Global burden of uterine fibroids among reproductive-aged women

Jun Wang[1], Juan Zhou[1], Anni Huo[1], Xia Cao[1], Wang Chen[2]*

[1]3201 Hospital, Hanzhong, China
[2]School of Biological Science and Engineering, Shaanxi University of Technology, Hanzhong, China

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***Corresponding author**
Wang Chen
School of Biological Science and Engineering
Shaanxi University of Technology
Hanzhong 723000, China
E-mail: chenwang@snut.edu.cn

Uterine fibroids, also known as uterine leiomyomas or myomas, are benign smooth-muscle tumors arising from the myometrium and represent one of the most common gynecological conditions in women [1]. Although often asymptomatic, 20–50% of affected women develop symptoms requiring clinical attention, including heavy menstrual bleeding, anemia, pelvic pain, and infertility [2]. Women of reproductive age constitute a particularly important population in the epidemiology of uterine fibroids [3], as fibroids in this group directly affect menstrual health, fertility, and reproductive autonomy through uterine cavity distortion, compromised implantation, and altered reproductive function [4]. Focusing on this age group allows evaluation of the burden when the disease has the greatest implications for reproductive decision-making, quality of life, and health-care utilization.

Using Global Burden of Disease 2021 estimates covering the period from 1990 to 2021 [5], we assessed the incidence and disability-adjusted life years (DALYs) of uterine fibroids among women aged 15-49 years across 204 countries and territories. We combined geographic and age-specific assessments with demographic decomposition and Socio-demographic Index (SDI)-based frontier analysis. This study aims to inform equity-based, region-specific strategies to reduce the global burden of uterine fibroids.

Methods. ***Data sources and processing.*** Data were obtained from the Global Burden of Disease Study 2021 through the Global Health Data Exchange results tool on May 1, 2026 (http://ghdx.healthdata.org/gbd-results-tool). We extracted uterine fibroid estimates from 1990 to 2021 across 204 countries and territories. Main measures included incidence and DALYs, with corresponding absolute numbers, age-standardized rates, and 95% uncertainty intervals [6]. The analysis focused on women aged 15–49 years. SDI data were also obtained to assess the relationship between socioeconomic development and disease burden.

Statistical analysis. We performed descriptive statistics to summarize disease burden across geographies, age groups, and time periods. Decomposition analysis was applied to disentangle the drivers of changes in the absolute number of age-related disease cases and DALYs [7]. Frontier analysis was performed to quantify the gap between the observed burden and the frontier value estimated for countries at a comparable SDI level [8]. All tables and figures were generated using R software (version 4.0.5) with the ggplot2 package.

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Results. ***Global distribution of age-standardized incidence rates.*** Marked geographic heterogeneity in uterine fibroid age-standardized incidence rates (ASIR) persisted across 204 countries from 1990 to 2021. National ASIR ranged from 167.30 in Australia to 1,306.73 in Latvia in 1990, and from 159.71 in New Zealand to 1,357.43 in Latvia in 2021 (Supplementary Material S1). The highest rates remained concentrated in Eastern Europe, parts of Latin America, and Southern Africa. ASIR rose in 183 countries and declined in 21, with the largest increases in Brazil, Georgia, and India, and the greatest decreases in Poland, the United Kingdom, and Austria. These findings indicate persistent geographic heterogeneity in GBD-estimated uterine fibroid incidence.

Global distribution of age-standardized DALY rates. The age-standardized DALY rate (ASDR) of uterine fibroids among women aged 15-49 years showed substantial cross-national heterogeneity in 1990 and 2021 (Figure 1 A). In 1990, rates ranged from 0.77 in New Zealand to 29.10 in Antigua and Barbuda. In 2021, they ranged from 0.56 in New Zealand to 21.25 in Guyana. High DALY rates were concentrated in the Caribbean, Central America, and southern Africa in both years. The lowest rates were consistently observed in New Zealand, Australia, and selected Middle Eastern countries. Overall, 159 of 204 countries showed declines, while 45 increased. The largest increases occurred in Gambia, Guinea-Bissau, and Sierra Leone, whereas the greatest decreases occurred in Antigua and Barbuda, Cuba, and Guatemala. These findings indicate a declining but geographically unequal DALY burden among reproductive-aged women.

Age-specific patterns across SDI quintiles and GBD regions. The age-specific pattern of uterine fibroid incidence among women aged 15-49 years remained consistent across 21 GBD regions and five SDI quintiles between 1990 and 2021 (Figure 1 B). Globally, incidence was concentrated in women aged 30-39 years and peaked at 35–39 years. This pattern was observed across all SDI quintiles and most regions. In contrast, DALYs showed a later-age pattern: women aged 40–49 years accounted for 58.1% of DALYs in 1990 and 54.5% in 2021, with the peak shifting from 45–49 years to 40–44 years. Across SDI quintiles, DALYs remained dominated by women aged 40–49 years. Thus, incidence peaked in mid-reproductive ages, whereas the DALY burden was concentrated in later reproductive ages.

