



Global prevalence of hepatitis C virus in women of childbearing age in 2019: a modelling study

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Summary

Background Treatment for infection with hepatitis C virus (HCV) during pregnancy has not yet been approved; however, interventions specifically targeting women, especially those of childbearing age (15–49 years), could prevent vertical transmission and community spread. To assess the impact of such interventions, improved prevalence estimates in this group are needed. We aimed to estimate the global prevalence of viraemic HCV in 2019 among women of childbearing age.

Methods In this modelling study, we used previously developed models for 110 countries inputted with country-specific demographic and HCV epidemiology data. We did a literature review, searching PubMed, Embase, and grey literature for studies published between Jan 1, 2000, and June 30, 2018, reporting HCV antibody or viraemic prevalence in women of childbearing age. Studies from the literature review and studies in models were compared by use of a data quality scoring system and models were updated, as appropriate, when a better study was identified. We used these HCV disease burden models to calculate the 2019 prevalence of viraemic HCV in women of childbearing age. In countries without a model, prevalence was extrapolated by Global Burden of Disease (GBD) region.

Findings An estimated 14 860 000 (95% uncertainty interval [UI] 9 667 000–18 282 000) women aged 15–49 years had HCV infection worldwide in 2019, corresponding to a viraemic prevalence of 0.78% (95% UI 0.62–0.86). Globally, HCV prevalence increased with age, rising from 0.25% (95% UI 0.20–0.27) in women aged 15–19 years to 1.21% (0.97–1.34) in women aged 45–49 years. China (16% of total infections) and Pakistan (15%) had the greatest numbers of viraemic infections, but viraemic prevalence was highest in Mongolia (5.14%, 95% CI 3.46–6.28) and Burundi (4.91%, 3.80–18.75). Of the countries with 500 cases or more, viraemic prevalence was lowest in Chile (0.07%, 95% UI 0.04–0.12). Among the GBD regions, eastern Europe had the highest viraemic prevalence (3.39%, 95% UI 1.88–3.54). By WHO region, the Eastern Mediterranean region had the highest viraemic prevalence (1.75%, 95% UI 1.26–1.90).

Interpretation Most research on HCV disease burden among women aged 15–49 years focuses on pregnant women. Using modelling, this analysis provides global and national estimates of HCV prevalence in all women of childbearing age. These data can inform preconception test-and-treat strategies to reduce vertical transmission and total disease burden.

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Introduction

Women of childbearing age (15–49 years) account for nearly a quarter of the world's population. With a global fertility rate of 2.4 births per woman,¹ the health of many women in this group is inextricably tied to the wellbeing of neonates, especially considering vertical transmission of hepatitis C virus (HCV). For HCV RNA-positive women who become pregnant, perinatal transmission occurs in about 5% of individuals.² An estimated 224 000 children aged 0–2 years are infected with HCV globally;³ however, a successful intervention to prevent vertical transmission is currently unavailable. Although direct-acting antivirals are 95–99% effective in curing HCV, their use is not recommended during pregnancy because safety and efficacy data are sparse. Ribavirin, a

common antiviral medication used to treat HCV in resource-limited settings, is a known teratogen. In addition, no data exist to guide treatment during breastfeeding. Because of these considerable barriers to peripartum and post-partum treatment for HCV, women of childbearing age could be considered a key population for screening.

In some areas, such as the USA, increases in injection drug use among women of childbearing age are believed to have increased the incidence of HCV infection in this cohort and their children. From 2011 to 2016, anti-HCV antibody positivity increased by 36% in women of childbearing age and 13% in children younger than 5 years in the USA.⁴ Globally, an estimated 3.2 million women aged 15–64 years inject drugs⁵ and, in 2015,

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For more on HCV interventions see www.hcvguidelines.org

Research in context

Evidence before this study

Most estimates of hepatitis C virus (HCV) prevalence for women of childbearing age (15–49 years) are from studies of pregnant women, particularly those engaged in prenatal care, and probably do not represent the true prevalence in all women within this age group. Prenatal care and other women's wellness visits are an important opportunity to reach women who might be infected with HCV, especially women who inject drugs or who might not otherwise be engaged with the health-care system. However, prevalence studies in peripartum women under care do not identify infections in pregnant women who are not engaged in health care. Additionally, prenatal HCV treatment is not clinically approved, highlighting the importance of preconception screening and treatment. Injection drug use has increased among young women, and has led to increases in HCV within this demographic and in children as a result of vertical transmission.

Added value of this study

This is the first analysis, to our knowledge, to combine a literature search and modelling work to estimate viraemic HCV prevalence at a national, global, and regional level, specifically

for women of childbearing age. We built models for countries with robust HCV prevalence data, and prevalence was extrapolated for the remaining countries for which data were absent. The model's disease projection and forecasting components allowed us to input data from various years and create a standardised prevalence estimate for 2019. In 2019, approximately 15 million women of childbearing age were living with chronic HCV. China and Pakistan had the greatest number of viraemic infections and viraemic prevalence was highest in Mongolia and Burundi.

Implications of all the available evidence

Women of childbearing age account for about a quarter of the world's population and more than a fifth of total chronic HCV infections. The literature review showed that most studies of HCV prevalence in women of childbearing age have focused on pregnant women, particularly those engaged in prenatal care. Our estimates of the prevalence of HCV among all women of childbearing age can guide national and global strategies for HCV elimination to reduce vertical transmission and overall disease burden.

people who inject drugs accounted for 6063 500 (8·5%) of 71146 000 viraemic HCV infections.⁶ Isolated transmission outbreaks⁷ and reuse of medical or dental equipment also result in infection among women of childbearing age. Additionally, pregnant women with HCV infection who also have substance use disorders⁸ or liver cirrhosis⁹ are at an increased risk for poor maternal and fetal health outcomes. Curing disease before pregnancy could dually reduce vertical and horizontal HCV transmission. Outcomes of chronic HCV infection, such as liver damage, can take 20 years post-infection to develop.¹⁰ The average age of people who inject drugs coincides with the average reproductive age, meaning that, in the absence of a comprehensive or universal screening campaign, asymptomatic transmission (including vertical) can continue undetected, especially among populations of women at high risk.^{11,12}

The burden of HCV is a global health concern as liver-related morbidity and mortality continue to rise.¹³ To date, the prevalence of HCV has been evaluated in the general population and in groups at high risk of infection, such as people living with HIV, hepatitis B, or both, and people who inject drugs.^{5,13,14} However, estimates are scarce for other key populations, including women of childbearing age. Leading health-care organisations across the globe are working towards the 2030 elimination targets for HCV incidence, diagnosis, treatment, and mortality.¹⁵ Calculating the global number of viraemic HCV infections among women of childbearing age and identifying regional hotspots of disease are needed to frame screening and treatment plans. We aimed to combine a

literature search, modelling work, and extrapolation to estimate the global prevalence of viraemic HCV among women of childbearing age in 2019.

Methods

In this modelling study, we took the following steps to develop our estimates. First, we did a literature search to identify studies reporting HCV prevalence in women of childbearing age. Studies meeting our inclusion criteria (appendix p 2) were scored for generalisability, sample size, and year of analysis (appendix p 3). Second, we compared the studies with the highest scores with the studies used in previously published models (for each country or territory).¹³ We did this because the prevalence studies used in the existing models were done in the general population and might not have specifically focused on women of childbearing age (appendix pp 5–7). Studies from the literature review and studies used in models were compared by use of the data quality scoring system (appendix p 3) so that the model could be updated if a better study was identified. Third, for countries where data were available, the 2019 viraemic prevalence was extracted from the model. Finally, for countries where data were not available (ie, for those countries without a model), prevalence estimates were extrapolated from countries with data by use of regional average calculations based on Global Burden of Disease (GBD) region.

Disease burden modelling

In this modelling analysis, we used models for 110 countries and territories developed by the Center for

See Online for appendix

Disease Analysis Foundation by use of a Markov-type method.¹³ Of the 110 models used in this analysis, 100 were published previously¹³ and ten were developed following the same protocols as the original 100 (unpublished data). The Markov HCV disease burden model (Microsoft Excel, version 365) was previously inputted with country-specific or territory-specific population data and all-cause mortality rates for 1950–2050 from the UN World Population Prospects and HCV epidemiological data, as described previously.¹³ When available, models were updated with new epidemiological inputs until July 7, 2020. The model tracked the distribution of viraemic HCV by age (1-year age cohorts), sex, year (1950–2050), and disease stage (ie, acute, chronic, cirrhosis, decompensated cirrhosis, hepatocellular carcinoma, and liver-related death), while accounting for background mortality, disease progression rates, spontaneous clearance, and new infections (horizontally or vertically acquired).¹³ The sources for prevalence by age and by sex (where applicable) and the year in which data were collected are reported in the appendix for all 110 models (pp 5–7). Horizontally acquired infections in the future were calculated as a function of viraemic prevalence and accounted for country-specific or territory-specific and year-specific treatment restrictions by fibrosis stage (ie, a F0 on the Meta-analysis of Histological Data in Viral Hepatitis scale). Vertically acquired viraemic infections were calculated by use of the vertical transmission rate of HCV,¹⁶ fertility rates among women of childbearing age,¹ and estimates of age-specific viraemic HCV prevalence calculated by the model. For each country or territory with a model, the infected population was aged to 2019 and viraemic HCV prevalence was extracted by 5-year age cohorts for women aged 15–49. 80 of the 110 country or territory models included were reviewed and agreed upon by local experts through a structured Delphi process, which has been described previously.¹³ The remaining 30 country or territory models were validated internally within the Center for Disease Analysis Foundation.

Literature review

Details of the literature review, data collection, and scoring of data sources are summarised in the appendix (pp 2–3). We searched PubMed and Embase for peer-reviewed studies published between Jan 1, 2000, and June 30, 2018, reporting HCV antibody or viraemic prevalence in women of childbearing age (15–49 years) using the search terms: “((hepatitis C) or “hepatitis C virus)” AND “(COUNTRY)” AND “(prevalence)” AND “(women of childbearing age*” OR “women of child bearing age*” OR “WoCBA*” OR “pregnant*” OR “pregnancy*” OR “maternal*” OR “maternity*” OR “mother to child*” OR “mother)”.¹⁷ No language restrictions were applied. Review articles, commentaries, guidance documents, interviews, and letters were

included, and modelling studies were excluded. Non-indexed government reports, meta-analyses, surveillance reports, and unpublished data provided by experts were included. Abstracts and full-text studies were excluded if they met exclusion criteria for study type (eg, review articles), reported the incorrect study design for this analysis (eg, all HCV-positive patients, grouped country estimates only, insufficient sample size for analysis, and self-reported results), or, if the target population was studied but data were not broken down for the subgroup (women of childbearing age). When studies reported antibody prevalence only, data were converted to viraemic prevalence by applying the country-specific or territory-specific viraemic rates for the total infected population (published previously).¹³ Studies were assessed by three researchers (KJ [Center for Disease Analysis Foundation, Lafayette, CO, USA], MD, and SMO) and scored on the basis of the representativeness of the study population (relative to the general population of women of childbearing age), the study sample size, and the year of analysis (appendix p 3). If there was disagreement among the original reviewers, independent scoring was completed by one of two epidemiologists (SR-S and JS).

For more on the World Population Prospects see <https://population.un.org/wpp/>

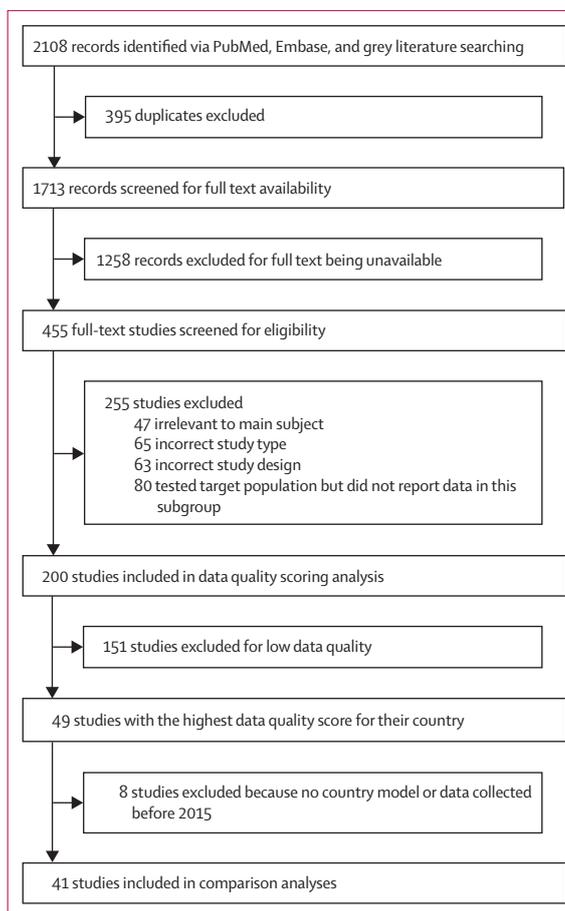


Figure 1: Study selection

Comparing models with literature

To identify which data source was more representative of women of childbearing age, studies with the highest data quality score for their country or territory from the

literature review (the comparator studies) were compared with studies underlying the existing model for each country or territory. Only studies with data collected in the past 5 years (ie, 2015–19) were retained for comparison

