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Global Burden and Elimination Progress of Viral Hepatitis B and C Toward the 2030 WHO Targets: A Structured Review of Epidemiology, Inequities, and Service Delivery Gaps

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Abstract

Viral hepatitis B and C remain leading infectious causes of cirrhosis, liver cancer, and premature death worldwide, and the World Health Organization (WHO) has called for both infections to be eliminated as public health threats within this decade. This single-reviewer, selectively sourced structured narrative review provides a non-exhaustive overview of progress toward that goal, with attention to long-term burden trends, inequities between and within countries, model-based projections of elimination timelines, and gaps in service delivery. It is not a systematic review and makes no claim to be comprehensive. Evidence was identified through a small number of general web queries and full-text files held by the author; bibliographic database search strings were drafted but not executed, so relevant evidence may have been missed or misclassified. One reviewer performed screening, extraction, and appraisal, and a PRISMA-style flow diagram is provided for transparency only. Eligible records were global, regional, or multinational analyses and WHO reports addressing disease burden, service coverage, elimination progress, or prevention. Reporting completeness, risk of bias, and funding and conflict-of-interest declarations were appraised as separate dimensions. In the sources reviewed, age-standardized rates of infection have declined over recent decades, a pattern consistent with the effects of vaccination and improved treatment, although the analyses cannot establish causation. However, population growth, aging, and infections acquired before vaccination have kept the absolute burden high. Modeled estimates suggest that low-resource settings and people who inject drugs bear a disproportionate share of that burden, and the projections and program data reviewed indicate that most countries are not on course to meet the elimination targets. The main obstacles appear to lie in diagnosis, treatment access, timely birth-dose vaccination, antenatal testing, and harm reduction rather than in a lack of effective tools. Falling age-standardized rates should therefore not be mistaken for sufficient progress. These findings are hypothesis-generating and should be confirmed by a prospectively registered, database-complete systematic review.

Categories: Epidemiology/Public Health, Infectious Disease, Gastroenterology
Keywords: disease eradication, global burden of disease, hepatitis b, hepatitis b vaccines, hepatitis c

Introduction And Background

Infection with hepatitis B virus (HBV) or hepatitis C virus (HCV) remains one of the most common infectious routes to cirrhosis and liver cancer. In 2022, the two viruses accounted for an estimated 1.3 million deaths, about 3,500 a day, and the global reservoir comprised 254 million people with chronic HBV and 50 million with chronic HCV [1]. Controlling them requires different tools. A vaccine protects against HBV, yet infection acquired in the first year of life becomes chronic in 80-90% of cases, compared with roughly 5% of infected adults, and available treatment suppresses the virus without clearing it [2,3]. Vaccination cannot prevent HCV, but direct-acting antivirals (DAAs) now cure it [4]. HBV is transmitted from mother to child around the time of birth, through percutaneous or mucosal exposure to infected blood or body fluids, and sexually. HCV is transmitted mainly through blood-borne exposure, including injecting drug use, unsafe medical procedures, and unscreened blood products, with vertical and sexual transmission being less common. Over years to decades, chronic infection with either virus can progress to cirrhosis, hepatic decompensation, and hepatocellular carcinoma (HCC) [2,4]. The burden is unevenly distributed: prevalence and mortality are highest, and gaps in prevention, diagnosis, and treatment are widest in low- and middle-income countries (LMICs) [1].

Two terms need to be distinguished. In WHO usage, "elimination as a public health threat" means achieving defined, measurable reductions in new infections and deaths against a fixed baseline, whereas "eradication" means the permanent worldwide absence of the pathogen, a status achieved for only one human disease

(smallpox). Neither HBV nor HCV is currently considered eradicable: HBV persists in chronic carriers, and treatment suppresses rather than clears it, and HCV, although curable, has no vaccine and can be re-acquired after cure. The Global Health Sector Strategy frames elimination as a 90% reduction in incidence and a 65% reduction in mortality by 2030 relative to a 2015 baseline, supported by 90% diagnosis and 80% treatment coverage [5]. The incidence target refers to new chronic HBV infections and new HCV infections, and the mortality target to deaths from HBV- and HCV-related liver disease, including cirrhosis and HCC. The diagnosis target is expressed against all people living with chronic infection, and the treatment target against those eligible for treatment [1]. The programmatic routes differ by virus: HBV targets center on childhood immunization, including a timely birth dose, and on prevention of mother-to-child transmission, whereas HCV targets center on harm-reduction services for people who inject drugs, blood and injection safety, and access to DAA treatment [1].

Two ways of expressing burden are also used throughout this review. An age-standardized rate (per 100,000 population) re-weights observed rates to a common reference age structure so that places and years can be compared independently of differences in age composition, and it approximates individual-level risk. Absolute burden, expressed as counts of cases, deaths, or disability-adjusted life years (DALYs), reflects the number of people affected and rises with population growth and aging even when individual risk falls. Rates and counts can therefore move in opposite directions. Several recent publications have examined individual elements of this agenda, namely, chronic HBV [3], total HCV burden [4], the timing of HCV elimination in high-income countries [5], acute HBV in women of childbearing age [6], HCV incidence in people who inject drugs [7], and national policy performance [8,9]. As their data sources and endpoints differ, these reports are seldom interpreted together. This review therefore offers a selectively sourced, single-reviewer narrative overview that brings evidence on burden trends, inequities, elimination trajectories, and delivery gaps into one structured account and that seeks to separate apparent progress from improvement that exists only in standardized rates. It is not comprehensive or database-complete, and it does not pool data.

