9 | 20,952 | 11,428 | 36,190 |
| | Kazakhstan | 780,840 | 3.3 | 1 | 6.7 | 18,037 | 5,466 | 36,621 |
| | Italy | 323,210 | 4.4 | 1.6 | 7.3 | 9,955 | 3,620 | 16,516 |
| | Romania | 442,280 | 3.2 | 2.9 | 3.6 | 9,907 | 8,978 | 11,145 |
| | Turkey | 1,303,200 | 1 | 0.7 | 1.1 | 9,122 | 6,386 | 10,035 |
| | Ukraine | 199,000 | 3.6 | 0.9 | 4.5 | 5,015 | 1,254 | 6,269 |
| | Uzbekistan | 32,040 | 11.3 | 6.4 | 13.1 | 2,534 | 1,435 | 2,938 |
| | Greece | 156,180 | 1.9 | 0.5 | 2.6 | 2,077 | 547 | 2,842 |
| | Iraq | 75,660 | 3.2 | 0.3 | 3.2 | 1,695 | 159 | 1,695 |
| **Host Country** | **Greece** | **9,464,000** | **1.9** | **0.5** | **2.6** | **125,871** | **33,124** | **172,245** |
| **Country of origin of first generation migrants** | Albania | 323,392 | 2.4 | 2 | 2.8 | 5,433 | 4,527 | 6,338 |
| | Georgia | 49,076 | 6.7 | 5.6 | 7.3 | 2,302 | 1,924 | 2,508 |
| | Egypt | 10,304 | 15.7 | 13.9 | 17.5 | 1,132 | 1,003 | 1,262 |
| | Russia | 34,197 | 4.1 | 1.2 | 5.6 | 981 | 287 | 1,341 |
| | Pakistan | 21,769 | 5 | 4.4 | 5.5 | 762 | 670 | 838 |
| | Romania | 29,629 | 3.2 | 2.9 | 3.6 | 664 | 601 | 747 |
| | Armenia | 8,660 | 5.4 | 3.5 | 6.8 | 327 | 212 | 412 |
| | Ukraine | 10,393 | 3.6 | 0.9 | 4.5 | 262 | 65 | 327 |
| | Bulgaria | 31,730 | 1.1 | 0.3 | 2.4 | 244 | 67 | 533 |
| | Syria | 9,089 | 3.1 | 2.5 | 3.9 | 197 | 159 | 248 |
| **Host Country** | **Hungary** | **8,477,933** | **0.8** | **0.4** | **2.7** | **47,476** | **23,738** | **160,233** |
| **Country of origin of first generation migrants** | Romania | 186,660 | 3.2 | 2.9 | 3.6 | 4,181 | 3,789 | 4,704 |
| | Ukraine | 27,866 | 3.6 | 0.9 | 4.5 | 702 | 176 | 878 |
| | Former Soviet Union (bf. 91) | 14,061 | 3.3 | 1.6 | 4.5 | 325 | 157 | 443 |
| | Serbia | 34,934 | 1.3 | 1.1 | 1.6 | 318 | 269 | 391 |
| | Slovakia | 20,412 | 1.4 | 0.9 | 2 | 200 | 129 | 286 |
| | China | 9,620 | 1.3 | 0.4 | 2 | 88 | 27 | 135 |
| | Russia | 2,816 | 4.1 | 1.2 | 5.6 | 81 | 24 | 110 |
| | Italy | 2,536 | 4.4 | 1.6 | 7.3 | 78 | 28 | 130 |
| | Egypt | 697 | 15.7 | 13.9 | 17.5 | 77 | 68 | 85 |
| | Nigeria | 1,277 | 8.4 | 3.9 | 12.8 | 75 | 35 | 114 |
| **Host Country** | **Iceland** | **255,391** | **0.9** | **0.7** | **1.5** | **1,609** | **1,251** | **2,682** |
| **Country of origin of first generation migrants** | Poland | 8,577 | 1.1 | 0.6 | 1.9 | 66 | 36 | 114 |
| | Lithuania | 1,269 | 2.9 | 0.7 | 3 | 26 | 6 | 27 |
| | Thailand | 1,068 | 2.7 | 1.8 | 3.7 | 20 | 13 | 28 |
| | United States | 1,516 | 1.3 | 1.2 | 2.4 | 14 | 13 | 25 |