Decomposition of changes in incidence and DALY counts from 1990 to 2021. Decomposition analysis showed that population growth accounted for 72.11% and 73.25% of the global increases in incident cases and DALYs, respectively (Figure 1 C), while population aging and epidemiological change contributed less. Regional heterogeneity was marked. South Asia, Western Sub-Saharan Africa, and North Africa and the Middle East showed the largest absolute increases. Population growth contributed most in these regions. In contrast, Eastern Europe, Central Europe, Western Europe, and High-income Asia Pacific experienced net declines. Favorable epidemiological changes contributed to offsetting demographic pressures in these high-income settings. Across SDI quintiles, low-middle, middle, and low SDI groups had the greatest DALY increases. This pattern highlights the greater absolute increases in DALYs in lower-SDI settings.

Frontier analysis of incidence and DALY rates across SDI levels. Frontier analysis using country-year observations from 1990 to 2021 showed substantial heterogeneity in uterine fibroid burden among women aged 15–49 years across SDI levels (Figure 1 D). The left panels show the evolution of incidence and DALY rates across the SDI spectrum during 1990–2021, whereas the right panels present country-specific values in 2021 and indicate whether rates increased or decreased relative to 1990. In 2021, several countries had incidence rates far above the attainable frontier. Latvia showed the largest efficiency gap, followed by the Russian Federation, Ukraine, and Belarus. New Zealand, Somalia, and Afghanistan were close to the frontier.

For DALYs, between-country variation was even more pronounced. The Bahamas showed the largest efficiency gap, followed by Guyana and Trinidad and Tobago. New Zealand, Australia, and Indonesia were close to the DALY frontier. These results indicate substantial observed-to-frontier gaps across SDI levels.

Discussion. This study identified distinct geographic patterns of uterine fibroid incidence and DALY burden: incidence was highest in Eastern Europe, whereas disability burden was greatest in the Caribbean, Central America, and southern Africa. Incidence peaked earlier than DALYs, population growth contributed most to the increase in absolute burden, and frontier analysis revealed substantial country-level gaps. By integrating age-specific analysis, demographic decomposition, and SDI-based frontier analysis in women aged 15–49 years, this study further clarifies patterns in disease burden and supports the hypothesis that GBD-estimated incidence may reflect diagnostic intensity, whereas DALYs may better indicate delayed recognition and inadequate symptom management [9, 10].

Regional variation likely reflects multiple factors. Recorded incidence may be shaped by access to ultrasonography, gynecological assessment, incidental detection, diagnostic thresholds, and

coding practices; therefore, low incidence in resource-limited settings may indicate underdiagnosis rather than low occurrence [11]. High DALY rates may reflect delayed recognition of heavy menstrual bleeding, untreated iron-deficiency anemia, and limited access to imaging, medical therapy, and fertility-preserving procedures [4, 9, 10]. Ancestry-related differences in uterine fibroid burden have been recognized as an important area of investigation [12], while current mechanis-