	15–19 years	20–24 years	25–29 years	30–34 years	35–39 years	40–44 years	45–49 years	Total	
								Prevalence	Cases
Global	0.25% (0.20–0.27)	0.45% (0.36–0.49)	0.68% (0.54–0.74)	0.84% (0.67–0.92)	1.02% (0.82–1.12)	1.18% (0.94–1.30)	1.21% (0.97–1.34)	0.78% (0.62–0.86)	14 860 000 (9 667 000–18 282 000)
Asia-Pacific									
Japan	0.02% (0.01–0.02)	0.03% (0.01–0.03)	0.05% (0.02–0.06)	0.07% (0.03–0.08)	0.09% (0.04–0.11)	0.14% (0.06–0.16)	0.23% (0.10–0.28)	0.10% (0.04–0.12)	25 700 (10 900–30 700)
South Korea	0.06% (0.04–0.06)	0.11% (0.07–0.13)	0.20% (0.13–0.23)	0.32% (0.21–0.36)	0.35% (0.23–0.4)	0.40% (0.26–0.46)	0.41% (0.26–0.46)	0.28% (0.18–0.32)	34 000 (21 800–38 300)
Singapore	0.03% (0.02–0.03)	0.06% (0.03–0.06)	0.10% (0.05–0.12)	0.15% (0.08–0.17)	0.18% (0.09–0.20)	0.22% (0.12–0.25)	0.29% (0.15–0.33)	0.16% (0.08–0.18)	2 200 (1 200–2 500)
Central Asia									
Armenia	0.19% (0.15–0.21)	0.56% (0.45–0.61)	0.79% (0.63–0.86)	0.94% (0.75–1.02)	1.09% (0.87–1.18)	1.58% (1.26–1.72)	2.51% (1.99–2.72)	1.09% (0.86–1.18)	8 100 (6 500–8 800)
Azerbaijan	0.20% (0.13–0.22)	0.46% (0.30–0.51)	0.59% (0.39–0.65)	0.76% (0.50–0.85)	1.05% (0.69–1.17)	1.21% (0.80–1.35)	0.96% (0.63–1.06)	0.75% (0.49–0.83)	19 700 (13 000–21 900)
Georgia	0.36% (0.26–0.37)	0.56% (0.40–0.57)	0.85% (0.61–0.87)	1.26% (0.91–1.29)	1.59% (1.15–1.63)	1.83% (1.32–1.87)	1.97% (1.42–2.01)	1.25% (0.90–1.27)	11 300 (8 200–11 500)
Kazakhstan	1.77% (1.17–2.00)	3.28% (2.16–3.69)	3.32% (2.18–3.74)	3.46% (2.28–3.90)	3.98% (2.62–4.49)	3.97% (2.61–4.47)	4.08% (2.69–4.60)	3.44% (2.26–3.87)	154 000 (102 000–174 000)
Kyrgyzstan	1.88% (1.50–2.04)	2.55% (2.03–2.77)	2.84% (2.25–3.08)	3.54% (2.82–3.85)	5.72% (4.54–6.21)	6.10% (4.84–6.62)	5.75% (4.57–6.24)	3.80% (3.02–4.13)	61 600 (48 900–66 800)
Mongolia	1.77% (1.19–2.16)	2.67% (1.79–3.26)	3.63% (2.44–4.43)	4.77% (3.21–5.83)	7.16% (4.82–8.75)	8.16% (5.49–9.97)	8.51% (5.73–10.40)	5.14% (3.46–6.28)	43 800 (29 400–53 500)
Tajikistan	0.51% (0.41–0.55)	1.44% (1.14–1.56)	2.33% (1.85–2.53)	2.93% (2.33–3.18)	4.11% (3.27–4.46)	5.36% (4.26–5.82)	6.75% (5.37–7.33)	2.88% (2.29–3.12)	66 600 (52 900–72 300)
Turkmenistan	1.53% (1.22–1.67)	2.70% (2.14–2.93)	3.17% (2.52–3.44)	3.37% (2.67–3.65)	3.88% (3.08–4.21)	4.16% (3.30–4.51)	4.27% (3.39–4.63)	3.21% (2.55–3.49)	50 200 (39 900–54 500)
Uzbekistan	2.17% (1.52–2.56)	3.74% (2.61–4.41)	4.47% (3.12–5.27)	4.52% (3.16–5.33)	4.57% (3.19–5.39)	4.72% (3.30–5.57)	4.75% (3.32–5.60)	4.11% (2.87–4.85)	365 000 (255 000–430 000)
East Asia									
China	0.24% (0.16–0.27)	0.40% (0.27–0.44)	0.46% (0.32–0.51)	0.53% (0.36–0.58)	0.89% (0.61–0.99)	1.06% (0.72–1.17)	0.94% (0.64–1.04)	0.67% (0.45–0.74)	2 317 000 (1 579 000–2 562 000)
North Korea	0.24% (0.17–0.27)	0.40% (0.28–0.44)	0.47% (0.33–0.52)	0.53% (0.37–0.59)	0.89% (0.62–0.98)	1.06% (0.74–1.17)	0.95% (0.67–1.06)	0.65% (0.45–0.71)	42 300 (29 600–46 800)
Hong Kong	0.02% (0.01–0.02)	0.12% (0.05–0.17)	0.19% (0.07–0.27)	0.17% (0.07–0.25)	0.19% (0.07–0.27)	0.26% (0.10–0.38)	0.34% (0.14–0.49)	0.21% (0.08–0.30)	4 000 (1 600–5 700)
Macao	0.24% (0.17–0.27)	0.40% (0.28–0.44)	0.47% (0.33–0.52)	0.53% (0.37–0.59)	0.89% (0.62–0.98)	1.06% (0.74–1.17)	0.95% (0.67–1.06)	0.68% (0.48–0.76)	1 200 (840–1 300)
Taiwan	0.23% (0.15–0.42)	0.53% (0.34–0.95)	0.80% (0.51–1.43)	0.98% (0.62–1.76)	0.96% (0.61–1.73)	1.38% (0.88–2.48)	2.34% (1.49–4.20)	1.09% (0.69–1.96)	63 700 (40 400–114 000)
South Asia									
Afghanistan	0.18% (0.09–0.26)	0.32% (0.15–0.45)	0.59% (0.27–0.83)	0.89% (0.42–1.26)	1.12% (0.52–1.58)	1.42% (0.66–2.00)	1.46% (0.68–2.05)	0.66% (0.31–0.93)	58 700 (27 300–82 800)
Bangladesh	0.29% (0.00–0.34)	0.46% (0.00–0.55)	0.71% (0.01–0.84)	0.94% (0.01–1.11)	1.11% (0.01–1.32)	1.28% (0.01–1.53)	1.49% (0.01–1.77)	0.84% (0.01–0.99)	382 000 (300–454 000)
Bhutan	0.29% (0.00–0.34)	0.46% (0.00–0.55)	0.71% (0.01–0.84)	0.94% (0.01–1.11)	1.11% (0.01–1.32)	1.28% (0.01–1.53)	1.49% (0.01–1.77)	0.81% (0.01–0.97)	1 700 (13–2 000)
India	0.08% (0.06–0.13)	0.12% (0.09–0.21)	0.19% (0.15–0.34)	0.30% (0.23–0.52)	0.45% (0.34–0.79)	0.63% (0.48–1.11)	0.84% (0.64–1.47)	0.33% (0.25–0.59)	1 182 000 (898 000–2 073 000)
Nepal	0.29% (0.00–0.34)	0.46% (0.00–0.55)	0.71% (0.01–0.84)	0.94% (0.01–1.11)	1.11% (0.01–1.32)	1.28% (0.01–1.53)	1.49% (0.01–1.77)	0.80% (0.01–0.95)	70 500 (550–83 900)
Pakistan	1.51% (1.13–1.57)	2.46% (1.84–2.57)	3.82% (2.86–3.99)	5.18% (3.87–5.40)	5.92% (4.43–6.18)	6.30% (4.71–6.58)	6.86% (5.13–7.16)	4.09% (3.06–4.27)	2 219 000 (1 659 000–2 316 000)

(Table 1 continues on next page)

	15-19 years	20-24 years	25-29 years	30-34 years	35-39 years	40-44 years	45-49 years	Total	
								Prevalence	Cases
(Continued from previous page)									
Southeast Asia									
Cambodia	0.33% (0.19-0.35)	0.52% (0.29-0.55)	0.62% (0.35-0.66)	0.79% (0.45-0.84)	0.81% (0.46-0.86)	2.73% (1.56-2.90)	2.63% (1.51-2.79)	0.95% (0.55-1.01)	42 500 (24 300-45 100)
Indonesia	0.19% (0.06-0.30)	0.28% (0.10-0.45)	0.39% (0.13-0.62)	0.49% (0.17-0.77)	0.55% (0.19-0.88)	0.65% (0.22-1.03)	0.72% (0.25-1.14)	0.46% (0.16-0.72)	326 000 (112 000-518 000)
Laos	0.16% (0.11-0.18)	0.26% (0.18-0.29)	0.36% (0.25-0.41)	0.50% (0.34-0.56)	0.63% (0.43-0.71)	0.81% (0.55-0.91)	0.96% (0.66-1.09)	0.46% (0.31-0.52)	8 900 (6 100-10 000)
Malaysia	0.08% (0.05-0.08)	0.16% (0.10-0.17)	0.31% (0.19-0.32)	0.54% (0.34-0.58)	0.90% (0.57-0.95)	1.21% (0.76-1.28)	1.15% (0.72-1.21)	0.56% (0.35-0.59)	48 400 (30 400-51 200)
Maldives	0.16% (0.11-0.18)	0.26% (0.18-0.29)	0.36% (0.25-0.41)	0.50% (0.34-0.56)	0.63% (0.43-0.71)	0.81% (0.55-0.91)	0.96% (0.66-1.09)	0.50% (0.34-0.57)	560 (390-640)
Myanmar	0.16% (0.11-0.18)	0.26% (0.18-0.29)	0.36% (0.25-0.41)	0.50% (0.34-0.56)	0.63% (0.43-0.71)	0.81% (0.55-0.91)	0.96% (0.66-1.09)	0.50% (0.34-0.56)	74 500 (50 900-84 200)
Philippines	0.11% (0.06-0.11)	0.19% (0.11-0.20)	0.30% (0.17-0.32)	0.48% (0.28-0.51)	0.67% (0.38-0.71)	0.87% (0.50-0.92)	1.12% (0.64-1.19)	0.47% (0.27-0.49)	130 000 (75 000-138 000)
Sri Lanka	0.16% (0.11-0.18)	0.26% (0.18-0.29)	0.36% (0.25-0.41)	0.50% (0.34-0.56)	0.63% (0.43-0.71)	0.81% (0.55-0.91)	0.96% (0.66-1.09)	0.52% (0.35-0.59)	27 600 (18 800-31 200)
Thailand	0.10% (0.05-0.10)	0.11% (0.06-0.12)	0.17% (0.09-0.18)	0.29% (0.16-0.30)	0.39% (0.21-0.41)	0.55% (0.30-0.58)	0.72% (0.40-0.76)	0.35% (0.19-0.37)	61 500 (33 800-64 700)
Timor-Leste	0.16% (0.11-0.18)	0.26% (0.18-0.29)	0.36% (0.25-0.41)	0.50% (0.34-0.56)	0.63% (0.43-0.71)	0.81% (0.55-0.91)	0.96% (0.66-1.09)	0.42% (0.29-0.48)	1 300 (910-1500)
Vietnam	0.20% (0.11-0.21)	0.35% (0.19-0.37)	0.43% (0.23-0.45)	0.59% (0.32-0.62)	0.83% (0.45-0.87)	1.11% (0.60-1.16)	1.43% (0.78-1.50)	0.69% (0.38-0.73)	177 000 (96 300-185 000)
Australasia									
Australia	0.06% (0.05-0.06)	0.12% (0.09-0.12)	0.23% (0.18-0.25)	0.44% (0.34-0.47)	0.79% (0.61-0.84)	1.02% (0.79-1.08)	1.03% (0.79-1.09)	0.54% (0.41-0.57)	31 500 (24 300-33 400)
New Zealand	0.22% (0.13-0.28)	0.40% (0.25-0.52)	0.63% (0.39-0.81)	0.91% (0.57-1.18)	1.27% (0.78-1.63)	1.57% (0.97-2.03)	1.55% (0.96-2.00)	0.93% (0.58-1.20)	10 300 (6 400-13 200)
Caribbean									
The Bahamas	0.09% (0.07-0.13)	0.18% (0.14-0.27)	0.35% (0.26-0.52)	0.57% (0.43-0.86)	0.83% (0.63-1.24)	1.02% (0.77-1.53)	1.11% (0.84-1.66)	0.57% (0.43-0.86)	610 (460-920)
Belize	0.09% (0.07-0.13)	0.18% (0.14-0.27)	0.35% (0.26-0.52)	0.57% (0.43-0.86)	0.83% (0.63-1.24)	1.02% (0.77-1.53)	1.11% (0.84-1.66)	0.51% (0.38-0.76)	560 (420-830)
Cuba	0.05% (0.02-0.11)	0.14% (0.06-0.32)	0.33% (0.13-0.73)	0.51% (0.20-1.12)	0.66% (0.25-1.44)	0.62% (0.24-1.35)	0.57% (0.22-1.25)	0.42% (0.16-0.93)	10 900 (4 200-23 900)
Dominican Republic	0.09% (0.06-0.14)	0.18% (0.11-0.28)	0.31% (0.19-0.50)	0.58% (0.35-0.91)	0.98% (0.60-1.55)	1.49% (0.91-2.37)	2.12% (1.30-3.36)	0.71% (0.44-1.13)	20 000 (12 200-31 600)
Guyana	0.09% (0.07-0.13)	0.18% (0.14-0.27)	0.35% (0.26-0.52)	0.57% (0.43-0.86)	0.83% (0.63-1.24)	1.02% (0.77-1.53)	1.11% (0.84-1.66)	0.52% (0.39-0.77)	1 000 (780-1500)
Haiti	0.09% (0.07-0.13)	0.18% (0.14-0.27)	0.35% (0.26-0.52)	0.57% (0.43-0.86)	0.83% (0.63-1.24)	1.02% (0.77-1.53)	1.11% (0.84-1.66)	0.50% (0.38-0.75)	15 100 (11 400-22 600)
Jamaica	0.09% (0.07-0.13)	0.18% (0.14-0.27)	0.35% (0.26-0.52)	0.57% (0.43-0.86)	0.83% (0.63-1.24)	1.02% (0.77-1.53)	1.11% (0.84-1.66)	0.55% (0.42-0.82)	4 300 (3 300-6 400)
Puerto Rico	0.21% (0.14-0.36)	0.38% (0.25-0.65)	0.60% (0.39-1.02)	0.85% (0.55-1.45)	0.90% (0.58-1.53)	0.84% (0.54-1.42)	0.82% (0.53-1.38)	0.68% (0.44-1.15)	4 300 (2 800-7 300)
Suriname	0.09% (0.07-0.13)	0.18% (0.14-0.27)	0.35% (0.26-0.52)	0.57% (0.43-0.86)	0.83% (0.63-1.24)	1.02% (0.77-1.53)	1.11% (0.84-1.66)	0.55% (0.42-0.83)	820 (620-1 200)
Trinidad and Tobago	0.09% (0.07-0.13)	0.18% (0.14-0.27)	0.35% (0.26-0.52)	0.57% (0.43-0.86)	0.83% (0.63-1.24)	1.02% (0.77-1.53)	1.11% (0.84-1.66)	0.61% (0.46-0.91)	2 100 (1 600-3 200)
Central Europe									
Albania	0.23% (0.19-0.24)	0.51% (0.41-0.52)	0.76% (0.61-0.77)	0.90% (0.73-0.92)	0.95% (0.77-0.97)	0.91% (0.74-0.93)	0.96% (0.78-0.99)	0.73% (0.59-0.74)	4 900 (4 000-5 000)
Bosnia and Herzegovina	0.23% (0.19-0.24)	0.51% (0.41-0.52)	0.76% (0.61-0.77)	0.90% (0.73-0.92)	0.95% (0.77-0.97)	0.91% (0.74-0.93)	0.96% (0.78-0.99)	0.77% (0.62-0.79)	5 600 (4 600-5 800)
Bulgaria	0.45% (0.24-0.58)	1.06% (0.56-1.36)	1.39% (0.73-1.78)	1.82% (0.96-2.34)	2.74% (1.45-3.52)	2.41% (1.27-3.09)	1.48% (0.78-1.90)	1.74% (0.92-2.23)	25 800 (13 600-33 100)

