Research letter

Gastroenterology

The global, regional and national burden and its trends of chronic hepatitis B and C including cirrhosis among women of childbearing age: a systematic analysis for the Global Burden of Disease Study 2021

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Chronic hepatitis B virus (HBV) and hepatitis C virus (HCV) infections remain major global health challenges and are leading causes of cirrhosis, hepatocellular carcinoma, liver transplantation, and liver-related mortality worldwide [1]. Despite substantial progress in hepatitis prevention and treatment, HBV and HCV continue to contribute significantly to global morbidity and mortality, particularly in low- and middle-income countries [2]. Women of childbearing age (15–49 years) represent a critical population because maternal infection affects both women's health and the risk of vertical transmission to newborns. Approximately 4–5 million children acquire chronic HBV infection from their mothers annually, while perinatal transmission remains an important route for HCV infection [3, 4]. Importantly, HBV infection acquired during the perinatal or early-childhood period has a substantially greater likelihood of becoming chronic, potentially leading to cirrhosis, hepatocellular carcinoma, and liver-related mortality later in life. Thus, reducing HBV and HCV infections among women of reproductive age may provide benefits extending beyond maternal health by reducing vertical transmission and the subsequent disease burden in future generations. However, comprehensive evaluations of the global burden and future trends of chronic hepatitis B (CHB) and chronic hepatitis C (CHC) among women of reproductive age remain limited.

Using data from the Global Burden of Disease (GBD) 2021 study, we assessed the global, regional, and national burden of CHB and CHC including cirrhosis among women aged 15–49 years from 1990 to 2021. The GBD study provides standardized estimates of disease burden across 204 countries and territories and enables comparative evaluation of temporal trends and socioeconomic inequalities [2]. GBD-based analyses have also been increasingly applied to characterize disease burden and geographical disparities specifically among women of childbearing age [5]. We extracted prevalence, incidence, mortality, and disability-adjusted life years (DALYs). All prevalence, incidence, mortality, and DALY estimates included in the present analysis were restricted to females aged 15–49 years. Accordingly, the DALYs reported in this study represent disease burden among women of childbearing age and do not include

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health loss occurring among neonates or children attributable to maternal HBV or HCV infection. Age-standardized prevalence rates (ASPR), incidence rates (ASIR), mortality rates (ASMR), and DALY rates (ASDR) were calculated. Joinpoint regression was applied to estimate temporal trends [6], while Bayesian age-period-cohort (BAPC) models were used to predict disease burden through 2050. Health inequalities were evaluated using the slope index of inequality (SII) and concentration index (CI). Similar GBD-based approaches have been used to characterize cross-country inequalities in disease burden and their temporal evolution [7].

In 2021, the global burden of CHB and CHC showed distinct patterns among women of childbearing age. The global age-standardized prevalence, incidence, mortality, and DALY rates of CHB were 3636.02, 52.26, 1.22, and 63.46 per 100,000 population, respectively. Corresponding rates for CHC were 1735.27, 29.92, 1.42, and 74.07 per 100,000 population. Although CHB demonstrated a higher prevalence and incidence burden, CHC produced greater mortality and DALY rates, indicating a substantial unresolved impact of HCV-related disease.

Global temporal analysis revealed divergent trends between CHB and CHC. CHB-related DALYs declined continuously from 1990 to 2021, with an average annual percentage change (AAPC) of approximately –1.87%. This decline is consistent with the widespread implementation of infant HBV vaccination and interventions preventing mother-to-child transmission [8, 9]. In contrast, CHC burden decreased more slowly, reflecting persistent challenges caused by the absence of an effective vaccine and unequal access to direct-acting antiviral (DAA) therapy [10].