| | Latvia | 596 | 2.4 | 1.7 | 3.3 | 10 | 7 | 14 |
| | Russia | 334 | 4.1 | 1.2 | 5.6 | 10 | 3 | 13 |
| | Italy | 201 | 4.4 | 1.6 | 7.3 | 6 | 2 | 10 |
| | Ukraine | 242 | 3.6 | 0.9 | 4.5 | 6 | 2 | 8 |
| | Romania | 240 | 3.2 | 2.9 | 3.6 | 5 | 5 | 6 |
| | Portugal | 412 | 1.8 | 0.5 | 2.9 | 5 | 1 | 8 |
| **Host Country** | **Ireland** | **3,586,829** | **1.1** | **0.7** | **1.6** | **27,619** | **17,575** | **40,172** |
| **Country of origin of first generation migrants** | Nigeria | 20,819 | 8.4 | 3.9 | 12.8 | 1,224 | 568 | 1,865 |
| | Poland | 93,763 | 1.1 | 0.6 | 1.9 | 722 | 394 | 1,247 |
| | Lithuania | 28,152 | 2.9 | 0.7 | 3 | 571 | 138 | 591 |
| | Romania | 15,106 | 3.2 | 2.9 | 3.6 | 338 | 307 | 381 |
| | Pakistan | 8,887 | 5 | 4.4 | 5.5 | 311 | 274 | 342 |
| | Latvia | 16,249 | 2.4 | 1.7 | 3.3 | 273 | 193 | 375 |
| | Italy | 6,276 | 4.4 | 1.6 | 7.3 | 193 | 70 | 321 |
| | Egypt | 1,539 | 15.7 | 13.9 | 17.5 | 169 | 150 | 189 |
| | Russia | 5,437 | 4.1 | 1.2 | 5.6 | 156 | 46 | 213 |
| | United States | 17,094 | 1.3 | 1.2 | 2.4 | 156 | 144 | 287 |

| | | Adult population 15+ | Anti-HCV prevalence estimate (%) | | | Estimated number of chronic hepatitis C cases (70% of anti-HCV) | | |
|---|---|---|---|---|---|---|---|---|
| | | | % | Lower limit | Upper limit | CHC cases | Lower range | Upper range |
| **Host Country** | **Italy** | **51,336,889** | **4.4** | **1.6** | **7.3** | **1,581,176** | **574,973** | **2,623,315** |
| **Country of origin of first generation migrants** | Romania | 933,854 | 3.2 | 2.9 | 3.6 | 20,918 | 18,957 | 23,533 |
| | Egypt | 95,572 | 15.7 | 13.9 | 17.5 | 10,503 | 9,299 | 11,708 |
| | Albania | 411,994 | 2.4 | 2 | 2.8 | 6,921 | 5,768 | 8,075 |
| | Ukraine | 199,021 | 3.6 | 0.9 | 4.5 | 5,015 | 1,254 | 6,269 |
| | Morocco | 385,177 | 1.6 | 0.6 | 1.9 | 4,314 | 1,618 | 5,123 |
| | Moldova | 146,367 | 3.3 | 1.6 | 4.5 | 3,381 | 1,639 | 4,611 |
| | Nigeria | 51,022 | 8.4 | 3.9 | 12.8 | 3,000 | 1,393 | 4,572 |
| | Senegal | 74,211 | 5.3 | 2.9 | 9.1 | 2,753 | 1,506 | 4,727 |
| | Pakistan | 66,303 | 5 | 4.4 | 5.5 | 2,321 | 2,042 | 2,553 |
| | Russia | 69,963 | 4.1 | 1.2 | 5.6 | 2,008 | 588 | 2,743 |
| **Host Country** | **Latvia** | **1,731,509** | **2.4** | **1.7** | **3.3** | **29,089** | **20,605** | **39,998** |
| **Country of origin of first generation migrants** | Russia | 145,768 | 4.1 | 1.2 | 5.6 | 4,184 | 1,224 | 5,714 |
| | Ukraine | 35,597 | 3.6 | 0.9 | 4.5 | 897 | 224 | 1,121 |
| | Belarus | 51,433 | 1.3 | 0.9 | 2.9 | 468 | 324 | 1,044 |