(Table 1 continues on next page)

	15–19 years	20–24 years	25–29 years	30–34 years	35–39 years	40–44 years	45–49 years	Total	
								Prevalence	Cases
(Continued from previous page)									
Croatia	0.04% (0.02–0.04)	0.07% (0.05–0.08)	0.18% (0.12–0.20)	0.34% (0.22–0.37)	0.52% (0.33–0.56)	0.65% (0.41–0.70)	0.71% (0.45–0.77)	0.38% (0.24–0.42)	3400 (2200–3700)
Czech Republic	0.06% (0.03–0.07)	0.20% (0.10–0.22)	0.33% (0.17–0.37)	0.45% (0.23–0.51)	0.47% (0.24–0.53)	0.35% (0.18–0.40)	0.29% (0.15–0.33)	0.33% (0.17–0.37)	7800 (4000–8900)
Hungary	0.09% (0.05–0.09)	0.22% (0.12–0.24)	0.41% (0.22–0.43)	0.73% (0.40–0.77)	0.76% (0.42–0.81)	0.59% (0.33–0.63)	0.59% (0.32–0.63)	0.51% (0.28–0.54)	11 400 (6300–12 100)
Kosovo	0.23% (0.16–0.23)	0.51% (0.36–0.61)	0.76% (0.53–0.96)	0.90% (0.62–1.13)	0.95% (0.64–1.15)	0.91% (0.62–1.19)	0.96% (0.67–1.46)	0.72% (0.50–0.93)	3400 (2400–4400)
Montenegro	0.23% (0.19–0.24)	0.51% (0.41–0.52)	0.76% (0.61–0.77)	0.90% (0.73–0.92)	0.95% (0.77–0.97)	0.91% (0.74–0.93)	0.96% (0.78–0.99)	0.76% (0.61–0.78)	1100 (900–1100)
North Macedonia	0.23% (0.19–0.24)	0.51% (0.41–0.52)	0.76% (0.61–0.77)	0.90% (0.73–0.92)	0.95% (0.77–0.97)	0.91% (0.74–0.93)	0.96% (0.78–0.99)	0.77% (0.62–0.79)	3900 (3200–4000)
Poland	0.09% (0.07–0.12)	0.24% (0.18–0.29)	0.37% (0.27–0.45)	0.41% (0.30–0.50)	0.38% (0.28–0.46)	0.36% (0.26–0.43)	0.38% (0.28–0.46)	0.33% (0.25–0.41)	29 100 (21 500–35 500)
Romania	0.63% (0.46–0.66)	1.36% (0.99–1.41)	2.09% (1.52–2.16)	2.17% (1.57–2.24)	2.42% (1.76–2.50)	2.14% (1.55–2.21)	2.55% (1.85–2.64)	1.99% (1.44–2.06)	85 600 (62 100–88 600)
Serbia	0.23% (0.19–0.24)	0.51% (0.41–0.52)	0.76% (0.61–0.77)	0.90% (0.73–0.92)	0.95% (0.77–0.97)	0.91% (0.74–0.93)	0.96% (0.78–0.99)	0.76% (0.62–0.78)	15 300 (12 400–15 700)
Slovakia	0.15% (0.09–0.17)	0.38% (0.23–0.43)	0.52% (0.31–0.59)	0.56% (0.33–0.63)	0.56% (0.34–0.63)	0.54% (0.32–0.61)	0.55% (0.33–0.63)	0.49% (0.29–0.55)	6300 (3800–7200)
Slovenia	0.11% (0.08–0.13)	0.28% (0.19–0.32)	0.40% (0.28–0.46)	0.46% (0.32–0.53)	0.49% (0.34–0.56)	0.38% (0.26–0.43)	0.26% (0.18–0.29)	0.35% (0.24–0.40)	1500 (1100–1700)
Eastern Europe									
Belarus	1.00% (0.02–1.04)	2.89% (0.04–2.99)	3.96% (0.06–4.11)	3.58% (0.05–3.71)	3.52% (0.05–3.64)	4.21% (0.06–4.36)	3.50% (0.05–3.62)	3.39% (0.05–3.51)	73 800 (1100–76 500)
Estonia	0.23% (0.15–0.26)	0.52% (0.33–0.57)	0.76% (0.49–0.84)	1.22% (0.79–1.34)	2.13% (1.38–2.35)	2.63% (1.70–2.89)	2.19% (1.42–2.41)	1.49% (0.96–1.64)	4200 (2700–4700)
Latvia	0.30% (0.19–0.34)	1.17% (0.76–1.35)	1.79% (1.16–2.07)	2.32% (1.50–2.68)	2.81% (1.82–3.25)	2.74% (1.78–3.17)	2.37% (1.54–2.74)	2.07% (1.34–2.40)	8300 (5400–9600)
Lithuania	0.33% (0.20–0.39)	0.69% (0.42–0.81)	0.94% (0.57–1.11)	1.20% (0.73–1.42)	1.35% (0.82–1.60)	1.44% (0.87–1.71)	1.39% (0.84–1.65)	1.09% (0.66–1.29)	6300 (3800–7500)
Moldova	1.00% (0.02–1.04)	2.89% (0.04–2.99)	3.96% (0.06–4.11)	3.58% (0.05–3.71)	3.52% (0.05–3.64)	4.21% (0.06–4.36)	3.50% (0.05–3.62)	3.39% (0.05–3.51)	35 600 (540–36 900)
Russia	1.06% (0.72–1.11)	3.49% (2.38–3.65)	4.87% (3.32–5.09)	4.31% (2.94–4.51)	4.08% (2.78–4.26)	4.68% (3.19–4.89)	3.45% (2.35–3.61)	3.88% (2.65–4.06)	1326 000 (904 000–1 385 000)
Ukraine	0.89% (0.01–0.92)	1.32% (0.02–1.36)	1.30% (0.02–1.35)	1.24% (0.02–1.28)	1.81% (0.03–1.87)	2.92% (0.04–3.03)	3.87% (0.06–4.01)	2.00% (0.03–2.07)	206 000 (3100–214 000)
Western Europe									
Austria	0.07% (0.02–0.09)	0.10% (0.03–0.14)	0.12% (0.03–0.18)	0.15% (0.04–0.21)	0.16% (0.04–0.23)	0.18% (0.05–0.26)	0.18% (0.05–0.26)	0.14% (0.04–0.20)	2800 (780–4000)
Belgium	0.06% (0.02–0.08)	0.12% (0.04–0.14)	0.20% (0.07–0.23)	0.30% (0.11–0.35)	0.40% (0.14–0.47)	0.57% (0.20–0.67)	0.73% (0.26–0.86)	0.35% (0.12–0.41)	8800 (3100–10 300)
Cyprus	0.04% (0.04–0.06)	0.09% (0.07–0.12)	0.15% (0.12–0.20)	0.23% (0.19–0.32)	0.34% (0.28–0.48)	0.45% (0.37–0.64)	0.50% (0.41–0.70)	0.26% (0.21–0.36)	790 (640–1100)
Denmark	0.03% (0.02–0.03)	0.06% (0.04–0.06)	0.10% (0.08–0.11)	0.20% (0.15–0.20)	0.30% (0.22–0.30)	0.36% (0.26–0.36)	0.46% (0.34–0.46)	0.22% (0.16–0.22)	2700 (2000–2700)
Finland	0.10% (0.07–0.12)	0.22% (0.16–0.25)	0.42% (0.30–0.48)	0.65% (0.47–0.76)	0.66% (0.47–0.77)	0.59% (0.42–0.68)	0.52% (0.37–0.60)	0.46% (0.33–0.53)	5200 (3800–6100)
France	0.01% (0.01–0.01)	0.03% (0.01–0.03)	0.08% (0.04–0.09)	0.15% (0.07–0.17)	0.24% (0.11–0.27)	0.33% (0.16–0.37)	0.33% (0.16–0.38)	0.17% (0.08–0.20)	24 200 (11 500–27 600)
Germany	0.01% (0.00–0.01)	0.02% (0.01–0.02)	0.03% (0.01–0.05)	0.06% (0.03–0.09)	0.13% (0.06–0.20)	0.23% (0.10–0.35)	0.25% (0.11–0.39)	0.11% (0.05–0.17)	18 800 (8300–28 700)
Greece	0.07% (0.04–0.09)	0.14% (0.08–0.17)	0.22% (0.14–0.28)	0.31% (0.19–0.40)	0.41% (0.26–0.53)	0.55% (0.35–0.71)	0.69% (0.43–0.89)	0.38% (0.24–0.49)	8500 (5300–10 900)
Ireland	0.02% (0.02–0.04)	0.03% (0.02–0.05)	0.08% (0.06–0.12)	0.44% (0.30–0.63)	0.72% (0.49–1.03)	0.57% (0.39–0.82)	0.49% (0.33–0.70)	0.37% (0.25–0.54)	4400 (3000–6300)

(Table 1 continues on next page)