Review

Design and reporting

This was a single-reviewer structured narrative review of selectively sourced evidence. It is not a systematic review: it was not registered in advance, bibliographic database searches were not executed, and one reviewer carried out all screening, extraction, and appraisal without independent verification. A PRISMA 2020-style flow diagram [10] is used solely to document how records were handled and does not imply that systematic-review methods were followed (Figure *1*). The single-reviewer design carries a risk of missed or misclassified evidence, extraction error, and subjective appraisal judgments, which are addressed under Limitations.

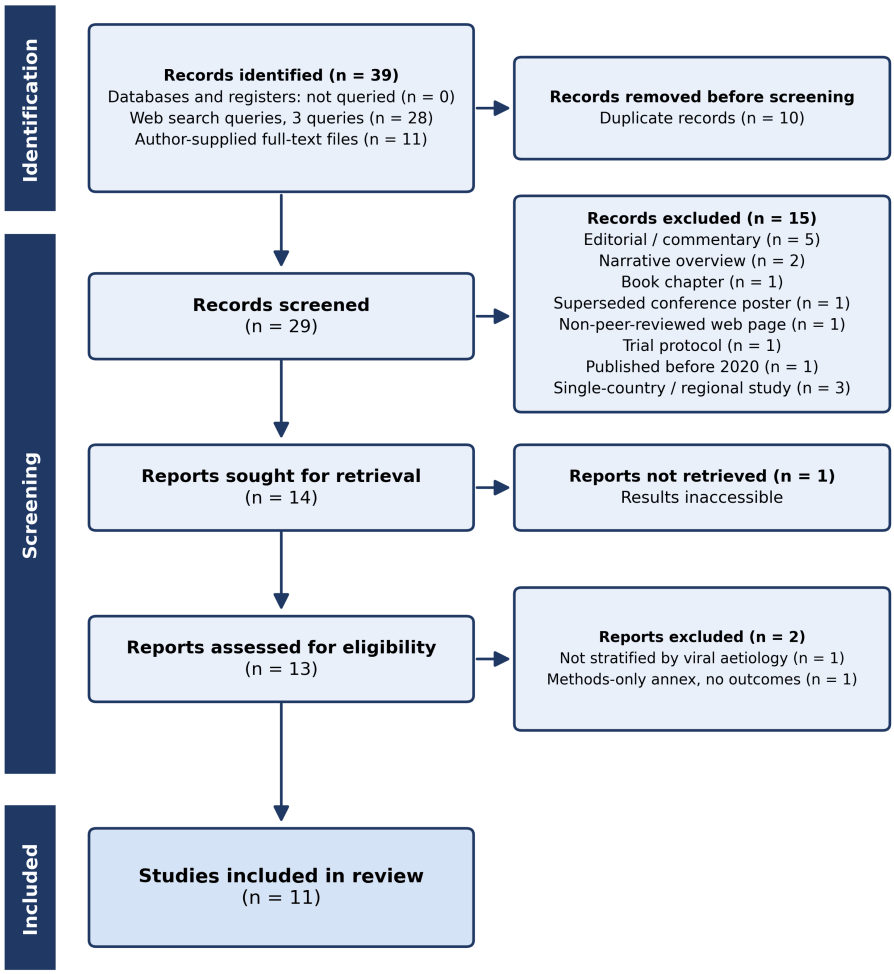


FIGURE 1: PRISMA 2020-style flow diagram of record identification, screening, and inclusion.

Records were identified through web queries and author-supplied files; bibliographic databases (PubMed, Scopus, Web of Science, and the Cochrane Library) were not queried. Eligibility assessment is shown within the screening phase, as in the PRISMA 2020 template [10]. The diagram documents record handling in a single-reviewer structured narrative review and does not reflect database-complete searching.

Information sources

Searching was limited to general web queries and to author-held files. On 4 October 2026, three queries were submitted to Google Search and Google Scholar. The first (Table *1*, Q1) was exploratory, and the second and third were targeted title lookups used to confirm the bibliographic details of records surfaced by the first. The queries returned 28 records in total (Q1: 18 records; Q2: six records; Q3: four records), and every item returned was counted. Search strings were drafted for PubMed/MEDLINE, Scopus, Web of Science, and the Cochrane Library (Table *1*), but these databases were not queried, and no database records are reported; the strings are provided solely to allow future replication. Eleven full-text files already in the authors' possession were added as records from other methods.