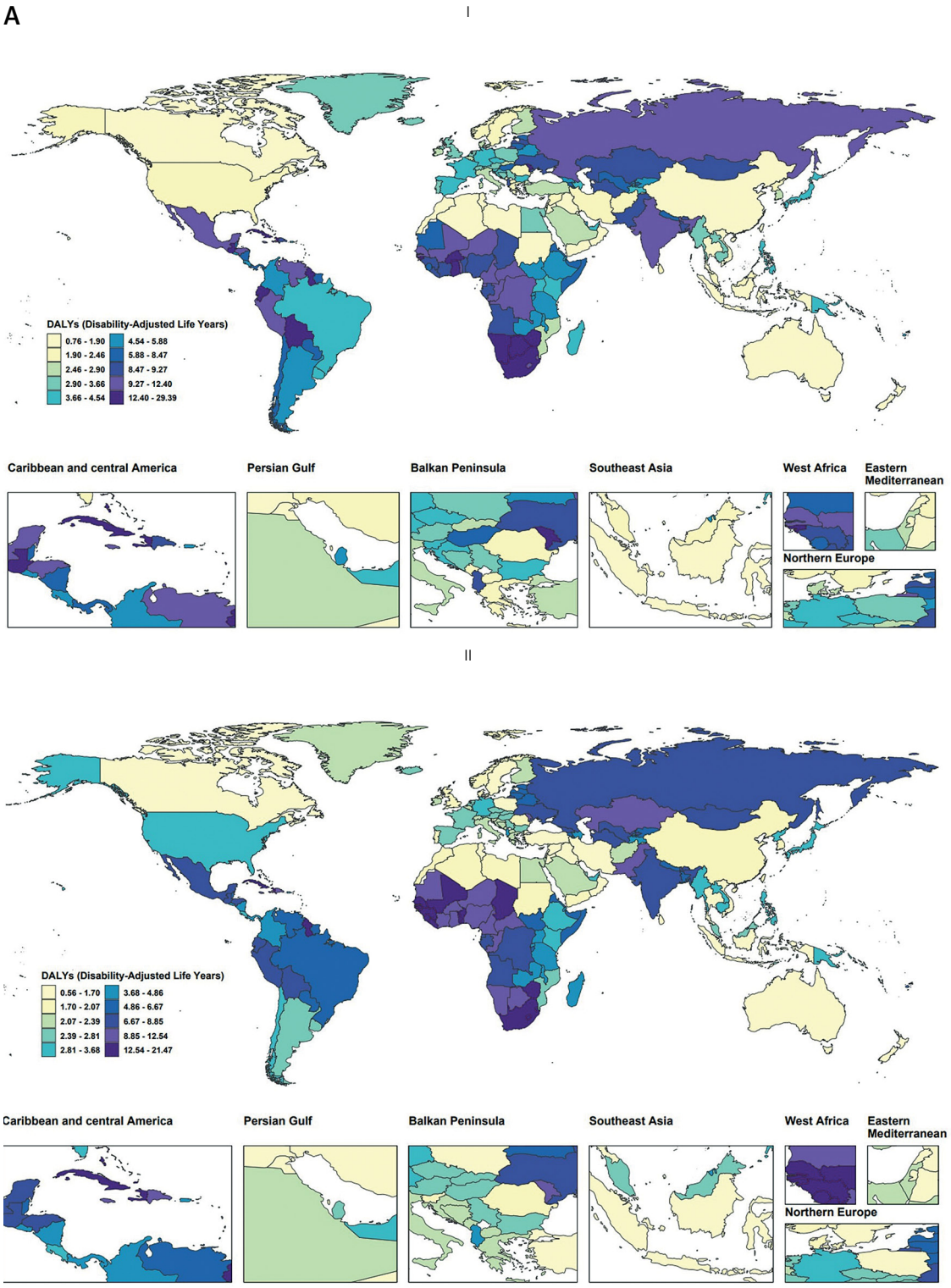

Figure 1. Comparative analysis of the global burden of uterine fibroids among women of reproductive age in 1990 and 2021. **A** – Global distribution of age-standardized disability-adjusted life year (DALY) rates of uterine fibroids in 1990 (I) and 2021 (II)