	15-19 years	20-24 years	25-29 years	30-34 years	35-39 years	40-44 years	45-49 years	Total	
								Prevalence	Cases
(Continued from previous page)									
Israel	0.17% (0.10-0.17)	0.37% (0.22-0.38)	0.70% (0.42-0.72)	1.04% (0.63-1.07)	1.38% (0.83-1.42)	1.71% (1.03-1.76)	2.06% (1.24-2.11)	1.02% (0.61-1.04)	20 000 (12 000-20 500)
Italy	0.15% (0.10-0.36)	0.29% (0.19-0.70)	0.41% (0.27-0.98)	0.59% (0.39-1.43)	0.81% (0.54-1.94)	0.91% (0.61-2.20)	1.00% (0.67-2.42)	0.65% (0.44-1.58)	81 800 (54 700-197 000)
Luxembourg	0.11% (0.07-0.12)	0.29% (0.18-0.32)	0.57% (0.35-0.62)	0.73% (0.45-0.80)	0.81% (0.50-0.88)	0.99% (0.62-1.09)	1.00% (0.62-1.10)	0.67% (0.42-0.74)	1000 (630-1100)
Netherlands	0.01% (0.00-0.02)	0.03% (0.01-0.04)	0.05% (0.02-0.08)	0.09% (0.03-0.14)	0.12% (0.04-0.19)	0.13% (0.04-0.21)	0.13% (0.04-0.20)	0.08% (0.03-0.13)	3000 (940-4600)
Norway	0.03% (0.02-0.04)	0.13% (0.09-0.15)	0.34% (0.25-0.40)	0.47% (0.34-0.55)	0.48% (0.35-0.56)	0.48% (0.35-0.56)	0.43% (0.31-0.50)	0.34% (0.25-0.40)	4200 (3000-4900)
Portugal	0.05% (0.04-0.06)	0.07% (0.06-0.10)	0.11% (0.09-0.15)	0.17% (0.14-0.23)	0.30% (0.25-0.40)	0.42% (0.35-0.56)	0.43% (0.35-0.58)	0.25% (0.21-0.34)	5600 (4700-7600)
Spain	0.03% (0.02-0.05)	0.05% (0.03-0.08)	0.06% (0.03-0.09)	0.11% (0.06-0.18)	0.29% (0.15-0.46)	0.45% (0.24-0.73)	0.51% (0.27-0.83)	0.26% (0.14-0.42)	26 800 (14 000-43 100)
Sweden	0.08% (0.06-0.09)	0.12% (0.09-0.13)	0.14% (0.10-0.16)	0.21% (0.16-0.24)	0.31% (0.23-0.36)	0.38% (0.28-0.44)	0.39% (0.29-0.45)	0.24% (0.17-0.27)	5100 (3800-5800)
Switzerland	0.08% (0.04-0.09)	0.11% (0.06-0.12)	0.16% (0.09-0.18)	0.26% (0.15-0.29)	0.42% (0.25-0.47)	0.71% (0.41-0.79)	0.88% (0.51-0.98)	0.40% (0.23-0.44)	7600 (4400-8500)
UK	0.01% (0.01-0.02)	0.03% (0.02-0.04)	0.09% (0.05-0.12)	0.14% (0.08-0.18)	0.20% (0.11-0.25)	0.26% (0.14-0.33)	0.26% (0.14-0.32)	0.15% (0.08-0.18)	22 100 (12 000-27 700)
Andean Latin America									
Bolivia	0.11% (0.06-0.11)	0.18% (0.11-0.20)	0.29% (0.17-0.31)	0.45% (0.26-0.48)	0.75% (0.44-0.81)	1.01% (0.59-1.09)	1.14% (0.67-1.24)	0.48% (0.28-0.52)	14 000 (8300-15 300)
Ecuador	0.11% (0.06-0.11)	0.18% (0.11-0.20)	0.29% (0.17-0.31)	0.45% (0.26-0.48)	0.75% (0.44-0.81)	1.01% (0.59-1.09)	1.14% (0.67-1.24)	0.50% (0.29-0.54)	22 800 (13 400-24 700)
Peru	0.11% (0.06-0.11)	0.18% (0.11-0.20)	0.29% (0.17-0.31)	0.45% (0.26-0.48)	0.75% (0.44-0.81)	1.01% (0.59-1.09)	1.14% (0.67-1.24)	0.52% (0.31-0.56)	44 600 (26 400-48 500)
Central Latin America									
Colombia	0.10% (0.07-0.11)	0.23% (0.15-0.25)	0.37% (0.24-0.39)	0.53% (0.35-0.57)	0.72% (0.48-0.77)	0.93% (0.62-0.99)	0.99% (0.66-1.06)	0.52% (0.35-0.56)	71 300 (47 300-75 900)
Costa Rica	0.09% (0.06-0.09)	0.17% (0.12-0.17)	0.29% (0.20-0.29)	0.45% (0.32-0.45)	0.65% (0.47-0.66)	0.84% (0.60-0.85)	0.96% (0.69-0.98)	0.47% (0.34-0.48)	6200 (4400-6300)
El Salvador	0.03% (0.02-0.03)	0.05% (0.04-0.05)	0.10% (0.07-0.10)	0.18% (0.13-0.18)	0.29% (0.21-0.29)	0.40% (0.29-0.40)	0.49% (0.35-0.50)	0.19% (0.14-0.19)	3500 (2500-3500)
Guatemala	0.09% (0.06-0.09)	0.17% (0.12-0.17)	0.29% (0.20-0.29)	0.45% (0.32-0.45)	0.65% (0.47-0.66)	0.84% (0.60-0.85)	0.96% (0.69-0.98)	0.41% (0.29-0.41)	19 300 (13 800-19 600)
Honduras	0.09% (0.06-0.09)	0.17% (0.12-0.17)	0.29% (0.20-0.29)	0.45% (0.32-0.45)	0.65% (0.47-0.66)	0.84% (0.60-0.85)	0.96% (0.69-0.98)	0.41% (0.30-0.42)	11 000 (7900-11 200)
Mexico	0.09% (0.05-0.09)	0.14% (0.08-0.15)	0.25% (0.14-0.26)	0.42% (0.24-0.44)	0.66% (0.38-0.69)	0.88% (0.50-0.92)	1.03% (0.59-1.08)	0.46% (0.26-0.49)	160 000 (91 800-168 000)
Nicaragua	0.09% (0.06-0.09)	0.17% (0.12-0.17)	0.29% (0.20-0.29)	0.45% (0.32-0.45)	0.65% (0.47-0.66)	0.84% (0.60-0.85)	0.96% (0.69-0.98)	0.45% (0.32-0.45)	8000 (5700-8100)
Panama	0.16% (0.09-0.17)	0.35% (0.21-0.38)	0.42% (0.25-0.45)	0.38% (0.23-0.42)	0.37% (0.22-0.40)	0.32% (0.19-0.35)	0.33% (0.19-0.36)	0.33% (0.20-0.36)	3600 (2100-3900)
Venezuela	0.08% (0.04-0.08)	0.19% (0.09-0.20)	0.34% (0.17-0.36)	0.47% (0.23-0.50)	0.57% (0.28-0.60)	0.66% (0.33-0.70)	0.79% (0.39-0.84)	0.42% (0.21-0.45)	30 700 (15 200-32 600)
Southern Latin America									
Argentina	0.07% (0.03-0.11)	0.14% (0.06-0.20)	0.23% (0.10-0.35)	0.38% (0.17-0.57)	0.61% (0.27-0.92)	0.94% (0.41-1.42)	1.52% (0.67-2.29)	0.52% (0.23-0.78)	58 200 (25 600-87 400)
Chile	0.01% (0.00-0.01)	0.02% (0.01-0.03)	0.03% (0.02-0.05)	0.05% (0.03-0.08)	0.08% (0.04-0.13)	0.14% (0.08-0.24)	0.21% (0.11-0.35)	0.07% (0.04-0.12)	3500 (1900-5800)
Uruguay	0.06% (0.03-0.08)	0.10% (0.05-0.15)	0.17% (0.09-0.25)	0.28% (0.14-0.40)	0.45% (0.23-0.65)	0.71% (0.36-1.02)	1.10% (0.57-1.59)	0.39% (0.20-0.57)	3300 (1700-4700)

(Table 1 continues on next page)

	15–19 years	20–24 years	25–29 years	30–34 years	35–39 years	40–44 years	45–49 years	Total	
								Prevalence	Cases
(Continued from previous page)									
Tropical Latin America									
Brazil	0.06% (0.05–0.07)	0.10% (0.07–0.10)	0.15% (0.11–0.16)	0.22% (0.16–0.23)	0.29% (0.21–0.31)	0.38% (0.27–0.40)	0.41% (0.30–0.44)	0.22% (0.16–0.24)	128 000 (92 300–135 000)
Paraguay	0.06% (0.05–0.07)	0.10% (0.07–0.10)	0.15% (0.11–0.16)	0.22% (0.16–0.23)	0.29% (0.21–0.31)	0.38% (0.27–0.40)	0.41% (0.30–0.44)	0.20% (0.14–0.21)	3700 (2600–3900)
North Africa and Middle East									
Algeria	0.16% (0.06–0.29)	0.25% (0.09–0.43)	0.34% (0.12–0.59)	0.48% (0.17–0.83)	0.67% (0.24–1.17)	1.00% (0.36–1.73)	1.40% (0.50–2.43)	0.58% (0.21–1.01)	63 700 (23 000–111 000)
Bahrain	0.21% (0.13–0.22)	0.39% (0.25–0.41)	0.55% (0.36–0.58)	0.95% (0.61–0.99)	1.41% (0.91–1.47)	1.64% (1.05–1.70)	2.02% (1.30–2.10)	0.99% (0.64–1.03)	3400 (2200–3600)
Egypt	0.39% (0.28–0.41)	0.46% (0.33–0.50)	0.71% (0.51–0.77)	1.07% (0.76–1.15)	1.71% (1.22–1.84)	2.76% (1.97–2.97)	4.19% (2.99–4.50)	1.38% (0.99–1.49)	345 000 (246 000–371 000)
Iran	0.09% (0.06–0.10)	0.14% (0.09–0.16)	0.12% (0.08–0.13)	0.10% (0.07–0.11)	0.10% (0.07–0.11)	0.10% (0.07–0.12)	0.10% (0.06–0.11)	0.11% (0.07–0.12)	24 300 (15 700–27 600)
Iraq	0.17% (0.12–0.19)	0.26% (0.19–0.30)	0.36% (0.26–0.41)	0.45% (0.32–0.51)	0.54% (0.38–0.61)	0.58% (0.41–0.66)	0.61% (0.43–0.69)	0.38% (0.27–0.43)	37 800 (26 800–42 900)
Jordan	0.04% (0.02–0.05)	0.10% (0.04–0.12)	0.20% (0.09–0.23)	0.29% (0.13–0.35)	0.34% (0.15–0.40)	0.50% (0.22–0.59)	0.76% (0.33–0.89)	0.27% (0.12–0.32)	7100 (3100–8400)
Kuwait	0.21% (0.17–0.23)	0.34% (0.28–0.37)	0.49% (0.39–0.53)	0.61% (0.49–0.67)	0.76% (0.62–0.83)	1.03% (0.83–1.13)	1.42% (1.14–1.54)	0.77% (0.62–0.84)	7400 (6000–8000)
Lebanon	0.02% (0.01–0.06)	0.05% (0.02–0.12)	0.10% (0.04–0.23)	0.14% (0.05–0.34)	0.16% (0.06–0.38)	0.18% (0.07–0.44)	0.25% (0.09–0.58)	0.12% (0.05–0.28)	2300 (870–5300)
Libya	0.76% (0.59–0.79)	0.98% (0.76–1.02)	1.22% (0.94–1.26)	1.39% (1.07–1.44)	1.49% (1.15–1.55)	1.46% (1.13–1.51)	1.50% (1.16–1.55)	1.26% (0.97–1.30)	23 800 (18 400–24 700)
Morocco	0.26% (0.19–0.33)	0.41% (0.30–0.51)	0.54% (0.39–0.68)	0.67% (0.49–0.84)	0.79% (0.57–0.98)	1.03% (0.74–1.28)	1.16% (0.84–1.44)	0.67% (0.48–0.83)	63 700 (46 100–79 400)
Oman	0.19% (0.14–0.21)	0.25% (0.19–0.28)	0.26% (0.20–0.29)	0.28% (0.21–0.31)	0.31% (0.24–0.35)	0.36% (0.27–0.40)	0.65% (0.49–0.73)	0.30% (0.23–0.34)	2900 (2200–3300)
Occupied Palestinian territory	0.21% (0.17–0.23)	0.34% (0.28–0.37)	0.49% (0.39–0.53)	0.61% (0.49–0.67)	0.76% (0.62–0.83)	1.03% (0.83–1.13)	1.42% (1.14–1.54)	0.58% (0.46–0.63)	7200 (5800–7800)
Qatar	0.09% (0.07–0.09)	0.11% (0.09–0.12)	0.12% (0.10–0.13)	0.34% (0.26–0.36)	0.88% (0.69–0.94)	1.85% (1.45–1.97)	2.42% (1.90–2.58)	0.74% (0.58–0.79)	3300 (2600–3500)
Saudi Arabia	0.12% (0.09–0.22)	0.22% (0.16–0.39)	0.21% (0.15–0.37)	0.23% (0.17–0.42)	0.26% (0.19–0.46)	0.30% (0.22–0.53)	0.39% (0.29–0.70)	0.24% (0.18–0.44)	20 600 (15 300–37 000)
Syria	0.42% (0.19–0.50)	1.34% (0.59–1.58)	2.70% (1.19–3.18)	3.03% (1.34–3.57)	2.85% (1.26–3.37)	2.76% (1.22–3.26)	3.18% (1.40–3.75)	2.22% (0.98–2.61)	102 000 (45 200–121 000)
Tunisia	0.02% (0.01–0.03)	0.05% (0.01–0.06)	0.16% (0.04–0.19)	0.35% (0.08–0.39)	0.58% (0.13–0.65)	0.81% (0.19–0.92)	0.92% (0.21–1.04)	0.41% (0.10–0.47)	12 400 (2900–14 100)
Turkey	0.07% (0.04–0.10)	0.12% (0.07–0.19)	0.20% (0.11–0.31)	0.28% (0.15–0.43)	0.37% (0.21–0.58)	0.49% (0.27–0.77)	0.57% (0.31–0.88)	0.29% (0.16–0.45)	63 500 (35 000–98 500)
United Arab Emirates	0.76% (0.29–0.92)	1.14% (0.43–1.38)	1.27% (0.48–1.54)	1.08% (0.41–1.30)	0.96% (0.36–1.16)	1.00% (0.38–1.21)	1.09% (0.41–1.32)	1.06% (0.40–1.28)	21 400 (8100–25 900)
Western Sahara	0.21% (0.17–0.23)	0.34% (0.28–0.37)	0.49% (0.39–0.53)	0.61% (0.49–0.67)	0.76% (0.62–0.83)	1.03% (0.83–1.13)	1.42% (1.14–1.54)	0.65% (0.52–0.71)	1000 (840–1100)
Yemen	0.27% (0.19–0.33)	0.61% (0.41–0.74)	0.85% (0.58–1.05)	1.17% (0.79–1.44)	1.31% (0.89–1.61)	1.62% (1.10–1.98)	3.05% (2.07–3.74)	0.99% (0.67–1.21)	73 400 (49 700–89 800)
North America									
Canada	0.04% (0.02–0.04)	0.09% (0.06–0.11)	0.21% (0.13–0.24)	0.36% (0.23–0.42)	0.45% (0.29–0.52)	0.56% (0.36–0.65)	0.65% (0.42–0.76)	0.35% (0.22–0.40)	29 500 (18 900–34 100)
USA	0.06% (0.04–0.07)	0.21% (0.16–0.27)	0.48% (0.37–0.63)	0.61% (0.46–0.79)	0.64% (0.49–0.84)	0.70% (0.53–0.91)	0.75% (0.57–0.98)	0.49% (0.37–0.64)	368 000 (280 000–480 000)
Oceania									
French Polynesia	0.23% (0.17–0.79)	0.44% (0.33–1.51)	0.83% (0.63–2.88)	1.55% (1.17–5.33)	2.33% (1.76–8.03)	2.76% (2.09–9.51)	2.86% (2.17–9.88)	1.56% (1.18–5.38)	1100 (850–3900)
Guam	0.23% (0.17–0.79)	0.44% (0.33–1.51)	0.83% (0.63–2.88)	1.55% (1.17–5.33)	2.33% (1.76–8.03)	2.76% (2.09–9.51)	2.86% (2.17–9.88)	1.44% (1.09–4.97)	580 (440–2000)