| | Lithuania | 17,756 | 2.9 | 0.7 | 3 | 360 | 87 | 373 |
| | Uzbekistan | 2,009 | 11.3 | 6.4 | 13.1 | 159 | 90 | 184 |
| | Kazakhstan | 6,186 | 3.3 | 1 | 6.7 | 143 | 43 | 290 |
| | Georgia | 1,374 | 6.7 | 5.6 | 7.3 | 64 | 54 | 70 |
| | Estonia | 2,674 | 3.3 | 1.6 | 4.5 | 62 | 30 | 84 |
| | Azerbaijan | 2,002 | 3.1 | 1 | 6.7 | 43 | 14 | 94 |
| | Moldova | 1,742 | 3.3 | 1.6 | 4.5 | 40 | 20 | 55 |
| **Host Country** | **Liechtenstein** | **31,142** | **0.9** | **0.7** | **1.5** | **196** | **153** | **327** |
| **Country of origin of first generation migrants** | Switzerland | 10,565 | 1.5 | 0.7 | 1.8 | 111 | 52 | 133 |
| | Italy | 846 | 4.4 | 1.6 | 7.3 | 26 | 9 | 43 |
| | Portugal | 394 | 1.8 | 0.5 | 2.9 | 5 | 1 | 8 |
| | Turkey | 597 | 1 | 0.7 | 1.1 | 4 | 3 | 5 |
| | Spain | 260 | 1.7 | 0.4 | 2.6 | 3 | 1 | 5 |
| | Bosnia and Herzegovina | 299 | 1.3 | 1.1 | 1.6 | 3 | 2 | 3 |
| | Kosovo (UN SCR 1244/99) | 230 | 1.3 | 1.1 | 1.6 | 2 | 2 | 3 |
| | Brazil | 157 | 1.6 | 1.1 | 1.6 | 2 | 1 | 2 |
| | Egypt | 15 | 15.7 | 13.9 | 17.5 | 2 | 1 | 2 |
| | Russia | 45 | 4.1 | 1.2 | 5.6 | 1 | 0 | 2 |
| **Host Country** | **Lithuania** | **2,535,329** | **2.9** | **0.7** | **3** | **51,467** | **12,423** | **53,242** |
| **Country of origin of first generation migrants** | Russia | 59,191 | 4.1 | 1.2 | 5.6 | 1,699 | 497 | 2,320 |
| | Belarus | 35,262 | 1.3 | 0.9 | 2.9 | 321 | 222 | 716 |
| | Ukraine | 12,396 | 3.6 | 0.9 | 4.5 | 312 | 78 | 390 |
| | Kazakhstan | 4,479 | 3.3 | 1 | 6.7 | 103 | 31 | 210 |
| | Latvia | 5,483 | 2.4 | 1.7 | 3.3 | 92 | 65 | 127 |
| | Uzbekistan | 971 | 11.3 | 6.4 | 13.1 | 77 | 43 | 89 |
| | Georgia | 666 | 6.7 | 5.6 | 7.3 | 31 | 26 | 34 |
| | Armenia | 561 | 5.4 | 3.5 | 6.8 | 21 | 14 | 27 |
| | Azerbaijan | 879 | 3.1 | 1 | 6.7 | 19 | 6 | 41 |
| | Estonia | 791 | 3.3 | 1.6 | 4.5 | 18 | 9 | 25 |
| **Host Country** | **Luxembourg** | **417,377** | **0.9** | **0.6** | **0.9** | **2,629** | **1,753** | **2,629** |
| **Country of origin of first generation migrants** | Portugal | 56,208 | 1.8 | 0.5 | 2.9 | 708 | 197 | 1,141 |
| | Italy | 12,205 | 4.4 | 1.6 | 7.3 | 376 | 137 | 624 |
| | Cape Verde | 4,266 | 5.3 | 2.9 | 9.1 | 158 | 87 | 272 |
| | Romania | 1,779 | 3.2 | 2.9 | 3.6 | 40 | 36 | 45 |
| | Cameroon | 444 | 11.6 | 4.3 | 29.7 | 36 | 13 | 92 |
| | Russia | 1,180 | 4.1 | 1.2 | 5.6 | 34 | 10 | 46 |
| | Spain | 2,690 | 1.7 | 0.4 | 2.6 | 32 | 8 | 49 |
| | Montenegro | 2,628 | 1.3 | 1.1 | 1.6 | 24 | 20 | 29 |