The integrated findings are summarized in Figure 1. Joinpoint analysis demonstrated a sustained reduction in global CHB burden and a slower decline in CHC burden (Figure 1 A). Geographic analysis showed considerable international variation. Central Sub-Saharan Africa exhibited the highest CHB burden, while Central Asia and several countries in Eastern Europe showed substantial CHC burden. Country-level analyses identified Zimbabwe as having one of the highest CHB incidence rates, whereas Egypt and Pakistan demonstrated particularly high CHC-related burden (Figures 1 B, C). These regional differences reflect variations in healthcare infrastructure, vaccination coverage, diagnostic capacity, and antiviral treatment accessibility.

Age-specific analysis showed that women aged 30–34 years experienced the highest prevalence

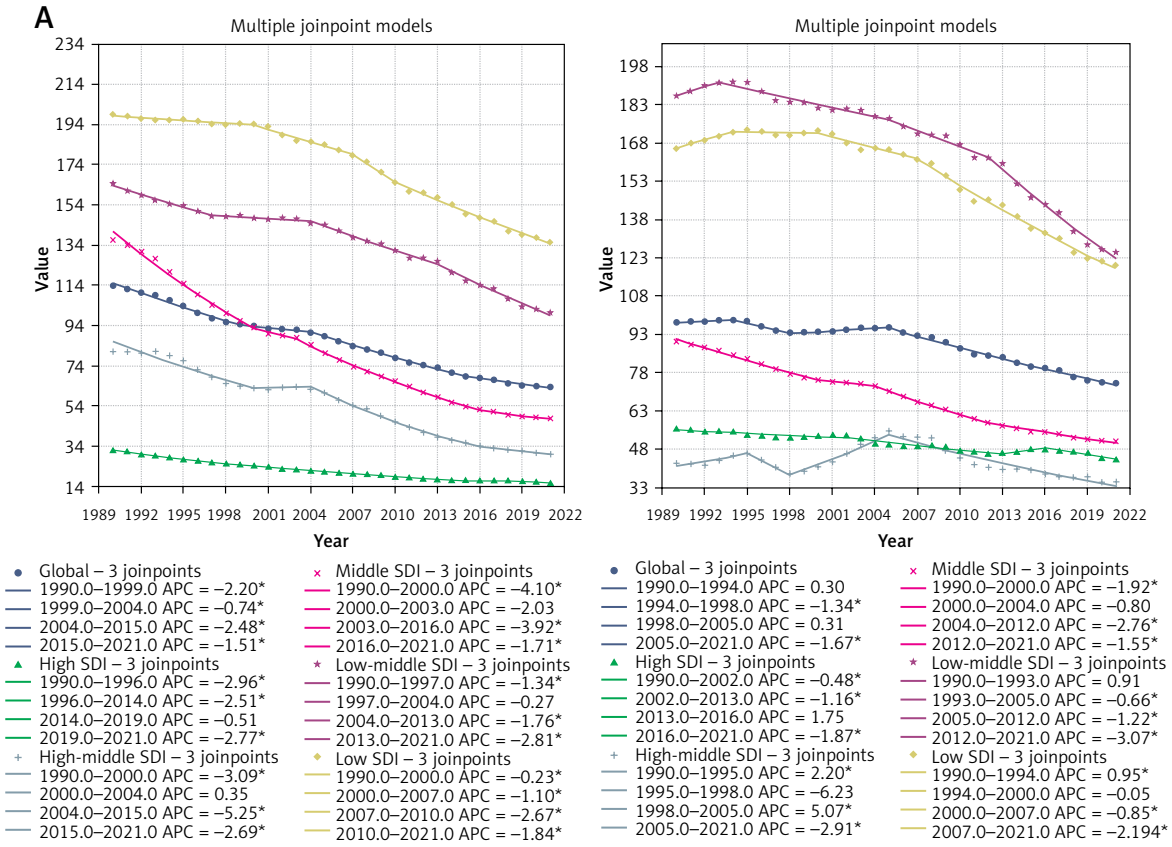

Figure 1. A – Chronic hepatitis B including cirrhosis (left) Chronic hepatitis C (right) including cirrhosis (per 100,000 populations)