(Table 1 continues on next page)

	15-19 years	20-24 years	25-29 years	30-34 years	35-39 years	40-44 years	45-49 years	Total	
								Prevalence	Cases
(Continued from previous page)									
New Caledonia	0.23% (0.17-0.79)	0.44% (0.33-1.51)	0.83% (0.63-2.88)	1.55% (1.17-5.33)	2.33% (1.76-8.03)	2.76% (2.09-9.51)	2.86% (2.17-9.88)	1.56% (1.18-5.37)	1100 (850-3900)
Papua New Guinea	0.25% (0.19-0.87)	0.48% (0.36-1.68)	0.93% (0.69-3.24)	1.73% (1.29-6.02)	2.63% (1.97-9.15)	3.10% (2.32-10.81)	3.25% (2.43-11.30)	1.49% (1.12-5.20)	33 000 (24 700-115 000)
Solomon Islands	0.23% (0.17-0.79)	0.44% (0.33-1.51)	0.83% (0.63-2.88)	1.55% (1.17-5.33)	2.33% (1.76-8.03)	2.76% (2.09-9.51)	2.86% (2.17-9.88)	1.34% (1.01-4.61)	2100 (1600-7400)
Vanuatu	0.23% (0.17-0.79)	0.44% (0.33-1.51)	0.83% (0.63-2.88)	1.55% (1.17-5.33)	2.33% (1.76-8.03)	2.76% (2.09-9.51)	2.86% (2.17-9.88)	1.32% (1.00-4.54)	970 (740-3400)
Central sub-Saharan Africa									
Angola	0.22% (0.00-0.23)	0.34% (0.00-0.34)	0.45% (0.00-0.46)	0.54% (0.00-0.54)	0.56% (0.00-0.57)	0.58% (0.00-0.59)	0.70% (0.00-0.71)	0.43% (0.00-0.44)	31 600 (0-32 000)
Central African Republic	0.04% (0.03-0.05)	0.09% (0.07-0.11)	0.19% (0.13-0.22)	0.32% (0.22-0.36)	0.42% (0.29-0.47)	0.48% (0.33-0.54)	0.54% (0.37-0.61)	0.22% (0.15-0.25)	2400 (1700-2800)
Democratic Republic of the Congo	0.20% (0.00-0.21)	0.30% (0.00-0.30)	0.37% (0.00-0.38)	0.40% (0.00-0.41)	0.40% (0.00-0.40)	0.40% (0.00-0.41)	0.47% (0.00-0.48)	0.34% (0.00-0.34)	65 000 (0-65 900)
Republic of the Congo	0.22% (0.00-0.23)	0.34% (0.00-0.34)	0.45% (0.00-0.46)	0.54% (0.00-0.54)	0.56% (0.00-0.57)	0.58% (0.00-0.59)	0.70% (0.00-0.71)	0.45% (0.00-0.45)	5800 (0-5800)
Equatorial Guinea	0.22% (0.00-0.23)	0.34% (0.00-0.34)	0.45% (0.00-0.46)	0.54% (0.00-0.54)	0.56% (0.00-0.57)	0.58% (0.00-0.59)	0.70% (0.00-0.71)	0.44% (0.00-0.45)	1300 (0-1300)
Gabon	1.81% (1.31-1.87)	2.62% (1.91-2.72)	3.60% (2.61-3.73)	4.62% (3.36-4.79)	5.51% (4.00-5.71)	6.46% (4.69-6.69)	8.49% (6.17-8.80)	4.26% (3.09-4.41)	23 100 (16 700-23 900)
East sub-Saharan Africa									
Burundi	1.49% (1.15-5.70)	2.95% (2.28-11.26)	4.55% (3.52-17.38)	6.11% (4.72-23.33)	7.79% (6.02-29.73)	9.37% (7.25-35.79)	10.42% (8.05-39.77)	4.91% (3.80-18.75)	133 000 (103 000-506 000)
Comoros	0.22% (0.17-0.29)	0.42% (0.32-0.56)	0.72% (0.55-0.95)	1.04% (0.80-1.38)	1.33% (1.02-1.77)	1.64% (1.26-2.17)	1.93% (1.48-2.56)	0.87% (0.67-1.15)	1800 (1400-2400)
Djibouti	0.22% (0.17-0.29)	0.42% (0.32-0.56)	0.72% (0.55-0.95)	1.04% (0.80-1.38)	1.33% (1.02-1.77)	1.64% (1.26-2.17)	1.93% (1.48-2.56)	0.95% (0.73-1.26)	2400 (1900-3200)
Eritrea	0.22% (0.17-0.29)	0.42% (0.32-0.56)	0.72% (0.55-0.95)	1.04% (0.80-1.38)	1.33% (1.02-1.77)	1.64% (1.26-2.17)	1.93% (1.48-2.56)	0.86% (0.66-1.15)	7100 (5500-9400)
Ethiopia	0.09% (0.06-0.10)	0.15% (0.10-0.17)	0.28% (0.18-0.31)	0.54% (0.34-0.60)	0.93% (0.59-1.04)	1.52% (0.96-1.71)	2.15% (1.36-2.41)	0.56% (0.35-0.62)	153 000 (97 200-172 000)
Kenya	0.40% (0.15-0.45)	0.75% (0.28-0.82)	1.14% (0.42-1.26)	1.33% (0.49-1.47)	1.48% (0.54-1.63)	1.56% (0.58-1.72)	1.71% (0.63-1.89)	1.06% (0.39-1.17)	145 000 (53 600-160 000)
Madagascar	0.11% (0.08-0.16)	0.20% (0.14-0.29)	0.36% (0.25-0.52)	0.55% (0.39-0.80)	0.71% (0.50-1.03)	0.82% (0.57-1.19)	0.95% (0.66-1.38)	0.43% (0.30-0.62)	28 500 (19 800-41 300)
Malawi	0.22% (0.17-0.29)	0.42% (0.32-0.56)	0.72% (0.55-0.95)	1.04% (0.80-1.38)	1.33% (1.02-1.77)	1.64% (1.26-2.17)	1.93% (1.48-2.56)	0.82% (0.63-1.09)	37 300 (28 700-49 400)
Mauritius	0.22% (0.17-0.29)	0.42% (0.32-0.56)	0.72% (0.55-0.95)	1.04% (0.80-1.38)	1.33% (1.02-1.77)	1.64% (1.26-2.17)	1.93% (1.48-2.56)	1.02% (0.79-1.36)	3300 (2500-4400)
Mayotte	0.22% (0.17-0.29)	0.42% (0.32-0.56)	0.72% (0.55-0.95)	1.04% (0.80-1.38)	1.33% (1.02-1.77)	1.64% (1.26-2.17)	1.93% (1.48-2.56)	0.90% (0.69-1.19)	600 (460-800)
Mozambique	0.27% (0.20-0.35)	0.55% (0.43-0.73)	1.02% (0.78-1.35)	1.56% (1.20-2.07)	2.05% (1.58-2.72)	2.40% (1.85-3.18)	2.43% (1.87-3.23)	1.17% (0.90-1.55)	85 400 (65 700-113 000)
Reunion	0.22% (0.17-0.29)	0.42% (0.32-0.56)	0.72% (0.55-0.95)	1.04% (0.80-1.38)	1.33% (1.02-1.77)	1.64% (1.26-2.17)	1.93% (1.48-2.56)	1.03% (0.80-1.37)	2200 (1700-2900)
Rwanda	0.54% (0.41-0.72)	1.07% (0.82-1.42)	1.50% (1.15-1.99)	1.40% (1.08-1.86)	1.72% (1.32-2.28)	2.55% (1.96-3.38)	3.24% (2.49-4.29)	1.46% (1.12-1.94)	46 800 (36 000-62 000)
Somalia	0.22% (0.17-0.29)	0.42% (0.32-0.56)	0.72% (0.55-0.95)	1.04% (0.80-1.38)	1.33% (1.02-1.77)	1.64% (1.26-2.17)	1.93% (1.48-2.56)	0.79% (0.61-1.05)	27 300 (21 000-36 200)
South Sudan	0.22% (0.17-0.29)	0.42% (0.32-0.56)	0.72% (0.55-0.95)	1.04% (0.80-1.38)	1.33% (1.02-1.77)	1.64% (1.26-2.17)	1.93% (1.48-2.56)	0.84% (0.64-1.11)	22 200 (17 100-29 400)
Sudan	0.22% (0.17-0.29)	0.42% (0.32-0.56)	0.72% (0.55-0.95)	1.04% (0.80-1.38)	1.33% (1.02-1.77)	1.64% (1.26-2.17)	1.93% (1.48-2.56)	0.85% (0.66-1.13)	88 800 (68 300-118 000)
Tanzania	0.09% (0.07-0.12)	0.17% (0.13-0.22)	0.24% (0.19-0.32)	0.32% (0.25-0.43)	0.41% (0.31-0.54)	0.49% (0.38-0.65)	0.55% (0.42-0.73)	0.27% (0.21-0.36)	37 100 (28 600-49 200)

(Table 1 continues on next page)

(appendix p 8–9). Two epidemiologists (ED and SB) first scored the studies in the models for data quality, and these scores were compared with those of the comparator studies (appendix p 5–7). The model was updated, as appropriate, if a higher scoring study was identified.