Source	Query or string
Web search (Google Search and Google Scholar), executed 4 Oct 2026	Q1: hepatitis C elimination progress 2030 countries on track Polaris Observatory Lancet Gastroenterology Hepatology | Q2 and Q3: targeted title lookups, each entering the full title of a record surfaced by Q1 in quotation marks to verify author, journal, year, and DOI details | Yield: Q1, 18 records; Q2, 6 records; Q3, 4 records (28 records in total)
PubMed/MEDLINE	("Hepatitis B"[Mesh] OR "Hepatitis C"[Mesh] OR "hepatitis B virus"[tiab] OR "hepatitis C virus"[tiab]) AND ("Global Burden of Disease"[Mesh] OR "Disease Eradication"[Mesh] OR "global burden"[tiab] OR elimination[tiab] OR "2030 target*"[tiab]) AND ("Infectious Disease Transmission, Vertical"[Mesh] OR "Hepatitis B Vaccines"[Mesh] OR "birth dose"[tiab] OR "mother-to-child"[tiab] OR diagnos*[tiab] OR treatment[tiab]) AND ("2020/01/01"[dp] : "2026/12/31"[dp]) AND English[lang]
Scopus	TITLE-ABS-KEY(("hepatitis B" OR "hepatitis C" OR HBV OR HCV) AND ("global burden of disease" OR "global burden" OR elimination OR "2030 target*") AND ("birth dose" OR "mother-to-child" OR vaccination OR diagnos* OR treatment)) AND PUBYEAR > 2019 AND PUBYEAR < 2027 AND LANGUAGE(english)
Web of Science Core Collection	TS=(("hepatitis B" OR "hepatitis C" OR HBV OR HCV) AND ("global burden of disease" OR "global burden" OR elimination OR "2030 target*") AND ("birth dose" OR "mother-to-child" OR vaccination OR diagnos* OR treatment)); timespan 2020-2026; LA=English
Cochrane Library (CENTRAL, CDSR)	#1 MeSH descriptor: [Hepatitis B] explode all trees; #2 MeSH descriptor: [Hepatitis C] explode all trees; #3 (hepatitis B OR hepatitis C OR HBV OR HCV): ti, ab,kw; #4 #1 OR #2 OR #3; #5 MeSH descriptor: [Disease Eradication] explode all trees; #6 (elimination OR "global burden" OR "2030 target*"): ti, ab,kw; #7 #5 OR #6; #8 #4 AND #7; limit 2020-2026

TABLE 1: Web queries executed and database search strings drafted solely for future replication (not executed).

Database strings were not executed; no database records are reported, and the strings are provided solely so that a future systematic review can replicate and extend this work.

MeSH: Medical Subject Headings; tiab: title/abstract; dp: date of publication; TS: topic; ti, ab, kw: title, abstract, keywords.

Eligibility criteria

Eligible records were peer-reviewed articles and WHO reports from 2020 to 2026, available in English as an abstract or full text, that offered quantitative or systematic evidence at a global, regional, or multinational scale on HBV or HCV burden, service coverage, elimination progress, or prevention. We included narrative overviews only if they provided quantitative service-coverage data or explicit guideline-gap data. We excluded editorials and commentaries, narrative overviews that did not meet this condition, book chapters, conference posters, earlier versions superseded by updates, single-country or local studies, and analyses that did not separate viral etiologies.

Selection and level of text access

The flow of records (Figure *1*) began with 39 identifications: 28 from web queries and 11 from author-supplied files. After 10 duplicates were removed, 29 records were screened by title and abstract, 14 reports were sought, 13 were assessed in full, and 11 studies were included. One reviewer screened and assessed records and extracted the design, data source, scope, key figures, and limitations. Text access varied by source and is stated for each study in Table *2*. Eight studies were evaluated from the full text. Three were assessed at abstract or summary level only: the Lancet Gastroenterology & Hepatology Commission update (abstract) [8], the 33-country hepatitis C elimination profiles (summary) [9], and the WHO 2025 report [1], which was available as a slide presentation. Findings and appraisal ratings for these sources are correspondingly less detailed and should be read with more caution. The included studies were ecological burden analyses, mathematical models, policy indices, and evidence syntheses.

Study	Design/data source	Population/scope	Key numerical findings (reference year)	Text access	Limitations
WHO 2025 [1]	Program and policy data, 2022-2023	194 member states	HBV 13% diagnosed, 3% treated; HCV 36% and 20% (of all with chronic infection; 2022); mortality 16.6/100,000	Summary level (slide presentation)	Incomplete country data; no UIs; presentation format
GBD 2019 HBV [2]	GBD 2019; DisMod-MR 2.1, CODEm	204 locations; 1990-2019	HBsAg 4.1% (316 million); 555,000 HBV-related deaths (2019); 68/194 met the 4 per 100,000 target	Full text	Sparse data in some regions; modeled estimates
Shen 2026 [3]	GBD 2021; Joinpoint; BAPC	Chronic HBV, 1990-2021, to 2030	283.64 million cases (2021); incidence AAPC −2.61%; deaths +20.04%; 2030 projected ASMR 4.58	Full text	Co-infection not isolated; trend extrapolation
Bai 2026 [4]	GBD 2021; Joinpoint; BAPC	Total HCV burden, 1990-2021, to 2030	Cases 9.41 to 11.64 million; liver cancer deaths 84,665 to 146,522	Full text	Underreporting; modeled data
Gamkrelidze 2021 [5]	Markov model; industry funded	45 high-income countries; published 2021, inputs to about 2019	Projected: 11 (24%) on track for 2030; 27 (60%) not before 2050	Full text	Constant-treatment assumption; excludes LMICs; projection, not current status
Wu 2026 [6]	GBD 2021; Joinpoint; APC; BAPC	Acute HBV, women 15-49 years (not restricted to pregnancy)	ASIR 1,282 to 856/100,000 (1990-2021); 2021 ASMR 0.524 (low SDI) vs. 0.006 (high SDI)	Full text	Text-table inconsistencies; ascertainment bias
Artenie 2025 [7]	Multi-stage modeling and meta-analysis	HCV in PWID; 260 incidence estimates	76.7% decline needed (95% UI: 71.8-81.3); 833,760 new infections/year incl. reinfections (627,620 primary only)	Full text	Incidence data absent in many countries
Cooke 2024 [8]	Commission update; policy index	20 highest-burden countries	Over 75% of DALYs; policy index gains in 14 of 20 after 2018	Abstract only	Policy index is not outcome-based
Hiebert-Suwondo 2025 [9]	Country elimination profiles	33 countries/territories (HCV)	12 (36%) restrict non-specialist prescribing; 10 (30%) met diagnosis, 5 (15%) treatment, and 7 (21%) syringe-exchange target.	Summary level	Limited to profiled countries
Jaquet 2021 [11]	Narrative review of research gaps	LMICs, sub-Saharan Africa	Birth dose below 10%; APRI missed over 50% of cirrhosis.	Full text	No systematic search; pre-2021 evidence
Solomon-Rakiep 2024 [12]	Qualitative systematic review	28 studies; 12 African states	Eight cross-cutting determinants of birth-dose performance	Full text	Evidence clustered in Nigeria and Senegal