B

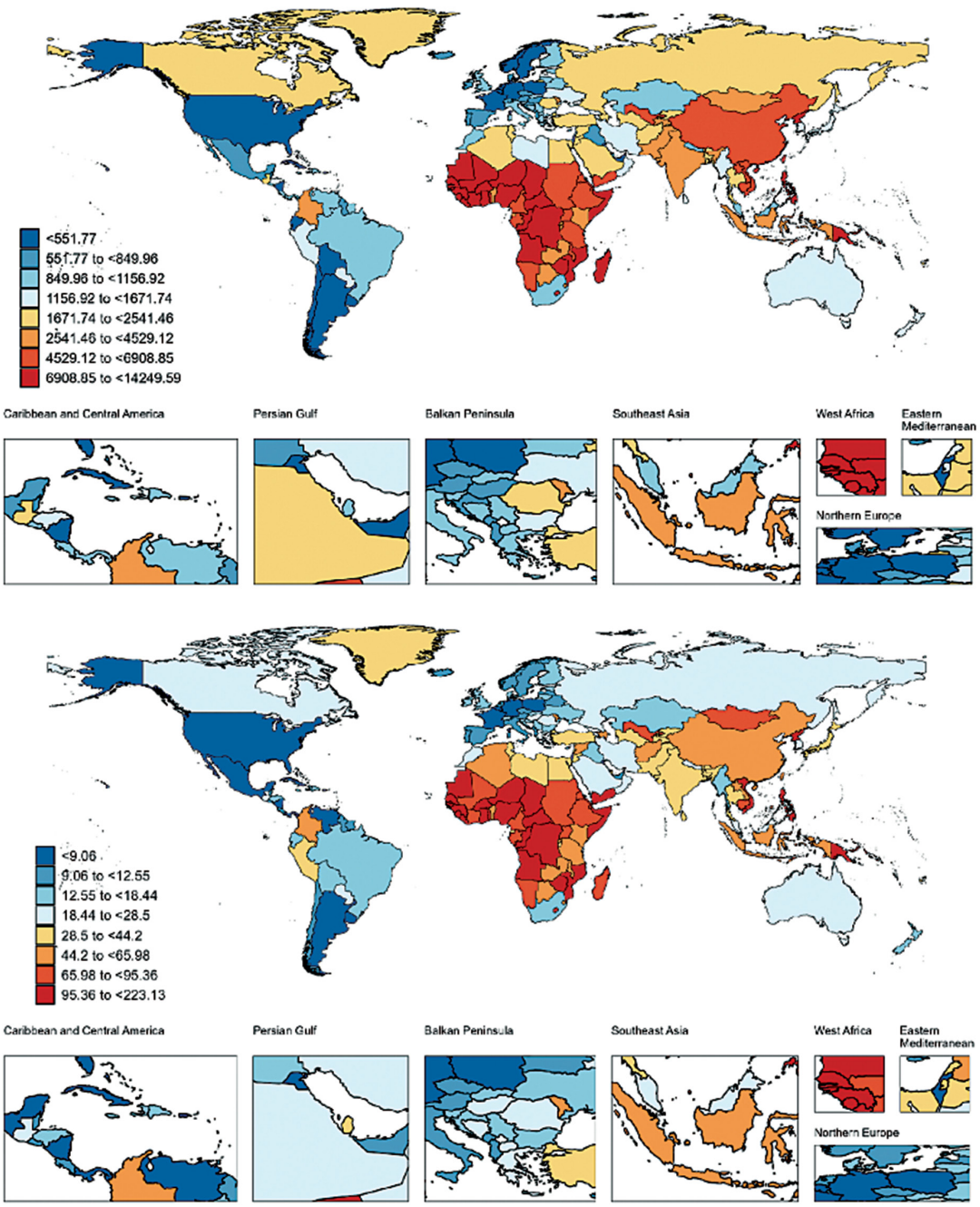

Figure 1. Cont. **B** – Chronic hepatitis B including cirrhosis burden rate in 204 countries and territories