| | Bosnia and Herzegovina | 2,060 | 1.3 | 1.1 | 1.6 | 19 | 16 | 23 |
| | Angola | 636 | 4.2 | 2.4 | 9.2 | 19 | 11 | 41 |

| | | Adult population 15+ | Anti-HCV prevalence estimate (%) | | | Estimated number of chronic hepatitis C cases (70% of anti-HCV) | | |
|---|---|---|---|---|---|---|---|---|
| | | | % | Lower limit | Upper limit | CHC cases | Lower range | Upper range |
| **Host Country** | **Malta** | **355,704** | **0.9** | **0.7** | **1.5** | **2,241** | **1,743** | **3,735** |
| **Country of origin of first generation migrants** | Australia | 4,293 | 1.7 | 1.2 | 2.3 | 51 | 36 | 69 |
| | Egypt | 438 | 15.7 | 13.9 | 17.5 | 48 | 43 | 54 |
| | Italy | 1,419 | 4.4 | 1.6 | 7.3 | 44 | 16 | 73 |
| | Russian Federation | 705 | 4.1 | 1.2 | 5.6 | 20 | 6 | 28 |
| | Nigeria | 310 | 8.4 | 3.9 | 12.8 | 18 | 8 | 28 |
| | Canada | 1,737 | 1.1 | 0.6 | 1.3 | 13 | 7 | 16 |
| | Romania | 564 | 3.2 | 2.9 | 3.6 | 13 | 11 | 14 |
| | United States | 1,131 | 1.3 | 1.2 | 2.4 | 10 | 10 | 19 |
| | Somalia | 930 | 1 | 0.6 | 3.1 | 7 | 4 | 20 |
| | Ukraine | 256 | 3.6 | 0.9 | 4.5 | 6 | 2 | 8 |
| **Host Country** | **Netherlands** | **13,901,653** | **0.2** | **0.1** | **0.4** | **19,462** | **9,731** | **38,925** |
| **Country of origin of first generation migrants** | Morocco | 166,178 | 1.6 | 0.6 | 1.9 | 1,861 | 698 | 2,210 |
| | Turkey | 193,763 | 1 | 0.7 | 1.1 | 1,356 | 949 | 1,492 |
| | Egypt | 11,341 | 15.7 | 13.9 | 17.5 | 1,246 | 1,103 | 1,389 |
| | Former Soviet Union (bf. 91) | 38,194 | 3.3 | 1.6 | 4.5 | 882 | 428 | 1,203 |
| | Iraq | 38,494 | 3.2 | 0.3 | 3.2 | 862 | 81 | 862 |
| | Italy | 21,197 | 4.4 | 1.6 | 7.3 | 653 | 237 | 1,083 |
| | Poland | 78,845 | 1.1 | 0.6 | 1.9 | 607 | 331 | 1,049 |
| | Ghana | 13,352 | 5.3 | 2.9 | 9.1 | 495 | 271 | 851 |
| | China | 52,993 | 1.3 | 0.4 | 2 | 482 | 148 | 742 |
| | Former Yugoslavia (bf. 92) | 50,357 | 1.3 | 1.1 | 1.6 | 458 | 388 | 564 |
| **Host Country** | **Norway** | **4,122,334** | **0.7** | **0.6** | **0.9** | **20,199** | **17,314** | **25,971** |
| **Country of origin of first generation migrants** | Pakistan | 17,780 | 5 | 4.4 | 5.5 | 622 | 548 | 685 |
| | Poland | 69,545 | 1.1 | 0.6 | 1.9 | 535 | 292 | 925 |
| | Lithuania | 25,226 | 2.9 | 0.7 | 3 | 512 | 124 | 530 |
| | Iraq | 20,250 | 3.2 | 0.3 | 3.2 | 454 | 43 | 454 |
| | Russia | 14,250 | 4.1 | 1.2 | 5.6 | 409 | 120 | 559 |
| | Thailand | 14,039 | 2.7 | 1.8 | 3.7 | 265 | 177 | 364 |
| | Romania | 7,371 | 3.2 | 2.9 | 3.6 | 165 | 150 | 186 |
| | Somalia | 20,449 | 1 | 0.6 | 3.1 | 143 | 86 | 444 |