TABLE 2: Summary of the 11 included studies.

AAPC: average annual percentage change; ASIR: age-standardized incidence rate; ASMR: age-standardized mortality rate; APC: annual percentage change; APRI: aspartate aminotransferase-to-platelet ratio index; BAPC: Bayesian age-period-cohort; CODEm: Cause of Death Ensemble model; DALYs: disability-adjusted life years; GBD: Global Burden of Disease; HBsAg: hepatitis B surface antigen; HBV: hepatitis B virus; HCV: hepatitis C virus; LMICs: low- and middle-income countries; PWID: people who inject drugs; SDI: socio-demographic index; 95% UI: 95% uncertainty interval.

Critical appraisal

Design-specific instruments for trials or cohort studies, such as Risk of Bias 2 (RoB 2) [13], Risk of Bias in Non-randomized Studies of Interventions (ROBINS-I) [14], or the Newcastle-Ottawa Scale [15], did not apply to these diverse designs, and no single validated instrument fits all of them. To make each source's strengths and weaknesses transparent, we applied an informal, domain-based appraisal adapted from elements of the Guidelines for Accurate and Transparent Health Estimates Reporting (GATHER) statement [16] for health

estimates, Consolidated Health Economic Evaluation Reporting Standards (CHEERS) 2022 [17] and International Society for Pharmacoeconomics and Outcomes Research-Society for Medical Decision Making (ISPOR-SMDM) good-practice guidance [18] for modeling studies, and the domain-based logic of ROBIS [19] and A Measurement Tool to Assess Systematic Reviews (AMSTAR 2) [20] for evidence syntheses. The framework is not validated, yields no numerical score, and relies on a single reviewer's judgment. Three distinct dimensions were assessed, and they are reported separately rather than combined: (1) Reporting completeness: Were data sources, methods, assumptions, uncertainty intervals, and limitations described sufficiently for a reader to understand and reproduce the estimates? This dimension concerns reporting transparency, not the likelihood of bias, and was rated as complete, partial, or limited. (2) Risk of bias: Were input-data selection and coverage, reliance on imputation or covariate-driven modeling, trend-extrapolation assumptions, and the testing of alternative scenarios likely to distort the main conclusions? This dimension was rated as low, moderate, high, or unclear. (3) Funding and conflict-of-interest (COI) declarations: What funding sources and COI were declared? This dimension is documented descriptively (declared non-commercial source, declared commercial source, or unclear). We classified declarations that were not checked as unclear. Commercial funding was recorded as context for the reader and did not automatically raise the risk-of-bias rating, and an academic affiliation was not taken as evidence that no conflict existed.

Each rating carries a one-sentence justification (Table *3*). Ratings were assigned from full text where it was accessible and from abstracts or summaries otherwise, and the level of access is shown in Table *3*. No rule-based algorithm was used to derive an overall judgment; the final column of Table *3* records the reviewer's overall level of concern for interpretation, informed by all three dimensions. Appraisal ratings were not used to exclude studies. As we synthesized the evidence narratively without pooling, we used the ratings to weight the interpretation of findings and flag conclusions that rest on higher-risk sources. Four Global Burden of Disease (GBD) analyses [2-4,6] use a shared modeling framework [21] and were not regarded as independent replications. Excluded editorials and reports are cited for context only. Where available in the accessed text, 95% uncertainty intervals (UIs) are reported alongside principal estimates; where none is shown, none was reported in or extracted from the accessible text.