In a descriptive analysis, we compared prevalence estimates from the studies in the models with the prevalence estimates in the comparator studies (appendix pp 8–9). The modelled viraemic prevalence was extracted from the year of data collection of the

	15–19 years	20–24 years	25–29 years	30–34 years	35–39 years	40–44 years	45–49 years	Total	
								Prevalence	Cases
(Continued from previous page)									
Uganda	0.16% (0.12–0.21)	0.30% (0.23–0.40)	0.67% (0.51–0.88)	1.19% (0.92–1.58)	1.46% (1.12–1.94)	1.63% (1.25–2.15)	1.71% (1.32–2.27)	0.77% (0.59–1.02)	81 200 (62 500–108 000)
Zambia	0.22% (0.17–0.29)	0.42% (0.32–0.56)	0.72% (0.55–0.95)	1.04% (0.80–1.38)	1.33% (1.02–1.77)	1.64% (1.26–2.17)	1.93% (1.48–2.56)	0.82% (0.63–1.09)	35 700 (27 400–47 300)
Southern sub-Saharan Africa									
Botswana	0.03% (0.02–0.03)	0.06% (0.04–0.07)	0.14% (0.09–0.17)	0.26% (0.17–0.32)	0.39% (0.25–0.49)	0.56% (0.36–0.70)	0.79% (0.50–0.98)	0.27% (0.17–0.34)	1700 (1100–2100)
Lesotho	0.03% (0.02–0.03)	0.06% (0.04–0.07)	0.14% (0.09–0.17)	0.26% (0.17–0.32)	0.39% (0.25–0.49)	0.56% (0.36–0.70)	0.79% (0.50–0.98)	0.25% (0.16–0.31)	1400 (870–1700)
Namibia	0.03% (0.02–0.03)	0.06% (0.04–0.07)	0.14% (0.09–0.17)	0.26% (0.17–0.32)	0.39% (0.25–0.49)	0.56% (0.36–0.70)	0.79% (0.50–0.98)	0.25% (0.16–0.31)	1600 (1000–2000)
South Africa	0.03% (0.02–0.03)	0.06% (0.04–0.07)	0.14% (0.09–0.17)	0.26% (0.17–0.32)	0.39% (0.25–0.49)	0.56% (0.36–0.70)	0.79% (0.50–0.98)	0.28% (0.18–0.35)	45 000 (28 600–55 700)
Eswatini	0.03% (0.02–0.03)	0.06% (0.04–0.07)	0.14% (0.09–0.17)	0.26% (0.17–0.32)	0.39% (0.25–0.49)	0.56% (0.36–0.70)	0.79% (0.50–0.98)	0.25% (0.16–0.30)	750 (480–930)
Zimbabwe	0.03% (0.02–0.03)	0.06% (0.04–0.07)	0.14% (0.09–0.17)	0.26% (0.17–0.32)	0.39% (0.25–0.49)	0.56% (0.36–0.70)	0.79% (0.50–0.98)	0.24% (0.15–0.30)	9100 (5800–11 300)
West sub-Saharan Africa									
Benin	0.40% (0.33–0.45)	0.85% (0.70–0.96)	1.56% (1.28–1.75)	2.13% (1.75–2.39)	2.41% (1.98–2.70)	2.45% (2.01–2.75)	2.38% (1.95–2.67)	1.49% (1.22–1.67)	41 700 (34 200–46 800)
Burkina Faso	0.43% (0.33–0.45)	1.10% (0.84–1.14)	2.16% (1.66–2.25)	2.84% (2.18–2.94)	3.09% (2.37–3.21)	3.31% (2.54–3.44)	3.59% (2.75–3.72)	1.97% (1.51–2.04)	93 100 (71 300–96 600)
Cameroon	0.15% (0.11–0.17)	0.32% (0.23–0.36)	0.53% (0.37–0.59)	0.74% (0.53–0.83)	0.92% (0.65–1.03)	1.08% (0.77–1.21)	1.40% (0.99–1.56)	0.60% (0.42–0.67)	37 400 (26 500–41 900)
Cape Verde	0.40% (0.33–0.45)	0.85% (0.70–0.96)	1.56% (1.28–1.75)	2.13% (1.75–2.39)	2.41% (1.98–2.70)	2.45% (2.01–2.75)	2.38% (1.95–2.67)	1.64% (1.35–1.84)	2400 (2000–2700)
Chad	0.21% (0.14–0.23)	0.47% (0.33–0.54)	0.85% (0.58–0.96)	1.26% (0.86–1.42)	1.55% (1.07–1.76)	1.83% (1.26–2.08)	2.48% (1.71–2.82)	0.92% (0.63–1.05)	33 200 (22 800–37 700)
Côte d'Ivoire	0.40% (0.33–0.45)	0.85% (0.70–0.96)	1.56% (1.28–1.75)	2.13% (1.75–2.39)	2.41% (1.98–2.70)	2.45% (2.01–2.75)	2.38% (1.95–2.67)	1.46% (1.20–1.64)	91 100 (74 800–102 000)
The Gambia	0.13% (0.07–0.20)	0.32% (0.18–0.49)	0.65% (0.37–1.01)	1.02% (0.58–1.59)	1.20% (0.68–1.87)	1.12% (0.64–1.74)	1.29% (0.74–2.01)	0.67% (0.38–1.03)	3800 (2100–5800)
Ghana	0.78% (0.60–1.85)	1.20% (0.92–2.84)	1.66% (1.27–3.94)	2.11% (1.61–4.99)	2.49% (1.91–5.90)	2.87% (2.20–6.80)	3.18% (2.43–7.52)	1.83% (1.40–4.33)	138 000 (106 000–328 000)
Guinea	0.40% (0.33–0.45)	0.85% (0.70–0.96)	1.56% (1.28–1.75)	2.13% (1.75–2.39)	2.41% (1.98–2.70)	2.45% (2.01–2.75)	2.38% (1.95–2.67)	1.45% (1.19–1.63)	45 300 (37 200–50 800)
Guinea-Bissau	0.40% (0.33–0.45)	0.85% (0.70–0.96)	1.56% (1.28–1.75)	2.13% (1.75–2.39)	2.41% (1.98–2.70)	2.45% (2.01–2.75)	2.38% (1.95–2.67)	1.51% (1.24–1.69)	7200 (5900–8100)
Liberia	0.40% (0.33–0.45)	0.85% (0.70–0.96)	1.56% (1.28–1.75)	2.13% (1.75–2.39)	2.41% (1.98–2.70)	2.45% (2.01–2.75)	2.38% (1.95–2.67)	1.51% (1.24–1.69)	17 900 (14 700–20 100)
Mali	0.40% (0.33–0.45)	0.85% (0.70–0.96)	1.56% (1.28–1.75)	2.13% (1.75–2.39)	2.41% (1.98–2.70)	2.45% (2.01–2.75)	2.38% (1.95–2.67)	1.45% (1.19–1.63)	63 700 (52 300–71 500)
Mauritania	0.40% (0.33–0.45)	0.85% (0.70–0.96)	1.56% (1.28–1.75)	2.13% (1.75–2.39)	2.41% (1.98–2.70)	2.45% (2.01–2.75)	2.38% (1.95–2.67)	1.54% (1.26–1.73)	17 000 (14 000–19 100)
Niger	0.40% (0.33–0.45)	0.85% (0.70–0.96)	1.56% (1.28–1.75)	2.13% (1.75–2.39)	2.41% (1.98–2.70)	2.45% (2.01–2.75)	2.38% (1.95–2.67)	1.42% (1.17–1.60)	69 600 (57 100–78 100)
Nigeria	0.39% (0.29–0.41)	0.89% (0.66–0.92)	1.70% (1.27–1.77)	2.34% (1.74–2.43)	2.60% (1.94–2.70)	2.53% (1.88–2.62)	2.24% (1.67–2.33)	1.57% (1.17–1.63)	725 000 (540 000–753 000)
São Tomé and Príncipe	0.40% (0.33–0.45)	0.85% (0.70–0.96)	1.56% (1.28–1.75)	2.13% (1.75–2.39)	2.41% (1.98–2.70)	2.45% (2.01–2.75)	2.38% (1.95–2.67)	1.50% (1.23–1.68)	750 (620–850)

(Table 1 continues on next page)

	15–19 years	20–24 years	25–29 years	30–34 years	35–39 years	40–44 years	45–49 years	Total	
								Prevalence	Cases
(Continued from previous page)									
Senegal	0.40% (0.33–0.45)	0.85% (0.70–0.96)	1.56% (1.28–1.75)	2.13% (1.75–2.39)	2.41% (1.98–2.70)	2.45% (2.01–2.75)	2.38% (1.95–2.67)	1.52% (1.25–1.70)	60 800 (49 900–68 200)
Sierra Leone	0.40% (0.33–0.45)	0.85% (0.70–0.96)	1.56% (1.28–1.75)	2.13% (1.75–2.39)	2.41% (1.98–2.70)	2.45% (2.01–2.75)	2.38% (1.95–2.67)	1.49% (1.22–1.67)	28 500 (23 400–31 900)
Togo	0.40% (0.33–0.45)	0.85% (0.70–0.96)	1.56% (1.28–1.75)	2.13% (1.75–2.39)	2.41% (1.98–2.70)	2.45% (2.01–2.75)	2.38% (1.95–2.67)	1.52% (1.25–1.71)	30 200 (24 800–33 900)

Prevalences are percentage (95% UI); cases are n (95% UI). Countries and territories with less than 500 cases of viraemic HCV in women of childbearing age are not shown here. HCV=hepatitis C virus. UI=uncertainty interval.

Table 1: Modelled viraemic HCV prevalence by GBD region, country or territory, and age cohort in 2019

comparator study. For countries that had comparator studies but not a model, the 2019 viraemic prevalence estimates calculated by extrapolation from GBD region data were used as a comparator.

Extrapolation

For the 139 countries and territories without prevalence data available in a model, prevalence was estimated. First, for each GBD region, a population-weighted mean prevalence (stratified by 5-year age cohort) was calculated using the 2019 prevalence estimates from approved and estimated models. Second, the prevalence estimates for each 5-year age cohort were applied equally to corresponding 1-year general population censuses from the UN World Population Prospects.¹ Results were reported in the age categories: 15–19 years, 20–24 years, 25–29 years, 30–34 years, 35–39 years, 40–44 years, and 45–49 years, and divided by the population in the same age ranges. Finally, results were summarised by country or territory, GBD region, WHO region, and World Bank income classification (appendix pp 25–27).

Statistical analysis

We did an uncertainty analysis to account for variation in data inputs and provide a measured range of uncertainty. Uncertainty intervals (UIs) for each country or territory’s estimate of viraemic prevalence were calculated by use of low and high ranges of viraemic prevalence in the adult population in the published literature applied to the population of women of childbearing age. Monte Carlo simulation (1000 trials) was used to calculate 95% UIs around each prevalence estimate. The 95% UI represents a range that captures the known uncertainties identified in the study in which each uncertainty was represented by a beta-PERT distribution and sampled randomly 1000 times. Typically, UIs are used in Bayesian statistics in settings where few datapoints are available, and they represent the range of uncertainty, whereas CIs are associated with classical statistics in settings where numerous datapoints are available (eg, population height). We used Microsoft Excel, version 16.44 for all analyses.

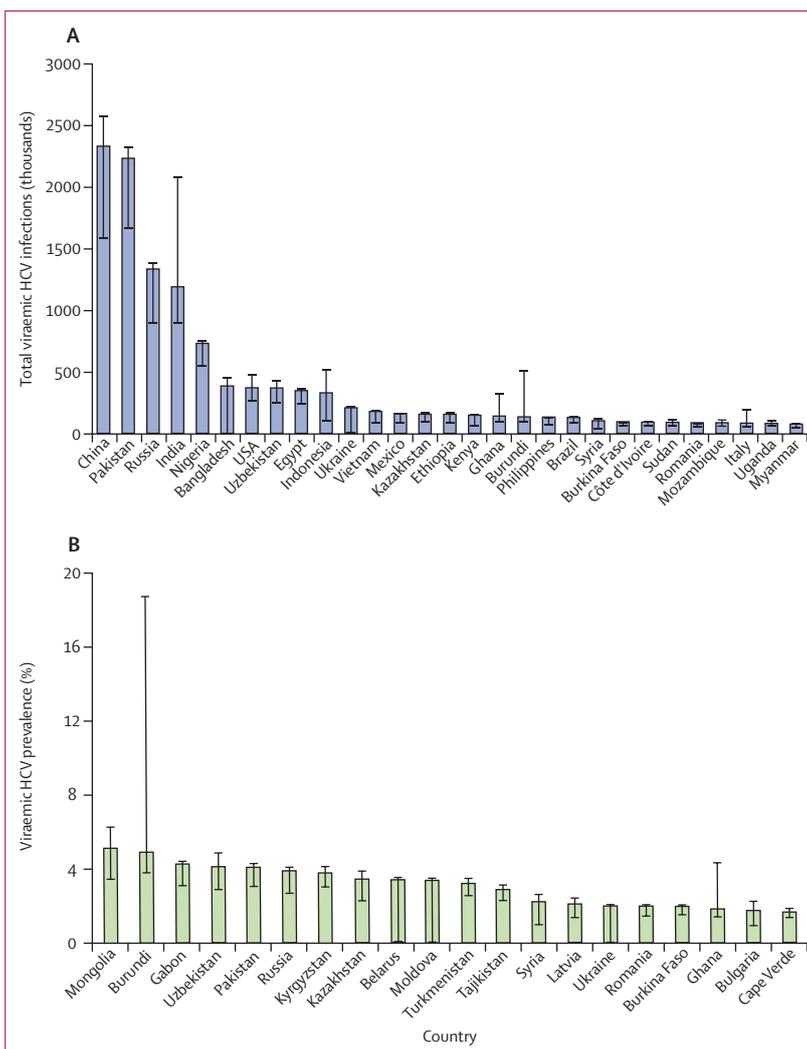


Figure 2: Country ranking of total infections and viraemic HCV prevalence in women aged 15–49 years in 2019

(A) Ranking of countries accounting for 80% of global viraemic HCV infections in women aged 15–49 years in 2019. (B) Ranking of the top 20 countries with the highest global viraemic HCV prevalence in women aged 15–49 years in 2019. Error bars represent 95% uncertainty intervals. HCV=hepatitis C virus.