B

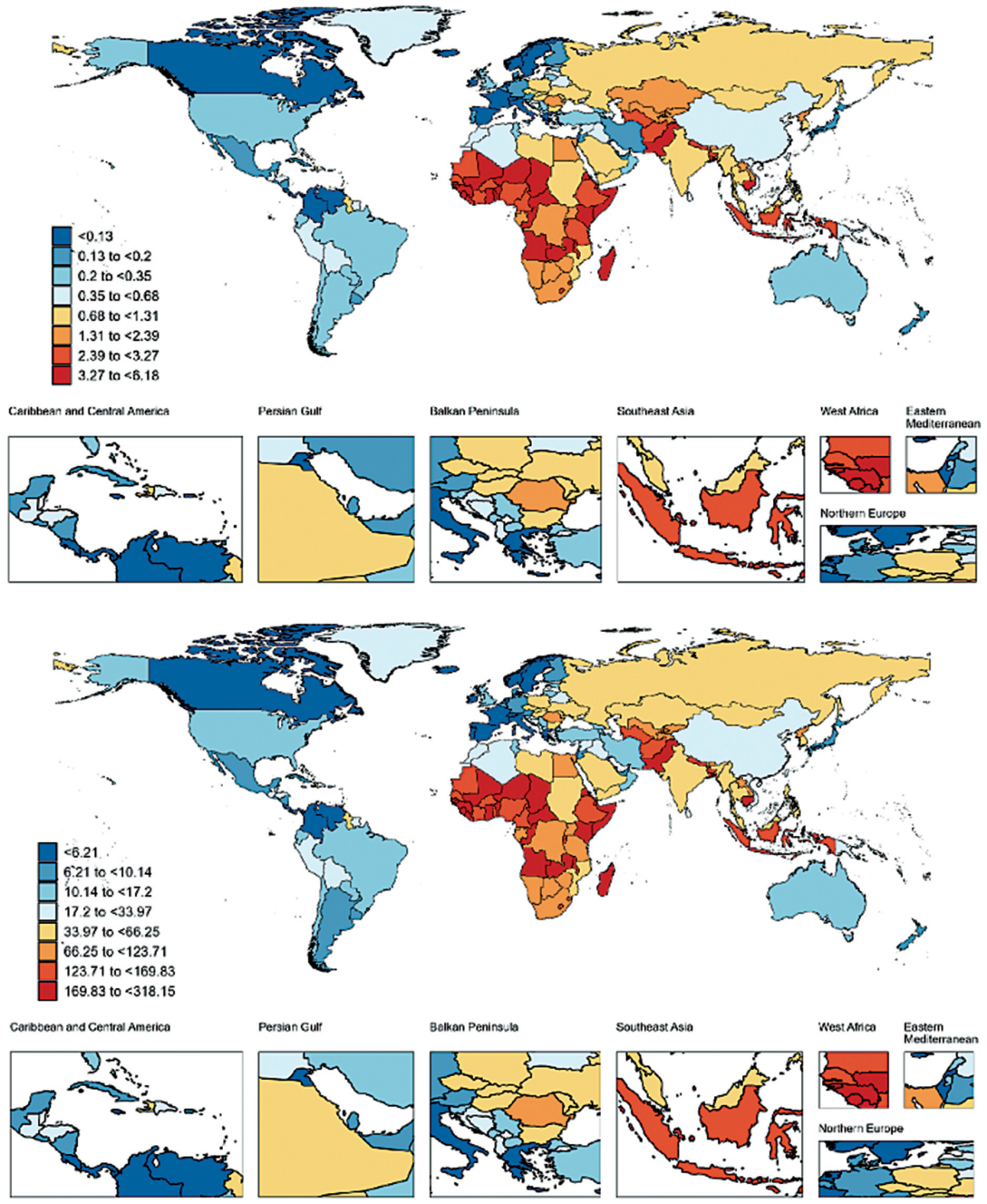

Figure 1. Cont. **B** – Chronic hepatitis B including cirrhosis burden rate in 204 countries and territories