Study (text access)	Reporting completeness	Risk of bias	Funding/COI declarations	Overall concern
WHO 2025 [1] (summary level)	Limited. Headline figures appear as point estimates in a slide format with no uncertainty intervals; methods are deferred to a separate annex.	Moderate. Country-reported and validated data cover 194 member states, but submissions are incomplete and partly supplemented by partner models.	Unclear. Declarations were not checked; the source is an intergovernmental public-health agency.	Moderate
GBD 2019 HBV [2] (full text)	Complete. 95% uncertainty intervals are propagated, and counterfactual vaccination scenarios are reported.	Moderate. Systematic data identification across 204 locations, but estimates rely on covariate-based modeling where primary data are sparse.	Declared, non-commercial. Philanthropic funder with standard author declarations.	Low
Shen 2026 [3] (full text)	Partial. Joinpoint estimates and GBD intervals are reported, but co-infection is not isolated, and no intervention scenarios are given.	Moderate. A secondary analysis of GBD 2021 inherits its modeled inputs; BAPC projections extrapolate existing trends.	Unclear. Declarations not verified.	Moderate
Bai 2026 [4] (full text)	Partial. Intervals and Joinpoint results are reported, but the 2030 projection is not stress-tested.	Moderate. HCV estimates depend on modeled data and likely underreport in low-surveillance settings.	Unclear. Declarations not verified.	Moderate
Gamkrelidze 2021 [5] (full text)	Partial. Country inputs are drawn from published and expert-derived sources, and the constant-treatment-volume assumption is stated.	Moderate. Restricted to 45 high-income countries and dependent on constant treatment volumes, which limits generalizability and scenario robustness.	Declared, commercial source. Funded by a pharmaceutical manufacturer; recorded as context for interpretation and not as an automatic bias rating.	Moderate
Wu 2026 [6] (full text)	Partial. Intervals, Joinpoint, and BAPC outputs are reported, but text-table inconsistencies were found.	Moderate. The incidence peak partly reflects antenatal-testing ascertainment, and projections are not scenario-tested.	Unclear. Declarations not verified.	Moderate
Artenie 2025 [7] (full	Complete. 95% uncertainty intervals are reported for pooled,	Moderate. Built on 260 incidence estimates, but data are absent in	Unclear. Declarations not verified.	Low

text)	country, and attributable-infection estimates.	many countries and require model-based imputation.		
Cooke 2024 [8] (abstract only)	Limited. A composite policy index is reported without quantified uncertainty in the accessible text.	Moderate. The index is not outcome-based and compiles published and country-level sources; detail was limited by abstract-level access.	Unclear. Not assessable from the abstract.	Moderate
Hiebert-Suwondo 2025 [9] (summary level)	Limited. Descriptive proportions of countries meeting targets are given without uncertainty or sensitivity analysis in the accessible summary.	Moderate. Profiles compiled from program and partner information cover only the 33 profiled countries and territories.	Unclear. Not assessable from the summary.	Moderate
Jaquet 2021 [11] (full text)	Limited. A narrative review without systematic search, quality appraisal of sources, or quantitative uncertainty.	High. No defined selection process, so the evidence base is potentially selective, and it predates 2021.	Unclear. Declarations not verified.	High
Solomon-Rakiep 2024 [12] (full text)	Complete. A systematic search and quality appraisal of 28 studies are reported.	Moderate. Evidence is concentrated in Nigeria and Senegal (17 of 28), and three studies were of lower quality.	Unclear. Declarations not verified.	Moderate

TABLE 3: Critical appraisal of the 11 included studies by separate dimensions (reporting completeness, risk of bias, and funding/COI declarations).

Notes: Reporting completeness is rated complete, partial, or limited. Risk of bias is rated low, moderate, high, or unclear and refers to the likelihood that methods or data distort conclusions, not to study importance. Funding/COI is documented descriptively; declarations not checked are unclear. Overall concern is the reviewer's informal judgement and is not derived by an algorithm. Text access is given in parentheses beside each study.

BAPC: Bayesian age-period-cohort; COI: conflict of interest; GBD: Global Burden of Disease; HBV: hepatitis B virus; HCV: hepatitis C virus.

Study selection and characteristics

The three web queries yielded 28 records, and the authors' own files added 11, for a total of 39 identifications (Figure *1*). After removing 10 duplicates (nine mirrored copies of the same articles in the web results and one repeated file), 29 records remained for screening. Fifteen of these were excluded at title and abstract level: five editorials or commentaries, two narrative overviews, one book chapter, one superseded conference poster, one non-peer-reviewed institutional web page, one trial protocol, one modeling study published before 2020, and three single-country or regional analyses of people who inject drugs. Fourteen reports were then sought. One, a 2025 national HBV policy report, could not be assessed because only its listing was accessible. Of the 13 reports assessed in full, two were excluded: a GBD 2021 liver cancer analysis that did not distinguish etiology [22] and a WHO methods annex with no outcome data [23]. The 11 remaining studies (Table *2*) comprised four GBD analyses, one HCV elimination model, one global incidence analysis in people who inject drugs, one policy-index commission update, one report based on country profiles, one narrative review of research gaps, one qualitative systematic review, and one WHO program dataset.

Reading the estimates: Sources, definitions, and reference years

Estimates in the included studies differ in source, case definition, and reference year, and they are therefore not interchangeable. The reference year or period is stated for each principal statistic below. The four GBD analyses [2-4,6] share a common modeling infrastructure [21]; their consistent findings therefore constitute one body of evidence, not independent replications. GBD and WHO figures should not be compared directly. The GBD 2019 estimate of 555,000 deaths in 2019 refers to HBV-related disease, which includes deaths from cirrhosis and liver cancer attributed to HBV [2]. The WHO figure of 1.3 million deaths in 2022 combines HBV and HCV, includes cirrhosis and HCC, and derives from country-validated data supplemented by partner models [1,23]. The scope of the death counts in the GBD 2021 chronic HBV analysis [3] was not detailed in the accessible text, so those counts are not compared with the 2019 or WHO figures. For HCV, the incident cases reported by GBD 2021 [4] and the new infections attributed to injecting drug use [7] use different case definitions: the latter distinguishes all new infections, including re-infections, from primary infections only, whereas the accessible text of the GBD analysis did not state whether re-infections are counted. These series should therefore not be reconciled arithmetically.