| | United States | 14,886 | 1.3 | 1.2 | 2.4 | 135 | 125 | 250 |
| | Latvia | 7,078 | 2.4 | 1.7 | 3.3 | 119 | 84 | 164 |
| **Host Country** | **Poland** | **32,736,685** | **1.1** | **0.6** | **1.9** | **252,072** | **137,494** | **435,398** |
| **Country of origin of first generation migrants** | Ukraine | 226,887 | 3.6 | 0.9 | 4.5 | 5,718 | 1,429 | 7,147 |
| | Russia | 40,808 | 4.1 | 1.2 | 5.6 | 1,171 | 343 | 1,600 |
| | Lithuania | 55,493 | 2.9 | 0.7 | 3 | 1,127 | 272 | 1,165 |
| | Belarus | 83,480 | 1.3 | 0.9 | 2.9 | 760 | 526 | 1,695 |
| | Kazakhstan | 4,717 | 3.3 | 1 | 6.7 | 109 | 33 | 221 |
| | Italy | 3,414 | 4.4 | 1.6 | 7.3 | 105 | 38 | 174 |
| | Armenia | 2,349 | 5.4 | 3.5 | 6.8 | 89 | 58 | 112 |
| | Romania | 2,606 | 3.2 | 2.9 | 3.6 | 58 | 53 | 66 |
| | United States | 6,117 | 1.3 | 1.2 | 2.4 | 56 | 51 | 103 |
| | Egypt | 480 | 15.7 | 13.9 | 17.5 | 53 | 47 | 59 |
| **Host Country** | **Portugal** | **8,989,849** | **1.8** | **0.5** | **2.9** | **113,272** | **31,464** | **182,494** |
| **Country of origin of first generation migrants** | Angola | 159,008 | 4.2 | 2.4 | 9.2 | 4,675 | 2,671 | 10,240 |
| | Cape Verde | 57,903 | 5.3 | 2.9 | 9.1 | 2,148 | 1,175 | 3,688 |
| | Brazil | 125,547 | 1.6 | 1.1 | 1.6 | 1,406 | 967 | 1,406 |
| | Guinea-Bissau | 27,196 | 5.3 | 2.9 | 9.1 | 1,009 | 552 | 1,732 |
| | Ukraine | 30,355 | 3.6 | 0.9 | 4.5 | 765 | 191 | 956 |
| | Sao Tome and Principe | 17,115 | 5.3 | 2.9 | 9.1 | 635 | 347 | 1,090 |
| | Mozambique | 72,308 | 1 | 0.6 | 3.1 | 506 | 304 | 1,569 |
| | Romania | 20,885 | 3.2 | 2.9 | 3.6 | 468 | 424 | 526 |
| | Moldova | 12,746 | 3.3 | 1.6 | 4.5 | 294 | 143 | 401 |
| | Venezuela | 24,133 | 1.5 | 0.3 | 2.6 | 253 | 51 | 439 |

| | | Adult population 15+ | Anti-HCV prevalence estimate (%) | | | Estimated number of chronic hepatitis C cases (70% of anti-HCV) | | |
|---|---|---|---|---|---|---|---|---|
| | | | % | Lower limit | Upper limit | CHC cases | Lower range | Upper range |
| **Host Country** | **Romania** | **16,880,465** | **3.2** | **2.9** | **3.6** | **378,122** | **342,673** | **425,388** |
| **Country of origin of first generation migrants** | Moldova | 56,435 | 3.3 | 1.6 | 4.5 | 1,304 | 632 | 1,778 |
| | Ukraine | 8,589 | 3.6 | 0.9 | 4.5 | 216 | 54 | 271 |
| | Russia | 4,893 | 4.1 | 1.2 | 5.6 | 140 | 41 | 192 |
| | Italy | 3,383 | 4.4 | 1.6 | 7.3 | 104 | 38 | 173 |
| | Bulgaria | 11,109 | 1.1 | 0.3 | 2.4 | 86 | 23 | 187 |
| | Syria | 1,985 | 3.1 | 2.5 | 3.9 | 43 | 35 | 54 |