C

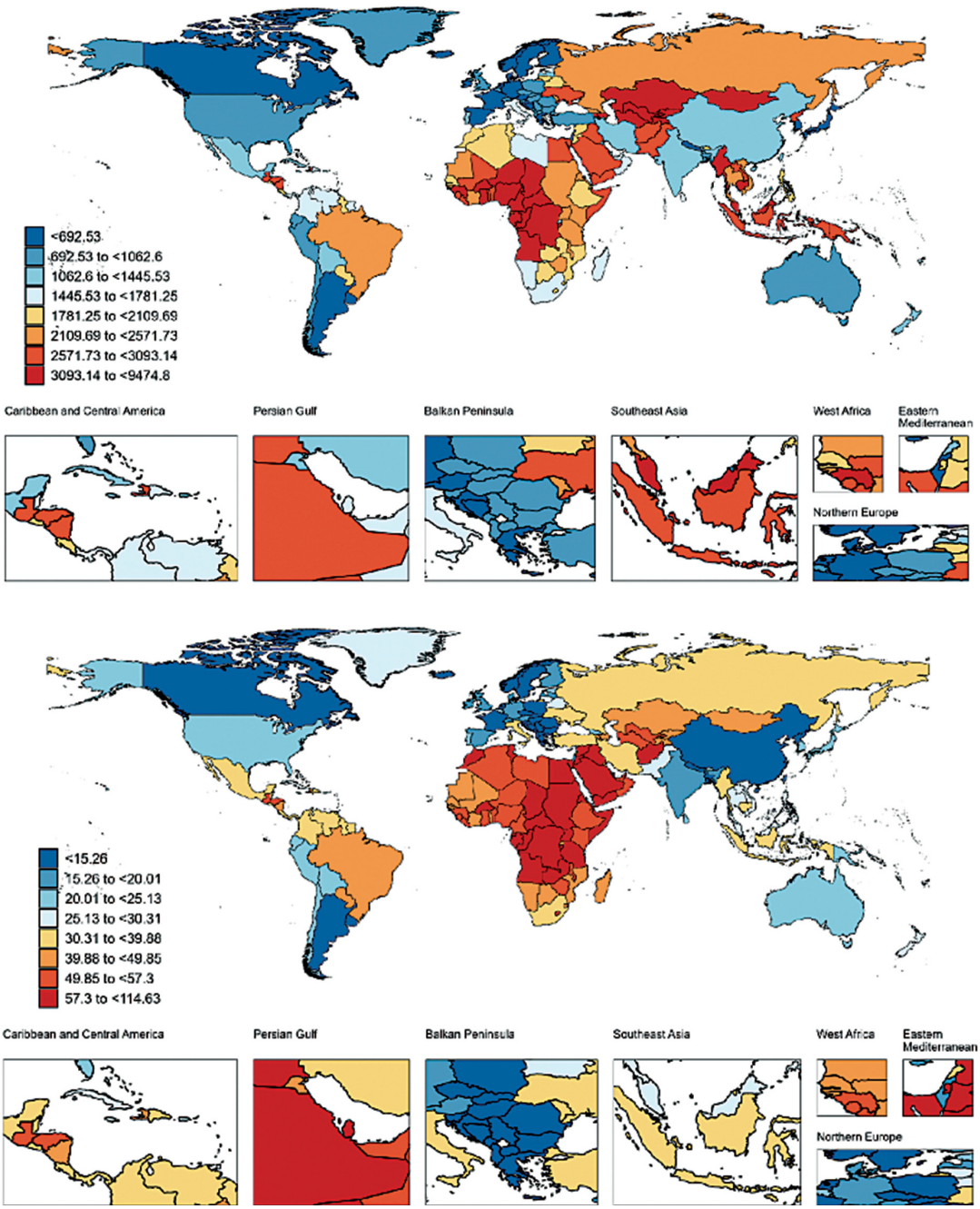

Figure 1. Cont. **C** – Chronic hepatitis C including cirrhosis burden rate in 204 countries and territories