Hepatitis B Burden and Trends

The GBD analyses consistently suggest that individual risk of HBV has fallen. From 1990 to 2021, age-standardized incidence of chronic HBV dropped from 134.58 to 61.51 per 100,000 (average annual percentage change (AAPC) = −2.61%), and prevalence (−1.59%), mortality (−1.83%), and DALYs (−1.86%) declined in parallel (GBD 2021) [3]. For 1990-2019, GBD 2019 reported a 31.3% reduction in all-age hepatitis B surface antigen (HBsAg) prevalence and a 76.8% reduction in children younger than five years, and its counterfactual modeling estimated that three-dose vaccination alone prevented 85 million infections (95% UI: 51-118 million) [2]. These are modeled estimates, and they are consistent with, but do not by themselves prove, a causal effect of vaccination.

Absolute numbers tell a less favorable story. In 2021 there were 283.64 million people with chronic HBV, only 8.32% fewer than in 1990, while annual deaths rose from 359.85 to 431.96 thousand (+20.04%) and DALYs from 12.47 to 13.88 million (+11.3%) [3]. GBD 2019 identified the same divergence and attributed it, in the authors' interpretation, to population growth, aging, and cohort effects [2]. Case numbers grew in people aged 30 years or older and deaths in those aged 45 years or older, which is compatible with infections acquired before vaccination. In contrast, the steepest fall in incidence was seen in children younger than five [3]. Acute HBV in women of childbearing age (15-49 years, irrespective of pregnancy status) follows the same course. Incident cases hardly changed (17.34 million in 1990 and 16.79 million in 2021), even though the age-standardized incidence rate fell from 1,282.146 to 855.774 per 100,000; Joinpoint regression showed the decline accelerating to −2.916% a year over 2019-2021, yet age-standardized mortality rose over the same interval [6]. Bayesian age-period-cohort (BAPC) projections place chronic HBV incidence at 57.24 per 100,000 in 2030 [3], although these models extrapolate existing trends and do not account for intervention scale-up.

Hepatitis C Burden and Trends

According to GBD 2021, HCV-related incident cases rose from 9.41 million in 1990 to 11.64 million in 2021, although the age-standardized incidence rate declined from 173.93 to 153.82 per 100,000 [4]. Deaths from HCV-related liver cancer almost doubled (84,665 to 146,522 over 1990-2021), and the incidence rate is projected to reach 156.55 per 100,000 by 2030, a trajectory that would be inconsistent with a 90% reduction [4]. Injecting drug use lies at the heart of this problem. A multi-stage analysis built on 260 incidence estimates (pooled global incidence of 13.9 per 100 person-years before 2015 and 8.6 per 100 person-years in 2015-2021) concluded that HCV incidence among people who inject drugs would need to fall by 76.7% (95% UI: 71.8-81.3) worldwide to meet the 2030 target, with required reductions ranging from 0% in Georgia, Madagascar, and Nigeria to 95.1% in Libya; an estimated 833,760 new infections a year (including re-infections) (95% UI: 493,716-1,544,395) were attributed to injecting drug use, or 627,620 when only primary infections were counted [7]. The year of estimation is that specified in the source analysis [7].

Inequities by Socio-Demographic Index and Geography

The gradient across socio-demographic index (SDI) strata is steep. In 2021, prevalence of acute HBV in women of childbearing age was 170.17 per 100,000 in low-SDI settings against 33.334 in high-SDI settings, and incidence was 1,474.808 against 288.896, a roughly five-fold gap in each case; mortality differed far more, at 0.524 versus 0.006 per 100,000 [6]. Improvement was also slowest in low-SDI settings, where the prevalence estimated annual percentage change (EAPC) was −0.52%, compared with −2.14% in high-middle-SDI settings [6]. The relatively high incidence in some higher SDI regions was attributed by the authors partly to more intensive screening [3,6]. At country level, Zimbabwe recorded the highest acute incidence (3,734.095 per 100,000), and Pakistan ranked third worldwide for both mortality and DALYs in these women (2021) [6]. For HBV-related disease as a whole in 2019, Pakistan had 16,200 deaths (7.2 per 100,000), above the interim target of four per 100,000 [2]. The WHO lists 96 countries with HBV prevalence above 2%, together home to about 65% of the world's population (2022 data) [1], and the burden is concentrated, since the 20 highest-burden countries carry more than 75% of global DALYs from viral hepatitis [8].