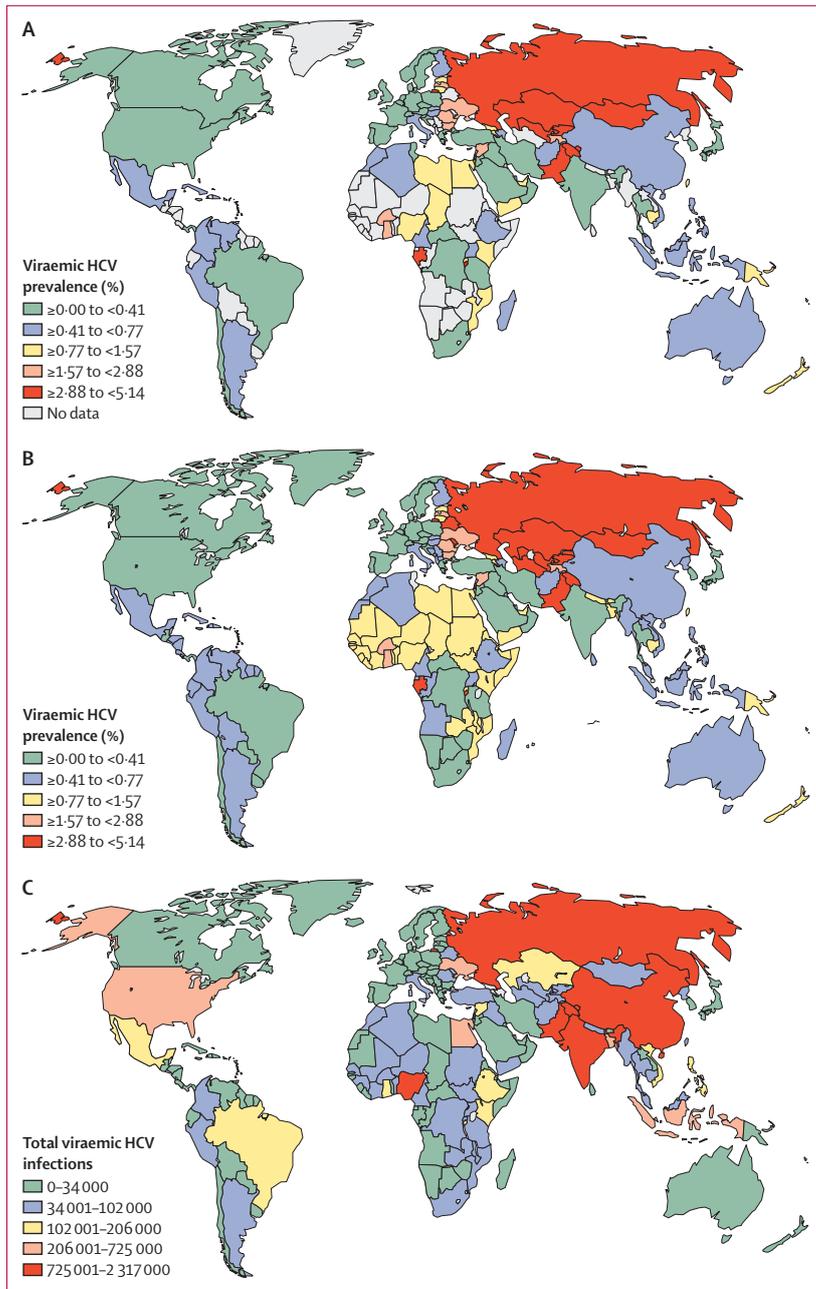


Figure 3: Maps of viraemic HCV prevalence and total infections in women aged 15–49 years in 2019 (A) 2019 viraemic HCV prevalence in countries and territories with approved or estimated models. (B) 2019 viraemic HCV prevalence in all countries and territories. (C) Total number of viraemic HCV infections in all countries and territories in 2019. Data for Greenland were extrapolated from western Europe data. HCV=hepatitis C.

Role of the funding source

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

Results

2108 studies were identified in the literature search, of which 455 met our eligibility criteria for a full-text review

(figure 1). 41 studies met our inclusion criteria and had a country or territory model based on prevalence studies or extrapolations available for comparison (appendix pp 8–9). 34 (83%) of the 41 comparator studies reported prevalence as measured by anti-HCV antibody, 38 (93%) studies included pregnant or post-partum women, and only five (12%) were done at the national level and considered generalisable to the target population (women aged 15–49 years). Prevalence estimates from 11 (27%) of the comparator studies fell within the UIs of the modelled prevalence estimates. Prevalence estimates in two (40%) of five comparator studies done at the national level and in three (23%) of 13 comparator studies done at an individual site (eg, a hospital or clinic) fell within the range of modelled data. None of the 41 comparator studies were determined to be of higher quality than the current model inputs for prevalence in the target population and therefore no model studies were replaced. Additional discussions of the results from the literature review and descriptive analysis are available in the appendix (pp 4–11).

Data for viraemic HCV prevalence in women of childbearing age were available for all countries except the Democratic Republic of the Congo, for which prevalence was approximated by use of prevalence data for people aged 0–14 and people 40 and older. 74 (67%) of the 110 studies used in models did not stratify age-specific prevalence by sex. For these countries, a ratio of prevalence by sex (found in the literature) was applied to the prevalence distribution by age to estimate prevalence in women of all ages in the year of report.

The 2019 global prevalence of viraemic HCV in women aged 15–49 years was estimated to be 0.78% (95% UI 0.62–0.86), corresponding to 14 860 000 (95% UI 9 667 000–18 282 000) infected women (table 1). Country-specific or territory-specific models were available for 13.15 million (88%) of this estimated number of infected women. For case numbers, please see appendix (pp 12–24). Globally, the number of HCV infections and prevalence increased with age. The largest increase occurred between the youngest age cohorts, with nearly twice as many infections among women aged 20–24 years than among women aged 15–19 years (appendix pp 12–24).

Nearly half of viraemic HCV infections in women of childbearing age were concentrated in four countries: China (16% of total infections), Pakistan (15%), Russia (9%), and India (8%; figures 2A, 3). However, viraemic prevalence was highest in Mongolia, Burundi, Gabon, and Uzbekistan (table 1; figures 2B, 3). Of the countries with 500 cases or more, viraemic prevalence was lowest in Chile, the Netherlands, and Japan (table 1). Among the GBD regions, eastern Europe (3.39%, 95% UI 1.88–3.54) and central Asia (3.25%, 2.31–3.72) had the highest viraemic prevalence estimates (table 2). Of the top ten countries with the highest viraemic prevalence, four reside in central Asia (Mongolia, Uzbekistan, Kyrgyzstan, and Kazakhstan). High prevalence estimates in Mongolia and Uzbekistan heavily influenced the

	15–19 years	20–24 years	25–29 years	30–34 years	35–39 years	40–44 years	45–49 years	Total	
								Prevalence	Cases
GBD region									
High-income Asia Pacific	0.03% (0.02–0.03)	0.06% (0.03–0.06)	0.10% (0.06–0.12)	0.15% (0.09–0.17)	0.18% (0.10–0.20)	0.22% (0.12–0.25)	0.29% (0.15–0.33)	0.16% (0.09–0.19)	62 100 (34 000–71 800)
Central Asia	1.53% (1.09–1.76)	2.70% (1.91–3.10)	3.17% (2.24–3.64)	3.37% (2.39–3.86)	3.88% (2.76–4.43)	4.16% (2.97–4.74)	4.27% (3.05–4.86)	3.25% (2.31–3.72)	781 000 (555 000–894 000)
East Asia	0.24% (0.16–0.27)	0.40% (0.27–0.45)	0.47% (0.32–0.53)	0.53% (0.36–0.60)	0.89% (0.60–1.00)	1.06% (0.72–1.19)	0.95% (0.65–1.08)	0.67% (0.46–0.75)	2 428 000 (1 651 000–2 730 000)
South Asia	0.29% (0.19–0.35)	0.46% (0.30–0.55)	0.71% (0.47–0.86)	0.94% (0.62–1.16)	1.11% (0.73–1.42)	1.28% (0.85–1.71)	1.49% (0.99–2.05)	0.83% (0.55–1.06)	3 913 000 (2 589 000–5 012 000)
Southeast Asia	0.16% (0.08–0.21)	0.26% (0.12–0.33)	0.36% (0.18–0.46)	0.50% (0.25–0.63)	0.63% (0.31–0.79)	0.81% (0.41–1.00)	0.96% (0.49–1.18)	0.50% (0.25–0.63)	899 000 (449 000–1 130 000)
Australasia	0.09% (0.06–0.10)	0.17% (0.12–0.19)	0.30% (0.21–0.34)	0.51% (0.37–0.57)	0.86% (0.63–0.95)	1.10% (0.81–1.22)	1.11% (0.82–1.24)	0.60% (0.44–0.67)	41 800 (30 700–46 600)
Caribbean	0.09% (0.06–0.14)	0.18% (0.12–0.29)	0.35% (0.22–0.58)	0.57% (0.36–0.96)	0.83% (0.54–1.37)	1.02% (0.66–1.68)	1.11% (0.70–1.85)	0.56% (0.36–0.92)	63 300 (40 300–105 000)
Central Europe	0.23% (0.16–0.25)	0.51% (0.36–0.56)	0.76% (0.53–0.83)	0.90% (0.62–0.99)	0.95% (0.64–1.05)	0.91% (0.62–1.01)	0.96% (0.67–1.06)	0.78% (0.54–0.86)	205 000 (142 000–227 000)
Eastern Europe	1.00% (0.52–1.05)	2.89% (1.64–3.02)	3.96% (2.33–4.14)	3.58% (2.12–3.74)	3.52% (1.99–3.67)	4.21% (2.27–4.39)	3.50% (1.67–3.65)	3.39% (1.88–3.54)	1 661 000 (921 000–1 734 000)
Western Europe	0.04% (0.03–0.08)	0.09% (0.05–0.15)	0.15% (0.09–0.24)	0.23% (0.13–0.37)	0.34% (0.20–0.56)	0.45% (0.26–0.75)	0.50% (0.29–0.83)	0.27% (0.16–0.45)	254 000 (149 000–420 000)
Andean Latin America	0.11% (0.06–0.11)	0.18% (0.11–0.20)	0.29% (0.17–0.31)	0.45% (0.26–0.48)	0.75% (0.44–0.81)	1.01% (0.59–1.09)	1.14% (0.67–1.24)	0.51% (0.30–0.55)	81 400 (48 000–88 500)
Central Latin America	0.09% (0.05–0.09)	0.17% (0.10–0.18)	0.29% (0.17–0.30)	0.45% (0.27–0.47)	0.65% (0.39–0.68)	0.84% (0.51–0.88)	0.96% (0.58–1.01)	0.45% (0.28–0.48)	314 000 (191 000–329 000)
Southern Latin America	0.06% (0.02–0.08)	0.10% (0.05–0.15)	0.17% (0.08–0.26)	0.28% (0.12–0.42)	0.45% (0.20–0.68)	0.71% (0.32–1.06)	1.10% (0.49–1.66)	0.38% (0.17–0.58)	65 000 (29 200–98 000)
Tropical Latin America	0.06% (0.05–0.07)	0.10% (0.07–0.10)	0.15% (0.11–0.16)	0.22% (0.16–0.23)	0.29% (0.21–0.31)	0.38% (0.27–0.40)	0.41% (0.30–0.44)	0.22% (0.16–0.24)	131 000 (95 000–139 000)
North Africa and Middle East	0.21% (0.14–0.26)	0.34% (0.21–0.42)	0.49% (0.30–0.60)	0.61% (0.37–0.75)	0.76% (0.47–0.94)	1.03% (0.65–1.27)	1.42% (0.91–1.72)	0.65% (0.41–0.79)	886 000 (555 000–1 083 000)
High-income North America	0.05% (0.04–0.07)	0.19% (0.15–0.25)	0.45% (0.34–0.59)	0.58% (0.44–0.75)	0.62% (0.47–0.81)	0.68% (0.51–0.88)	0.74% (0.56–0.96)	0.48% (0.36–0.61)	398 000 (299 000–514 000)
Oceania	0.23% (0.17–0.79)	0.44% (0.33–1.51)	0.83% (0.62–2.89)	1.55% (1.15–5.36)	2.33% (1.73–8.07)	2.76% (2.05–9.55)	2.86% (2.13–9.92)	1.35% (1.01–4.68)	41 100 (30 600–142 000)
Central sub-Saharan Africa	0.22% (0.02–0.23)	0.34% (0.03–0.35)	0.45% (0.06–0.46)	0.54% (0.08–0.55)	0.56% (0.10–0.57)	0.58% (0.11–0.59)	0.70% (0.14–0.72)	0.43% (0.06–0.44)	129 000 (18 400–132 000)
East sub-Saharan Africa	0.22% (0.15–0.37)	0.42% (0.28–0.70)	0.72% (0.49–1.21)	1.04% (0.71–1.74)	1.33% (0.91–2.16)	1.64% (1.13–2.54)	1.93% (1.32–2.89)	0.83% (0.57–1.35)	939 000 (642 000–1 516 000)
South sub-Saharan Africa	0.03% (0.02–0.03)	0.06% (0.04–0.07)	0.14% (0.09–0.17)	0.26% (0.17–0.32)	0.39% (0.25–0.49)	0.56% (0.36–0.70)	0.79% (0.50–0.98)	0.27% (0.17–0.34)	59 600 (37 900–73 800)
West sub-Saharan Africa	0.40% (0.31–0.49)	0.85% (0.66–1.03)	1.56% (1.20–1.84)	2.13% (1.64–2.49)	2.41% (1.85–2.84)	2.45% (1.89–2.93)	2.38% (1.83–2.92)	1.49% (1.15–1.78)	1 507 000 (1 160 000–1 797 000)
WHO region									
African region	0.28% (0.18–0.38)	0.55% (0.37–0.74)	0.94% (0.66–1.27)	1.29% (0.91–1.73)	1.53% (1.07–2.04)	1.69% (1.18–2.27)	1.82% (1.25–2.46)	0.98% (0.68–1.32)	2 581 000 (1 790 000–3 472 000)
Eastern Mediterranean region	0.65% (0.48–0.71)	1.07% (0.77–1.16)	1.59% (1.14–1.72)	2.00% (1.44–2.17)	2.27% (1.63–2.47)	2.61% (1.88–2.84)	3.10% (2.23–3.38)	1.75% (1.26–1.90)	3 155 000 (2 275 000–3 430 000)
European region	0.43% (0.27–0.49)	1.00% (0.63–1.12)	1.50% (0.94–1.66)	1.57% (0.98–1.75)	1.56% (0.96–1.78)	1.72% (1.02–1.99)	1.53% (0.87–1.81)	1.37% (0.83–1.56)	2 920 000 (1 773 000–3 319 000)
Region of the Americas*	0.07% (0.05–0.08)	0.16% (0.11–0.19)	0.31% (0.21–0.37)	0.43% (0.29–0.53)	0.55% (0.37–0.67)	0.69% (0.45–0.82)	0.79% (0.51–0.96)	0.41% (0.27–0.50)	1 052 000 (702 000–1 274 000)
South-East Asia region	0.12% (0.06–0.18)	0.19% (0.09–0.28)	0.28% (0.13–0.43)	0.40% (0.20–0.61)	0.54% (0.29–0.84)	0.71% (0.39–1.11)	0.88% (0.51–1.39)	0.41% (0.22–0.64)	2170 000 (1 149 000–3 360 000)
Western Pacific region	0.21% (0.14–0.24)	0.35% (0.23–0.40)	0.43% (0.29–0.50)	0.52% (0.35–0.60)	0.83% (0.55–0.95)	1.00% (0.66–1.15)	0.95% (0.63–1.09)	0.63% (0.42–0.72)	2 982 000 (1 978 000–3 428 000)