| | Turkey | 4,129 | 1 | 0.7 | 1.1 | 29 | 20 | 32 |
| | Greece | 2,145 | 1.9 | 0.5 | 2.6 | 29 | 8 | 39 |
| | China | 2,882 | 1.3 | 0.4 | 2 | 26 | 8 | 40 |
| | Iraq | 1,041 | 3.2 | 0.3 | 3.2 | 23 | 2 | 23 |
| **Host Country** | **Slovakia** | **4,580,260** | **1.4** | **0.9** | **2** | **44,887** | **28,856** | **64,124** |
| **Country of origin of first generation migrants** | Ukraine | 9,589 | 3.6 | 0.9 | 4.5 | 242 | 60 | 302 |
| | Romania | 5,189 | 3.2 | 2.9 | 3.6 | 116 | 105 | 131 |
| | Russia | 2,208 | 4.1 | 1.2 | 5.6 | 63 | 19 | 87 |
| | Poland | 4,437 | 1.1 | 0.6 | 1.9 | 34 | 19 | 59 |
| | Italy | 878 | 4.4 | 1.6 | 7.3 | 27 | 10 | 45 |
| | Serbia | 1,502 | 1.3 | 1.1 | 1.6 | 14 | 12 | 17 |
| | Egypt | 109 | 15.7 | 13.9 | 17.5 | 12 | 11 | 13 |
| | Vietnam | 1,521 | 1 | 0.8 | 1.8 | 11 | 9 | 19 |
| | Bulgaria | 1,280 | 1.1 | 0.3 | 2.4 | 10 | 3 | 22 |
| | United States | 777 | 1.3 | 1.2 | 2.4 | 7 | 7 | 13 |
| **Host Country** | **Slovenia** | **1,760,726** | **1.3** | **1.1** | **1.6** | **16,023** | **13,558** | **19,720** |
| **Country of origin of first generation migrants** | Bosnia and Herzegovina | 95,960 | 1.3 | 1.1 | 1.6 | 873 | 739 | 1,075 |
| | Croatia | 47,670 | 1.3 | 1.1 | 1.6 | 434 | 367 | 534 |
| | Serbia | 25,839 | 1.3 | 1.1 | 1.6 | 235 | 199 | 289 |
| | FYR Macedonia | 13,641 | 1.3 | 1.1 | 1.6 | 124 | 105 | 153 |
| | Italy | 2,989 | 4.4 | 1.6 | 7.3 | 92 | 33 | 153 |
| | Kosovo (UN SCR 1244/99) | 9,190 | 1.3 | 1.1 | 1.6 | 84 | 71 | 103 |
| | Ukraine | 1,458 | 3.6 | 0.9 | 4.5 | 37 | 9 | 46 |
| | Russia | 1,221 | 4.1 | 1.2 | 5.6 | 35 | 10 | 48 |
| | Montenegro | 2,780 | 1.3 | 1.1 | 1.6 | 25 | 21 | 31 |
| | Egypt | 90 | 15.7 | 13.9 | 17.5 | 10 | 9 | 11 |
| **Host Country** | **Spain** | **39,637,891** | **1.7** | **0.4** | **2.6** | **471,691** | **110,986** | **721,410** |
| **Country of origin of first generation migrants** | Romania | 660,391 | 3.2 | 2.9 | 3.6 | 14,793 | 13,406 | 16,642 |
| | Morocco | 682,412 | 1.6 | 0.6 | 1.9 | 7,643 | 2,866 | 9,076 |
| | Italy | 93,453 | 4.4 | 1.6 | 7.3 | 2,878 | 1,047 | 4,775 |
| | Argentina | 248,101 | 1.5 | 0.5 | 2.5 | 2,605 | 868 | 4,342 |
| | Colombia | 342,317 | 1 | 0.8 | 1.4 | 2,396 | 1,917 | 3,355 |
| | Pakistan | 55,086 | 5 | 4.4 | 5.5 | 1,928 | 1,697 | 2,121 |
| | Nigeria | 32,421 | 8.4 | 3.9 | 12.8 | 1,906 | 885 | 2,905 |
| | Ukraine | 74,876 | 3.6 | 0.9 | 4.5 | 1,887 | 472 | 2,359 |
| | Senegal | 50,722 | 5.3 | 2.9 | 9.1 | 1,882 | 1,030 | 3,231 |
| | Russia | 58,889 | 4.1 | 1.2 | 5.6 | 1,690 | 495 | 2,308 |