C

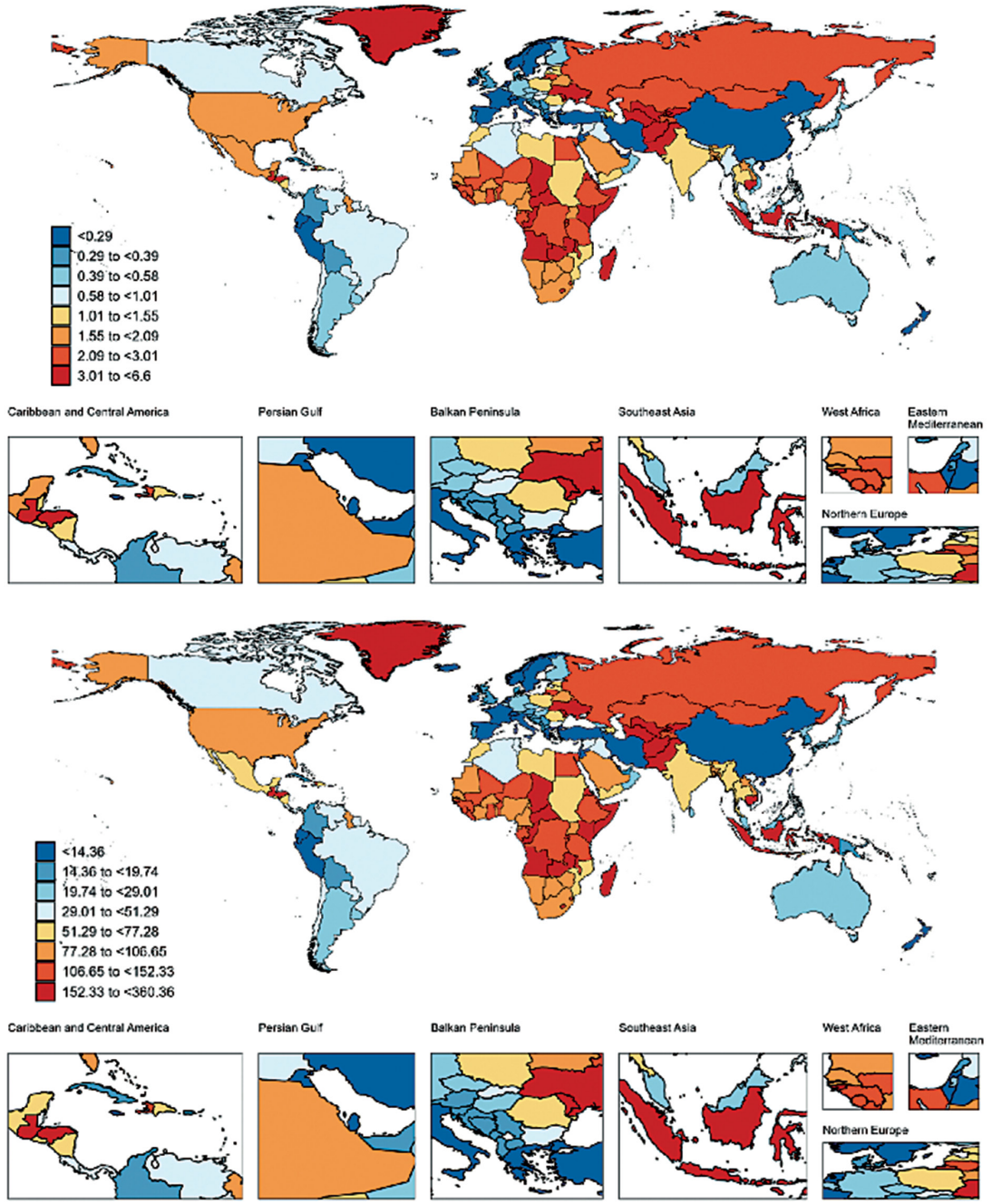

Figure 1. Cont. **C** – Chronic hepatitis C including cirrhosis burden rate in 204 countries and territories