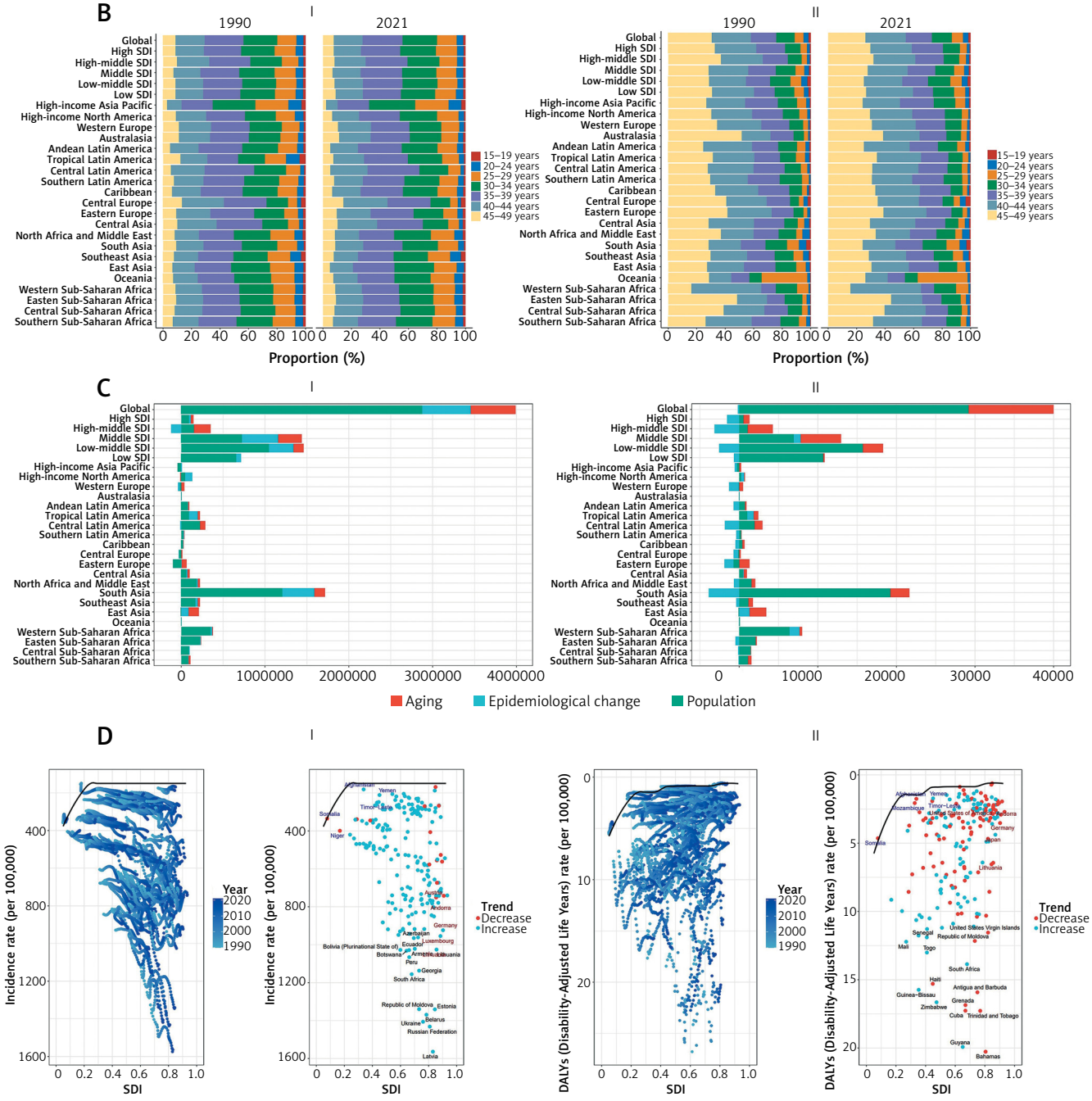

Figure 1. Cont. **B** – Age-specific distribution of uterine fibroid incidence (I) and DALY rates (II) across Socio-demographic Index (SDI) quintiles and Global Burden of Disease (GBD) regions. **C** – Decomposition of changes in uterine fibroids incidence (I) and DALYs (II) by region (1990–2021). **D** – Frontier analysis of age-standardized incidence (I) and DALY (II) rates of uterine fibroids by SDI, 1990-2021. The left panels show all country-year observations from 1990 to 2021. The right panels show 2021 country-specific values and changes from 1990

tic reviews implicate multiple genetic, hormonal, cellular, and molecular pathways in fibroid development [2, 13]. These factors may interact with adiposity, vitamin D status, and other metabolic or environmental exposures, while social and healthcare conditions may modify recognition and outcomes [3, 9, 13]. However, the present analysis cannot determine the relative contributions of these mechanisms.

Population growth may continue to increase demand for uterine fibroid services even where age-specific rates remain stable. Policy responses should therefore be matched to regional burden profiles rather than based on a uniform global strategy. In high-incidence but relatively low-DALY settings, priorities include standardized imaging and diagnostic criteria, consistent coding, and avoidance of unnecessary intervention for

incidentally detected asymptomatic fibroids [4, 11, 14]. In high-DALY settings, a feasible tiered pathway would include symptom-triggered assessment of heavy menstrual bleeding in primary care, hemoglobin testing and iron treatment, timely ultrasound referral, access to affordable evidence-based medical therapy, and referral networks for safe fertility-preserving procedures or surgery [9, 10, 15]. Countries experiencing rapid population growth should additionally plan for gynecological workforce capacity, ultrasound capacity, essential medicines, and anemia services.

Several limitations should be noted. GBD estimates may be affected by incomplete national data, underdiagnosis, and inconsistent coding, especially where imaging access is limited. The database also lacks individual-level clinical, demographic, environmental, treatment, and healthcare-access information, preventing direct testing of regional mechanisms or causal interpretation. Restricting the analysis to women aged 15–49 years also limits generalizability beyond reproductive age. Estimates for 2020–2021 may also reflect pandemic-related disruptions in diagnostic access.

In conclusion, among women aged 15–49 years, uterine fibroid incidence and DALY burden showed distinct geographic patterns, disability peaked later, population growth drove most of the increase in absolute burden, and several countries had large observed-to-frontier gaps. Strategies should prioritize standardized diagnosis in high-incidence settings and accessible anemia care, ultrasound, treatment, and fertility-preserving services in high-DALY settings. These findings may also guide future research and clinical care for women beyond reproductive age.

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Availability of data and materials

All data are open-access and available through the Global Health Data Exchange query tool (http://ghdx.healthdata.org/gbd-results-tool).

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Ethical approval

Not applicable.

Conflict of interest

The authors declare no conflict of interest.

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