| **Host Country** | **Sweden** | **7,944,034** | **0.6** | **0.5** | **0.7** | **33,365** | **27,804** | **38,926** |
| **Country of origin of first generation migrants** | Iraq | 115,086 | 3.2 | 0.3 | 3.2 | 2,578 | 242 | 2,578 |
| | Former Yugoslavia (bf. 92) | 68,961 | 1.3 | 1.1 | 1.6 | 628 | 531 | 772 |
| | Thailand | 31,136 | 2.7 | 1.8 | 3.7 | 588 | 392 | 806 |
| | Syria | 25,217 | 3.1 | 2.5 | 3.9 | 547 | 441 | 688 |
| | Poland | 69,711 | 1.1 | 0.6 | 1.9 | 537 | 293 | 927 |
| | Lebanon | 24,165 | 3.1 | 2.5 | 3.9 | 524 | 423 | 660 |
| | Bosnia and Herzegovina | 56,067 | 1.3 | 1.1 | 1.6 | 510 | 432 | 628 |
| | Romania | 20,858 | 3.2 | 2.9 | 3.6 | 467 | 423 | 526 |
| | Russia | 15,524 | 4.1 | 1.2 | 5.6 | 446 | 130 | 609 |
| | Pakistan | 10,023 | 5 | 4.4 | 5.5 | 351 | 309 | 386 |
| **Host Country** | **United Kingdom** | **52,082,285** | **0.6** | **0.4** | **1.2** | **218,746** | **145,830** | **437,491** |
| **Country of origin of first generation migrants** | Pakistan | 476,495 | 5 | 4.4 | 5.5 | 16,677 | 14,676 | 18,345 |
| | Nigeria | 186,220 | 8.4 | 3.9 | 12.8 | 10,950 | 5,084 | 16,685 |
| | Poland | 581,815 | 1.1 | 0.6 | 1.9 | 4,480 | 2,444 | 7,738 |
| | Italy | 134,100 | 4.4 | 1.6 | 7.3 | 4,130 | 1,502 | 6,853 |
| | Ireland | 456,690 | 1.1 | 0.7 | 1.6 | 3,517 | 2,238 | 5,115 |
| | Ghana | 91,795 | 5.3 | 2.9 | 9.1 | 3,406 | 1,863 | 5,847 |
| | Egypt | 29,145 | 15.7 | 13.9 | 17.5 | 3,203 | 2,836 | 3,570 |
| | China | 271,635 | 1.3 | 0.4 | 2 | 2,472 | 761 | 3,803 |
| | South Africa | 190,165 | 1.7 | 1 | 2.5 | 2,263 | 1,331 | 3,328 |
| | Lithuania | 96,120 | 2.9 | 0.7 | 3 | 1,951 | 471 | 2,019 |

## 5.11 Chronic hepatitis B burden country tables

This annex is included as a separate file (Chronic hepatitis B Country tables.doc) which includes 31 country tables for the estimated number of chronic hepatitis B (CHB) cases among the 50 largest foreign-born migrant populations residing in the individual EU/EEA host countries arranged by endemicity level and absolute number of CHB cases.

## 5.12 Chronic hepatitis C burden country tables

This annex is included as a separate file (Chronic hepatitis C Country tables.doc) which includes 31 country tables for the estimated number of chronic hepatitis C (CHC) cases among the 50 largest foreign-born migrant populations residing in the individual EU/EEA host countries arranged by endemicity level and absolute number of CHC cases.

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