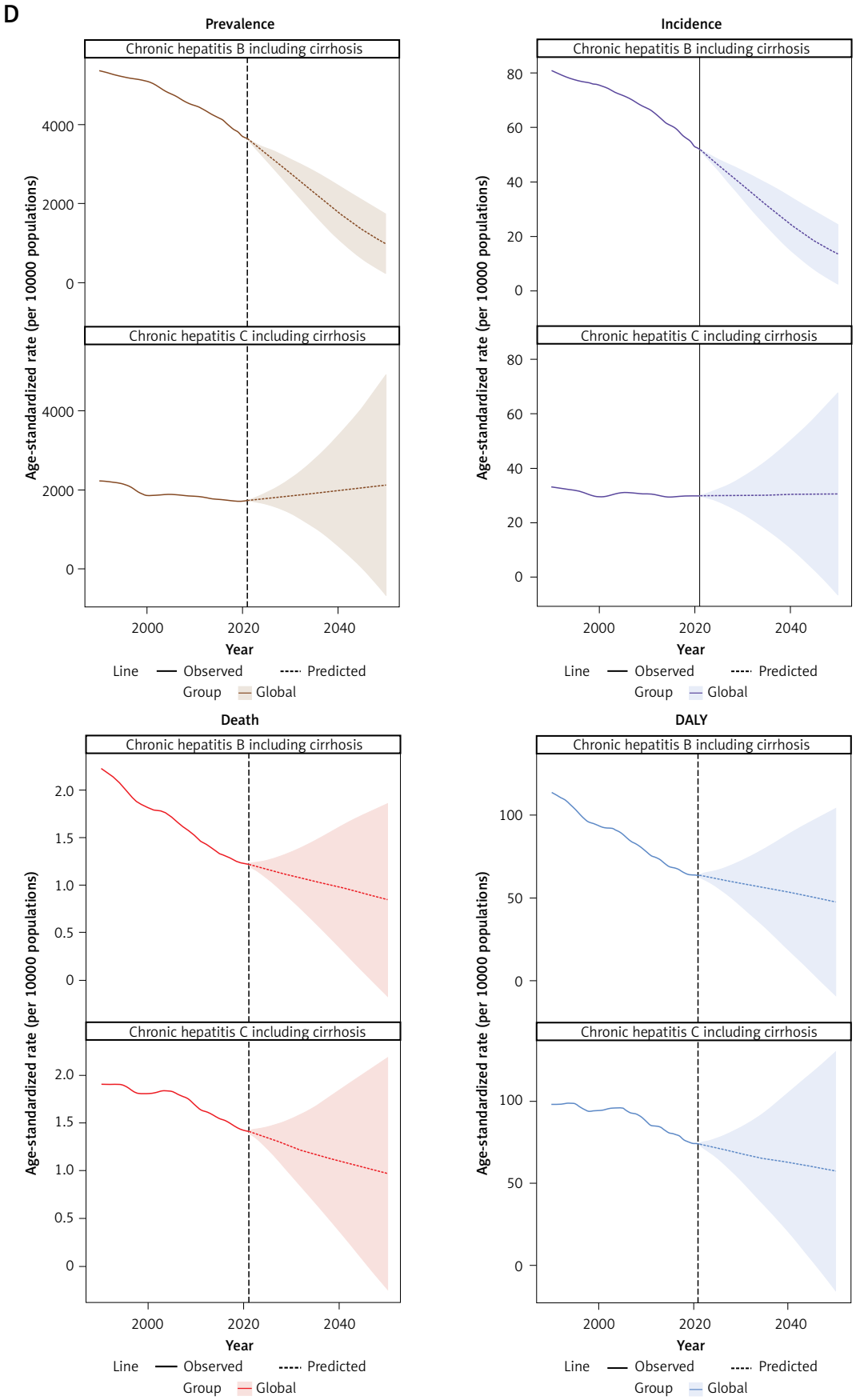

Figure 1. Cont. **D** – Predictive analysis of the disease burden of chronic Hepatitis B and C including cirrhosis among women of childbearing age until 2050