Sex and maternal health add further layers, and the populations involved need to be kept distinct. In 2021, men accounted for 60.38% of incident chronic HBV and for 304.20 of the 431.96 thousand deaths [3]. The acute HBV analysis [6] covers all women aged 15-49 years, not specifically pregnant women, and its figures should not be read as estimates for pregnancy; the incidence peak at ages 25-29 years may partly reflect antenatal testing in that group [6]. Statements about pregnant women, such as those on perinatal transmission, come from other sources: when infection occurs perinatally, 80-90% of cases become chronic [2,3]. A survey in Senegal cited in the acute HBV analysis found that only 1.6% of the women surveyed had ever been tested, although 9.2% were infected [6]; the source does not specify whether the sample was restricted to pregnant women. Identifying HBV infection in women of childbearing age, ideally before or early in pregnancy, offers a chance to interrupt vertical transmission. Still, this inference rests on the natural history above and not on the childbearing-age data themselves.

Service Delivery and Care Cascade Gaps

For HBV, the care cascade is the main obstacle. In WHO's 2022 data, only 13% of people with chronic HBV (34 million) knew their status and 3% (7 million) had received treatment, and just eight of 194 countries

were on track for 60% diagnosis coverage and four for 50% treatment coverage; for HCV, 36% had been diagnosed and 20% treated [1]. The denominator for these coverage figures is all people living with chronic infection (254 million for HBV and 50 million for HCV) [1]. It is not the same as the denominator of the 2030 treatment target, which is people eligible for treatment, or of the 90% diagnosis target, which is all infected people; the cascade percentages therefore cannot be compared directly with eligibility-based treatment coverage, and for HBV, where only a subset of infected people meets treatment criteria, the figures understate coverage among those eligible. The 60% diagnosis and 50% treatment thresholds cited above are interim targets, not the 2030 targets.

Birth-dose vaccination shows how far practice lags behind policy. The WHO recorded 147 countries with a birth-dose policy and 129 with antenatal HBV screening, but global birth-dose coverage among newborns was 43%, and only just over half of countries had reached 90% three-dose coverage [1]. Antenatal screening applies to pregnant women, whereas the GBD analysis of women of childbearing age [6] does not distinguish pregnancy. In sub-Saharan Africa, coverage was previously estimated at below 10% [11]. A qualitative systematic review of 28 studies from 12 WHO African Region states (12 from Nigeria and five from Senegal) distilled eight determinants: interpretation of policy, vaccine supply and cold chain, financing, health-worker capacity, immunization monitoring, context-dependent timeliness, maternal knowledge and socio-economic circumstances, and wider contextual influences [12]. Three studies were of lower quality, and the evidence was concentrated in two countries [12]. Policy action was associated with improvement in some settings: of the 20 highest-burden countries, 14 improved their elimination policy index after 2018, chiefly through national action plans, publicly funded screening, and subsidized antivirals [8], although a policy index is not an outcome measure and the association is not shown to be causal. However, Diagnostic limitations persist. The aspartate aminotransferase-to-platelet ratio index (APRI) score missed more than half of cirrhosis cases in cohorts from high-income countries and Ethiopia, and the evidence for tenofovir prophylaxis comes mainly from Asia [11].

Elimination Projections

Projections in this section are model-based scenarios built on specific baseline data. They describe what the models imply if their assumptions hold, not current assessments of country status. Projections from GBD 2021 indicate that no region will achieve a 95% reduction in new chronic HBV infections between 2015 and 2030, that only four will achieve a 65% reduction in deaths, and that global mortality in 2030 (4.58 per 100,000) will exceed the target of four per 100,000 [3]. GBD 2019 likewise found that, in 2019, no country had met the 65% mortality or 95% incidence targets. However, 68 of 194 had already reached the target mortality rate [2], and an editorial reported that no country was on track to eliminate HBV by 2030 [24]. The WHO's 2022 data show combined hepatitis mortality of 16.6 per 100,000, compared with a 2025 target of 10 [1].

A model published in 2021 projected HCV elimination timelines for 45 high-income countries using baseline data available through about 2019 [5]. These are model-based projections from 2021 baseline data, not an assessment of the countries' current position. In that model, only 11 countries (24%) were on course for 2030, five (11%) for 2040, and two (4%) for 2050, whereas 27 (60%) would not eliminate HCV before 2050. The incidence target was the one most often missed (33 countries), followed by mortality (29), treatment (24), and diagnosis (20) [5]. By 2019, 30 countries (67%) had lifted fibrosis-stage restrictions on treatment, and none that retained them was projected to reach elimination before 2050. However, the model assumed constant treatment volumes and was funded by a pharmaceutical manufacturer [5]. The authors interpreted these results as indicating that treatment capacity was not the limiting factor, an inference that depends on the model's assumptions. Profiles of 33 countries and territories published in 2025 (2024 report year) gave a comparable picture, in that 12 (36%) still had partial or full restrictions on prescribing by non-specialists, 10 (30%) had met the 60% diagnosis target, five (15%) the 50% treatment target, and seven (21%) the target for needle and syringe exchange [9]. National programs can nonetheless succeed at scale. Egypt, a lower-middle-income country, diagnosed and treated more patients in 2018-2019 than all high-income countries combined [5], and it subsequently became the only country validated at the gold tier for HCV elimination [24].