(Table 2 continues on next page)

	15–19 years	20–24 years	25–29 years	30–34 years	35–39 years	40–44 years	45–49 years	Total	
									Prevalence
(Continued from previous page)									
World Bank income classification									
High-income	0.06% (0.04–0.09)	0.15% (0.10–0.22)	0.29% (0.20–0.40)	0.39% (0.26–0.53)	0.46% (0.30–0.64)	0.54% (0.35–0.77)	0.62% (0.40–0.90)	0.37% (0.24–0.53)	1 043 000 (683 000–1 474 000)
Upper-middle-income	0.22% (0.15–0.25)	0.45% (0.30–0.49)	0.65% (0.43–0.71)	0.74% (0.49–0.81)	0.98% (0.65–1.08)	1.16% (0.77–1.29)	1.05% (0.69–1.17)	0.76% (0.50–0.84)	5 026 000 (3 313 000–5 545 000)
Lower-middle-income	0.31% (0.20–0.38)	0.52% (0.33–0.63)	0.79% (0.51–0.95)	1.02% (0.66–1.25)	1.20% (0.77–1.50)	1.40% (0.89–1.80)	1.61% (1.01–2.10)	0.91% (0.58–1.14)	7 125 000 (4 562 000–8 932 000)
Low-income	0.24% (0.15–0.34)	0.48% (0.31–0.69)	0.84% (0.56–1.20)	1.18% (0.79–1.68)	1.43% (0.96–2.01)	1.66% (1.11–2.29)	1.88% (1.25–2.54)	0.91% (0.60–1.27)	1 661 000 (1 106 000–2 327 000)
Prevalences are percentage (95% UI); cases are n (95% UI). GBD=Global Burden of Disease. HCV=hepatitis C virus. UI=uncertainty interval. *Data are from the Pan American Health Organization.									
Table 2: Viraemic HCV prevalence by age group, GBD region, WHO region, and World Bank income classification in 2019									

prevalence estimates for the central Asia region. By WHO region, the highest prevalence estimates were for the Eastern Mediterranean region, driven primarily by Pakistan (accounting for 70% of total regional cases), and the European region, driven primarily by Russia (accounting for 45% of total regional cases; table 2). The estimated prevalence of HCV also increased as income level decreased. Estimated viraemic prevalence among women of childbearing age in low-income and lower-middle-income economies was nearly 1.2-times higher than estimates for upper-middle-income economies and nearly 2.5-times higher than estimates for high-income economies (table 2).

Discussion

Approximately 3.85 billion women are 15–49 years old, accounting for half of the world’s population. Assuming an estimated 71 million HCV infections worldwide,¹³ about 21% of the global population infected with HCV are women of childbearing age. China, Pakistan, Russia, and India accounted for nearly half of global viraemic infections in women of childbearing age; these countries are home to 42% of the world’s population, so high total case counts were expected. Ranking of total viraemic infections in the adult population in 2015 also found that China, Pakistan, Russia, and India were in the top five countries, aligning with our results.¹³ In 2015, Egypt reported the fourth highest number of infections in the world; however, the country has since taken considerable strides to reduce their HCV disease burden, which is reflected in the results of this analysis.¹⁸ Despite high case counts, China and India have a relatively low HCV prevalence, influenced by a low total in-country prevalence. The total number of infections was similar between China and Pakistan and between Russia and India, but China and India have about six to ten times more women aged 15–49 years than do Russia and India.¹ High estimates of HCV prevalence in women of childbearing age in Mongolia and Burundi are driven mainly by a high total prevalence in-country.

At a regional level, injection drug use is likely a substantial driver of the high prevalence of HCV in eastern Europe; the prevalence of HCV among people who inject drugs in this region is 40–80%.^{17,19} In a 2020 analysis, the Center for Disease Analysis Foundation estimated the prevalence of HCV in children aged 0–2 years in eastern Europe to be about 4–10-times higher than in other European regions, implicating higher levels of vertical transmission in this region than in neighbouring regions and aligning with the results of this analysis.³ The high prevalence of HCV estimated for women of childbearing age in central Asia was heavily influenced by a high total HCV prevalence reported in Mongolia, Uzbekistan, Kyrgyzstan, and Kazakhstan. Additionally, the relationship between increasing case counts, increasing prevalence, and increasing age was evident worldwide; this trend was unrelated to the year of data collection and is probably related to a cumulative exposure to risk factors as people age.

Recommendations for routine HCV testing among women of childbearing age are non-existent²⁰ and, even among high-income nations, perinatal HCV screening is rare. Only three of 26 countries in the EU routinely do perinatal HCV screening.²¹ The American Association for the Study of Liver Diseases and the US Centers for Disease Control and Prevention began recommending perinatal screening in the USA in early 2020.²² However, because risk-based screening remains in place for the general population of women of childbearing age and treatment is not recommended during pregnancy, vertical transmission will not be reduced under these new guidelines. In addition, risk-based screening can lead to underdiagnosis compared with universal screening, particularly for people who engage in high-risk behaviours such as injection drug use.²³

In many low-income countries, women routinely face barriers to accessing health care because of gender inequity, which can limit physical mobility to clinics, financial resources, and decision making to seek out and access care.²⁴ The published literature also suggests that

pregnancy trends vary widely by country and region. Adolescent (15–18 years) pregnancies are more common in marginalised communities, influenced by poverty, lack of access to education, and poor employment opportunities.²⁵ 722 000 young women aged 15–19 years are estimated to be infected with HCV worldwide, with the highest prevalence in lower-middle-income countries.³ For these young women and other women facing barriers to accessing health care, pregnancy might be the only time they are engaged in the health-care system. Consequently, screening and treatment programmes for women of childbearing age would probably prove difficult in low-income and lower-middle income settings. In these situations, pregnancy could present the best opportunity for HCV testing and linking those who are infected to care. HCV can also be overlooked in paediatric health screenings, and many women are unaware of their infection status before prenatal testing.²⁶ Peripartum screening could improve post-partum treatment uptake, which would then prevent transmission in future pregnancies.²⁶ Worldwide, 87% of pregnant women access antenatal care at least once; however, rates of access drop as low as 20% in some countries in southeast Asia and 30% in some countries in Africa.²⁷ Opportunities for pregnancy-associated linkage to care in these regions are therefore limited and screening at the point of labour and delivery could be considered. After the success of targeted campaigns (eg, birth cohort or at-risk screening),²⁸ universal screening of pregnant women has been proposed²² because this screening could be designed similarly and also be successful; nevertheless, no such proposals exist to screen women of childbearing age. Even for patients successfully screened and diagnosed, however, additional barriers to a cure remain, including linkage to care, treatment approval, treatment cost, and chance of reinfection.

To our knowledge, our study presents the first estimates of viraemic HCV prevalence in women of childbearing age at the regional and global level. As shown in the literature review, most national studies of HCV prevalence among women aged 15–49 years focused on pregnant women, particularly those seeking prenatal care, and did not encompass pregnant women not engaged in health care or women who are not or will not become pregnant. The paucity of research done in women of childbearing age reflects the difficulty in diagnosing and treating women outside of the pregnancy cascade.

This study builds on previous modelling work used to estimate the global prevalence of HCV,¹³ with nearly three-quarters of models reviewed and validated by local experts. When available, models were updated with new epidemiological inputs until July 7, 2020. Local experts were consulted; for Egypt, this consultation resulted in a lower relative ranking of disease burden than projected based on 2015 data.

The limitations of modelling and extrapolation, as used in this analysis, have been addressed previously, and

most relate to data availability.¹³ First, most prevalence estimates used in the models were from studies that reported anti-HCV antibody testing only; therefore, previously identified country-specific or territory-specific viraemic rates were applied to antibody data. Although the year of estimation for viraemic rate might differ from the year of prevalence estimation, none of these studies reported data collected before direct-acting antiviral treatments became available in most nations in 2017, so recent treatment advances probably did not influence this statistic. Second, we considered that the prevalence estimates in the five country models using 2017 data (Armenia, Brazil, Chile, Rwanda, and Tajikistan; appendix pp 5–7) could be affected by elimination efforts. Finally, prevalence data were not stratified by sex for 67% of models. We believe that we used the next-best option; we applied a sex-specific ratio to the prevalence data from published literature, and, in many cases, from the same study as the original prevalence estimate. Despite these limitations, country-specific or territory-specific models were available for 88% of the global population of women of childbearing age estimated to have HCV viraemia resulting in more precise estimates than those that can be acquired with regional extrapolations (used most commonly in modelling studies).

Women of childbearing age should be considered a key population to target for HCV prevention because of the potential for vertical transmission and increased use of injection drugs over time among some members of this demographic. Screening for HCV could be offered during routine gynaecological visits for the general population of women, and during prenatal and gynaecological appointments for pregnant women. Additionally, universal prenatal screening could prove an effective method of preventing vertical transmission in future pregnancies, if the mother is treated post-partum. This method could be particularly useful in countries with high birth rates or poor access to family planning and contraception resources. Providing a reliable estimate of HCV prevalence in women of childbearing age should enable national governments, global health agencies, and patient groups to create better test-and-treat strategies to reduce vertical transmission and total disease burden.

Contributors

SB, ED, and HR created the methodology, analysed the data, and prepared the text. SB, ED, MD, SMO, SR-S, and JS contributed to the literature review. All authors had full access to all the data in the study and had final responsibility for the decisions to submit for publication. SB, ZC, ED, MD, CE, IG, SMa, SMO, HR, DR-S, KR-S, SR-S, and JS accessed the raw data. SB, ZC, ED, CE, IG, SMa, HR, DR-S, KR-S, SR-S, and JS accessed, analysed, and verified the data. MB, SB, ED, JF, SK, PM, and HR provided guidance on descriptive content within the text.

Declaration of interests

SB, ZC, ED, MD, CE, IG, SMa, SMO, HR, DR-S, KR-S, SR-S, and JS report grants from Gilead Sciences and the John C Martin Foundation during the conduct of the study and grants from AbbVie and Pfizer outside the submitted work. MB reports grants from Gilead and AbbVie, outside the submitted work. JF reports grants from AbbVie, Enanta, Gilead Sciences, Janssen, Eiger, and Wako/Fujifilm, and personal fees

from AbbVie, Enanta, Gilead Sciences, GSK, Arbutus, and Roche, outside the submitted work. SK reports grants from Gilead Sciences, Arbutus Pharmaceuticals, and Merck during the conduct of the study. PM declares no competing interests.

Data sharing

For a period of 1 year after publication, the authors will share HCV prevalence estimates by age group and the data used in the maps in an Excel format after written request to the corresponding author. Data sharing will be limited to government agencies, academic institutions, and non-profit organisations, and will not apply to for-profit or consulting organisations.

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