burden for both CHB and CHC. Mortality and DALY rates increased with increasing age, suggesting that women infected during earlier reproductive years may accumulate long-term liver-related complications. Previous studies have emphasized the importance of hepatitis screening among women of childbearing age because maternal infection represents an important pathway for transmission and adverse pregnancy outcomes [3, 11]. The implications of this burden extend to offspring: maternal HBV screening, antiviral prophylaxis when indicated, and timely neonatal immunoprophylaxis are essential for preventing mother-to-child HBV transmission, whereas identification and treatment of HCV-infected women before pregnancy or during their reproductive years may reduce subsequent vertical transmission. Consequently, reducing viral hepatitis among women of childbearing age may generate intergenerational benefits by preventing chronic infection and associated long-term liver disease in children.

Health inequality analyses demonstrated different patterns between HBV and HCV. CHB-related inequalities improved between 1990 and 2021, likely reflecting expanded vaccination programs and improved prevention strategies. Global HBV control programs, including universal infant vaccination and antiviral prophylaxis during pregnancy, have substantially reduced transmission risks [8, 9]. However, CHC-related inequalities remained persistent, particularly regarding mortality and DALY outcomes. Limited access to HCV testing and DAA treatment remains a major obstacle in achieving equitable HCV elimination [10, 12].

Future projections using BAPC models indicated continued improvement in CHB burden by 2050. In contrast, CHC prevalence is predicted to remain stable or increase slightly, with persistent disease burden among older reproductive-age women (Figure 1 D). These findings suggest that future hepatitis elimination strategies should maintain successful HBV prevention programs while accelerating HCV screening and treatment expansion.

The continuing burden of CHC among women of childbearing age requires particular attention. Unlike HBV, no preventive vaccine is currently available for HCV, and although highly effective DAA therapies have transformed treatment outcomes, barriers related to cost, healthcare access, and diagnosis remain substantial in many regions [10, 12]. Integrating HCV testing and treatment into reproductive healthcare services may provide an effective approach to reducing disease transmission and improving maternal health outcomes.

This study has several limitations. First, GBD estimates rely on available surveillance data, and underdiagnosis may remain substantial in regions with limited healthcare resources. Second, future projections assume continuation of current intervention patterns and may not fully capture future advances in prevention and treatment. Third, the present study quantified disease burden only among women aged 15–49 years. Although maternal HBV and HCV infections can influence neonatal and pediatric health through vertical transmission, the GBD estimates analyzed here did not allow us to attribute neonatal or childhood DALYs specifically to maternal infection. Consequently, the total intergenerational health burden associated with HBV and HCV infection among women of childbearing age may be underestimated. Nevertheless, this analysis provides a comprehensive evaluation of hepatitis burden among women of reproductive age by integrating temporal trends, socioeconomic inequalities, and future predictions.

In conclusion, CHB and CHC continue to represent important global health challenges among women of childbearing age. The decline in CHB burden demonstrates the effectiveness of vaccination and prevention strategies, whereas persistent CHC burden highlights remaining gaps in screening and treatment access. Strengthening equitable hepatitis prevention, diagnosis, and treatment within maternal healthcare systems will be essential to achieving global viral hepatitis elimination goals.

Data availability

Data were obtained from the Global Burden of Disease database.

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Ethical approval

Not applicable.

Conflict of interest

The authors declare no conflict of interest.

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