Critical appraisal of included studies

Table *3* presents the appraisal separately for reporting completeness, risk of bias, and funding and conflict-of-interest declarations. Reporting was complete for three studies (GBD 2019 HBV, the multi-stage analysis of HCV in people who inject drugs, and the qualitative systematic review of birth-dose vaccination), partial for four, and limited for four; the last group being the policy-index, program-report, and narrative evidence that gave point estimates or descriptive proportions without uncertainty quantification, three of which were assessed only at abstract or summary level. For risk of bias, none of the 11 studies was rated low: 10 were rated moderate, reflecting dependence of most estimates on covariate-based modeling, imputation, trend extrapolation, or self-reported program data where primary surveillance is sparse, and one was rated high (a narrative review without a systematic search). For funding and conflicts of interest, declarations were documented for two studies (one non-commercial philanthropic funder and one pharmaceutical manufacturer, the latter being the elimination model of high-income countries [5]) and were unclear for the remaining nine. Commercial funding was recorded as context and did not by itself determine any rating.

Overall concern was low for two studies, moderate for eight, and high for one. The four GBD analyses [2-4,6] share a modeling infrastructure, so their consistent findings should be read as a single body of evidence rather than independent replication. The principal observations of this review (falling age-standardized rates alongside rising absolute burden, steep inequities by development level, and large gaps in the diagnosis-to-treatment cascade) are supported by several studies with moderate or low overall concern. Quantitative elimination-timeline findings from [5] and care-cascade policy findings from [8,9] should be interpreted with greater caution because of the funding context, limited uncertainty reporting, and abstract- or summary-level access. Because the appraisal framework is adapted rather than validated, rests on a single reviewer, and some ratings relied on abstracts or summaries, these judgements indicate relative confidence. They should not be read as precise quantifications of bias.

Clinical and policy implications

The following implications are drawn from the sources reviewed and the limited evidence they contain; they are suggestions for consideration, not guideline recommendations. For pregnant women, antenatal HBsAg testing, viral-load or hepatitis B e antigen (HBeAg) risk stratification, tenofovir prophylaxis for eligible women, and a birth dose to the infant within 24 hours of delivery appear to work best when delivered as a single package [11,12]. For women of childbearing age more generally, who are a broader group than pregnant women, testing and vaccination before or early in pregnancy would extend the opportunity for perinatal prevention, and detection of acute HBV in this group should prompt follow-up and prevention planning [6]. In settings where HBsAg prevalence is 2% or higher, WHO guidance as summarized in the sources recommends population-wide testing, as targeted testing alone misses most infections [1,11]. For HCV, antibody-positive results ought to be confirmed by nucleic acid or core antigen testing, treatment should not depend on fibrosis stage or prescriber specialty, and treatment should be offered alongside harm-reduction services [5,9,11]. At the policy level, national action plans, funded screening, and subsidized antivirals are the measures associated with progress in the policy index [8], and targets for people who inject drugs need country-specific trajectories given the wide range of reductions required [7]. Individual patient management should follow local guidelines.

Limitations and strengths

The limitations of this review are central to its interpretation. First, the search was limited to three general web queries and files already held by the author; the bibliographic database strings in Table *1* were drafted but not executed, so completeness cannot be claimed, selection bias toward prominent and open-access sources is likely, and relevant evidence may have been missed. Second, this was a single-reviewer workflow: one reviewer performed screening, extraction, and appraisal without independent verification, creating a risk of missed or misclassified evidence and of extraction error. Third, access to some sources was limited to abstracts or summaries (Table *2*), which may have led to misclassification, particularly in the appraisal of policy and program reports. Fourth, the appraisal framework was adapted from existing guidance, is not validated, rests on subjective judgment, and no study was excluded based on its rating.

Four of the 11 studies are GBD analyses with a common modeling infrastructure, and GBD estimates depend on modeling where primary data are sparse, so under-diagnosis in LMICs may lower apparent incidence. At the same time, intensive screening elsewhere may raise it [3,6]. Projections assume that trends continue and cannot account for birth-dose scale-up or COVID-19 disruption [3]. Acute and chronic HBV are modeled separately, and co-infection with HIV or HCV cannot be isolated [3]. Definitions and reference years differ between GBD, WHO, and model-based sources, so figures are not directly comparable, and 95% uncertainty intervals were not available for every estimate. Several source papers contain discrepancies between text and tables, in which case table values were used. Because most sources are modeled or ecological, associations such as those between falling age-standardized rates and vaccination or policy action should not be read as causal. A prospectively registered systematic review applying the Table *1* strings would address most of these concerns. This review's strengths are limited to the joint consideration of burden, inequity, elimination trajectory, and service delivery evidence for both viruses, cross-checking extracted figures against the primary texts where accessible, and explicitly disclosing how records were found.

Conclusions

In this selectively sourced, single-reviewer narrative review, age-standardized HBV and HCV rates appeared to have declined. At the same time, absolute burden remained high, and the model-based projections and program data examined suggest that most countries are not on course for the 2030 targets. The apparent shortfall lies more in service delivery than in biomedical tools, although the non-exhaustive search limits how firmly this can be stated. Priorities for further work include serosurveys of HBsAg in children and pregnant women in high-burden settings to replace modeled estimates, implementation trials of integrated antenatal HIV, syphilis, and HBV testing with birth-dose delivery, validation of point-of-care viral-load and fibrosis assessment, scenario-based projections that model intervention scale-up, and a registered, database-complete systematic review.

Additional Information

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All authors have reviewed the final version to be published and agreed to be accountable for all aspects of the work.

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